Assessment whether a Ramsey-pricing methodology can be implemented for setting the Local Loop Unbundling ("LLU") Line Share ("LS") price in Ireland

A Report for ComReg,

prepared by TERA Consultants

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0 Executive summary

The Line Share ("LS") product offered by Eircom Wholesale allows the services provided by Eircom Retail and a digital subscriber line ("DSL") service offered by an Access Seeker, to be integrated over the same two wire metallic path or copper local loop. Given the copper local loop is shared, a key question in setting the LS price is how to determine an efficient methodology to allocate the common costs of the shared copper local loop between the related services i.e. the Public Switched Telephone Network ("PSTN") and LS.

Indecon/London Economics prepared a report for Eircom[1] in which they discussed the implementation of a Ramsey-type solution for allocating these common costs. The Indecon International Economics Consultants and London Economics (Indecon/London Economics) report was prepared in response to the ComReg Consultation Document No. 08/106[2] which also referred to the previous TERA Report in ComReg Document No. 08/106a[3] where ComReg put forward a proposal to use an "Incremental Cost" methodology.

The current report analyses in more detail whether the implementation of a Ramsey-type solution, as suggested by Eircom in its response to ComReg Consultation Document No. 08/106, is feasible in practice. The National Regulatory Authorities' ("NRAs") "common approach" is that Ramsey-pricing is not possible in the context of LS. Even if Ramsey-pricing is the optimal approach in theoretical terms, we observe that no NRA has ever used it in the telecommunications sector for LS[4]. This, in itself, is evidence that no other NRA regards it as a workable option in practice. TERA has conducted its analysis of Ramsey-pricing in four steps which are set out below.

Firstly, the economic background related to Ramsey-pricing will be presented, with specific attention to the various notions of price-elasticities (own-price, cross-price, wholesale price elasticity, retail price elasticity) and with a

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[1] *Response to ComReg's Line Share Consultation, Report Prepared for Eircom, By Indecon International Economic Consultants and London Economics, March 2009, published 18 August 2009 by ComReg as Consultation Document No. 09/66a.*

[2] *ComReg Consultation Document No. 08/106: Rental Price for Shared Access to the Unbundled Local Loop; published on 23 December 2008.*

[3] *ComReg Document No. 08/106a: A report prepared for the Commission for Communications Regulation: Methodology for Line Share Pricing in Ireland; published on 23 December 2008.*

[4] *See Section 7.4 – Opinion of NRAs regarding Ramsey Pricing.*

presentation of, both, the "classical" Ramsey-pricing and of one of its variants, namely the "Global Price Cap".

Secondly, we detail which process a NRA (and ComReg in the present case) should implement to apply the Ramsey-pricing in the particular case of LS in Ireland. We describe the different models that are available to derive elasticities and detail the list of data that are required for estimating the elasticities in the case of LS. This leads to the step-by-step process that ComReg should follow in order to appropriately implement Ramsey-pricing.

Thirdly, we proceed with a similar kind of exercise for the Global Price Cap (i.e. a decentralised Ramsey-pricing methodology), looking at its implementation by ComReg as part of a regulatory process.

Fourthly, we review the implementation of Ramsey-pricing proposed by Indecon/London Economics in their report "Response to ComReg's Line Share Consultation Report Prepared for Eircom By Indecon International Economic Consultants and London Economics – March 2009", so as to determine if their approach and results are consistent with a regulatory implementation by ComReg..

TERA's conclusion of these various in-depth "tests" is that the calculation of necessary and unbiased own-price and cross-price elasticities, required for the implementation of Ramsey-pricing in the case of LS in Ireland, are:

Highly complex because there is a need for:

- a large amount of data, with several price changes to be consistent.
- related to the very dynamic broadband market (new download speeds, new prices, bundles voice and broadband, bundles including calls, etc.).
- and covering a wide diversity of economic players, to gather information, to analyse it and to format it on a recurring basis.

Highly uncertain because many issues remain unresolved:

- How should PSTN call prices be considered in estimating elasticities?
- How should bundles be considered in estimating elasticities?
- How should mobile prices be considered in estimating elasticities?
- How should the various quality of service of the different products available in the telecommunications market be accounted for?

- Other issues may arise with the launch of new types of products.

Highly costly since:

- gathering the relevant information on a regular basis will take considerable time and resources of all the "stakeholders" (ComReg, Eircom, and the OAOs).
- it may lead to a heavy regulatory burden.

In summary, our conclusion is that implementing a version of Ramsey pricing (and whatever the version), is simply not technically feasible for the following reasons:

it is not possible to gain an appropriate degree of "certainty" on the elasticities,

the significant cost involved,

the uncertainty of a guarantee that the economic conclusion leads to a greater benefit than the alternative approach proposed, i.e. the incremental cost approach.

Even with a Global Price Cap, it is not clear how such a result can be obtained and Indecon-London Economics does not provide any new evidence to support why this approach would be effectively feasible. **A Global Price Cap would in fact only transfer the difficulties of appropriately implementing Ramsey-pricing from the NRA to the regulated firm. This would tend to increase the difficulties because the regulated firm would have more difficulties to collect the required data from its competitors. It would also prevent industry from ensuring that the regulated firm is making reasonable assumptions, is not prone to material error and is not behaving in a way that could penalise its competitors, for example by changing the LS price on a regular basis which gives rise to uncertainty, and possible predatory behaviours, etc**.

The incremental cost approach has, in comparison to an inappropriate implementation of Ramsey-pricing, the advantage to be much more practical to implement and to control in the medium term: it gives more visibility to OAOs, it allows Eircom to recover its costs (as long as the PSTN monthly rental charge recovers the cost of the local loop, and Eircom does not have to implement a mechanism where if some local loop costs are allocated to the LS product, then the PSTN monthly rental charge for end-users purchasing broadband on the basis of LS must be reduced).

We confirm our previous conclusions that the Incremental Cost methodology for pricing Line Share in Ireland is the preferred option as it appears that, contrary to Indecon/London Economics statement, it is not possible to appropriately implement Ramsey pricing for Line Share in Ireland.

It should also be noted that, if it were to be possible, our analysis shows that it would impose an unreasonable burden for ComReg and other stakeholders.

1 Introduction: a response to Indecon/London Economics report for Eircom

As previously highlighted, the Line Share ("LS") product allows the services provided by Eircom and a digital subscriber line ("DSL") service offered by an Access Seeker, to be integrated over the same two wire metallic path.

In practice, the LS product must be sold with the PSTN service of the incumbent and is, in general, used by Other Alternative Operators ("OAO") to provide broadband services to end users that will pay:

the PSTN monthly rental charge to the incumbent,

and the broadband service to the OAO.

Given that the copper local loop is shared, a key question related to setting the LS price is to determine an efficient methodology to allocate these common costs of the copper local loop between the related services, PSTN and LS.

In December 2008, ComReg published a Consultation titled "Rental Price for Shared Access to the Unbundled Local Loop" (ComReg Document N°08/106). A report prepared by TERA Consultants ("TERA") assessing the methodologies for common cost allocation in the context of LS was appended to ComReg's consultation paper.

Among the ten methods put forward, TERA recommended the Incremental Cost methodology to price LS. Even if Ramsey-pricing was considered, in this analysis, to be theoretically the most desirable method with respect to welfare maximisation, it was argued that implementing it appropriately for LS would not be technically possible. Furthermore, this recommendation to prefer the Incremental Cost in a situation where Ramsey-pricing is not implementable appeared to be in line with the choices made by a majority of NRAs in the OECD[5].

In response to ComReg's consultation paper, Indecon/London Economics prepared a report for Eircom[6] in which they discussed the implementation of a Ramsey-type solution. The non confidential version of this report has been

[5] *Organisation for Econonomic Co-operation and Development (OECD)*

[6] *Response to ComReg's Line Share Consultation, Report Prepared for Eircom, By Indecon International Economic Consultants and London Economics, March 2009, published 18 August 2009 by ComReg as Consultation Document No. 09/66a.*

published by ComReg – ComReg document 09/66a). Since Ramsey-pricing requires an estimation of price elasticities, this report selected a classical and relevant model, the "Almost Ideal Demand System" ("AIDS"), to estimate price elasticities in the specific context of LS in Ireland.

The main conclusions of Indecon/London Economics were as follows:

- that the calculations of elasticities is feasible in the context of LS in Ireland,
- and that, due to the compared elasticities levels for PSTN and LS, the current 50/50 rule is a reasonable approximation of the Ramsey-pricing price.

Indecon/London Economics' recommendation was to keep the previous method of allocation where LS covers 50% of the local loop costs. They also proposed to implement a form of decentralised Ramsey-pricing, described as the "Global Price Cap" however, no detailed description of how such a "Global Price Cap" should be implemented in the context of LS in Ireland was provided.

This report, for the purpose of setting the LS price in Ireland, aims to analyse whether the implementation of a Ramsey-type solution is feasible in practice. The "common approach" adopted by NRAs is that Ramsey-type methods are not relevant in the context of LS. Given Ramsey-pricing is the optimal methodology, in theoretical terms, the proof that it is effectively not implementable in practice in the context of LS is evident in the fact that it has not been used by NRAs to price LS.

The remainder of this report is set out as follows:

- In the second section, TERA summarises the economic background related to Ramsey-pricing.
- The third section details the process ComReg could implement if it were to apply Ramsey-pricing in the particular case of LS in Ireland.
- The fourth section details the process ComReg could implement if it were to apply the Global Price Cap (i.e. a decentralised Ramsey-pricing) in the particular case of LS.
- The fifth section analyses how Ramsey-pricing has been implemented by Indecon/London Economics in their report for LS pricing.
- In conclusion, TERA assesses whether the implementation of the Ramsey-pricing approach is feasible and practically possible in the particular case of LS pricing in Ireland.

2 Theoretical and technical background related to Ramsey-pricing

This section will describe the theoretical framework of Ramsey pricing.

2.1 The concept of price elasticity

Consumer demand theory is focused on the rational choices with respect to a basket of goods and under a budget constraint:

The rational consumer maximises his utility function by choosing quantities for each good, with respect to his budget constraint.

The resolution of this maximisation provides a demand equation for each good, depending on the prices of all goods included in the basket and the revenue (budget constraint) of the consumer.

Then, for each good, “own-price” elasticity (2.1.1) and “cross-price” elasticities (2.1.2) can be derived from the equations described below.

2.1.1 Own-price elasticity

Price elasticities measure the consumption variation rate induced by price variations. For example, the price elasticity of fixed calls would measure the variation of the volume of minutes consumed by end users if fixed call prices increased by 1%.

Own-price elasticity is usually negative, meaning that the consumption of a product decreases when its price increases.

The own price elasticity is measured as follows:

$$\eta_i = \frac{\%\Delta c_i}{\%\Delta p_i} = \frac{\Delta c_i / c_i}{\Delta p_i / p_i}$$

where *i* is the good,

c_i is the consumption of *i*

and p_i the price of *i*.

Own-price elasticities “absolute level” is a way to identify in which category the good belongs to, between:

elastic goods ($\eta_i < -1$);

inelastic goods ($\eta_i > -1$).

More precisely, if:

$\eta_i = -\infty$, the elasticity is perfect which means a small price decrease induces an infinite consumption increase.

$\eta_i < -1$, the good is elastic which means a small price variation induces a larger consumption variation.

$\eta_i = -1$, the elasticity is unitary, which means a small price variation induces a perfectly proportional consumption variation.

$-1 < \eta_i < 0$, the good is inelastic, which means a small price variation induces a smaller consumption variation.

$\eta_i = 0$, the inelasticity is perfect, which means a small price variation does not induce any consumption variation.

To highlight these different categories examples of own-price elasticities for various goods and services are provided in the table 1.

Table 1 - Estimated Price Elasticities of Demand for Various Goods and Services

	Goods	Estimated Elasticity of Demand
Inelastic	Matches	0.1
	Toothpicks	0.1
	Airline travel, short-run	0.1
	Gasoline, short-run	0.2
	Gasoline, long-run	0.7
	Residential natural gas, short-run	0.1
	Residential natural gas, long-run	0.5
	Coffee	0.25
	Fish (cod) consumed at home	0.5
	Tobacco products, short-run	0.45
	Legal services, short-run	0.4
	Physician services	0.6
	Taxi, short-run	0.6
	Automobiles, long-run	0.2
Approximately unitary elastic	Movies	0.9
	Housing, owner occupied, long-run	1.2
	Shellfish, consumed at home	0.9
	Oysters, consumed at home	1.1
	Private education	1.1
	Tires, short-run	0.9
	Tires, long-run	1.2
	Radio and television receivers	1.2
Elastic	Restaurant meals	2.3
	Foreign travel, long-run	4.0
	Airline travel, long-run	2.4
	Fresh green peas	2.8
	Automobiles, short-run	1.2 - 1.5
	Chevrolet automobiles	4.0
	Fresh tomatoes	4.6

Source: Economics: Private and Public Choice, James D. Gwartney and Richard L. Stroup, eighth edition 1997, seventh edition 1995; primary sources: Hendrick S. Houthakker and Lester D. Taylor, Consumer Demand in the United States, 1929-1970 (Cambridge: Harvard University Press, 1966,1970); Douglas R. Bohi, Analyzing Demand Behavior (Baltimore: Johns Hopkins University Press, 1981); Hsaing-tai Cheng and Oral Capps, Jr., "Demand for Fish" American Journal of Agricultural Economics, August 1988; and U.S. Department of Agriculture.

2.1.2 Cross-price elasticity

In the same way, cross-price elasticities measure the increase in the consumption of a given product when the price of another product increases. This is defined as follows:

$$\eta_{ij} = \frac{\%\Delta c_i}{\%\Delta p_j} = \frac{\Delta c_i / c_i}{\Delta p_j / p_j}$$

where c_i is the good *i* consumption

and p_j the price of good *j*.

