Regulation, risk and investment incentives

Regulatory Policy Note 06

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May 2010

Expertise Centre

Explanatory note

The Dutch Independent Post and Telecommunications Authority (OPTA) regulates the postal and electronic communication markets in The Netherlands. OPTA is an independent executive body that commenced its activities on the first of August 1997. OPTA's mission is to ensure competition and trust in the communications sector in the interests of the consumer.

In terms of market conditions, market structure and regulatory framework, electronic communications and postal markets present a continuously changing landscape. In this environment, OPTA has committed itself to continuously improve the transparency of economic reasoning on which strategic choices are made. In 2008 the OPTA bureau was complemented with the Expertise Centre. The Expertise Centre is formed by the legal expert and the economic expert and is responsible for developing economic reasoning and stimulating discussion on key issues within the telecommunications and postal markets. To achieve this, the Expertise Centre produces policy notes - short discussion papers. Economic Policy Notes focus on economic issues and principles. Regulatory Policy Notes focus on strategic economic issues in specific regulatory fields.

Often, lessons can be drawn from past cases. Policy Notes will try to benefit from analysing such cases. These Notes, however, are aimed at contributing to the development of future OPTA policies and are focused on providing sound economic reasoning to that effect. For the purpose of these Notes it is not necessary to take into account other considerations, either of a factual or of a policy nature that may have played a role in these past cases. Policy Notes are also not aimed at reviewing past policies or expressing future policies. They are solely intended to stimulate discussion and critical review within as well as outside of OPTA, thus laying a basis for the development of future policies.

The analyses and conclusions expressed in Economic and Regulatory Policy Notes of the Expertise centre do not necessarily reflect the opinions of the commission of OPTA. As such, the opinions in the policy notes, in whatever shape or form, do not have a legal status. Quotes from and references to these Notes can be made freely, provided that such quotes and references sufficiently express the preliminary character and purpose of the Notes.

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Executive summary

The emergence of Next Generation Access (NGA) networks has induced a renewed interest in access regulation and investment incentives. Like the investments in the traditional legacy networks investments in NGA networks have an irreversible character and are for a large part literally “sunk”. In addition investors in NGA networks are facing considerable uncertainty on a number of factors such as willingness to pay for the new types of services provided over these networks and regulation.

Public policy makers and regulators are facing difficult decisions. Investments in NGA networks are considered to be a desirable development which will enable the provision of innovative and better broadband services. The emergence of NGA networks logically raises the question whether regulation dealing with market power on the traditional networks should also apply to NGA networks. In this discussion NRAs will have to find a balance between the objectives of fostering efficient investment in new infrastructure and fostering competition.

This paper deals with the issues discussed above. It describes the balance between the objectives of encouraging competition and encouraging efficient investment and gives a theoretical overview of types of risk and the relationship between these types of risk and investment incentives and the impact of different types of regulation on risks faced by the investors and the possible actions of a regulator to deal with risks. The paper assesses OPTA’s approach on the regulation of access to unbundled fibre against these theoretical insights.

The risk that investors in NGA networks are facing can be broken up into different types of risks. The risks that capital investors face can generally be classified as systematic or non-systematic. Systematic risk is the variability in outcome caused by macro economic or economy wide events such as changes in interest rates, growth in the economy and changes in exchange rates. Since the systematic risk of an investment can not be diversified away by an investor, its is compensated in the Weighted Average Cost of Capital (WACC). Non-systematic risks are the risks not related to the market portfolio and not compensated through the WACC. They reflect idiosyncratic issues that are specific to the business or the industry in question. The risks associated with regulatory intervention are also non systematic due to their nature. Regulatory intervention can create asymmetric risk as a result of which investment incentives in new networks can be affected negatively. A National Regulatory Authority (NRA) can neutralize these effects by ensuring that the owner of the regulated business is compensated for the asymmetric risk induced by regulation.

Because of the fact that investments in NGA networks can be characterised for a large part as irreversible and sunk, the risks of these investments are considered to be higher than average. Furthermore, there are significant regulatory risks associated to investments in NGA networks. Risks of both the firm investing in the NGA networks and the firms seeking access to the NGA network can be influenced by mandating access to the Next Generation Networks against regulated prices. The risk distribution is also dependent on the methodology used to calculate the access fee. Rate of return

regulation for example creates incentives to invest more than economically optimal and price-cap regulation has an asymmetric effect on the risks associated with the investment.

In a non-regulated environment a firm has several possibilities to manage risks. These possibilities may be reduced as a result of regulation. An NRA can compensate for this, first by allowing for appropriate compensation for risks. In addition we suggest NRA's to design a regulatory system in such a way that it allows the investing firm enough room to take measures to reduce the risks it is facing. Furthermore we suggest NRA's to explicitly recognise that regulation itself can be an important source of risk. The level of regulatory risk can be reduced by setting out a clear and transparent regulatory framework to which the NRA commits itself for a longer period.

Important elements of the regulatory approach of OPTA are the policy rules on unbundled access to fibre networks and the measures they contain allowing investors to deal with risks. By issuing policy rules OPTA reveals information about the regulatory regime in the upcoming years. This reduces regulatory uncertainty. In the regulatory regime introduced, OPTA commits to a long term price-cap. The price-cap will only be adjusted if actual rates of return turn out to be higher than a certain percentage above the rate of return initially expected. In comparison to a regulatory regime in which the price-cap is reviewed every three years, the system of multiyear regulation introduced by OPTA has positive effects on investment and efficiency incentives.

Furthermore, OPTA allowed the investor to take several risk reducing measures. A discount scheme based on actual penetration reduces the sensitivity of the rate of return for penetration rate and thereby reduces risk. By allowing the use of price indexation, OPTA gives the investor some degree of freedom in choosing the optimal pricing technique. This freedom subsequently may reduce the investor's risks. By giving the investor the choice to recoup fixed costs via a one-off fee or periodic fees, the investor can affect his own investment risk and the entry risk resting on the buyers of unbundled fibre access ('risk sharing').

Although it is hard to quantify the effects, in our opinion, the combined impacts of the measures contained in OPTA's price-cap regime for NGA, can be summarized as presented in the table below. Compared to a regular price-cap regime, OPTA's price-cap regime for NGA is slightly less able to prevent monopoly profits. However, the regime is better able to provide efficiency incentives and in particular investment incentives.

	Prevent monopoly profits	*Efficiency incentives*	*Investment incentives*
Allowing an optimistic scenario	↓	↑	↑
Policy rules	0	0	↑
Freedom of risk reduction	0	0	↑
Cumulative result	↓	↑	↑↑↑

1 Introduction

The emergence of NGA networks has brought the discussion on the effect of access regulation on investment incentives back at the discussion tables of regulatory agencies and regulated companies. The issue of access regulation and investment incentives is not a new one. A new issue in this discussion is the way in which access regulation interacts with the risks associated with investment in next generation networks. Up till a few years ago access regulation in the telecommunications industry in Europe was in general restricted to access to existing legacy networks of incumbent operators who enjoyed advantages due to their former monopoly position. The concern for investment incentives was centred around the effects of regulation on incentives of third party access seekers and on incentives of incumbents to maintain the quality of the network and to upgrade existing networks. Risks associated with these type of investments were not considered to be very special compared to the risks of the companies as a whole.

The emergence of NGA networks has induced a renewed interest in access regulation and investment incentives. Like investments in traditional legacy networks investments in NGA networks have an irreversible character and are for a large part literally “sunk”. If their economic return falls below competitive levels, the firm cannot shift the assets to other uses because of their sunk and irreversible nature (Hausman, 1999). In addition investors in NGA networks are facing considerable uncertainty on a number of factors. On the demand side there is considerable uncertainty on consumers willingness to pay for the new types of services provided over these networks. While traditional telecommunications services like voice telephony tend to have a fairly stable demand profile, the demand for higher value services tend to be more income sensitive due to the more luxury character. This makes demand more volatile and difficult to predict (Pindyck, 2007). On the supply side operators are facing the prospect of competition through either investments in competing networks or by entry through regulated access to the new networks. Furthermore investment in NGA networks involves great sums.[1] Since its emergence NGA is still in its infancy, the investments in this type of networks are, for the vast majority of connections, still waiting to happen. As a result, investors are currently facing decisions to make irreversible investments of a major size into a sunk infrastructure in a situation with considerable uncertainty. Logically this has an impact on their incentives to invest.

Public policy makers and regulators are also facing difficult decisions. Investments in NGA networks are considered to be a desirable development which will enable the provision of innovative and better broadband services and therefore of great importance to the development of the European economy.[2] The prospective investors in NGA networks are for a large part the former incumbent operators. These parties have developed plans for NGA networks for reasons like meeting the increased demand for bandwidth, catching up with competition based on upgraded coaxial networks and cost reductions.

[1] Investments in FttH networks typically amount to some EUR 1,000 per line connected. The total investment involved in a nationwide roll-out of Ftth networks thus comes to several billions.

[2] Draft COMMISSION RECOMMENDATION of 12 June 2009 (for second public consultation) on regulated access to Next Generation Access Networks (NGA), recital 1, http://ec.europa.eu/information_society/policy/ecomm/doc/library/public_consult/nga_2/090611_nga_recommendation_spc.pdf

The former incumbents in Europe all still enjoy significant market power at the network level and therefore are obliged to provide unbundled access to their networks. The emergence of NGA networks logically raises the question whether regulation dealing with market power on the traditional networks should also apply to NGA networks. In this discussion NRAs will have to find a balance between the objectives of fostering efficient investment in new infrastructure and fostering competition. The way regulation takes account of the risks associated with NGA investment and if and how investors are compensated for these risks lies in the heart of this discussion.

This paper deals with the issues discussed above. Chapter 2 describes the balance between the objectives of encouraging competition and encouraging efficient investment. Chapter 3 gives a theoretical overview of types of risk and the relationship between these types of risk and investment incentives. In chapter 4 the impact of different types of regulation on risks faced by the investors and the possible actions of a regulator to deal with risks are described. In chapter 5 and chapter 6 OPTA's approach on the regulation of access to unbundled fibre is described and assessed against the theoretical insights of chapter 3 and 4. Chapter 7 provides an assessment of regulatory approach against different objectives and a final conclusion.

2 Encouraging competition and efficient investment

2.1 Introduction

The relationship between encouraging competition and efficient investment has a prominent place in the European Regulatory Framework for electronic communications. According to the 2002 Framework directive, the national regulatory authority has a duty "*to promote competition in the provision of electronic communications networks and electronic communications services by inter alia: (a) [.....] (b) ensuring that there is no distortion or restriction of competition in the electronic communications sector; (c) encouraging efficient investment in infrastructure and promoting innovation".* [3] In case an NRA intends to impose access obligations on an undertaking with SMP it has to take account of (amongst others) "*the technical and economic viability of using or installing competing facilities, in the light of the rate of market development" and " initial investment by the facility owner, bearing in mind the risks involved in making the investment;"*[4]

Although the objective of fostering competition is in the forefront of this objective, an NRA can not exclusively aim at competition in the short term. The framework makes it very clear that in fostering competition, the NRA has to balance in its measures the objectives of competition in the short and the long run. Translated in the context of tariff regulation a regulator is generally faced with a trade off between measures that foster competition in the short term and measures that foster competition in the long run. On the one hand, low access tariffs prevent competition problems as a result of SMP and foster effective competition in the short term. On the other hand, such low access tariffs discourage investments. The opposite applies to high access tariffs: they encourage investments but can work to the detriment of effective competition because entry is hampered in the short term.[5]

2.2 Balancing competition and efficient investment

The trade-off between fostering competition in the short term and encouraging investments has always played a role in the regulation of electronic communications networks. It is however of particular relevance in the case of access regulation in a NGA context. Whereas most access regulation on electronic communications networks relates to legacy networks where investments already have been made and the network is already in existence, this is not the case with NGA networks. The investments in this type of network are, for the vast majority of connections, still waiting to happen. Therefore the questions whether and how access to this networks will be regulated (and specifically the applicable tariff regulation) are thus significant factors for those investing on such large scale in NGA networks. This fact gives encouraging efficient investment a greater weight than before

[3] DIRECTIVE 2002/21/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive), OJ EC, 2002, L 108/33.
[4] DIRECTIVE 2002/19/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 7 March 2002 on access to, and interconnection of, electronic communications networks and associated facilities (Access Directive), OJ EC, 2002, L108/7.
[5] The access tariffs for the legacy infrastructure may have an impact on incentives to invest as well. However, this is beyond the scope of this paper.

but does not mean that the objective of short term competition is irrelevant. The NRA still has to make a trade off between the two objectives.

The importance of this trade off has been recognised in the review of the European Regulatory Framework for electronic communications which was finalised in 2009. The amendments to the directives introduce a new regulatory principle stating that NRAs shall apply objective, transparent, non-discriminatory and proportionate regulatory principles, by inter alia: "*promoting efficient investment and innovation in new and enhanced infrastructures, including by ensuring that any access obligation takes appropriate account of the risk incurred by the investing undertakings and by permitting various cooperative arrangements between investors and parties seeking access to diversify the risk of investment, whilst ensuring that competition in the market and the principle of non-discrimination are preserved;*" [6]

2.3 Overview of economic analysis

The trade off between encouraging efficient investment and encouraging competition has been subject of a growing body of theoretic and empirical economic research. In this context the issue is mostly presented as a trade off between static efficiency and dynamic efficiency (Bennet et. al., 2001). The increased static efficiency due to access regulation seems to be undisputed among economists (Friederiszick et. al., 2008). The effect of access regulation on dynamic efficiency (here represented by telecommunications investments) is the object of conflicting views and empirical research results.

Most theoretical literature on the relationship between access regulation and investment incentives (Hausman, 1999; Pindyck, 2007), points at the negative effects of access regulation (or low access prices) on potential returns on investments in infrastructure which in turn reduces investment incentives of the potentially regulated firm. Some authors also argue that access at cost based charges gives the entrants a risk free option to enter the market at no fixed costs, which negatively affects investment incentives of both access providers and access seekers (Pindyck, 2007). Other authors argue that access regulation can actually increase investment incentives of access seekers when the pricing structure is designed to implement the so called ladder of investment (Cave, 2006).

In the recent years a number of empirical studies have been published on the subject. The outcomes of theses studies point in different directions. For instance, one study performed for ETNO, the European association of telecom incumbents, indicated that lower access prices for ULL negatively affect investment in alternative infrastructure (Waverman et. al., 2007). Another study performed for the ECTA, the European association of competitive telecommunications providers, shows that there is a correlation between the "quality" of the regulatory regime in a certain country, which is measured through a set of indicators, and investment in telecommunications infrastructure (Cadman, 2007). A

[6] DIRECTIVE 2009/140/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 November 2009 amending Directives 2002/21/EC on a common regulatory framework for electronic communications networks and services, 2002/19/EC on access to, and interconnection of, electronic communications networks and associated facilities, and 2002/20/EC on the authorisation of electronic communications networks and services, OJ EU, 2010, L 337/37, article 8.

recent study indicates an insignificant or negative effect of access regulation on broadband penetration (Bouckaert, Van Dijk, Verboven, 2009)

Although the empirical studies do not point in one conclusive direction most theoretical analysis does and on that basis it is in our view fair to see the relationship between encouraging competition through access regulation and encouraging efficient investment as a trade off between different objectives. In the following paragraphs we will explain how this trade off can be made in practice in more detail.

3 Investment and risk

3.1 Introduction

As with every investment there are risks attached to investments in NGA networks. Amongst other things, these risks arise in connection with construction costs (which can turn out higher or lower than forecasted) market demand (penetration can turn out to be higher or lower than previously expected), the cost of capital and relevant regulation. Investments will only be made if there exists at least a reasonable return relative to these risks. This also means that the higher the risks of an investment, the higher the minimum reasonable return must be relative to those risks.

At the moment an investment decision is made, the potential investor has several expectations, for example with respect to the future market share obtained, the growth rate of this market share, the costs and the economic lifetime of the investment. To each of these variables applies that the future values can be higher or lower than expected ex ante. Knowing this in advance, the expectations of the investor with respect to the rate of return of the investment will be normally distributed (see figure 1). If the (average) expected rate of return, which is depicted by the dotted white line, exceeds the cost of the necessary capital for the investment, it is rational to invest. This minimum rate of return is called the “hurdle rate” in investment literature.

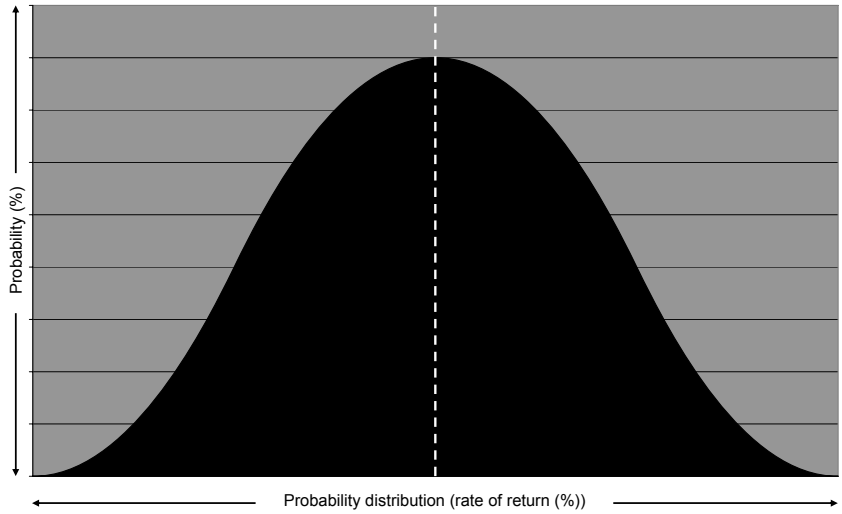

Figure 1: normal distribution of rate of return outcomes[7]

[7] The normal distribution is criticized for being an inaccurate description of investor’s expectations. Instead, some suggest to use distributions with so-called ‘fat tails’. These ‘fat tails’ describe traumatic ‘real world’ events (such as an oil shock or an abrupt change in political situation). In this paper we discuss the effects of regulatory measurements on the distribution of risk. The exact distribution of risk we take as a starting point does not influence the argument we want to make.