Cross-price elasticities absolute level is a way to identify which category two goods belongs to, between:

dependent goods:

- gross substitutes ($\eta_{ij} > 0$): when the good *j* becomes more expensive, the consumer increases consumption of good *i*. For example, mobile calls and fixed calls are sometimes considered as substitutes because if mobile call prices drop significantly, end-users may prefer calling using their mobile rather than using their fixed line phone. However the level of substitutability could be dependent on a number of other factors other than price which have not been analysed here.
- gross complements ($\eta_{ij} < 0$): when the good *j* becomes more expensive, the consumer reduces the consumption of good *j* and also of good *i*. This is, for example, the case mobile phones and mobile subscriptions or between video games and consoles.

independent goods ($\eta_{ij} = 0$): a variation of p_j does not impact the consumption of good *i*. This can be the case for example for very different products such as fruits and cars.

2.2 The Ramsey-Boiteux pricing theory

Once these concepts are defined, the second subsection presents the Ramsey-Boiteux ("Ramsey") pricing theory. More precisely, after summarising the basic principles (2.2.1), two specific cases of the Ramsey pricing are sequentially developed: the case of Ramsey-pricing at a unique level (e.g. retail market) with the issue of dependent versus independent goods (2.2.2) and the case of Ramsey-pricing at a dual level (e.g. retail and wholesale market) (0). Finally, another theoretical possibility is considered: the Global Price Cap, which is commonly referred to as a "decentralised Ramsey pricing" approach.

2.2.1 Basic Ramsey-pricing principles

Assuming that a National Regulatory Authority has full information about cost and demand, the question to be clarified is, in theoretical terms, the following one:

> "*What is the optimal price structure for a multiproduct regulated firm given that the overall price level must enable to break even?*" [p. 61][7]

In other words, when several products are using the same asset the NRA has to determine the appropriate level of prices for these products so that, overall, the costs of the asset are recovered (and also the marginal costs of the products) including a reasonable profit.

According to Laffont and Tirole (2000), the answer consists of looking for:

> "*prices that maximize social welfare subject to the firm's profit (revenue minus cost) being non negative. By definition, this optimization yields the Ramsey-Boiteux social welfare level.*" [pp. 61-62].

Lafont and Tirole (2000) highlight the Ramsey (or Ramsey-Boiteux) pricing rule as follows:

> "*It would be absurd (on efficiency grounds) to charge high mark-ups on those services for which consumers are not willing to pay much*

[7] *Laffont and Tirole (2000), Competition in Telecommunications, The MIT Press*

> *above the marginal cost. Cost recovery should place a higher burden on those services with relatively inelastic demands.*" [pp. 63-65].

The intuition behind the Ramsey-pricing is perfectly logical and, indeed, quite simple:

- When several products use a unique asset, a smaller part of the related common costs should be allocated to the product that is more price-sensitive.
- As such, prices of more sensitive products will be lowered, which will increase the demand. On the contrary, the prices for less sensitive products will be increased (so that the cost of the common asset is still recovered), with a limited impact on the demand for these products.
- As a consequence, the total demand for products supported by the common asset will be maximised (as well as the welfare) and the cost of the common asset will be recovered in full.

2.2.2 Ramsey-pricing at a unique level (e.g. retail market): the issue of dependent versus independent goods

Depending on the interrelations between products (or services) sharing a common asset, the type of elasticities to be calculated for implementing the Ramsey-pricing may vary.

In the case of independent products using a common asset:

> "*like an unregulated monopolist the Ramsey-Boiteux utility charges prices that are inversely proportional to the elasticities of demands for the services*" [Laffont and Tirole 2000, p.63][8].

Meaning that, in such a case, the assessment is limited to the own-price elasticity of each product:

- if product *1* and product *2* are independent
- if the common asset cost is equal to *C*
- and η_1 and η_2 represent the respective own-price elasticities product *1* and product *2*

[8] *See Section 7.1 of this document*

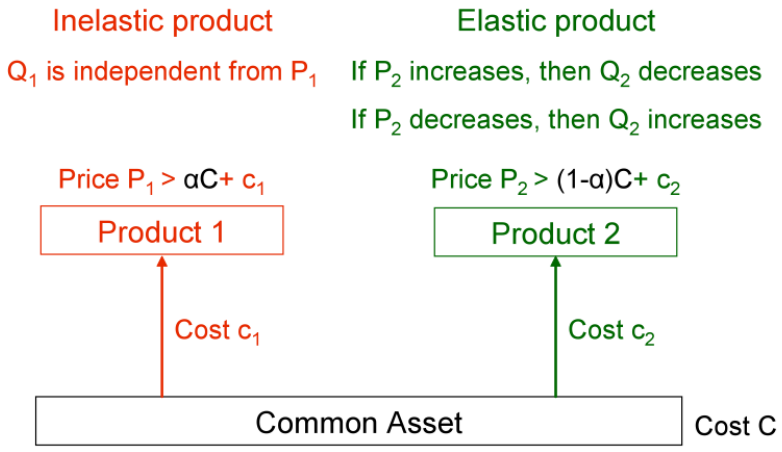
then:

The cost allocated to product *1* is $C \times \frac{\frac{1}{\eta_1}}{\frac{1}{\eta_1}+\frac{1}{\eta_2}}$

The cost allocated to product *2* is $C \times \frac{\frac{1}{\eta_2}}{\frac{1}{\eta_1}+\frac{1}{\eta_2}}$

Indeed, if product *2* is more elastic (price-sensitive) than product *1*, then η_2 is higher than η_1 (in absolute value). As a consequence, the cost allocated to product *2* would be smaller than the cost allocated to product *1*.

Figure 1 – Cost of a common asset shared by 2 independent products, one elastic and one inelastic



Pi = price of product i

Qi = quantity of product i

c1 = marginal cost of product i

C = cost of the common asset

Source: TERA Consultants

In the case of dependence, products are complements or substitutes, meaning that the price of one product impacts the demand for the other. In this case, the Ramsey-pricing is more complex, requiring both the assessment of own- and cross-price elasticities:

> *"The pricing rule must be corrected to account for the impact of service k on the demand for the other services."* [Laffont and Tirole (2000), p 64]

More precisely:

- if products *1* and *2* are substitutes: a decrease of price *1* induces a decrease of demand for product *2*. Then, the cost allocated for product *1* should rise above the level implied by the preceding rule (i.e. in the case of independent products).
- if products *1* and *2* are complements: a decrease of price *1* induces an increase of demand for product *2*. Then, the cost allocated for product *1* should set below the level implied by the preceding rule (i.e. in the case of independent products).

Laffont and Tirole (2000) show that:

> "*when services are complements or substitutes, elasticities must be replaced by the so-called "superelasticities.*" [p 64] (See Annex 7.2 for the "superelasticities" formulas).

Table 1 : Summary of price elasticities that are required when implementing Ramsey-pricing at a unique level (e.g. retail market)

Nature of the interrelations between the goods	Type of elasticities required	
	Own-price	Cross-price
Independency	YES	NO
Dependency	YES	YES

Source: TERA Consultants

When goods are not independent, cross-price elasticities have to be calculated in addition to own-price elasticities when implementing Ramsey-pricing[9] at a unique level (e.g. retail market).

[9] *See Section 7.1 of this document*

For obvious reasons of simplification, some economists discuss however under which conditions the simplified Ramsey formula (limited to own-price elasticity); can be selected, even in the presence of dependant goods.

This is the case of Miller's (2007)[10], widely quoted by Indecon/London Economics. In this paper, Miller gives a generalisation of Braeutigam (1979)[11] and Georges and Sherman (1979)[12] conditions required to apply the simple inverse elasticity rule (i.e. the rule used for independent products).

As summarised in Miller (2007), the following main conditions have to be simultaneously gathered for that simplification:

The regulated firm shall act as a Stackelberg price leader on the retail market[13].

The degree of differentiation shall be limited within the competitive sector

The number of rivals shall be high and the level of entry barriers low.

The demand function shall be linear.

Table 2 : Conditions under which cross-price elasticities are not required to apply Ramsey-pricing to dependent goods at a unique level (e.g. retail market)

Type of competition	Stackelberg
Degree of product differentiation	Low
Number of rivals	High
Level of entry barriers	Low
Nature of demand	Linear

Source: TERA Consultants, based on Miller (2007)

[10] *Miller (2007), Ramsey pricing with long run competition, Economics Bulletin, Vol. 12, No. 34 pp. 1-5*

[11] *Braeutigam (1979), Optimal Pricing with Intermodal Competition, The American Economic Review 69, 38-49*

[12] *George and Sherman (1979), Second Best Pricing for the U.S. Postal Service", Southern Economic Journal 45, 685-695*

[13] *A Stackelberg price leader is a firm which endogenously sets the price before all other firms in the industry. The followers (the other firms) observe the leader's choice and then "pick" a quantity.*

Therefore, if all "Miller's conditions" are respected simultaneously, the calculation shall be limited to own-price elasticities. If not, cross-price elasticities are also required to implement Ramsey-pricing at a unique level (e.g. retail market).

Ramsey-pricing at a dual level (e.g. retail and wholesale market)

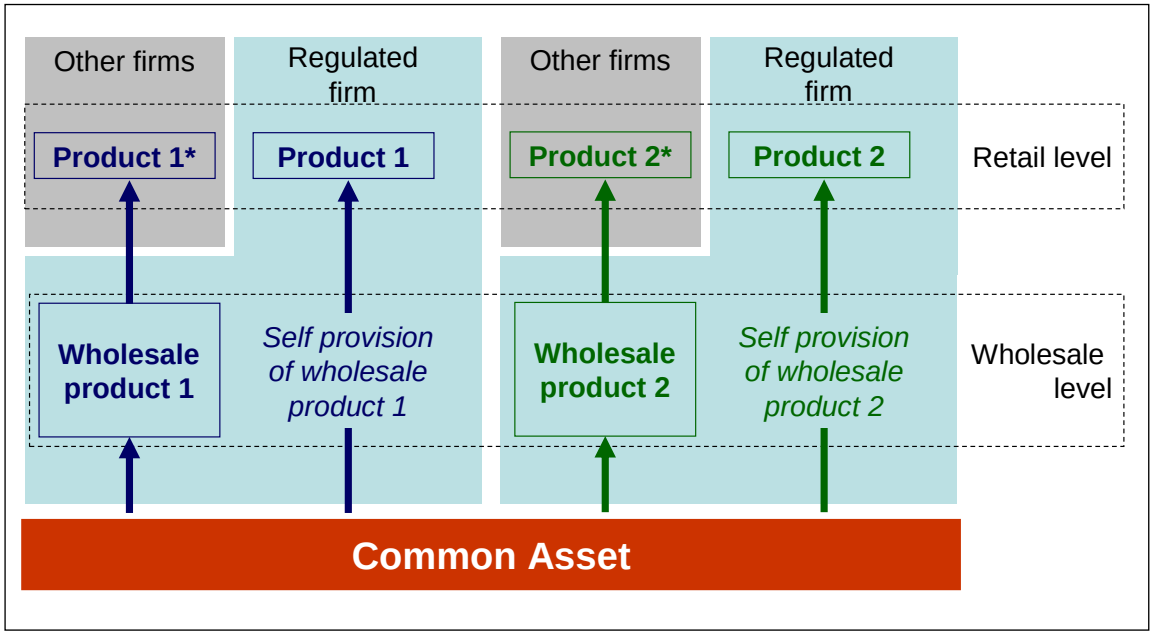
Another specification should also be made. Among the different products provided by the regulated firm using a common asset, some can be sold by the regulated firm at a retail level and some others at a wholesale level. The fact that such products are distributed on a wholesale market and others on a retail market may add a degree of complexity to the implementation of Ramsey-pricing.

The related pricing issues can be summarised as follows:

- What is the optimal price structure, between wholesale services and retail services, given that the overall price level must enable a break even?
- At what level, retail or wholesale, should the price elasticities be calculated?

For example, a product can be sold on the retail market by both the regulated firm (product 1) and the other rival firms (product 1*). These other rival firms use the regulated firm's wholesale product 1 to produce product 1*. The figure below shows the case of two different products using the same asset.

Figure 2 - Case of a regulated firm selling 2 products at wholesale and retail levels using a common asset



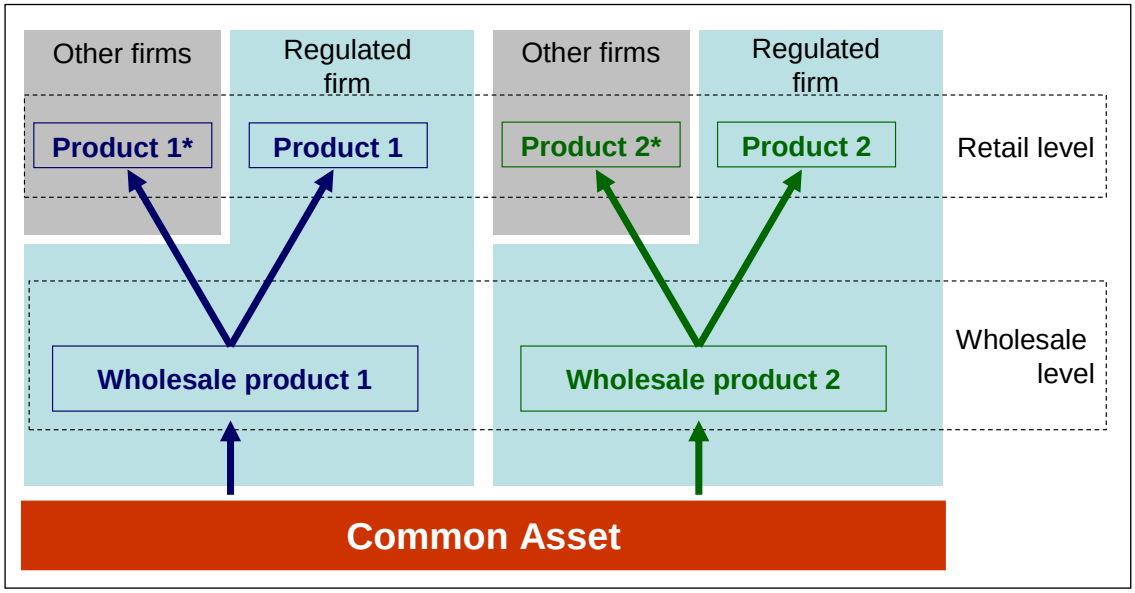
Source: TERA Consultants

Assuming that there is no discrimination between the regulated firm and other firms, industry is "structurally" separated between:

a downstream firm producing the asset from which two wholesale products (1 and 2) are derived;

Upstream firms acting into 2 markets: the market for product 1 and the market for product 2.