If all expectations come true, the actual rate of return will be equal to the expected rate of return. In case some of the outcomes differ from the investors expectations for better or for worse, the actual rate of return will be higher or lower than the expected rate of return ex ante. In case of total failure or success the actual return will be in respectively the left and right tail of the probability distribution. The probability that this very pessimistic or very optimistic scenario occurs is relatively small.

The risk that an investor in NGA networks is facing can be broken up into different types of risks. The following paragraphs describe the way in which these risks are generally classified and describes if and how taking different risks are compensated in a regulated environment.

3.2 Types of risks and their compensation

The way in which investors are compensated for bearing risks depends on the type of risks. Capital investors will only undertake an investment in a certain project if they are properly compensated for the risks associated with that investments. The rate of compensation must therefore be set at a level that adequately compensates for the risk of the investments. This rate of compensation is commonly known as the Weighted Average Cost of Capital (WACC). The WACC of an investment is a rate that reflects the risks of the investment to the providers of capital for the investment, given a particular capital structure (Synergies Economic Consulting, 2009).

3.2.1 Systematic risk

The risks that capital investors face can generally be classified as systematic or non-systematic. Systematic risk is the variability in outcome caused by macro economic or economy wide events such as changes in interest rates, growth in the economy (GNP changes) and changes in exchange rates. The essential feature is that these risks affect all businesses in the economy and therefore can not be diversified away by widening the investment portfolio. The systemic risk associated with an investment in a certain asset can be measured by comparing the variance of the outcomes of the asset with the variance of the outcomes of the market portfolio. This is called the covariance and is referred to as the “beta”. Since the systematic risk of an investment can not be diversified away by investors, it is compensated in the WACC.

The level of systematic risk that may be relevant in the context of NGA networks is amongst others determined by the sensitivity of a firm to GNP shocks. Some determinants for this type of systematic risk are for instance: the income elasticity of NGA services, the duration of contracts between suppliers and customers, the degree or market power, the operating leverage and the type of regulation. Firms producing products and services with low income elasticity of demand (necessities) should have lower sensitivity to real GNP shocks than firms producing products with high income elasticity of demand (luxuries), because demand for their product will be less sensitive to real GNP shocks. The returns of firms with contracts with customers and suppliers for a longer duration should be less sensitive to real GNP shocks. If firms have linear production functions and demand for their output is the only random variable (i.e., they enjoy monopoly power), then firms with greater operating leverage (higher fixed operating costs to total operating costs) should have greater sensitivity to real GNP shocks because their cash flows will be more sensitive to own demand, and hence to real GNP shocks. Firms subject to “rate of return regulation” (price regulation with frequent resetting of prices) should have low sensitivity to real GNP shocks, because the regulatory process is geared towards achieving a fixed rate of return.

3.2.2 Non-systematic or idiosyncratic risks

Non-systematic risks are the risks not related to the market portfolio. They reflect idiosyncratic issues that are specific to the business or the industry in question. Investors can eliminate their exposure to non systematic risk by holding a large diversified portfolio. Therefore these risks do not have to be compensated through the required rate of return. These risks however do affect the value of the investment. The company that has to bear the non systematic risk incorporates the expected impact of the exposure to these risks in its expected cash flows. Through this the non systematic risks affect the expected value of the investment. Expressed in financial terms this value is represented by the Net Present Value of the future cash flows discounted against the WACC. Examples of non systematic risks are the managerial decisions of the firms itself and the risks associated with irreversible investment in sunk assets. The risks associated with regulatory intervention are also non systematic due to their nature. This will be explained in following paragraph.

3.2.3 Regulatory risk

The risks induced by regulation can be either symmetric or asymmetric depending on the way in which they affect the distribution of outcomes of a certain project. If regulation affects both the upside and the downside risk to the same extent the regulation has a symmetric effect on risk. This effect can be increasing or decreasing depending on the type of regulation.

For example pure rate of return regulation has a symmetric effect on risk. Under rate of return regulation the investing firm would be able to earn a fixed return on its investment, irrespective of the success of the project. In this case the regulation does not directly affect the expected value of the

investment project but only the possible spread of outcomes (which represents risks). The reduction of risk is symmetric because both the upside and the downside risks are reduced with the same amount.

If regulation only affects the upside of the distribution, by truncating the distribution at a certain level or making the distribution more skewed on one side of the distribution, the regulation induces asymmetric risk. For instance a price-cap regime can reduce the likelihood of profits above the most likely profit level in the positive scenario while the likelihood of profits under the most likely profit level in the negative scenario is not affected. In this case the upside of the distribution of outcomes becomes more skewed or truncated exposing the firm to an asymmetric risk. The effect of the truncation of outcomes is an average expected profit which is lower than the most likely profit without truncation. The value of the project is therefore negatively affected by the asymmetric truncation of outcomes.

The lower average expected profit in the case that the business is regulated reduces the likelihood that a certain investment will be undertaken compared to the unregulated situation. Since this type of risk is not systematic, it will normally not affect the cost capital. It does however affect the expected cash flows of the business, the likelihood of the return of capital invested in de project and hence the value of the project. In this way the asymmetric risk caused by regulation can negatively affect investment incentives in new infrastructure. If the regulatory authority considers this effect likely and unwanted, the authority would have to take measures to neutralize the effects of regulation on the expected return of the investment project and thus restore the investment incentives to the situation in which there was no regulation. It can do so by ensuring that the owner of the regulated business is compensated for the asymmetric risk induced by regulation.

3.3 Conclusion

The risk that an investor in NGA networks is facing can be broken up into different types of risks. The risks that capital investors face can generally be classified as systematic or non-systematic. Systematic risk is the variability in outcome caused by macro economic or economy wide events such as changes in interest rates, growth in the economy and changes in exchange rates. Since the systematic risk of an investment can not be diversified away by an investor, it is compensated in the WACC. Non systematic risks are the risks not related to the market portfolio and not compensated through the WACC. They reflect idiosyncratic issues that are specific to the business or the industry in question. The risks associated with regulatory intervention are also non systematic due to their nature. Regulatory intervention can create asymmetric risk as a result of which investment incentives in new networks can be affected negatively. An NRA can neutralize these effects by ensuring that the owner of the regulated business is compensated for the asymmetric risk induced by regulation.

4 The relation between investment, risks and types of regulation

4.1 Introduction

Investments in NGA networks can be characterised for a large part as irreversible and sunk. This has implications for the level of risk associated with these investments. In a perfectly contestable market, if the return of an investment decreases below the competitive return, the investment is removed from the market and used elsewhere. In markets like the telecommunications market investments in networks are industry specific and often cannot be used for other purposes. Furthermore, since a large part of the costs are related to digging in the ground, the investments are literally sunk. The irreversible and sunk character of the investment means that if the return on the assets falls below competitive level, a firm that has invested cannot shift the assets to other uses because of their sunk and irreversible nature (Hausman, 1999). In other words, the firm has only one way to recoup its investment and that is to stay in the market and bear the risks of the investments. As a result of this the risks of sunk and irreversible investments are generally considered to be higher than average (Hausman and Myers, 2002).

Furthermore, there are significant regulatory risks associated to investing in NGA networks. The prospective investors in NGA networks are for a large part the former incumbent operators. These parties have developed plans for NGA networks to meet the increased demand for bandwidth, to catch up with competition based on upgraded coaxial networks and to reduce cost reductions. The former incumbents in Europe all still enjoy significant market power at the network level and therefore are obliged to provide unbundled access to their networks. The emergence of NGA networks logically raises the question whether regulation dealing with market power on the traditional networks i.e. mandated access should also apply to NGA networks.

4.2 The impact of different regulatory regimes on investment incentives

Mandated access to the Next Generation Networks against regulated prices can affect both the level of the risk the firm investing in NGN is facing and the distribution of risks between the firm investing in the NGA networks and the firms seeking access to the NGA network. This can be shown by the following example.[8]

Suppose a competitor of the firm that considers to invest in an NGA network wants to have access to the NGA network in order to provide services at the downstream market. The firm that considers investing could offer the access seeker a contract for the economic lifetime of the asset. The price of that contract would be the total investment costs plus the operating expenses. By making such a contract the investing firm shifts all the economic risks associated with the investment to the access seeker. If demand does not materialize the investing firm is still paid for the provision of access while

[8] This example is inspired on: Hausman, Jerry A. (1999), Regulation by TSLRIC: economic effects on investment and innovation, Multimedia Und Recht, 8 (3), 22-6.

the access seeker bears the complete economic risk and is does not recover its costs of access to the NGA network. The firm can also make an agreement with the access seeker to share the costs of the investment and share the future rights of use of the infrastructure. In this scenario both firms share the risks associated with the investment.