Figure 3 - Case of a regulated firm selling 2 products at wholesale and retail levels using a common asset where there is no discrimination



Source: TERA Consultants

Consumers are not directly impacted by wholesale prices when purchasing retail products. The only prices that matter and that are available for consumers are retail prices. Consumers do not mind (and in general do not know) what wholesale price a firm actually pays in order to provide the product.

Moreover, the demand for wholesale products is mechanically driven by the demand at the retail level: a firm will buy the exact volume of wholesale products that it requires (neither less nor more than the demand at the retail level). The demand for wholesale products is therefore exogenous for the firms[14].

The wholesale price is also exogenous for firms (because it is regulated). As a consequence, it is meaningless calculating elasticities based on wholesale prices because both wholesale demand and wholesale prices are exogenous to the firms purchasing the wholesale product.

[14] *However, it is important to note that the demand for wholesale products is not exogenous in the specific case where the regulated firm acts in an anticompetitive such as price squeezing. But, we propose not consider this case here as NRA and competition authorities act to prevent ex ante or to stop ex post such cases.*

Finally, the Ramsey-pricing structure is depending on both own- and/or cross- elasticities of retail products when implementing Ramsey-pricing at a dual level.

Each considered a retail product can be provided:

- directly by the regulated firm;

- from the other rival firms thanks to the wholesale service provided by the regulated firm.

Since one of the regulator's aims is to maximise social welfare, own and cross-elasticities have to be calculated from retail prices.

Decentralizing Ramsey-pricing via a Global Price Cap at a single level or at a dual level

If Ramsey-pricing is solidly grounded from a theoretical point of view, the efficiency of this method in terms of maximizing welfare is intimately related to the "quality" of the information gathered by the regulator. Laffont and Tirole (2000) summarise this widely mentioned objection:

> "*In practice, regulators have less information about the firm's environment than is presumed by the Ramsey-Boiteux paradigm.*" [p. 65].

Especially, demand elasticities can be more difficult to calculate for NRAs than for the regulated firm (due to classical asymmetries of information).

Based on those difficulties, Laffont and Tirole (1996)[15] propose a new theoretical orientation: defining a Global Price Cap as a tool to overcome the problem of asymmetric information between the operators and the NRA. Since a firm may have better expertise than the NRA concerning the demand conditions, the prices that maximise the surplus will be selected with more accuracy if this function is delegated by the regulator to a firm.

[15] *Laffont J.J., Tirole J. (1996), Creating competition through interconnection: theory and practice. Journal of Regulatory Economics, v. 10.*

The theoretical basis behind the Global Price Cap is that[16]:

this rule induces the firm to internalize the consumer surplus by setting the weights equal to the forecasted quantities.

the firm would be efficient in terms of cost reduction and assure minimum distortions from the first best rule.

More precisely, assuming that the NRA has full information on costs, the firm has full information on costs and demands, and that there is no incentive issues (such as predatory or squeeze practices), the NRA can choose to impose a Global Price Cap to the regulated firm instead of directly imposing a Ramsey pricing structure.

Thus:

> *"In principle, the choice of Ramsey-Boiteux prices can be decentralized to the firm through price caps. Suppose the firm is faced with an average price ceiling, with weights* $w = (w_1,...,w_n)$*:*
>
> $\sum_{k=1}^{n} w_k p_k \leq \bar{p}$ *and otherwise free to maximize its profit. That is, the price level is constrained, but not its structure. It is easily demonstrated that if weights are equal to the future realized quantities (which we denote by* $\bar{q}_k$*), then optimality conditions for the firm yield Ramsey prices in structure."* [Laffont and Tirole (2000), p. 65]

In the case where products are sold at the wholesale level, the choice of the price structure can still be decentralized through a Global Price Cap:

> "*In theory, the Ramsey pricing structure can be obtained by imposing a global price cap on the incumbent, with the following features:*
>
> *1. The intermediate good (access) is treated as a final good and is included in the computation of the price cap (this is the definition of a global price cap)*
>
> *2. Weights used in the computation of the price cap are exogenously determined and are proportional to the forecast quantities of the associated goods.*

[16] *Laffont J.J., Tirole J. (2000), Competition in Telecommunications, MIT Press.*

> *That is, a Global Price Cap induces a firm to select the proper Ramsey structure as long as all goods (including, here access goods) are included in the definition of the cap and the weights are* exogenously *fixed at the level of output that will be realized*." [Laffont and Tirole 2000, p. 170].

Assuming that:

-the information of the regulated firm on demand elasticities is sufficient

-there is no incentives issue such as a price squeeze or predatory pricing,

Then, the calculation of the Ramsey-pricing can, in theory, be decentralized to the regulated firm through a Global Price Cap.

In this case, the NRA needs to determine:

-the global cap

-the appropriate weights for each product (see section 4).

3 Assessing the appropriate way to implement the Ramsey-pricing for LS in Ireland from an NRA's (namely ComReg's) perspective

The previous section has discussed which type of elasticities (own-price, cross-price, wholesale price elasticity, retail price elasticity) should be calculated in the different cases of interrelations between the products and presented the Global Price Cap, under which the Ramsey-pricing is "decentralised" to the regulated firm.

Since the debate is to determine whether Ramsey-pricing can be technically implemented by ComReg, this section summarises the likely process involved.

More precisely, this section:

- describes the specific case of LS in Ireland (3.1),
- describes the different models that are available to derive elasticities (3.2),
- details the list of data that is required for estimating the elasticities in the case of LS (3,3),
- summarises and comments on the step-by-step process that ComReg should follow to appropriately implement Ramsey-pricing (3.4).

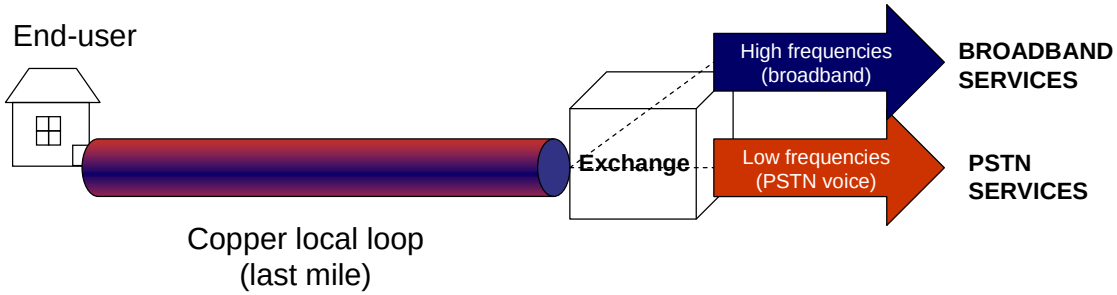
3.1 Context and objectives

3.1.1 Description of the products using Eircom's copper local loop

Eircom's copper local loop is a fixed asset that is used to produce ultimately various types of services on the retail market:

- broadband services offered via the higher frequency bandwidth
- and PSTN services via use of the lower frequency bandwidth.

Figure 4 - How broadband and PSTN services use the copper local loop?



Source: TERA Consultants

These two retail services are sold either:

by Eircom which is an integrated firm operating the copper local loop. This means that Eircom is using self-supply.

by OAOs through wholesale products provided by Eircom.

The following wholesale products are available for OAOs:

For the provision of retail broadband products, OAOs can use:

- the LS product where Eircom only provides the higher frequency bandwidth of the copper local loop;
- or the Bitstream product where Eircom provides also the transport of the traffic to OAO's point of presence in addition to the provision of the higher frequency bandwidth of the copper local loop.

For the provision of retail PSTN products, OAOs can use the wholesale line rental product (called here wholesale PSTN), which is a resale product.

NB: OAOs can also use the full LLU product where Eircom provides both the lower frequency bandwidth and the higher frequency bandwidth of the copper local loop.

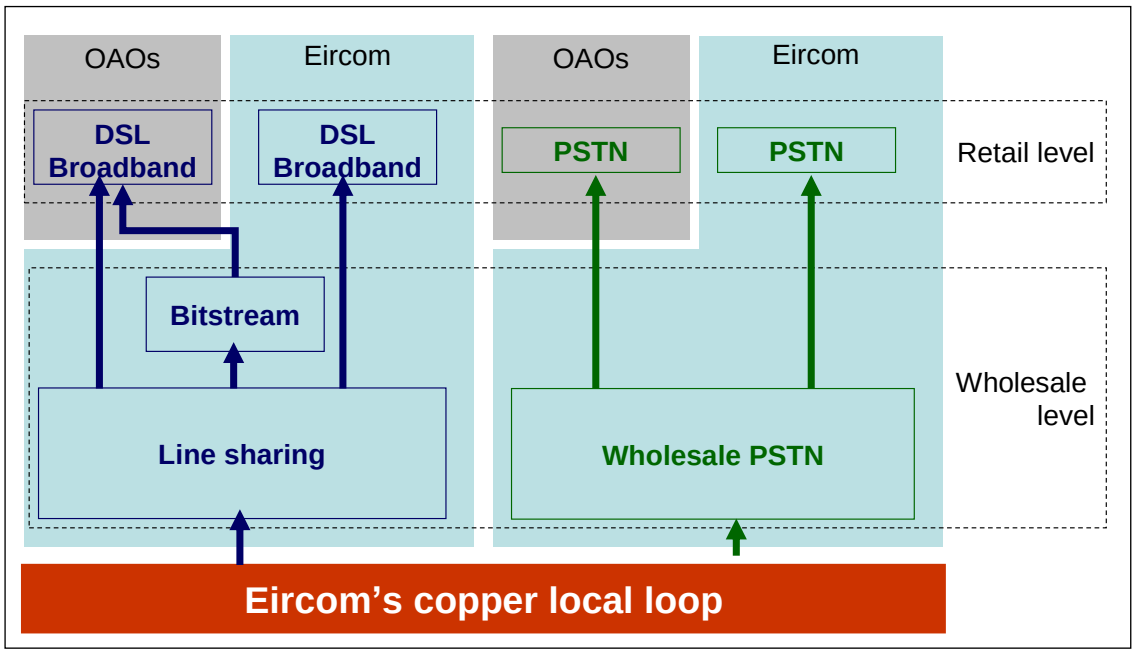
Eircom is also using these wholesale products for its own retail products.

As a consequence, the case here is similar to the combination of:

a downstream firm, Eircom, producing the asset, the copper local loop, from which are derived two wholesale products, LS and wholesale PSTN (bitstream is also using the LS product),

upstream firms acting into 2 markets: the retail broadband (where Eircom and OAOs are active) and the retail PSTN (where Eircom and OAOs are active).

Figure 5 – Retail and wholesale products using the Eircom's copper local loop



Source: TERA Consultants

One important feature is that LS cannot be offered by the OAOs if the end-user is not using and paying a PSTN monthly rental charge[17]. Eircom also cannot sell its DSL broadband services without the PSTN monthly rental charge. This means that end-users always pay, both, the PSTN service and the broadband service. The opposite is not true since end-users can have the PSTN service without the broadband one. The only cases where end-users may pay for broadband services without the PSTN monthly rental charge are:

broadband offers from alternative infrastructures (e.g. NFWS, cable TV, etc.),

and full LLU.

DSL broadband products are thus automatically sold with the PSTN monthly rental charge, either by Eircom or by OAOs (through their wholesale PSTN). This implies that end-users, when choosing the best retail offer, will

[17] *This is true is the PSTN monthly rental charge is to be paid to the incumbent or to the OAOs using the wholesale PSTN offer of the incumbent*

mechanically compare the sum of the retail broadband product price and of the retail PSTN with other prices.

3.1.2 Objectives of ComReg

As detailed in the ComReg Consultation Document No. 08/106, ComReg has to determine the optimal allocation of the common local loop costs between broadband and PSTN in order to maximise social welfare, and avoid an under- or over-recover the efficient cost of the local loop. Once this optimal allocation has been determined, the wholesale and retail prices will be chosen as the sum of the cost of the local loop allocated to the product, plus the marginal cost of the product at stake.

From paragraph 2.2, the first best solution of this issue of maximisation of the social welfare is Ramsey-pricing, which requires calculating the price elasticities of the different products[18].

As a consequence, to achieve these objectives, ComReg will have to complete the following process, step-by-step:

1. Select the relevant types of elasticities.
2. Select a method to assess the elasticities.
3. Collect the required data.
4. Assess the elasticities so as to set the regulated prices.

From the description of the use of the local loop above, providing broadband and PSTN services, the elasticities of these two products are ultimately necessary to share the common costs. The products sold by OAOs and by the incumbent on the retail market are similar when based on the copper local loop (they can replicate each other's products) and should be considered altogether when estimating elasticities.

[18] *If the Ramsey Boiteux pricing methodology is used to determine retail prices (which is not the case here since only the allocation of costs between LS and PSTN is required), then other information are necessary*

- the variable costs of the Eircom for providing its final service (here, the retail PSTN) and its wholesale service (here, the line share);
- the variable costs of the other authorized operators (OAO) for providing their final service (here, the broadband), based on the incumbent's wholesale service.

3.2 Selection of the relevant elasticities

From 0, we know that the elasticities of broadband and PSTN have to be assessed at the retail level.

From 2.2.2, we know that both own-price and cross-price elasticities are necessary except if "Miller's conditions" are simultaneously verified, i.e.

(i) The regulated firm acts as a Stackelberg price leader on the retail market.

(ii) There is a limited degree of differentiation within the competitive sector.

(iii) There are a large number of rivals and a low level of entry barriers.

(iv) The demand functions are linear.

Among these different conditions, the third one is obviously not verified since there are significant entry barriers in the broadband market, for OAOs purchasing the LS product: they need to install equipment (DSLAMs[19]) where the local loop ends (at Eircom's MDF[20]) and to deploy backhaul to link this equipment to OAO's premises. These investments are significant and constitute entry barriers[21].

Other "Miller's conditions" are not necessarily met as well: for example, OAOs purchasing the LS product can potentially differentiate from the incumbent and may not follow (at least on a transitory basis) the incumbent's prices.