Under a regulatory scheme that mandates unbundled access, the outcome is different. Suppose that in such a situation the access seeker could decide to start to rent the unbundled element at any given moment in the good times and could decide to stop doing so at any given moment in bad times. If demand is materializing and or downstream prices are high, the access seeker could then enter the market and capture a share of the returns of the investment at the downstream level. If demand is not materializing or prices fall the access seeker could exit the market easily by ceasing to rent unbundled elements from the investing firm without incurring any risks. The economic risks associated with the investment would have to be borne by the investing firm and not by the access seeker. The mandated access regime can therefore create an asymmetric distribution of risks.

The risk distribution is also dependent on the methodology used to calculate the access fee. This can be explained by taking two extreme examples: pure rate of return regulation and a pure price-cap system.

4.2.1 Rate of return regulation

Under rate of return regulation such as a Fully Distributed Costs (FDC) regulation where the access price is based on the actual realised costs divided by the actual realised volumes plus a reasonable return, the access price varies with the volumes realised on the network.[9] Under such a scheme the investing firm may recoup its investment costs through the access price regardless of the market success of the investment. In bad times when volumes are low the resulting access prices will be high and conversely in good times when volumes are high access prices will be low. The effect of using this type of rate of return regulation is that the risks associated with the investment are neither borne by the investing firm nor by the access seekers but passed on to the end users of the network. The level of risk that the investing firm faces is therefore greatly reduced, possibly even to zero. So under rate of return regulation, the investing firm gets a guaranteed return regardless of the market success of the investment which in turn causes the required return of the investment (WACC) to be lower.[10] The lower required return means that more investment projects are considered profitable than would be the case with a higher required return which in turn increases the incentives to invest.

This effect of rate of return regulation is realistic in situation where demand is fairly stable and relatively inelastic. In the NGA context however the willingness of end users to pay for new services

[9] We acknowledge that this is the effect of ex post calculation of the access price and not as such a feature of all types of FDC regulation.

[10] Note that in this sense rate of return regulation is circular since the risk profile and the WACC are affected by the type of regulation while at the same time the WACC is also used to calculate the reasonable rate of return for the regulated firm. See for further discussion: (Pedell, 2006. p 166).

over the NGA network is uncertain which causes demand uncertainties. This uncertainty restrains the possibilities to raise access prices even though regulation would allow it. If the prices are higher than customers are willing to pay, demand would not materialize.

Although rate of return regulation is effective in preventing rent extracting through excessive profits (only truly realized costs are reimbursed and the rate of return is fixed) it has important drawbacks in realizing the goals of efficient production of services. These drawbacks relate to the so called Averch Johnson effect. Due to this effect there exists a great danger of investments above the socially optimal level. In essence rate of return regulation ensures a profit margin on increases of the capital stock which causes the cost of capital of the regulated firm to effectively decrease relative to the cost of labour. A profit maximizing firm that is subject to this type of regulation would, as a result of the relative decrease of its cost of capital, make long run production decisions that use a higher capital/labour ratio than would be cost-minimizing given the firm's production function and true labour costs (Joskow, 2008). In practice this would amount to what is generally called "gold plating". Rate of return regulation therefore creates incentives to invest more than economically optimal.

4.2.2 Price-cap regulation

Under a price-cap regulation system a regulator fixes a price ceiling for a certain service or group of services for a certain period. This price ceiling is usually determined by the following formula: $p^1 = p^0 (1 + rpi – x)$ where rpi is the measure for inflation and x a target productivity gain. Normally the level of p^0 would be set on the basis of some cost measure. The price ceiling applies for a fixed period (normally 3 to 5 years) after which the price-cap will be reviewed and a new p^0 will be set.

The advantage of price-cap regulation is that it protects end users from exploitation of market power and that it creates incentives for efficiency in the production of services and incentives for increasing output. Any increased yields resulting from increasing efficiency further than the target x or from increased output translates into increased profits for the company. The other side of the same coin is that a price-cap system is less effective in passing through cost reductions or scale economies to the final customers. These are passed through to end users with a delay of the fixed number of periods. In addition price-cap regulation can cause underinvestment because the investing firm may not be able to pass through the cost of the investment to the end users through prices but has to cover these costs from its profits. This can have a negative effect on investment incentives.

Under a price-cap regime the investing firm has no guarantee that it will recover its investment. In bad times when volumes are lower then expected it can only increase the price up to the cap. In good times when volumes are high and hence the costs per unit low, the firm can achieve a higher return compared to the scenario with rate of return regulation. This return however may be lower than the possible return in a non regulated environment.[11] The effect of price-cap regulation on the distribution

[11] In the unregulated situation, when demand turns out to be high, the investing firm has the incentive and opportunity to increase prices above the level of the price-cap, if this enables the firm to increase profits.

of possible outcomes is that the downside is left untouched while the range of possible outcomes on the upside is decreased. Price-cap regulation therefore has an asymmetric effect on the risks associated with the investment.

4.3 The ways in which the regulatory authority can deal with risks

In a non-regulated environment a firm has several possibilities to manage risks. It can treat or mitigate the risk (for instance by insuring itself against uncertain occurrences). It can transfer the risk to another party (for instance by requiring customers to commit themselves to buy output for a longer period) or share the risks with another party (by for instance sharing part of the capital expenditure with others). The firm can also terminate the risk by not undertaking the investment project. Finally the business can take up the risk and set its prices at a level reflecting the level of risks associated with the project.

The possibilities for a firm to manage risks can be restricted by regulation (as discussed above). By restricting possibilities to manage risk, regulation can have an influence on the risk profile of an investment project. In both cases the investment incentives of the regulated firm are affected. As shown above, restricting the possibilities to shift risk from the investing firm to access seekers or end users through regulation is often desirable from the perspective of encouraging competition or protecting consumers. In case a regulatory authority wants to design its regulatory scheme in such a way that it creates the right balance between encouraging efficient investment on one hand and encouraging competition and consumer protection on the other hand the NRA has to take account of the investment risks in its regulatory strategy. The NRA can do so in a number of ways.

The first thing is to allow for appropriate remuneration for risks. As discussed earlier a NRA has to make a trade off between the objectives of providing incentives for efficient investment and the objective of promoting competition. The return that is allowed ex ante on capital to finance NGA networks should therefore strike a balance between providing adequate incentives for companies to invest (implying a sufficiently high rate of return), while at the same time promoting efficiency and sustainable competition and maximizing consumer benefits (implying a rate of return that is not excessive).

As discussed earlier in paragraph 3.2.1 it is common practice that investors have to be remunerated for taking up systematic risk through the WACC. In order to achieve this the regulated reasonable return for the NGA activities could therefore be based on the WACC of the NGA-activities of the regulated company. This mechanism ensures that if investments in NGA networks face a higher systematic risk than other parts of the invested capital a proper compensation for these higher risks is given.

In paragraph 3.2.3 we already discussed that regulation can be an important source of asymmetric risk. Since this asymmetric risk affects the likelihood of the return of capital of an investment, regulation can negatively affect the incentives to invest in a particular project. A regulator that wants to

ensure that its intervention does not negatively affect investment incentives in new networks (relatively to a situation of non intervention) could therefore allow an element of compensation for this risk in the regulated price.[12] This compensation can take the form of an extra allowance of cash flows (in a situation where revenues are regulated) or an additional element of return in the regulated price (in a situation where prices are regulated). If the allowed return is adjusted to compensate for regulatory risk these adjustment can be quite substantial (Pedell, 2006, p. 194).

In addition to measure relating to the appropriate compensation of risks a NRA there are some other options open to a NRA to deal with risks. The first of these options recognizes that the choice of regulatory methodology affects the possibilities of the investing firm to reduce the risk it is facing. In this option the NRA designs the regulatory system in such a way that it allows the investing firm enough room to take measures to reduce the risks it is facing. The second option explicitly recognises that regulation itself can be an important source of risk. The level of regulatory risk can be reduced by setting out a clear and transparent regulatory framework to which the NRA commits itself for a longer period. This period would preferably mirror the investment horizon of the investing firm. The two approaches to deal with risks are explained in more detail in the following paragraphs.

4.3.1 Allowing the investing firm enough room to reduce risks

Not all risks an investor in NGA networks faces are exogenous. As already indicated in paragraph 3.2.2 some risks relate to management decisions on market strategy. An investor in NGA networks has a wide number of possibilities to reduce risks of new infrastructure investment such as[13]:

- Build-and-share projects where the incumbent and alternative operators agree to share e.g. civil engineering works for joint roll-out;
- Commitment from alternative operators before rolling out new infrastructure reducing capacity utilisation risk;
- Bundling of demand. The investor can postpone the roll out till a certain penetration rate is secured by pre-subscription of end-users;
- Planned migration of the installed base of an existing network;
- Recouping investment costs partly via an one-off fee. Recouping the investment early on translates into a lower capital requirement over time and a decrease in the investment risk. This also means that the supplier of new infrastructure access does not bear the whole risk of the investment.

The effect of such measures is that risk is either reduced or transferred from the investing firm to its wholesale customers or end users. Some of these measures directly relate to forms of regulation (such as a one off fee) other ones relate more to cooperation forms between companies that are under competition law scrutiny. The regulatory authority should bear in mind that allowing measures

[12] See also: OXERA (2008) for a discussion on the relevance for ensuring return of capital in regulation of NGA networks.
[13] See for an extensive list: ERG (09) 17, Report on Next Generation Access – Economic Analysis and Regulatory Principles, June 2009, p. 20.

that have a positive effect on the risk profile of the project and therewith investment incentives may have a negative effect on other goals the NRA is pursuing (Pedell, 2006, p. 105). For instance allowing a one-off fee has an effect on the entry conditions of other players. In case risk are transferred to end users these end users may see their welfare reduced. Therefore, also these decisions have to be seen in the context of the trade-off between encouraging efficient investment and encouraging competition.

4.3.2 Providing greater regulatory certainty

Regulatory intervention normally affects or limits the allowed rate of return. Regulatory intervention, or the probability of future regulatory intervention affects the probability distribution of the expected rates of return, which will become left-skewed (see figure 2 below). This causes a decline of the (average) expected rate of return, which has the effect that the expected rate of return may no longer exceed the weighted average cost of capital, which may make investment irrational. It has therefore been claimed that regulatory holidays give the best incentives to invest in NGA networks. A regulatory holiday has as an effect that the probability distribution (as depicted in figure 1 in paragraph 3.1) keeps in shape.

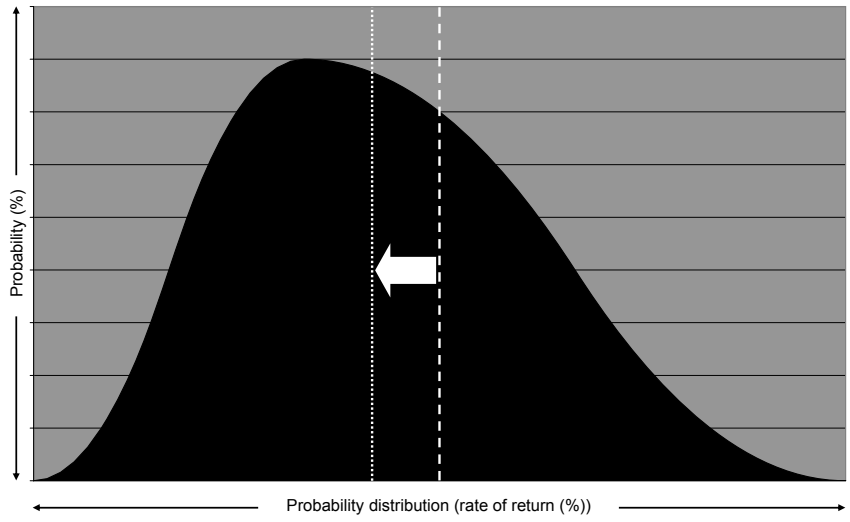

Figure 2. Effect of regulatory intervention on the distribution of outcomes

However, given the uncertainty surrounding the evolution of the electronic communications industry, a NRA cannot argue with certainty that there will be no reason for changing regulation in the future. It is, for example, unclear whether in the course of time the risk of excessively high access tariffs and of margin squeeze will increase. This uncertainty about the future means that some room must be reserved for subsequent intervention in order to continue serving general policy objectives. From this perspective, abstaining from any regulatory intervention, for example by granting a regulatory holiday is not justifiable and therefore not credible.

Taking account of the fact that abstaining from any regulatory intervention now and in the future is not an option, a NRA may choose to vest the greatest possible certainty in its conduct during a specified period or a NRA may choose not to provide such certainty in advance. The crucial point here is whether the regulator's provision of certainty takes place *before* an investment is made or *after* an investment is made. From the perspective of an investor, uncertainty is only reduced (and hence certainty is provides) when the regulators discloses intended regulatory intervention *before* the investment is made. Only in that scenario an investor can assess the likely effects of regulatory intervention on the possible outcomes of the investment project. An important drawback of this approach however is that it bears with it the risk of erroneous intervention. This erroneous intervention can both damage the investing firm which may not be able to recoup its capital investment due to regulatory intervention (which in turn may have an effect on future investment decisions) or the consumers who may face excessive prices as a result of an ill defined price regulation scheme.

Therefore, in providing greater regulatory certainty the regulator has to make a trade-off between the positive effects of greater certainty on investment incentives and possible negative effects of erroneous intervention on welfare. This trade-off can be partly solved by advance specification of the principles and the general mechanics of the regulatory intervention without specifying the exact details of regulation.[14] In this context it has to be noted that the possibilities for providing regulatory certainty under the current regulatory framework are limited by the fact that SMP designations containing the decision whether or not to regulate have to be renewed periodically.

4.4 Conclusion

Because of the fact that investments in NGA networks can be characterised for a large part as irreversible and sunk, the risks of these investments are considered to be higher than average. Furthermore, there are significant regulatory risks associated with investments in NGA networks. Risks of both the firm investing in the NGA networks and the firms seeking access to the NGA network can be influenced by mandating access to the Next Generation Networks against regulated prices. The risk distribution also depends on the methodology used to calculate the access fee. Rate of return regulation for example creates incentives to invest more than economically optimal and price-cap regulation has an asymmetric effect on the risks associated with the investment.

In a non-regulated environment a firm has several possibilities to manage risks. These possibilities may be reduced as a result of regulation. An NRA can compensate for this, first by allowing for appropriate remuneration of risks. In addition we suggest NRA's to design their regulatory system in such a way that it allows the investing firm enough room to take measures to reduce the risk it is facing. Furthermore we suggest NRA's to explicitly recognise that regulation itself can be an important source of risk. The level of regulatory risk can be reduced by setting out a clear and transparent regulatory framework to which the NRA commits itself for a longer period.

[14] ERG (09) 17, Report on Next Generation Access – Economic Analysis and Regulatory Principles, June 2009, p. 20.

5 Encouraging investment

This chapter analyses the regulatory regime that OPTA introduced for unbundled access to fibre networks against the theoretical background described in chapters 3 and 4.
In chapter 4 we explained that the level of regulatory risk can be reduced by setting out a clear and transparent regulatory framework to which the NRA commits itself for a longer period. This period would preferably mirror the investment horizon of the investing firm. Furthermore we explained that an NRA has to recognize that the choice of regulatory methodology affects the possibilities of the investing firm to reduce the risk it is facing. Therefore the NRA has to design the regulatory system in such a way that it allows the investing firm to take measures to reduce the risks it is facing.
While chapter 4 focuses on the theoretical framework of risk reduction induced by the regulator, this chapter will focus on the practical implementation of these measures. Important elements of the regulatory approach of OPTA are the policy rules on unbundled access to fibre networks and the measures they contain allowing the investors to deal with risks. In this chapter we elaborate on these measures in more detail and analyse their intended effects.

5.1 Providing greater regulatory certainty by drawing up policy rules

In paragraph 4.3 we explained that in providing greater regulatory certainty the regulator has to make a trade-off between the positive effects of greater certainty on investment incentives and possible negative effects of erroneous intervention on welfare. This trade-off can partly be solved by advance specification of the principles and the general mechanics of the regulatory intervention without specifying the exact details of the regulation. However, the possibilities for providing regulatory certainty under the current regulatory framework are limited by the fact that the decision whether of not to regulate has to be renewed periodically on the basis of an SMP analysis of the relevant market. OPTA has dealt with this problem by issuing policy rules. In principle these guidelines will apply to unbundled access to fibre networks as long as the operator(s) of these networks have significant market power under the regulatory framework for electronic communications.

5.1.1 Reduction of information asymmetry

In this paragraph we explain the effects of drawing up policy rules compared to a situation of regulatory uncertainty. We do not take into account the actual content of the policy rules. We just examine the effects of the reduction of information asymmetry. As we will explain, OPTA concludes that the positive effects of drawing up policy rules outweigh the drawbacks.

As described in paragraph 4.3.2 an important drawback of policy rules is that it bears the risk of erroneous intervention. This erroneous intervention can both damage the investing firm which may not be able to recoup its capital investment due to regulatory intervention or the consumers which may face excessive prices as a result of an ill defined price regulation scheme. However, the risk of an erroneous intervention can be reduced by specifying the framework governing how *potential* future

intervention will take place, without setting out the precise details of that regulation. These precise details of regulation have to be determined at the beginning of each regulatory period.