Thus, as the conditions to use the "simplified" Ramsey formula (based on own-prices) are not gathered, ComReg will have to consider both own- and cross-price elasticities for retail broadband and PSTN products.

[19] *Digital Subscriber Line Access Multiplexer (DSLAM)*

[20] *Main Distribution Frame (MDF)*

[21] *"ComReg considers that entry to the market for wholesale broadband access (both to itself and third parties) would require significant investment, largely as sunk costs. As noted above, these high sunk costs, together with the economies of scale and density that characterise access networks, significantly increase the barriers to entry for entities considering constructing new local access networks capable of supporting the provision of broadband access." ComReg, Market Analysis – Wholesale Broadband Access, Document No 04/25, 5 March 2004.*

Choice of the method for estimating elasticities

The calculation of own- and cross-price elasticities requires an understanding of how the demand at the retail level evolves when prices change, which means understanding how consumers react when prices change. Hence, estimating price elasticities means estimating consumer behaviour.

There is two ways to estimate consumer behaviour, which are:

- to question consumers about their reaction through interviews or surveys.
- to analyse their past reaction through historical data of the market (over the last number of months or years).

It is worthwhile to notice that the Competition Commission in the UK has also considered that these two families of methods were the only available method for determining elasticities[22].

Direct estimation through surveys

Surveys consist of interviewing end-users and asking them several questions in order to understand how they would react to price changes.

The American Bar Association, in an in-depth study dedicated to the econometrics in the context of market analysis[23], states that:

> "*a well-designed survey conducted on a representative sample of the population can provide unbiased results relatively quickly and efficiently.*" But underlining as well that "the cost of a survey may be significant" [p. 302]

There are nevertheless several sources of bias with surveys.

A first source of bias may appear in defining a sample representative of the relevant consumers. Indeed, the American Bar Association highlights the difficulties of selecting a representative sample through the following examples:

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[22] *Competition Commission, Reports on References under Section 13 of the Telecommunications Act 1984 on Charges made by Vodafone, O2, Orange and T-Mobile for Termination Calls from Fixed and Mobile Networks, UK, January 2003. See 8. Ramsey Prices and externalities*

[23] *Econometrics, by American Bar Association (ABA), Section of Antitrust Law, 2005*

> "*Another example of a biased survey would be Internet surveys. Clearly, the respondents will only be Internet users, and they are not generally representative of the population as a whole. Telephone surveys are the most popular interview method – over 95 percent of homes have a phone – however, calling during the day will bias the sample since only people who do not work from home will be reached. It is not likely that they will be representative of the population as a whole.*" [p. 302].

A second source of bias is whether the survey is "well-designed":

When carrying out real purchases, the consumer does not have full information about prices and features of the products and will act in a much more intuitive way.

The question to be asked can also be very complex for technological products such as PSTN, mobile or broadband which are characterised by many options.

For example, the Competition Commission in the UK[24] reports the case of a study about mobile subscriptions leading to a significant number of illogical and irrational answers:

> *"Holden Pearmain told us that a majority of the respondents (about two-thirds) did not consider the price changes suggested in the conjoint analysis sufficient to make them change their usage. It said that of those making changes, about one-third gave implausible responses (for example, respondents stating they would cancel mobile subscriptions even when prices were less than current)"* and also *"responses were excluded where more than half of a respondent's overall response was illogical."*

The Competition Commission also observes that surveys are artificial since they require making some strong assumptions and, for example, minimising or neglecting the switching costs:

> *"the artificial setting of the survey, in the sense that consumers are presented with known prices and there are no costs in switching for instance, may make it more likely that consumers will state they will switch in response to a price change than they would in reality."*

[24] *Competition Commission, Reports on References under Section 13 of the Telecommunications Act 1984 on Charges made by Vodafone, O2, Orange and T-Mobile for Termination Calls from Fixed and Mobile Networks, UK, January 2003. See 8. Ramsey Prices and externalities*

As a consequence, the use of surveys for estimating elasticities may not be relevant for LS for various reasons, most of them related to the difficulties in addressing correctly all the dimensions of the real choice (multiple substitutabilities in the dynamic context of telecom, switching costs, …).

Indirect analysis through historical data

The use of historical data of the market (volumes and demands for a given product observed over the last months or years) is an indirect method that implies a selection of an appropriate econometric process to estimate elasticities.

The selection is to be made between the categories of models, based on two types of demand specification[25] :

- A flexible demand specification that allows all of the own- and cross-elasticities of demand for these products to be estimated from aggregated data.
- A less flexible demand specification that has fewer parameters to estimate than a flexible demand specification[26].

As accurate estimates of elasticities are required to implement Ramsey-pricing, the first category of model is preferable and, in this category, the most commonly used is the Almost Ideal Demand System (AIDS) model, developed by Deaton and Muellbauer[27] (and selected by Indecon in their study).

This section will explain why the AIDS method is popular (0) and how this model should be used appropriately (0).

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[25] *The demand specification is the form of the function of demand depending on prices of all products and revenue.*

[26] *As a result, "a less flexible specification may not fit the data well, which can induce bias into the elasticity estimates." [American Bar Association, pp. 291 – 292]*

[27] *An almost Ideal Demand System, A. Deaton and J. Muellbauer, The American Economic Review, Vol. 70, No. 3 (June 1980), pp. 312-326*

Main characteristics of the AIDS model

The AIDS method is the most widely diffused:

> "*The almost ideal demand system (AIDS) of Deaton and Muellbauer (1980) has as been a popular functional form to model demand behaviour during the past two decades.*"[28]

AIDS model's "popularity" comes from:

its generality: AIDS demand specification is a first order linear approximation to any demand system and a second order linear approximation to any utility function,

its simplicity for the estimation of the parameters: the estimation of the AIDS parameters can be computed with a linear regression model,

its adequacy with consumer demand theory:

- AIDS allows an easy way to impose and to test the properties of consumer demand. Certain calculations (e.g., consumer welfare) would not be valid if the demand system did not satisfy the properties of consumer demand.
- The AIDS can be obtained through aggregation over individual consumers and can be treated as the demand system for a representative consumer. Then the demands and welfare calculations for this representative consumer appropriately reflect the aggregated demands and welfare of the individual consumers.

The AIDS has been used in a variety of markets, from food[29], to pharmacy[30] and the energy sector[31].

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[28] *Analysis of Household Demand for Food in South Africa: Model Selection, Expenditure Endogeneity, and the Influence of Socio-Demographic Effects, L. Bopape and R. Myers, 2007*

[29] *Wen S. Chern & Kimiko Ishibashi & Kiyoshi Taniguchi & Yuki Tokoyama, 2002. "Analysis of Food Consumption Behaviour by Japanese Households," Working Papers 02-06, Agricultural and Development Economics Division of the Food and Agriculture Organization of the United Nations (FAO - ESA). M. Torres, Almost ideal demand system: citrus fruit demand elasticities in Germany, 1996. Awudu Abdulai, "Household Demand for Food in Switzerland. A Quadratic Almost Ideal Demand System," Swiss Journal of Economics and Statistics (SJES), Swiss Society of Economics and Statistics (SSES), vol. 138(I), pages 1-18, March 2002.*

[30] *Massimo Filippini & Giuliano Masiero & Karine Moschetti, "Characteristics of demand for antibiotics in primary care: an almost ideal demand system approach," Quaderni della facoltÃ di Scienze economiche dell'UniversitÃ di Lugano 0701, Biblioteca universitaria di Lugano (University Library of Lugano), 2007.*

[31] *Oladosu, Gbadebo An Almost Ideal Demand System model of household vehicle fuel expenditure allocation in the United States. The Energy Journal Article, 2003*

Some variations of AIDS can also be selected, such as QAIDS (see Annex), since they respect the same characteristics as AIDS model.

Highlight on the "theoretical" design of the AIDS model

The Almost Ideal Demand System (AIDS) model is based on consumer demand theory and leads to estimate the following demand system:

$$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \ln p_j + \beta_i \ln\left(\frac{x}{P}\right)$$

where:

w_i is the budget share of good i,

x is total expenditure,

P is the price index, with $\ln(P) = \sum_{i=1}^{n} w_i \ln(p_i)$

with the following constraints:

$$\sum_j \gamma_{ij} = 0,\ \sum_i \beta_i = 0,\ \sum_i \gamma_{ij} = 0,\ \gamma_{ij} = \gamma_{ji},\ \sum_i \alpha_i = 0.$$

The demand system estimation aims at determining the coefficients α_i, γ_{ij} and β_i. They can be obtained by a linear regression with least square regression methodology. Nevertheless, these parameters are sometimes difficult to interpret directly.

Then, revenue elasticity, own-price elasticity and cross-price elasticities are derived from the demand system thanks to the coefficients α_i, γ_{ij} and β_i with the following formulas:

revenue elasticity of *i* : $\varepsilon_i = 1 + \frac{\beta_i}{w_i}$

own-price elasticity of *i* : $\eta_{ii} = -1 - \beta_i + \frac{\gamma_{ii}}{w_i}$

cross-price elasticity of i in relation to j: $\eta_{ij} = -\frac{\beta_i}{w_i} + \gamma_{ij}\frac{w_j}{w_j}$

Conclusion: selecting the AIDS model

Thus, we agree with the Indecon conclusion in their report where:

- ***the historical approach is more appropriate than the surveys***
- ***the AIDS model is an appropriate (and widely diffused) model to estimate price elasticities in the context of multi-products***

Its implementation requires aggregated data (volume and price for the whole market) for each concerned product (retail broadband and PSTN product) on the retail market over time, as detailed in the next section.

3.3 The data required for estimating elasticities through the AIDS

In this section, the categories of required data will be defined (3.4.1) and some "precautions" or constraints related to that process of collect will be explained in greater detail (3.4.2).

Categories of required data

Products data

From the paragraphs above, the implementation of Ramsey-pricing, in the case of the copper local loop in Ireland, requires calculating the own- and cross- price elasticities of:

- retail PSTN products (including products from Eircom and products from OAOs based on Eircom's wholesale PSTN offers),
- retail broadband products (including products from Eircom and products from OAOs through LS or bitstream).

The AIDS methodology requires collecting the following data in relation to these products:

- The volumes of sales for the different operators present at the retail level over time.

The retail price of these products proposed by each operator present at the retail level over time.

However, PSTN and Broadband may have some close substitutes or complements (such as other fixed voice products through cable instance). Neglecting the impact of the substitutes or complements when estimating elasticities may bias significantly the results since a change in the price of a close substitute or complementary product may impact the volumes of sales of the considered product(s). If these interdependences are not included in the calculation, some variations will be attributed to the focused products, even if they are the result of a phenomenon related to substitutes/complements (prices variations, innovations, etc).

This means that, at a minimum, ComReg will need:

to identify pertinent substitutes and complements to broadband and PSTN products;

to collect volumes and prices of all the different offers of these products available in the market.

These substitutes and complements are in 2009[32] :

Broadband provided by cable operators.

Broadband provided by fibre operators.

Broadband provided by FWA operators.

Broadband provided by satellite operators.

Mobile broadband.

Mobile calls.

Revenue data

The AIDS model also requires revenue data that represents the share of consumers' budget dedicated to the basket of goods including PSTN, broadband, and substitute/complement products identified according to sub-section 0

[32] *Notwithstanding future evolutions (such as Voice over Broadband).*

ComReg would have to gather the following data:

- ***volumes and prices of broadband and PSTN products on the retail market***
- ***volumes and prices of substitutes/complements to broadband and PSTN products on the retail market***
- ***share of consumers revenue dedicated to those products***

Precautions and constraints related to the data to be collected

The specificities of the telecommunications products generate significant issues when trying to gather prices and volumes for these products, issues that shall be considered by the regulator, since it may impact the feasibility of the process or the quality of the results in implementing Ramsey-pricing.

Related to the products data

About the retail PSTN product

With the PSTN service end-users pay both an access charge (a monthly rental charge) and a usage charge (price per min. or call). As a consequence, the PSTN monthly rental charge impacts the number of PSTN lines (the access), but also the "average price" (access + usage) for using this service. This means that the decrease in the demand for PSTN may be explained by the increase in the call prices. As quoted by Indecon, from an OECD's report:

> "*It is important to take into account the fact that these two services will usually be complements – a reduction in the usage charge may increase the number of customers wishing to sign up for service.*"[33]

An omission of usage price will bias the estimation own-price elasticity of PSTN access and cross-price elasticity between PSTN access and broadband product.

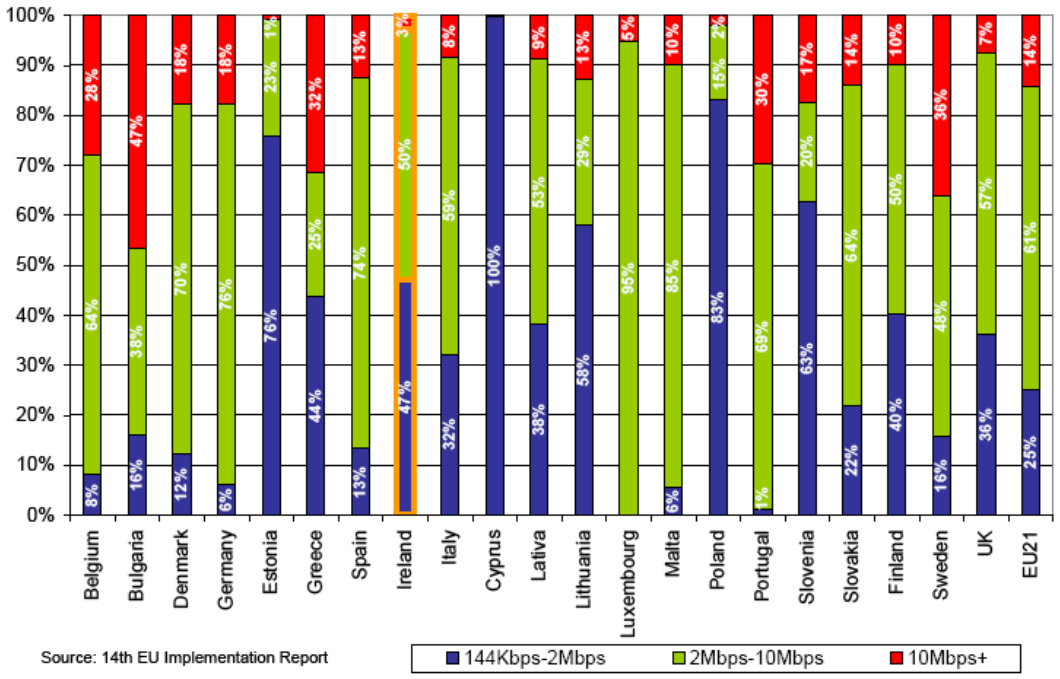
ComReg would have to choose whether to include fixed calls products in the estimation. The choice has to be objective. Its implications on the estimates of elasticities have to be described.