On the other hand, by drawing up policy rules, which set out the manner in which OPTA will regulate the tariffs for unbundled fibre access, OPTA reveals information about the regulatory regime in the upcoming years. Acting like this, regulatory certainty is provided before the investment is made. Uncertainty is reduced, because the investor can assess the likely effects of the described regulatory intervention on the possible outcomes of the investment project, before any investment is made. The policy rules therefore act, in themselves, as a constraint on regulatory risk on investments in local fibre loops.

5.1.2 Multi-year regulation

In this paragraph we explain the effects of the introduction of multi-year regulation compared to a situation of one-year or three-year regulation, not taking into account the characteristics of the actual regulatory regime. By means of the policy rules OPTA has shed light on the manner in which it will apply tariff regulation to unbundled fibre access in the future. Hereby, OPTA sees a possibility to provide greater clarity on the way in which it will give substance to remedies in a particular market now or in the future. The introduction of multi-year regulation is necessary, because of the sunk character of the investment the investor has to make a multi-year decision. To give any regulatory certainty, a consistent regulatory approach should apply over successive review periods as well.

In the regulatory regime introduced, OPTA commits to a long term price-cap. The price-cap will only be adjusted if actual rates of return turn out to be higher than a certain percentage above the rate of return initially expected. Under normal price-cap regulation, price-caps are adjusted every regulatory period (every three years). If efficiency gains have been made or if monopoly profits have been made, the price-cap will be negatively adjusted for the next regulatory period. In comparison to a regulatory regime in which the price-cap is reviewed every three years, the system of multiyear regulation introduced by OPTA has positive effects on investment incentives and efficiency incentives.

If an investor knows that, if he makes (excessive) profits, the price-cap will be adjusted within a timeframe of three years, his incentive to invest is reduced. The same holds with respect to incentives to be efficient. If an investor knows that, if he makes efficiency gains, the price-cap will be adjusted within a timeframe of three years, his incentive to be more efficient is limited. By making a commitment to adjust the price-cap only in cases the rate of return exceeds the ex ante expected rate of return with more than a certain percentage, the NRA improves efficiency and investment incentives. On the other hand, the commitment makes it harder to prevent monopoly profits. By maximizing the rate of return to a certain extent, monopoly profits are limited. On the other hand, if the price-cap is adjusted every regulatory period, preventing monopoly profits is easier.

This shows that, like drawing up policy rules, the introduction of multi-year regulation has the important drawback that it bears with it the risk of erroneous intervention. This erroneous intervention can both

damage the investing firm which may not be able to recoup its capital investment due to regulatory intervention (which in turn may have an effect on future investment decisions) and the consumers who may face excessive prices as a result of an ill defined price regulation scheme.

5.2 Allowing the investing firm to take measures to reduce risk

As we explained in paragraph 3.2.2 and 3.2.3, not all risks an investor in NGA is facing are exogenous. An investor in NGA has a wide number of possibilities to reduce risks of new infrastructure investment. We explained that the effect of such measures is that risk is either reduced or transferred from the investing firm to its wholesale customers or end users. The NRA should therefore bear in mind that allowing measures that have a positive effect on the risk profile of the project and therewith investment incentives may have a negative effect on other goals the NRA is pursuing.

In paragraph 5.2.1, 5.2.2 and 5.2.3 we will describe three examples of risk reducing measures by the investor which were allowed by OPTA. If allowing the measure has negative effects on other goals OPTA is pursuing, these negative side-effects are described as well. In general OPTA comes to the conclusion that the negative side effects are rather limited compared to the positive effects on investment incentives (see also paragraph 7.3.3).

5.2.1 Discount schemes

OPTA gives the investor limited degrees of freedom in the use of discount schemes. If only the buyers with a relatively large market share benefit from the discount, wholesale buyers with a relatively small amount of costumers are put at a disadvantage. A discount structure of that sort creates barriers to entry for new parties. For this reason OPTA does not allow discount schemes if they lead to different tariffs for different buyers in the same area. However, OPTA allows discount schemes in which all buyers profit from the offered discount.

Usually, in network industries, there is a negative relationship between market penetration and the cost per connection: the higher the penetration, the lower the cost per connection. This means that, to minimize cost per connection, a supplier of unbundled access to local fibre loops will want to encourage as many buyers as possible to purchase fibre connections. The introduction of a discount scheme is one way of incentivizing buyers, whereby part of the achievable economies of scale are given back to buyers of unbundled fibre access services.

The introduction of a discount scheme based on market penetration leads to relatively higher base prices. However, the prices with discount will be relatively lower in case the actual penetration rate is higher than expected. The net effect of the introduction of the discount scheme is that total turnover and consequently the rate of return becomes less sensitive for the sales volume or the penetration rate. This reduced sensitivity of the rate of return for the penetration rate reduces the risks of the investor. By giving the investor the choice to introduce an discount scheme as described, the investor can transfer some of his own investment risk to the buyers of unbundled fibre access (‘risk sharing’).

5.2.2 Allowing the use of price-indexation

OPTA allows the use of price-indexation. This means that the price-cap may be modified every year. The use of annual indexation must however be taken into account when determining the price-cap in the first year of the regulatory period. This means that the choice of indexation has the effect of not only increasing the tariffs over time, but also that the price-cap in the first year of the regulatory period will be relatively lower than in a situation without indexation.[15] The choice to apply indexation can be made in the interest of permitting over time a specified price model like penetration pricing.

Penetration pricing is the pricing technique of setting a relatively low initial entry price to attract new costumers. Penetration pricing is most commonly associated with a marketing objective of increasing market share or sales volume. Because, in a network industry, increasing sales volumes lowers costs per connection, penetration pricing may be an attractive pricing technique. By allowing the use of price indexation, OPTA gives the investor some degrees of freedom in choosing the optimal pricing technique. The freedom of choice of pricing techniques subsequently may reduce the investor's risks. One of the major risks the investor is faced with is the risk of insufficient sales volume. Especially this risk may be reduced by permitting the use of price indexation.

5.2.3 Allowing both one-off and periodic tariffs

OPTA allows the tariffs for access services for local fibre loops to consist of both one-off fees and periodic fees. By giving the investor the choice to recoup fixed costs via a one-off fee or periodic fees, the investor can affect his own investment risk and the entry risk resting on the buyers of unbundled fibre access ('risk sharing'). The advantage of recoupment via a one-off fee is that the investor recoups some of its investment in the early phase of the economic life of the network. This early recoupment of parts of the investment translates into a lower capital requirement over time, a decrease in the investment risk and an increase in the investor's willingness to invest.

OPTA allows the investor to charge as a one-off tariff a small part of the costs connected to the initial investment per fibre connection. However, charging this one-off fee must not create a barrier to entry for buyers of unbundled fibre access. If relatively many costs are charged as one-off tariffs, this raises the barrier for purchasing services, because a buyer is confronted with higher start-up costs.

5.3 Conclusion

In this chapter we elaborated the measures taken by OPTA in order to reduce risks or allow the sharing of risks. By issuing policy rules OPTA reveals information about the regulatory regime in the upcoming years. This reduces regulatory uncertainty. In the regulatory regime introduced, OPTA commits to a long term price-cap. The price-cap will only be adjusted if actual rates of return turn out to be higher than a certain percentage above the rate of return initially expected. In comparison to a

[15] In a Discounted Cash Flow Model (see paragraph 6.1 for further explanation) an increase in expected future cash flows allows for a lower current tariff.

regulatory regime in which the price-cap is reviewed every three years, the system of multiyear regulation introduced by OPTA has positive effects on investment incentives and efficiency incentives. Furthermore, OPTA allows several risk reducing measures by the investor. The discount scheme based on actual penetration reduces the sensitivity of the rate of return for penetration rate and thereby reduces risk. By allowing the use of price indexation, OPTA gives the investor some degree of freedom in choosing the optimal pricing technique. The freedom of choice of pricing techniques subsequently may reduce the investor's risk. By giving the investor the choice to recoup fixed costs via a one-off fee or periodic fees, the investor can affect his own investment risk and the entry risk resting on the buyers of unbundled fibre access ('risk sharing').

6 Regulating the access price

This chapter describes the price-cap methodology that OPTA applies for determining the access price for unbundled fibre access and the way in which this system provides compensation for the different types of risks associated with investment in NGA networks, as described in chapter 3.

6.1 The level and slope of the price-cap

The price for unbundled access to fibre lines is regulated through a price-cap mechanism. In principle the level of the price-cap is determined by the calculation of an access price at the starting point t^0. The slope of the price-cap is determined in principle by the Consumer Price Index. As described in paragraph 5.2.2. the use of price indexation is a measure to allow the investor to use a pricing technique that may reduce its risks.

Tariffs for NGA access must not exceed this wholesale price-cap. The calculation of the starting point of the price-cap is based on a Discounted Cash Flow Model (DCF model) that includes cash inflows (such as the revenues of providing access) and cash outflows (such as capital expenditures and operational expenditures) over a number of years that equals the expected economic lifetime of the investment project.