[33] *OECD Report on Access Pricing (2004), quoted in Indecon's report*

About the broadband products

Broadband operators offer different products with various download speeds/upload speeds. The products sold have therefore different levels of performance. For example, in Ireland, 47% of broadband lines have download speed below 2Mbps, 50% between 2Mbps and 10 Mbps and 3% above 10 Mbps (see Figure 6).

Figure 6 - Fixed Broadband Lines by Speed, January 2009



Source: ComReg quarterly report Q1 2009

This may reflect very different price elasticities and quality preferences among the end-users since the products are significantly differentiated. The question therefore arises whether the performances need to be considered in analysing price elasticities.

ComReg would have to choose whether to introduce a quality variable for broadband products. The choice has to be objective. Its implications on the estimates of elasticities have to be described.

About bundles

In the telecommunications sector, products are frequently bundled. For example, bundles associating fixed telephony and broadband may have an impact on the retail demand of broadband and PSTN products.

The treatment of those bundles in the context of Ramsey-pricing is not a trivial problem:

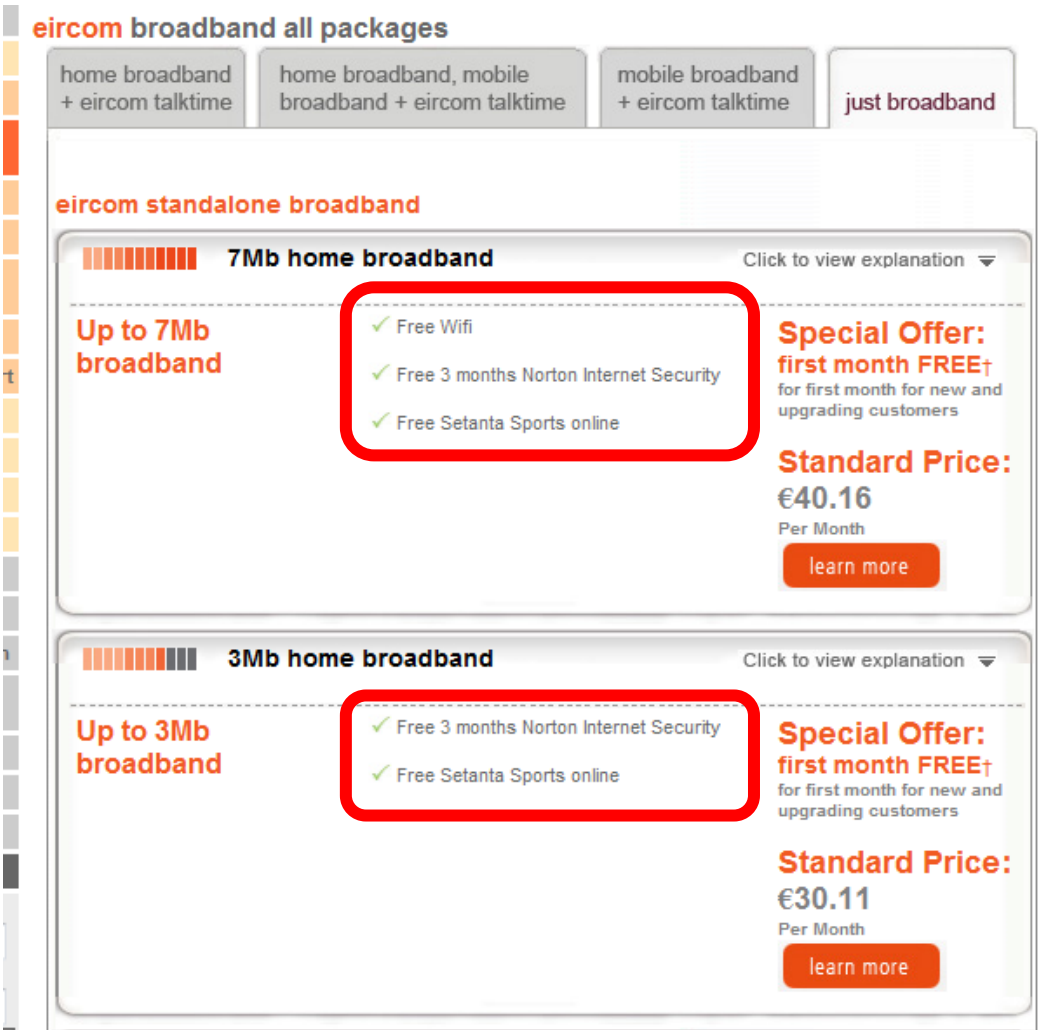
- Should such bundles be separated into two products – one fixed telephony product and one broadband product – and aggregated with other corresponding products? In such a case, which part of the global price of the bundle should be attributed to each product? And how to analyse the specific value related to the bundle (and that will disappear in case of separation)?
- Or should such bundles be considered as different products from fixed telephony product and broadband product?[34]

We believe that broadband/telephony bundles account for a significant share of DSL subscriptions in Ireland

And the problem is wider since other types of bundles like TV-Broadband bundles, triple play bundles, and mobile telephony-fixed telephony bundles also need to be considered as well as less sophisticated bundles like “just broadband” offers proposed by Eircom and including broadband access and access to a TV channel (see next figure).

[34] *It shall be noted that, according the European Commission, that there is no specific market for bundles.*

Figure 7 - Eircom's "just broadband offers" include also access to the Setanta Sports channel



Source: Eircom

These difficulties associated with bundles have been highlighted by the Competition Commission in the UK in 2003[35] in the particular case of mobile telecommunications:

> *"in practice mobile subscription price and mobile-originated price are usually bundled together for a certain number of calls for contract customers. Indeed in some instances the handset price is bundled along with the mobile subscription and mobile-originated call price. Therefore considering models where consumer's base decisions on separate subscription and mobile call prices might not be relevant when in reality consumers might base their decision on a bundled, or aggregated, price."*

Frontier Economics has also outlined this difficulty in the same context and specifically stressed the impact of the price-elasticity:

> *"Frontier Economics believed there were two reasons for its difficulty in estimating the price-elasticity of demand for mobile-originated calls. The first, it said, was due to the practice of charging customers a fixed monthly fee which included a number of call minutes. As a result, a significant pro-portion of call minutes were made as part of the allocation included in the monthly charge. This meant that users were only directly exposed to movements in the cost of calls per minute for a proportion of their calls. Frontier Economics told us this made it very difficult to identify the effects of call price movements on outbound mobile calls."*[36]

ComReg would have to choose whether to:

- disaggregate bundles and aggregate the separate components of the bundle with single products. In that case, ComReg should specify the methodology used to separate the global price between each component of the bundle.

---

[35] *Competition Commission, Reports on References under Section 13 of the Telecommunications Act 1984 on Charges made by Vodafone, O2, Orange and T-Mobile for Termination Calls from Fixed and Mobile Networks, UK, January 2003. See 8. Ramsey Prices and externalities*

[36] *Competition Commission, Reports on References under Section 13 of the Telecommunications Act 1984 on Charges made by Vodafone, O2, Orange and T-Mobile for Termination Calls from Fixed and Mobile Networks, UK, January 2003. See 8. Ramsey Prices and externalities*

- or consider bundles as a different product[37].

The choice has to be objective. Its implications on the estimates of elasticities have to be described.

Related to the revenue data: the endogeneity issue

When purchasing goods, consumers are restricted by the budget allocated to their needs. If prices of a given product increase, while demand decreases, it may not result from the elasticity but from simply the reduction of the budget.

The AIDS empirical model does not cover all products and services that consumers purchase (food, oil, accommodations, telecoms, etc.). Therefore, the typical practice with the AIDS model is to use the total expenditure of the goods considered in the model (i.e., in the present case, the sum of PSTN, broadband and other substitute/complement products expenses), instead of total revenues.

The total expenditure of the goods considered in the model is not easy data to find. Consequently, in circumstances where such data is unavailable, the NRA can replace it by endogenous data calculated as the sum of expenditures of each good considered in the model.

However, Bopape and Myers (2007) highlight the fact that this should go with some precautions in their paper using this approach:

> "*However, such a practice raises questions regarding the possibility of simultaneity bias in the budget share equations of the demand mode. Total expenditure may be determined jointly with the expenditure shares of the individual commodities that enter the demand model, making it endogenous in the expenditure share equations. Estimation ignoring expenditure endogeneity may lead to inconsistent demand parameter estimates.*"[38]

The next step is to introduce, "instrumental" variables to control for endogeneity. A good instrumental variable for expenditure must meet two conditions:

---

[37] *In this case, this would necessitate conducting a market analysis.*

[38] *Analysis of Household Demand for Food in South Africa: Model Selection, Expenditure Endogeneity, and the Influence of Socio-Demographic Effect, L. Bopape and R. Myers, 2007*

The relevance condition, which requires that the instrumental variable be sufficiently correlated with expenditure (the endogenous variable).

The exogeneity condition, which requires that income must not be correlated with the error term in the demand model.

If the expenditure is calculated with the expenditure shares of each good, the regulator shall have to take precautions concerning the endogeneity issue by introducing some instrumental variable. ComReg would have to specify those instrumental variables and justify their pertinence by verifying the relevance and the exogeneity conditions.

In the present case, possible instrumental variables could be the Irish GDP or the Irish employment stock. Their evolution may contribute to explain the evolution of PSTN lines in Ireland; thus, the current fall in the number of PSTN lines may be related to other factors than PSTN becoming more elastic. In this case, it is mandatory to consider this effect.

For example, the fall in the number of lines can be related to other factors among which the fact that the addressable market, i.e. the number of potential customers, has reduced. Such perspective is consistent in the Irish case:

The number of small and medium enterprises has decreased during the last few months in Ireland due to the sharp economic downturn. The fact that many SME's are closing down[39], mechanically implies that many of them cancel their PSTN line. For example, there were 136,000 companies in 2006, now reduced to 113,700[40]. Even if this fall in the number of companies can be attributed in part to mergers, this figure will contribute significantly to the 48,308 access path reduction seen by Eircom[41].

Between April 2008 and April 2009, the numbers unemployed has increased by around 200,000. When companies reduce their number of employees, they may also decide to reduce the corresponding number of PSTN lines, especially for companies with employees working in offices. As a

[39] http://www.rte.ie/business/2008/1217/isme.html and http://news.eircom.net/breakingnews/15420147/?view=Standard

[40] Source : Millward Brown IMS information, extracted from the Bill Moss (http://www.bill-moss.com/) database

[41] Comstat.ie - Total access paths (Direct & Indirect) reduction from Q2 2008 to Q1 2009.

consequence, this will also be a contributing factor in the fall in the number of working lines.

Many immigrants are leaving Ireland. 100,000 immigrants left Ireland at the end of 2008[42]. Some of them have a PSTN line and the fact that they leave Ireland contributes to the decrease in the number of PSTN residential lines.

Related to the number of observations

Like every other statistical methodology, the AIDS model requires many observations. Indeed, the more observations that are used, the more precise the results are.

As a matter of fact, in order to estimate price elasticities, the observation samples must contain several significant price changes for each product, because, by definition, elasticity measures the impact of price changes. As a consequence, with only one or two price changes, the elasticity calculated may not be statistically significant.

For instance, if price change occurs only once over 10 years, then at the end of the fifth year, is it more appropriate to consider the level of demand over the first five years or over the subsequent five years? Year 1 demand? Year 2 demand? Year 3 demand? This is why the AIDS model has often been used in the food sector where price changes can occur throughout the year.

Thus, in an inquiry report[43], the Competition Commission stated that in a Ramsey-pricing model:

> *"For the estimated models to pick up the relationship between variables effectively, some variation in the data is required. Estimates based on a short time-series and with relatively little variation will be imprecise."*

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[42] http://www.herald.ie/national-news/100000-workers-leave-ireland-as-pressure-on-jobs-grows-1587316.html

[43] *"Vodafone, O2, Orange and T-Mobile: Reports on references under section 13 of the Telecommunications Act 1984 on the charges made by Vodafone, O2, Orange and T-Mobile for terminating calls from fixed and mobile networks."*

The AIDS model requires a long time-series of observation with a relatively important number of significant price variations. ComReg would have to verify that each price series used to implement the AIDS model contains an important number of significant price variations.

3.3.1.1 Related to some specificities of telecommunications

Also, the telecommunications sector is very dynamic. For example, significant changes have been observed in the Irish broadband market between 2005 and today:

- The number of broadband lines has been multiplied by 4.7 between the 4th quarter of 2005 (270,539 broadband subscriptions) and the 1st quarter of 2009 (1,272,166 broadband subscriptions)[44].
- The importance of DSL, as a % of total broadband subscriptions has decreased from 75% at the 4th quarter of 2005 to 55% at the 1st quarter of 2009[45].
- The download speeds have also increased during this period.

These quick evolutions raise some issues described below.

3.3.1.1.1 Introduction of new products

New products appear frequently in the telecommunication sector. The introduction of a new product in the middle of a period of observation could bias elasticity estimation for the corresponding aggregated category of products. Frontier Economics highlighted this issue in the estimation of mobile-origination calls elasticities:

> "*the introduction of pre-pay in the middle of the period of model estimation might mean that there might not be a single relationship*

[44] *Comstat.ie - Summary statistical data on the Irish broadband market*

[45] *Comstat.ie - Summary statistical data on the Irish broadband market*

between the demand for mobile-originated calls and its price that had persisted over the entire sample period" [46]

ComReg would have to assess the impact of the introduction of new products on the estimation of elasticities.