The input for this cost model comprises, amongst other things, the expected economic lifetime, the expected market penetration level and the expected expenditure streams and revenue streams over time. OPTA has assessed whether the inputs in this business model contain reasonable, genuinely expected values. The inputs in the business model which are assessed by the NRA are, amongst others, the expected economic lifetime, the expected market penetration, the expected costs and revenues and the expected costs of capital. By 'genuine expectations' is meant ‘neutral’ expectations and not the expectations in a pessimistic or optimistic scenario. Indeed, if these parameters are wrongly estimated, the price-cap cannot be estimated at the right starting level and it can no longer be assumed that competition problems such as excessive tariffs and margin squeeze will be avoided.

Using genuine expectations is important for preventing excessive profits and for providing investment incentives. If the level of the price-cap would be based on pessimistic expectations, it would already be possible to realise high profits in the average scenario. On the other hand, if the level of the price-cap would be based on the optimistic expectation, the chances of realising a profit on the investment project would become small and investment incentives would be negatively affected. Not using the genuine expectations would therefore be in conflict with a key element of the regulatory regime, which is that the NRA excepts some profits in case of success, while the investor has to bear some loss in case of failure.

By using a discounted cash flow model for calculation of the access tariffs OPTA allows the regulated firm a higher degree of flexibility in its pricing. In the view of OPTA a Discounted Cash Flow model is

better suited for regulating access tariffs of future NGA networks than a pure Fully Distributed Cost model. In such a model book value of new network assets is high (more or less equal to that of the investments) which cause high capital costs in the early periods. These costs fall over time in line with depreciation. Hence cost prices are high at the beginning whilst later on they are very low. This can cause entry barriers for access seekers and sub optimal tariffs from a perspective of achieving the desired penetration in the retail market at the beginning of the project and can cause inefficient entry later in time.[16] Another advantage of the use of the DCF model is the possibility to take explicit account of discount schemes, price indexation and one-off tariffs in the calculation of access tariffs.

Since one of the aims of the regulatory approach is to prevent excessive tariffs and margin squeeze, OPTA has to ensure that the expected returns used in de DCF model are set at a reasonable level. In order to do so OPTA has compared the IRR used in the DCF model with a number of WACCs of comparable companies. On the basis of these comparisons, OPTA has concluded that an IRR as proposed by the regulated company was reasonable. In order to ensure that the price-cap is based on costs plus a reasonable return, OPTA has calculated the starting point of the price-cap by setting the NPV in de DCF model at zero. The tariff for fibre access is the output variable of the cost model set out above in which the net present value of the cash flows prior to the investment over the expected economic lifetime of the investment is set at zero. This tariff forms the basis for the price-cap, which provides the investor with flexibility in terms of tariffs. By setting the Net Present Value at zero in the DCF model one can calculate the access tariff at which the investment project breaks even over the lifetime of the project.

The fact that the NPV is set at zero for the purpose of calculating the starting point of the price-cap does not mean that the project cannot achieve a positive result in reality. De facto the net present value of the realised cash flows at the end of the economic service life can turn out higher or lower than the net present value of the cash streams expected at the moment of calculating the level of the price-cap.

6.2 Periodic review of the price-cap

In addition to determining the price-cap for NGN access when the first regulatory period starts, the cost model will also be used for the NRA's periodic checks. In the periodic checks the NRA will check whether the price-cap still deters the risk of excessively high tariffs to a sufficient degree. These periodic checks will be performed for as long as the supplier of NGN access is regarded as a supplier with significant market power. If it appears from the market analysis that the supplier of NGN access no longer enjoys significant market power, the price-cap will no longer apply.

OPTA will periodically asses the effectiveness of the price-cap in preventing excessively high tariffs. In this assessment OPTA will compare the prevailing IRR of the SMP supplier with a prevailing standard

[16] These effects can be mitigated through amendments to the pure FDC methodology, for instance by applying other depreciation methods.

rate, a so called “all risk” WACC. The way in which this standard rate will be calculated is described in the following paragraph (6.3).

The periodic check may lead to a downward adjustment of the price-cap, specifically in cases where the internal rate of return has turned out significantly higher than the WACC. The cost model which is used to determine the price-cap at the beginning of the first regulatory period will be used to determine the actual internal rate of return. As explained, this actual (ex post) internal rate of return may exceed the expected internal rate of return at the moment of investment. To determine the actual internal rate of return the cost model is updated making use of information with respect to the actual costs incurred, the actual revenues obtained and the realised parameter values as well as the future expectations in terms of revenues and expenditures. In other words, the actual internal rate of return determined in this way indicates, amongst other things, how the investment project has evolved relative to the original plan.

6.3 Compensation for systematic risk and restricting asymmetrical regulatory risk

6.3.1 Compensation for systematic risk

As discussed earlier in paragraph 3.2.1 systematic risk is normally compensated through the WACC. The regulatory approach of OPTA explicitly takes account of the possibility that fibre investments have a different risk profile than other parts of the regulated business of the incumbent operator and the situation that the regulation itself may have asymmetric effects on risks. In order to take proper account of the systematic risks attendant upon fibre investments, OPTA calculates a WACC for the regulated company at the time of the periodic review of the price-cap and subsequently every three years. This calculation will reveal whether the WACC for a company investing in NGN will be higher (or lower) than for instance the WACC of the traditional telecommunications business. This means that OPTA, when calculating the WACC for the company investing in fibre, will implicitly include a fibre premium in the WACC in case the “fibre risk” materializes in reality. Conversely, in a situation where the WACC for the company investing in fibre turns out to be lower than the traditional business WACC, the mechanism may lead to a fibre risk discount.

6.3.2 Restricting asymmetrical regulatory risk

As discussed in paragraph 4.1 project risks may be distributed asymmetrically depending on the form of regulation. For instance the possibility that a regulated firm can lobby for review of the price-cap if results are worse than expected reduces the range of possible
results. On balance this reduces the risk, which in turn leads to a lower required return and to an increase in the expected return. The contrary applies when the investors has to bear the negative results while at the same time the regulator intervenes whenever the expenditures or the revenues turn out better than expected. This too reduces the spread of possible results, but at the same time results in a reduction of the expected average return.

Given that the first objective of regulation is to foster competition, and in the context of the specific case the aim of the regulation is to prevent excessively high tariffs and margin squeeze, a degree of asymmetric risk as a result of regulation is unavoidable. Leaving the complete spectrum of possible outcomes untouched would be the same as not regulating at all (i.e. a regulatory holiday). Especially in the situation where a higher return than was initially expected is obtained, the chance of competition problems in the form of excessively high tariffs and margin squeeze increases.

OPTA explicitly allows for asymmetrical regulatory risks in its approach to tariff regulation of unbundled fibre access. It does so by incorporating a fixed premium of 3,5% for regulatory risks in the all-risk WACC against which the IRR is periodically checked for excess profits. By incorporating this fixed premium for asymmetrical regulatory risks in the all-risk WACC, OPTA commits itself, ahead of the moment at which the investment decision is made, not to skim off positive results up to a certain level. Investors may assume they may hold on to the positive results from their investments up to a certain level.

6.4 Conclusion

The price for unbundled access to fibre lines is regulated through a price-cap mechanism. The level of the price-cap is determined by the calculation of an access price at the starting point t^0. The starting point of the price-cap is calculated with Discounted Cash Flow Model that includes cash inflows and cash outflows over a number of years that equal the expected economic lifetime of the investment project. The price-cap is calculated by setting the Net Present Value at zero in the DCF model. By using a discounted cash flow model for calculating the access tariffs OPTA allows the regulated firm a higher degree of flexibility in its pricing.
Since one of the aims of the regulatory approach is to prevent excessive tariffs and margin squeeze, OPTA has to ensure that the IRR used in de DCF model is set at a reasonable level. OPTA has therefore compared the IRR used in the DCF model with a number of WACCs for comparable companies. OPTA will asses the effectiveness of the price-cap in preventing excessively high tariffs periodically. In this assessment OPTA will compare the prevailing IRR of the SMP supplier with a prevailing standard rate, a so called “all risk” WACC. The regulatory approach of OPTA thereby explicitly takes account of the possibility that fibre investments have a different risk profile than other parts of the regulated business of the incumbent operator and that the regulation itself may have asymmetric effects on risks. OPTA allows for asymmetrical regulatory risks by incorporating a fixed premium for regulatory risks of 3,5% in the all-risk WACC against which the IRR is periodically checked for excess profits.

7 Comparative analysis of regulatory regimes and conclusion

In the previous chapters we described the balancing act that an NRA has to perform in finding a balance between the objectives of fostering efficient investment in new infrastructure and fostering competition. To find this balance an NRA has to give several kinds of incentives. These incentives, which have effect on the risks the investor is exposed to, influence the investor's decision making process. In this conclusive chapter, we will try to qualify these different incentives.

7.1 Qualification of incentives of different regulatory regimes

Poort and le Grand (2008) studied the effect of regulation on several kinds of incentives. To study the effect of different regulatory scenarios, Poort and le Grand used a stylized business case for deploying a new fibre network in a small municipality in the Netherlands. For each type of regulatory regime Poort and le Grand tried to quantify the extent in which the regime:

1. prevents monopoly profits;
2. gives incentives to be efficient; and
3. gives incentives to invest.