3.3.1.1.2 The difference between early adopters and other customers

For each product, the early adopters do not behave as other consumers, as they seem to be less sensitive to the price of the products, and move to other products more often. Therefore, their elasticity is lower and would be overrepresented during the period of observation. Indeed, in the case of mobile originated calls, the Competition Commission in the UK in 2003 reminds that:

"*It may be argued that the own-price elasticity of mobile-originated calls is underestimated using historical data. This is because, arguably, the first subscribers to mobile phones had different characteristics from those who subscribed later. For instance, we might expect that those who joined first might be less price-sensitive (as they joined when prices were quite high) as compared to those who joined later. Therefore, an own-price elasticity based on historical data will give more weight to less price-sensitive customers than might be relevant now when a greater proportion of price-sensitive customers make up the mobile phone population; the coefficient estimates might, therefore, suffer from selectivity bias."* [47]

ComReg would have to assess the impact of the difference of behaviour among users on the estimation of elasticities.

3.3.1.1.3 The penetration rate of products

The penetration rate of products is also an important parameter. Indeed, as some products are now near to full penetration, a price decrease should have

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[46] *"Vodafone, O2, Orange and T-Mobile: Reports on references under section 13 of the Telecommunications Act 1984 on the charges made by Vodafone, O2, Orange and T-Mobile for terminating calls from fixed and mobile networks.", §8.21*

[47] *"Vodafone, O2, Orange and T-Mobile: Reports on references under section 13 of the Telecommunications Act 1984 on the charges made by Vodafone, O2, Orange and T-Mobile for terminating calls from fixed and mobile networks.", §8.41*

less of an effect now than it had in the past. As a consequence, the use of historical data might lead to an overestimation of own-prices elasticity. This point was highlighted by the Competition Commission in the UK in 2003 in the inquiry report on termination charges, about mobile subscription for example:

> "*if subscription prices fall from present levels we might not see the same increase in the number of consumers as seen in the past, because the industry is much nearer to full penetration now than it was in the past. From around 1997 to 2001 mobile phone penetration went from moderate level to very high levels. It is hard to believe that this trend could continue for much longer.*" [§8.37, p.213]

ComReg would have to assess the impact of the penetration rate on the estimation of elasticities.

3.3.1.1.4 Other demand drivers than prices over time

Price is not the only driver for the market growth. Those drivers (like product quality, word of mouth information, fashion etc…) should be assessed for the estimations. This point is highlighted by Competition Commission in the UK in 2003 in the inquiry report on termination charges, about mobile subscription for example:

> "*it is also possible that price was not the only or main driver of this rapid market growth. If other drivers, such as word of mouth information diffusion, increasing product quality, fashion and so on, are not controls for, the estimates of the own price elasticity of demand for mobile subscription using data from that period may be biased upwards.*"[§8.37, p. 213]

In the same way:

> "*Dr Rohlfs, in a submission commissioned by Oftel, said that whilst demand for mobile phones had increased, in part because prices had declined and service improved, a large part of the increase was attributable to more and more people recognizing the usefulness and convenience of mobile communications and adjusting their lifestyles to use it effectively.*" [48]

[48] *Competition Commission inquiry report, §8.37*

ComReg would have to assess the impact of other demand drivers – such as word of mouth information diffusion, increasing product quality, fashion and so on – on the estimation of elasticities.

3.3.1.2 Related to the frequency of collect

A consequence of the dynamics of telecommunications highlighted above is that an NRA will have to frequently readdress the issue of calculating elasticities, for example on an annual basis. Otherwise, if price elasticities change due to the dynamics of the market, the social welfare may not be optimal in absence of any changes in the allocation of the costs of the local loop.

The need to reallocate the costs of the local loop every year is a plausible perspective, but:

- would create a high level of uncertainty for OAOs who would be unable to create their business plans, forecast properly their revenues and their working capital. Also, end-users may tend to have a bad image of these OAOs changing their retail prices so frequently.
- This impact would be both on all wholesale broadband offers (LS, bitstream, etc…) and wholesale PSTN offers. Indeed, if wholesale broadband offer price changes, wholesale PSTN monthly rental charge change too in order to avoid under or over recovery of common local loop costs.
- This means that, with the non-discrimination criteria, applied by the regulated firm, both Eircom and OAOs would have regular cost updates, and thus would need to change their prices frequently.

A consistent implementation of Ramsey-pricing would imply a readjustment of the data more frequently than in more stable sectors (like electricity for example). ComReg has to evaluate the risk of uncertainty created by frequent changes in the allocation of the costs of the local loop and its impact on the operators (both Eircom and OAOs) and on the consumers.

A step-by-step definition of the implementation process by ComReg

The table hereunder details the different steps of the regulatory process to be implemented by ComReg and, if any, defines the potential issues related to each of these steps.

Figure 8 - Summary of steps to be completed by ComReg

Steps in the setting of the LS price	Description of actions to be completed by ComReg	Potential issues
1- Deciding which elasticities are required	Determine which products use the infrastructure	-
	Determine whether “Miller’s conditions” apply	-
	Determine the level in the value chain	-
2- Choosing the methodology	AIDS should be used	-
3- Collecting data	Request retail prices and retail volumes of all the retail products using the local loop	It involves some time and costs to collect the data, especially because there are various products per player and many players
	Request retail prices and retail volumes of all the retail products of the complements and substitutes	
	Collect revenues (household budget allocated to the products considered)	A priori no source available (see 4) except from the Household Budget survey. However data from this survey are already 2 ½ years out of date when published (latest one for 2004/2005 was published in final form in December 2007). Also, they are published every 5 years. This makes such survey very difficult to use.
4- Analysing the data	Find a way to include bundles	Complex issue as a way to allocate retail prices to each products sold in the bundles is required

	Find a way to include fixed calls	May be complex to due the many fixed price plans (including unlimited calls, on-net/off-net prices)
	Propose a method to consider other non-price drivers (such as QoS[49], word of mouth, etc.)	May be complex as it requires to include variables related to each non price driver with some being qualitative
	Check that there are several price changes for all the products	If they are few price changes, no elasticities assessment.
	Find the variables to solve the endogeneity issue	Linked to revenues
	Find a way to consider the dynamics of elasticities (in case of early adopters, new products)	If the elasticities are very dynamic, an option could be to consider a very short term period of observation
5- Calculating elasticities	Run the AIDS model	-
6- Determining the percentage of the local loop costs that can be allocated to the products	Apply the Ramsey-pricing formulas	-
7 – Determining the prices of the products	Apply the percentage calculated to the local loop costs and add the marginal cost	Stability of the allocation and necessity to regularly re-implement the process (from step 3 to step 7).

Source: TERA Consultants

This framework deserves some final comments:

[49] Quality of service (QoS)

Most tasks to be implemented are associated with one (or more) specific issue(s).

For some, the solution will imply costs and times with a good guarantee on the intermediate results obtained,

For the others (in most cases in fact) the problem is deeper and may interrupt the whole process.

Due to the complexity and the diversity of the issues, the regulatory process may lead to:

- No result (meaning no allocation of the common costs).
- Uncertain results.

Therefore, it appears that, as soon as the debate is centred on the practical implementation of Ramsey-pricing for LS in Ireland, the list of specific issues is not limited to the asymmetries of information that are often mentioned in the literature.

This conclusion is in line with the analysis of the Competition Commission and OFTEL in the UK in 2003[50]:

> *"it could be argued that using Ramsey prices would provide scope for various interested parties to argue about what value the elasticities used in the Ramsey prices should be. This may increase the regulatory burdens or the cost of regulation. Oftel said that there was a risk that substantial resources could be diverted to an increasingly arcane debate about econometrics without robust elasticity estimates being derived from the body of work undertaken."* [p. 223, §8.84]

[50] *Competition Commission (UK), 2003, « Vodafone, O2, Orange and T-Mobile: Reports on references under section 13 of the Telecommunications Act 1984 on the charges made by Vodafone, O2, Orange and T-Mobile for terminating calls from fixed and mobile networks"*

4 Assessing the appropriate way to implement the Global Price Cap for LS in Ireland from an NRA's (namely ComReg's) perspective

The previous section has assessed the implementation of Ramsey-pricing by ComReg. Considering the difficulties identified and that the Global Price Cap, according to the theory, may lead to the same result (i.e. maximising the social surplus), we will assess the regulatory process related to the Global Price Cap for Line Sharing in Ireland in this section.

Accordingly this section will:

- describe the context and the objective of this process (4.1),
- detail the method to be implemented (both at the level of the regulator and of the incumbent) (4.2),
- detail the list of data that is required for implementing the Global Price Cap (4,3),
- summarise and comment on the step-by-step process that ComReg should implement (4.4).

Context and objectives

The issue to be resolved by ComReg is to determine what the optimal allocation of the common local loop costs to the LS product and to the PSTN product should be in order to maximise social welfare, taking into account that the local loop efficient costs must not be over-recovered or under-recovered.

From section 2.2, the solution of this issue is Ramsey pricing. As seen in this same section, the implementation of Ramsey pricing requires calculating the own- (and sometimes cross-) price elasticities of the different products. The 2 types of products for which own- and cross-price elasticities need to be determined for setting the correct level of prices for LS and PSTN are:

- DSL broadband.
- PSTN.

Consequently, in order to avoid the price elasticities estimation step, from paragraph 0, ComReg could choose to implement a Global Price Cap pursuant

to the Laffont and Tirole suggestion. Since that process is much simpler, it may overcome some of the issues identified in section 4 and related to the "direct" application of Ramsey-pricing.

The Global Price Cap could include different types of products. For example, in the present case, ComReg could decide to implement a Global Price Cap on the following products:

Retail PSTN monthly rental charge from Eircom.

Wholesale PSTN offer from Eircom.

Wholesale LS PSTN offer from Eircom (including all retail products that use the LS product: bitstream, Eircom's broadband offers).

Since demand elasticities can be more difficult to calculate for NRAs than for the regulated firm, the Global Price Cap is thus a tool to overcome the problem of asymmetric information between the operators and the NRA. Since the regulated firm may have better expertise than the NRA concerning the demand conditions, the prices that maximise the surplus will be selected with more accuracy if this function is delegated to the regulated firm by the NRA.

4.1 The Global Price Cap model

4.1.1 The mechanism of the Global Price Cap

The Global Price Cap involves three major steps:

Setting the Global Price Cap and the weights. All the products (both retail and wholesale of the regulated firm) using the local loop are impacted by the Global Price Cap. This step would be completed by ComReg.

Choosing the prices of the products such as overall the Global Price Cap is achieved. This step would be completed by the regulated firm (i.e. Eircom).

While implementing a Global Price Cap in order to arrive at Ramsey-pricing, the NRA assumes that the regulated firm has perfect knowledge of demand elasticities for retail products. The NRA then assumes that the estimation of those elasticities, avoided by the NRA, will be properly made by the regulated firm thanks to its better knowledge of the market.

> "*In contrast with the regulator, the regulated firm has strong incentives to acquire the information about demand elasticities and to*

make use of this information; if it misjudges demand elasticities or does not act on knowledge of them, its profit will be substantially smaller."[51]

But, one may observe that such a mistake would not only impact negatively the firm's profit but also the social welfare.

4.1.2 What has to be done by ComReg In order to implement the Global Price Cap?

In order to implement the Global Price Cap, ComReg needs first to set the cap. It means it has to estimate:

- the weights to be used for each product, which are equal to the future realized quantities for each product (see paragraph 0). Difficulties may be anticipated in light of the high broadband penetration increase (and in light of the current economic downturn),
- the maximum level of earnings the regulated firm will be allowed to make on the two products.

First, the cap has to be chosen appropriately: if too low, the firm incurs a deficit; if too high, the firm makes a "rent". Laffont and Tirole (2000) stress that risk:

"*In practice, regulators lack the information needed to institute such a perfect price cap.*"[52]

Second, the exogeneity of weight qualified as weights based on realizations of output create some difficulties, also highlighted by Laffont and Tirole (2000):

"*Weights should equal realized quantities in a perfect price cap. Uncertainty about cost, about market demand, and about the competitor's market share may, however make it difficult to forecast these quantities accurately. We can, of course avail ourselves of mechanisms for updating weights on the basis of past outcomes.*" [53]

[51] *Laffont and Tirole (2000) page 87*

[52] *Laffont and Tirole (2000), page 66*

[53] *Laffont and Tirole (2000), page 66*

Therefore, determining the Global Price Cap is not an easy task for the NRA when the demand evolves due to the introduction of innovations in the market. The Global Price Cap would need to be monitored and revised more frequently than more mature services.

4.1.3 What has to be done by the regulated firm?

Then, the regulated firm is requested to set prices so that the weighted average of those prices remains below the Global Price Cap. In order to maximise its profits under the Global Price Cap constraint, the regulated firm will have to assess the elasticities of the different products: for the same reasons as the ones detailed in 0, it will have to assess retail price elasticities of broadband products and PSTN products.

Either the incumbent already estimates about its products price elasticities (through market studies and its experience). Or, if not, the regulated firm will have to complete exactly the same steps as the ones detailed for the Ramsey-pricing (see section 3), i.e.:

i. Deciding which elasticities are required
ii. Choosing the methodology
iii. Collecting data, including data about prices and volumes of complements/substitutes of its products
iv. Analysing the data
v. Calculating elasticities
vi. Determining the percentage of the local loop costs that can be allocated to the products
vii. Determining the prices of the products

As a consequence, the regulated firm (i.e. Eircom) has exactly the same issues as ComReg with no absolute guarantee that its informational advantage will be decisive (in the dynamic context of telecommunications).

4.2 The data required for implementing the Global Price Cap

List of required data for the regulated firm

Since the regulated firm must calculate the elasticities of its products and services, it needs to collect exactly the same amount of data as the NRA when the NRA endeavours to implement Ramsey-pricing (see section 3.3).

The implementation of the Global Price Cap presents some additional risks related to the fact that many decisions are left to the regulated firm.

These risks are:

Risk that the regulated firm has a low informational advantage.

Risk that the regulated firm changes the prices frequently.

Risk of predatory pricing or squeeze pricing.

Risk of a low informational advantage

Even if the knowledge of the regulated firm on demand function(s) is better than the NRA, it may nevertheless suffer from myopia: in front of new services (or due to the appearance of new substitutes for old services) the regulated firm may face difficulties to determine Ramsey based prices (and especially in the field of telecommunications, see 3.4.2.4).

In other words, the relative advantage of the Global Price Cap thanks to the better knowledge of the regulated firm does not solve all the technical problems mentioned previously.

Risk of changing the prices

The regulated firm is able to change prices over time as long as the weighted price remains below the cap. Such changes could destabilise the cost structure of OAOs that will not necessarily be able to change their retail prices in accordance with the wholesale price changes due to some rigidity such as the contract with their customers.

Risk of predatory pricing or squeeze pricing?

The regulated firm could choose a predatory pricing strategy. In theory, Laffont and Tirole (2000) argue that it's not an optimal choice when the regulated firm has perfect information on demand. But in reality, the regulated firm does not have the required levels of information. Moreover, even theoretically, Laffont and Tirole do not refute the possibility that a price squeeze strategy could be implemented by the regulated firm. One solution that they propose would be to mix a Global Price Cap and the ECPR[54], but another degree of complexity is then introduced.

Indeed, it needs to be stressed that ComReg has previously studied the possibility to retain a global price cap for Eircom (for fixed Narrowband Access Markets)[55], with the following conclusion:

> "*A global price cap covering the basket of services would allow Eircom a greater degree of flexibility on how is balances charges. However it only acts as a limited constraint on Eircom's ability to increase prices and will not necessarily prevent excessive pricing. It may afford Eircom the opportunity to target price reductions at higher level access users and increase their market by lower level access where certain consumers groups or areas may be captive*" [p. 31].

List of required data for the NRA

The NRA needs to assess the future quantities of the different products sold by the incumbent in order to apply the appropriate weights for setting the Global Price Cap.

The NRA must also determine the cost of the local loop.

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[54] *The Efficient Component Pricing Rule (ECPR) represents the incremental cost plus the opportunity cost that the incumbent incurs when the OAO provides the service. This opportunity cost is computed as revenues less all incremental costs. As a consequence, prices derived on the basis of the ECPR represent both profit and contribution to common costs of the incumbent, given the existing retail prices for the service considered.*

[55] *Consultation on a Retail Price Cap as a Potential Remedy on Fixed Narrowband Access Markets – Part II. Consultation and Response to Consultation 05/41, Document No: 07/48*

4.3 A step-by-step definition of the implementation process of the Global Price Cap for LS price in Ireland by ComReg

The table below details the different steps of the regulatory process that could be implemented by ComReg and, if any, defines the potential issues related to each of these steps.

Figure 9 - Summary of steps that would need to be completed by the NRA

Steps in the setting of the Global Price Cap	**Description of actions to be completed by the NRA**	**Potential issues**
1- Choosing the relevant product to be included in the Global Price Cap	Determine the incumbent's products that share the local loop (LS, bitstream, retail PSTN, wholesale PSTN, etc.)	-
2- Setting the weights for each product	Forecast the volumes of sales	Difficulty related to the forecasting exercise
3 – Setting the level of the Global Price Cap	Calculate the local loop cost	Calculating the local loop cost is a specific issue
4- Letting the incumbent setting the prices		Risk that the incumbent has less accurate information compared to the NRA Risk that the incumbent changes the prices often Risk of predatory pricing or squeeze pricing

Source: TERA Consultants

Some final comments on this framework:

Even if the regulatory process is lighter than the "classical" Ramsey-pricing (and thus its direct costs probably reduced), the efficiency of the Global Price Cap (i.e. leading to a surplus maximisation) is not guaranteed at all in the case of LS (and more generally for telecommunications services).

On the side of the NRA:

- Determining the Global Price Cap implies to set the weight of each product, which is a delicate exercise, subject to regular reassessments.
- Since the position of OAOs may be weakened by the variations of the Global Price Cap and of the incumbent's prices, the regulators may be faced with a conflict between two of its objectives: maximising the social welfare and sustaining a high degree of competition.

On the side of the regulated firm:

- Even if, as a service provider, the incumbent is closer to the end-users (compared to the regulator), this relative proximity is not sufficient to make the choices that will also maximise the social welfare. For obvious reasons, related to the complexity of such a dynamic and innovative economic sphere as the telecom services, there is no guarantee that the incumbent will be able to make the choices that will both maximise its profits and the global welfare.
- And, the incumbent might be "tempted" to use its delegation as a strategic tool, since the price adjustments related to the Global Price Cap may destabilise the OAOs and, even, lead to predatory effects.

For all these reasons, the Global Price Cap does not appear to be the "golden tool" that will overcome the numerous limits identified previously when assessing the regulatory process related to "classical" Ramsey-pricing. Moreover, the Global Price Cap presents some specific limits (or dangers) inducing other kinds of negative consequences on the consumers or on the OAOs and, thus, impacting on overall welfare.

5 Assessing the Indecon/London Economics' study in light of the previously defined appropriate way to implement Ramsey-pricing for LS in Ireland from an NRA's (namely ComReg) perspective

TERA proposes here to review the implementation of Ramsey-pricing proposed by Indecon/London Economics in their report. The following subsections follow the same framework as the ones previously used, that is:

Section 0 describes the objectives of Indecon/London Economics and especially detailing the elasticities they propose to use for implementing Ramsey-pricing.

Section 5.2 assesses the appropriateness of the method proposed by Indecon/London Economics.

Section 5.3 analyses of the data used by Indecon/London Economics.

Section 5.4 determines how the results from Indecon/London Economics could be used by ComReg for setting of the LS price.

Context and objectives considered by Indecon/London Economics

In Section 3 of their report, Indecon/London Economics purport to show *"that Ramsey pricing is not insurmountable in the context of cost allocation in LS, provided price elasticities of demand can be calculated".* They argue in this section that Ramsey-pricing is not complex and show that it is feasible by providing examples and by calculating elasticities in the context of LS in Ireland.

We first observe that, even if Indecon/London Economics refer to a "*vast body of international research*" [Ind.-L.E. p.ii], the cases that are mentioned often relate to utilities with a low degree of significance concerning the specific issues linked to LS. In the cases referred to in their report, compared to the telecommunications services, the range of products is generally limited or the rate of technical progress and innovation is lower. In the sectoral environments they mention, most of time, the preferences on the demand side are more stable meaning that, even if the task is not obvious, assessing and monitoring the elasticities with a reasonable degree of accuracy and reliability is "easier".

Such differences are underlined in the World Bank Institute's working paper mentioned by Indecon-London Economics:

> "*While it is true that elasticity of demand is difficult to forecast for new innovative services (especially in the telecommunications sector) in some utilities (gas, electricity) patterns of demand are rather standard and predictable so that the regulator could and should try to produce such estimates*" [Valletti & Estache, 1998 p.24].

For example, Indecon-London Economics refers to:

- the postal services "*The United States Postal Service (USPS) explicitly uses Ramsey pricing principles and estimates the elasticities of products and sets prices according to these elasticities*" [Ind.-L.E. p.24].
- the railroad: "*in Ireland, rail prices have peak and off-peak, a commuter belt ticket is quite a bit less expensive than an intercity ticket […] are set with respect to demand elasticities, etc"* [Ind.-L.E.p.7].
- airlines: "*Ryanair and other low cost carriers charge a high fare for fliers who book late, and high margins on certain items in-flight"* [Ind.-L.E. p.24].
- electricity: "*Ramsey pricing is the basis of pricing in a number of regulated markets, including electricity prices in general (where peak-load pricing can be seen as the original application of the concept by Boiteux-while working for Electricitie de France (EdF) Energy))"* [Ind.-L.E. p.24]. "*Ramsey pricing approach is in Chinese electricity tariffs, where high rates for commercial customers allow subsidized consumption in residential sectors*" [Ind.-L.E. p.42].

The relevance of these cases is limited and not only because most of them are more "mature" and less "technical progress intensive" than telecommunications:

- Except in the case of the Chinese electricity, there is little feedback regarding the final impact in terms of economic surplus. In other words, showing some examples of Ramsey-pricing does not imply that the implementations have been successful compared to the initial objectives.
- Some of these cases are not decisions taken by NRAs (EDF, Ryanair, USPS, …).
- Regarding "*peak/off peak*", such a measure also refers to price discrimination; the general issue is different as "*peak*" and *"off peak"* are substitutable services. The goal is to give incentives (or penalties) to consumers in order to avoid infrastructure saturation (be it in terms of

production or transport). In the case of LS, the issue is not to give price signals to the users as to switch from PSTN to broadband or vice-versa.

By comparison, the cases proposed by Indecon-London Economics on the side of telecommunication services are very limited (and mainly theoretical). They widely cite De Ridder (2008) who concludes that Ramsey-pricing meets "*all the criteria*" [De Ridder p.13]. However De Ridder (2008) does not pay any consideration to the practical implementation process and proposes a comparison limited at a theoretical level.

In their report prepared for Eircom, Indecon/London Economics propose an estimation "of the price elasticity of demand for various Eircom products using various levels of aggregation (e.g., Broadband, PSTN rental, retail and wholesale)". This calculation of price elasticity can then be used to derive an allocation of common local loop costs compatible with Ramsey-pricing.

5.1 The choice of the elasticities by Indecon/London Economics

Even if one of the overall goals of Indecon/London Economics is to show that implementing Ramsey-pricing is feasible, the ultimate objective is to assess elasticities to be used for setting the LS price. Indecon/London Economics aims at assessing estimates of *"the price elasticity of demand for various Eircom products using various levels of aggregation (e.g. Broadband, PSTN rental, retail and wholesale)"*.

While the goals in terms of the types of elasticities Indecon/London Economics are not detailed in their report, we can infer from their conclusions that their goal is to calculate the own-price elasticity of retail PSTN (provided by Eircom) and the own-price elasticity of retail DSL (provided by Eircom). However, we note also that they calculate the own-price and cross-price elasticities of the wholesale DSL product (bitstream), the retail DSL product (provided by Eircom), the wholesale PSTN product and the retail PSTN product.

As demonstrated in section 3.1.2, price-elasticities to be estimated when implementing the Ramsey-pricing in the case of LS are elasticities:

At the retail level.

For broadband and PSTN services.

Own-price and cross- price elasticities are necessary.

The way these 3 points have been considered by Indecon/London Economics is discussed below.

5.1.1 Is it Indecon/London Economics' aim to calculate elasticities at the retail level?

As explained in 0, retail price elasticities of all products using the common asset, Eircom's local loop, should be calculated. Thus, retail elasticities should be calculated for PSTN products and broadband products using Eircom's local loop. Indecon/London Economics separate these two groups of products between Eircom's retail products and Eircom's wholesale products. Then, they calculate wholesale price elasticities (even if it is not used in conclusions) for the wholesale DSL and the wholesale PSTN instead of aggregating these products at the retail level with Eircom's retail products.

Also, cross-elasticities between wholesale and retail products are meaningless because they do not address the same type of buyers (operators on the one hand and end-users on the other hand).

5.1.2 Is it Indecon/London Economics' aim to calculate the price elasticities for the broadband and the PSTN services?

Indecon/London Economics split the calculation of elasticities between retail PSTN, wholesale PSTN, retail DSL and wholesale DSL, instead of calculating elasticities for broadband and PSTN. We first observe that this split is not justified and is not in line with the non-discrimination principle (cf. 0 and 3.1.1). This principle implies that Eircom and OAOs are both using the same common local loop and the same wholesale product (the wholesale product LS and the wholesale product wholesale PSTN) to provide on the one hand DSL broadband services in the retail market and PSTN services in the retail market.

In particular, if Indecon/London Economics' view is that the 4 products (retail PSTN, wholesale PSTN, retail DSL and wholesale DSL) are acting in different markets and should be considered separately, then they should have added the LS product. However the LS product is not considered.

For example, by artificially calculating separately the elasticity of the retail PSTN product and the elasticity of the wholesale PSTN product, Indecon/London Economics are calculating own-price elasticities that may be very different from the overall PSTN own-price elasticity (for example, the overall PSTN elasticity may equal -0.2, the retail PSTN price elasticity may equal -0.4 and the wholesale PSTN price elasticity may equal 0).

But, the overall price elasticity is required since wholesale PSTN and retail PSTN are substitutes for end-users. From a technical point of view, they are indeed identical. NB: Confidential information from Eircom was reviewed to arrive at such conclusions.

5.1.3 Do Indecon/London Economics aim at using cross-elasticities?

In part 2.2.1, it has been explained that cross-price elasticities are not always necessary in the Ramsey-pricing methodology. Miller (2007), for example, states that under some conditions that are simultaneously verified (see part 2.2.1) only own-price elasticities are necessary.

While calculating cross-price elasticities, Indecon assumes that only own-price elasticities are useful in the case of LS, based on Miller's paper and justifies it as follows:

> *"We consider that Miller's recent model may be applicable in the context of this consultation exercise because of the following factors:*
>
> - *Eircom's position may be that of a leader in the competitive market (retail PTSN);*
> - *It would be plausible to assume that competitors would take Eircom's output in the competitive market as given in deciding what to provide in the competitive market;*
> - *Free entry and exit conditions exist in the competitive market;*
> - *Linear demand represents a workable and simple conceptualization of Eircom's demand in both markets."*[56]

However, while the fact that Eircom is acting as a Stackelberg leader in the PSTN market and the fact that demand is linear may be accepted, the

[56] *Response to ComReg's Line Share Consultation, Report Prepared for Eircom, By Indecon International Economic Consultants and London Economics, March 2009, page 41*

broadband market is not a market with “free entry”, since it requires large investments (especially for alternative infrastructure operators) and large sunk costs. Also, it is not clear that Eircom is a Stackelberg leader in the broadband market, since even this firm is considered dominant in the broadband market by ComReg; we observe that some competitors, such as UPC (the cable operator) have aggressive pricing strategies and do not necessarily follow Eircom’s prices.

As a consequence, Indecon/London Economics fails to take into account cross-price elasticities in its conclusions while it has calculated them.