The types of regulatory regimes which are examined are: 1) no regulation (base scenario); 2) rate of return regulation; 3) price-cap regulation; and 4) turnover regulation. Poort and Le Grand come to the conclusion that the different regulatory regimes score on the incentives as presented in table I.

Table I

	Prevent monopoly profits	*Efficiency incentives*	*Investment incentives*
No regulation	--	++	++
Rate of return regulation	++	--	+/-
Price-cap regulation	+/-	++	--
Turnover regulation	++	+/-	--

++ = positive effect
+/- = neutral or ambiguous effect
-- = negative effect

7.2 OPTA's regular price-cap regime and its incentives

Leaving the periodic reviews and complementary measures aside, the regular regulatory regime used by OPTA can be considered as a price-cap regulatory regime. As described by Poort and Le Grand (2008) such a price-cap regulation regime gives operators incentives to be efficient. The actual rate of return in the regulatory period depends on the actual costs and the actual penetration rate, which makes that the operator can increase returns if he is efficient. At the same time, a price-cap regime limits monopoly profits, because the operator is not allowed to increase prices to a level which is

above the price-cap. However, if the operator is efficient or if he is able to increase the penetration rate, returns may still become excessive under a price-cap regime.

Poort and Le Grand (2008) argue that investment incentives are relatively small under a price-cap regime. In their example the expected net present value of the investment is equal to zero under a price-cap regime. In this situation there will be neither a financial incentive nor a financial disincentive. At the same time, under a rate of return regime, they come to the conclusion that investment incentives exist when the net present value of the investment is equal to zero, assuming that management of a firm prefers investing above non-investing if incentives and disincentives are balanced. Contrary to Poort and Le Grand (2008), we would therefore conclude that investment incentives under a price-cap regime are, comparable with a rate of return regime and thus limited, but not non-existent.

It furthermore appears that the scenario described by Poort and Le Grand does not foresee a regular periodic review of the price-cap. However, as discussed earlier, an important feature of most price-cap regimes is the periodic review of the cap. Due to the fact that law obliges NRA's to review its regulatory package periodically, long term price-caps are uncommon. In a regular price-cap regime, NRA's will use this periodic review of the price-cap to bring the price-cap in line with the actual costs per unit, including a reasonable rate of return. This means that in case the regulated firm made monopoly profits or made profits because of efficiency gains, the NRA is able to prevent the extra profits in the new regulatory period, by lowering the price-cap.

Compared to the scenario described by Poort and Le Grand, the effect of this periodic review of the price-cap, with possibilities to alter the price-cap both upwards and downwards, increases the possibilities to prevent monopoly profits, but decreases efficiency incentives. In our opinion, the incentives produced by a regular price-cap regime as used by most NRA's, can therefore better be summarized as presented in table II.

Table II

	Prevent monopoly profits	*Efficiency incentives*	*Investment incentives*
Price-cap regulation plus review	+	+/-	+/-

7.3 OPTA's NGAN price-cap regime and its incentives

The regulatory regime, described in chapter 6, and the complementary measures, described in chapter 5, both influence incentives. In this paragraph we will try to score the introduced regulatory regime and the complementary measures on the three incentives described in paragraph 7.1. This analysis is pure qualitative. This means that the scores give information about the direction of the effect, but not about the magnitude of the effect. In the following paragraphs we will assess the impact

of the specific aspects of the regulatory regime as described in chapters 5 and 6. These relative impacts will be denoted as '↑' in case of a positive impact, '↓' for a negative impact and '0' for a neutral impact.

7.3.1 Impact of allowing an optimistic scenario in the periodic review of the cap

In a regular price-cap regime the price-cap will be adjusted in the next regulatory period, in case the rate of return exceeds the WACC. If an investor knows that if he makes (excessive) profits the price-cap will be adjusted within a timeframe of three years, his incentive to invest is reduced. As explained in paragraph 6.2, in this regulatory regime, the NRA is willing to allow a certain optimistic scenario to occur. In periodic reviews the NRA will check whether the price-cap to a sufficient degree still deters the risk of excessively high tariffs. By making a commitment to adjust the price-cap only in case the rate of return exceeds the ex ante expected rate of return with more than a certain percentage, the NRA improves the incentives to invest.

The same holds for efficiency incentives. In a regular price-cap regime the price-cap will be adjusted in the next regulatory period, when excessive profits are made because of efficiency gains. If an operator knows that, his incentives to be efficient are reduced. By making a commitment to adjust the price-cap only in case the rate of return exceeds the ex ante expected rate of return with more than a certain percentage, and thus allowing the investor a larger share of the realised efficiency gains, the NRA improves efficiency incentives.

As a regular price-cap regulatory regime, this price-cap regime with regular check on excessive internal rates of return, is also able to prevent monopoly profits. The level above which rates of return are considered not acceptable however lies on a higher level than in a regular price-cap regime. Therefore the chances that returns are excessive are greater than under the regular price-cap regime and thus the ability to the prevent excessive returns is diminished compared to a regular price-cap regime. In our opinion, the impacts of allowing an optimistic scenario in the review of the price-cap can be summarized as presented in table III.

Table III

	Prevent monopoly profits	*Efficiency incentives*	*Investment incentives*
Allowing an optimistic scenario	↓	↑	↑

7.3.2 Impact of the policy rules

By drawing up policy rules, OPTA has removed uncertainty about the way the industry is going to be regulated. The policy rules therefore act as a constraint on regulatory risk on investments in local fibre loops. Drawing up policy rules, however bears with it the risk of erroneous intervention. This erroneous

intervention can both damage the investing firm or the consumers. As described in paragraph 5.1, OPTA however believes that the overall effect of drawing up policy rules on investment incentives is positive.

Under normal price-cap regulation, price-caps are adjusted every regulatory period which causes uncertainty about which exact share of positive returns will be topped of by regulatory intervention. By means of the policy rules OPTA has provided information and commitment on the manner in which it will apply tariff regulation to unbundled fibre access on the longer term. The introduction of multi-year regulation is necessary, because of the sunk character of the investment the investor has to make a multi-year decision. In the regulatory regime introduced, OPTA commits to a long term price-cap. The price-cap will only be adjusted if rates of return turn out to be more than a certain percentage above the rate of return initially expected. Therefore a certain opportunity to make a positive return is created. In our opinion, the impacts of issuing policy guidelines that provide information and a long term commitment on the principles of regulation can be summarized as presented in table IV.

Table IV

	Prevent monopoly profits	*Efficiency incentives*	*Investment incentives*
Policy rules	0	0	↑

7.3.3 Impact of freedom to reduce risk

In paragraph 5.2.1, 5.2.2 and 5.2.3 we worked out three examples of risk reducing measures by the investor, which are allowed by OPTA. If allowing the measures has negative effects on other goals OPTA is pursuing, these negative side-effects were described as well. The first risk reducing measure described is the introduction of a discount scheme as described in paragraph 5.2.1. The effect of such a discount scheme is that total turnover and consequently the rate of return becomes less sensitive for the sales volume or the penetration rate. This reduced sensitivity of the rate of return for the penetration rate reduces the risks of the investor. By giving the investor the choice to introduce an discount scheme as described, the investor can transfer some of his own investment risk to the buyers of unbundled fibre access (‘risk sharing’).

The second risk reducing measure (paragraph 5.2.2) is the use of price-indexation. By allowing the use of price indexation, OPTA gives the investor some degree of freedom in choosing the optimal pricing technique (e.g. penetration pricing). This freedom of choice may reduce the investor’s risk. The third risk reducing measure described in paragraph 5.2.3 is that OPTA allows the tariffs for access services for local fibre loops to consist of both one-off fees and periodic fees. By giving the investor the choice to recoup fixed costs via a one-off fee or periodic fees, the investor can affect his own investment risk and the entry risk resting on the buyers of unbundled fibre access (‘risk sharing’). In our opinion, incentives produced by giving the investor freedom to reduce risk can be summarized as presented in table VI.

Table V

	Prevent monopoly profits	*Efficiency incentives*	*Investment incentives*
Freedom of risk reduction	0	0	↑

7.4 Conclusion

Again, we want to stress that the analysis performed only gives information about the direction of effects and not about magnitudes. Although it is hard to quantify the effects, in our opinion, the combined impacts of the measures contained in OPTA's NGA price-cap regime, can be summarized as presented in table VI. Compared to a regular price-cap regime, OPTA's NGA price-cap regime is slightly less able to prevent monopoly profits. However, the regime is better able to provide efficiency incentives and in particular investment incentives.

Table VI

	Prevent monopoly profits	*Efficiency incentives*	*Investment incentives*
Allowing an optimistic scenario	↓	↑	↑
Policy rules	0	0	↑
Freedom of risk reduction	0	0	↑
Cumulative result	↓	↑	↑↑↑

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