5.1.4 Conclusion

The elasticities that Indecon/London Economics intend to use and use to conclude on the way the common local loop costs should be allocated between broadband and PSTN are inadequate:

- ***Some elasticities are calculated at the wholesale level.***
- ***The products considered are not the appropriate retail products.***
- ***Cross-price elasticities are not used (while calculated).***

By not clearly determining and clearly justifying its goals and which types of elasticities it intends to calculate, Indecon/London Economics seem to calculate several type of elasticities and to finally choose the most appropriate one to conclude on a 50/50 cost allocation between broadband and PSTN.

5.2 Choice of the method by Indecon/London Economics

Indecon/London Economics propose to use historical data and to implement the QAIDS method to derive elasticities. The QAIDS is a variant of the AIDS method and as explained in Annex, this is a valid and classical method to estimate elasticities.

The particularity of the QAIDS method is that it allows the model to be non-linear in the expenditure (see Annex for details).

We note that Indecon/London Economics has not specified why it has used this variation of the AIDS method.

Finally, we note that estimating at the same time elasticities of wholesale and retail products is incompatible with the AIDS methodology. Indeed, the AIDS methodology is based on consumer demand theory, which means all products used in the data have to be on the retail level.

With QAIDS, Indecon/London Economics has chosen an appropriate model to calculate elasticities

5.3 Data used by Indecon/London Economics for estimating elasticities through the AIDS method

In this section, we will assess the appropriateness of the data used by Indecon/London Economics and then examine whether they have considered the precautions listed in section 3.3.

5.3.1 The list of data used by Indecon/London Economics

5.3.1.1 Product data

Volumes and prices for both wholesale and retail PSTN and DSL broadband services proposed by Eircom since 2004 have been provided by Eircom to Indecon/London Economics.

Then, Indecon/London Economics consider the period 2004 –2009 and 4 categories of products (without the bundles): retail PSTN, wholesale PSTN, retail DSL and wholesale DSL.

Using the prices and volumes provided for each product, Indecon/London Economics calculated for all 4 product categories the corresponding volumes (i.e. the sum of the sales volumes for the different product being part of a given category) and the average prices.

Then, the volumes and prices of the 4 product categories are available for the 60 months considered.

As a consequence, Indecon/London Economics data is inadequate:

For the 4 products considered by Indecon/London Economics, wholesale prices have been used instead of retail prices. Collecting retail prices is also much more difficult than collecting wholesale prices.

All the possible substitutes of DSL broadband and PSTN have not been considered, such as:

- broadband offers from cable operators, from FWA operators, from mobile broadband which are subs
- mobile offers which can be substitutes from PSTN lines.

Indecon/London Economics have omitted to collect a significant amount of data. This results in significant flaws in the results of Indecon/London Economics analysis.

Revenue data

The AIDS methodology also requires revenue data that represents the share of consumers' budget dedicated to the basket of goods including PSTN, broadband, and substitutes/complements products. Indecon/London Economics has not considered this data.

Indecon/London Economics has not collected all the necessary revenue data. This implies they should have checked that there are no endogeneity issues (see 3.4.2.2)

5.3.2 Has Indecon/London Economics considered the specific precautions and constraints related to the data?

5.3.2.1 Precautions related to the products data

5.3.2.1.1 The complementarities between access and usage

These two services are complements, as it is outlined in Indecon/London Economics' report through a quote of the OECD[57]:

> "*it is important to take into account the fact that these two services ["access" and "usage"] will usually be complements – a reduction in the usage charge may increase the number of customers wishing to sign up for the service*".

The omission of the usage service can lead to an over or under estimation of own-price elasticity for PSTN access service when the usage charge increases or decreases.

Data on retail usage charge, in addition to access charges should be included. Excluding retail usage charges may bias elasticity estimates.

5.3.2.1.2 Performance of the products proposed on the broadband market

Broadband offers in the Irish market have different download/upload speeds. Indecon has aggregated all these different offers (for Eircom) in two categories (one for Eircom retail DSL and another for Eircom wholesale DSL). Then the price-elasticities related to these categories may evolve over time while the mix between these products is changing. Then the aggregation made by Indecon could result in a bias in estimation. Indecon does not tackle this.

Indecon has not considered the impact on price elasticities of the different levels of quality of services offered by the same player in the broadband market.

[57] *Quotation of OECD Report on Access Pricing in Indecon's report, page 33*

5.3.2.1.3 The offers proposed in bundles

Indecon/London Economics should take into account bundles between PSTN and DSL. This can be a difficult exercise in trying to separate the two products by extracting the value of each part of the bundles. We believe that bundles represent a significant portion of DSL subscriptions, therefore should be integrated into elasticity calculations.

Indecon should include bundles in elasticity calculations and Indecon has not discussed how they could be integrated into the elasticity calculations.

5.3.2.2 Precautions related to the endogeneity issue

As Indecon/London Economics has not collected revenue data, it must consider the endogeneity issue.

As indicated in section 0 the evolution in the demand of PSTN is not necessarily due to price elasticity but to specific economic conditions in Ireland that are not considered by Indecon. Such factors have not been considered by Indecon/London Economics.

Indecon does not discuss this endogenity issue. Indecon does not introduce any instrumental variable to control this endogeneity issue.

5.3.2.3 Precautions related to the number of observations

In section 0, we illustrated how the AIDS model requires many observations however, due to the dynamics of the market; these observations must be completed over a short-term period. Moreover, many price changes are necessary to assess the impact of price changes. However, Indecon/London Economics do not address these issues.

In particular:

Indecon considers the 2004 – 2009 period during which the broadband market and the PSTN market have significantly changed:

- Wholesale PSTN offers accounts 17% of fixed line access paths in Q3 2008 while they accounted for 0% in March 2004[58];
- The broadband household penetration rate is at 60% in January 2009[59] while it was at 3% in March 2004[60];
- Bundles have been introduced in the market such as fixed voice + broadband bundles or bundles including calls to Meteor.

Indecon/London Economics have also highlighted the dynamics of the market in their report: *"However, Eircom, and judgementally Indecon, believe that dynamically and going forward, DSL, and PSTN for fixed line networks are likely to become more elastic, and that DSL might still be somewhat more elastic than PSTN; this could change, however. There are also possible dynamics with complimentarity between a variety of products going forward that might be important. We have not fully investigated this as this would require modelling interrelated demands of voice, TV, mobile, and DSL. Qualitatively, though, we argue that this investigation is not necessary, or alternatively, could be done with additional time and effort."*

The period of observation raises the risk that estimated elasticities are not valid since they incorporate historic end-user behaviours. Also, Indecon/London Economics does not test the stability of these results. We can also ask Indecon/London Economics why they only provided the results of price elasticity calculations over the period 2004 –2009 in their report. One reason could be that any shorter period would have a much lower statistical significance, which shows the limit of the exercise carried out by Indecon/London Economics especially in a very dynamic market.

It does not raise the issue that during the period considered, the retail PSTN price has only changed once, and the wholesale PSTN price has only changed twice.

[58] *Source: ComReg quarterly report*

[59] *Source: ComReg quarterly report*

[60] *Source: ComReg quarterly report*

Retail and wholesale PSTN present too few variations over the period of observations to be used to measure elasticities and the period of observation appears to be too large in light of the dynamics of the markets considered. Indecon/London Economics have not detailed this point. These two points could have a major impact on elasticities calculated.

5.4 Could the results from Indecon/London Economics be used by ComReg when setting the LS price?

Indecon/London Economics uses the QAIDS model to derive own- and cross-price elasticities for the 4 product categories with the following results:

Figure 10 - Indecon/London Economics' results

Table 4.1 Own and Cross Price Demand Elasticities

		ΔQ			
		Retail DSL	Wholesale DSL	Retail PSTN	Wholesale PSTN
ΔP	Retail DSL	-0.626	-0.272	0.697	0.201
	Wholesale DSL	-0.236	-0.134	0.288	0.082
	Retail PSTN	0.794	0.440	-0.696	-0.539
	Wholesale PSTN	-0.069	-0.075	0.177	-0.032

Source: Indecon analysis of Eircom Line Base Data

Source: Indecon/London Economics

Looking at own price elasticities only and for retail PSTN (from Eircom) and retail DSL (from Eircom) only, Indecon/London Economics conclude that since own-price elasticities for retail DSL and retail PSTN are very similar, "*the 50/50 rule is not likely to be too far from the optimal Ramsey rule*".

However, it is important to note that LS can also be sold with the wholesale PSTN offer. As a consequence, it is not clear why the own-price elasticity of the wholesale PSTN offer has been rejected. We observe in this respect that the own-price elasticity of wholesale PSTN is 20 times lower than the own-price elasticity of retail DSL. Expanding the conclusions of Indecon/London

Economics would generate two LS prices: one LS price where 50% of the local loop costs are allocated to the LS price when it shares the local loop with a retail PSTN offer from Eircom and one LS price where 0% of the local loop costs are allocated to the LS price when it shares the local loop with a retail PSTN offer from OAOs.

However, these results cannot be used by ComReg to determine the LS price that would maximize social welfare since:

- Indecon/London Economics have not considered the appropriate elasticities.
- Indecon/London Economics have not considered the appropriate products and prices.
- Indecon/London Economics have collected a very small amount of data (omitting mobile, UPC, FWA volumes and prices for example).
- Indecon/London Economics are using data on which PSTN prices have changed only once or twice.
- Indecon/London Economics are using a too long observation period while the markets considered are dynamic.
- Indecon/London Economics should take precautions to properly consider bundles, complementarities between access and calls in the PSTN market, different levels of quality of service in the broadband market, etc.
- There are some mistakes in the data used by Indecon/London Economics that cast doubts on their calculation.

All these points have a significant impact on the level of price elasticities and cannot therefore be used by ComReg for the setting the LS price under a Ramsey-pricing approach. Finally, our view is that it is not possible to conclude, as Indecon/London Economics, that "the structure of line share/PSTN rental prices should be set on a 50/50 basis".

6 Conclusions

Pursuant to this assessment whether the Ramsey-pricing method can be implemented for the setting of Line Sharing in Ireland, TERA is of the view that **the calculation of necessary and unbiased own-price and cross-price elasticities, required for the implementation of Ramsey-pricing in the case of LS in Ireland, is**:

Highly complex because there is a need to have:

- a large amount of data, with several price changes to be consistent.
- related to the very dynamic broadband market (new download speeds, new prices, bundles with voice and broadband, bundles including calls, etc.),
- and covering a wide diversity of economic players (Eircom, bitstream operators, LS operators, full LLU operators, cable operators), to secure it, to analyse it, to format it on a recurring basis.

Highly uncertain because many issues stay unresolved:

- How should PSTN call prices be considered in the estimates of elasticities?
- How should bundles be considered in the estimates of elasticities?
- How should mobile prices be considered in the estimates of elasticities?
- How should the various quality of service of the different products available in the telecommunications market be accounted for?
- Other issues may arise with the launch of new types of products.

Highly costly since:

- gathering regularly the relevant information will mobilise time and budgets of all the “stakeholders” (ComReg, Eircom, the OAO,
- and, due to the aforementioned uncertainties, may nevertheless lead to

Thus, our conclusion is that implementing a version of the Ramsey pricing (and whatever the version), is simply not technically feasible with:

an appropriate degree of “certainty” on the elasticities,

reasonable costs of monitoring,

and, at the end, the guarantee that the economic surplus is maximised.

Even with a Global Price Cap, such a result cannot be obtained and Indecon-London Economics does not provide any new evidence to support why this approach would be effectively feasible. **A Global Price Cap would in fact only transfer the difficulties of appropriately implementing Ramsey-pricing from the NRA to the regulated firm. This would tend to increase the difficulties because the regulated firm would have more difficulties to collect the required data from its competitors. It would also prevent industry from ensuring that the regulated firm is making valid assumptions, is not making any mistakes and is not behaving in a way that would penalise its competitors, for example by changing the LS price on a regular basis, by having predatory pricing behaviours, etc**.

The incremental cost approach has, in comparison to an inappropriate implementation of Ramsey-pricing, the advantage of being much easier to implement and to control in the medium term: it gives more visibility to OAOs, it does prevent Eircom from recovering efficient network costs as long as the PSTN monthly rental charge recovers the efficient cost of the local loop and it does not require ComReg and Eircom to implement a mechanism by which if some local loop costs are allocated to the LS product, then the PSTN monthly rental charge for end-users purchasing broadband on the basis of LS needs to be reduced.

We confirm our previous conclusions to select the Incremental Cost for Line Sharing in Ireland as it appears that, contrary to Indecon/London Economics statement, it is not possible to appropriately implement Ramsey pricing for Line Sharing in Ireland.

It should also be noted that, if it were possible, our analysis shows that it would be at an unreasonable cost for ComReg and all stakeholders involved.

7 Annexes

7.1 Ramsey pricing in the case of independent products

Mathematically, for each service k, and letting p_k, q_k, η_k, and c_k denote the price, quantity, elasticity (where $\eta_k = -\left(dq_k/dp_k\right)\left(q_k/p_k\right)$) and marginal cost of service k, $\frac{p_k - c_k}{p_k} = \frac{\lambda}{1+\lambda}\frac{1}{\eta_k}$, where $\frac{\lambda}{1+\lambda} < 1$ is the same for all k.

7.2 Ramsey pricing in the case of non independent products

Indeed, in case of substitutes or complementary goods, "superelasticities" should be used instead of own-price elasticities. For instance, for two goods, 1 and 2, $\frac{p_1 - c_1}{p_1} = \frac{\lambda}{1+\lambda}\frac{1}{\hat{\eta}_1}$ and $\frac{p_2 - c_2}{p_2} = \frac{\lambda}{1+\lambda}\frac{1}{\hat{\eta}_2}$ where $\frac{\lambda}{1+\lambda} < 1$ and $\hat{\eta}_k$ are price "superelasticities". If goods 1 and 2 are substitutes, $\hat{\eta}_1 = \eta_1 \frac{\eta_1\eta_2 - \eta_{12}\eta_{21}}{\eta_1\eta_2 + \eta_1\eta_{12}} < \eta_1$ and $\hat{\eta}_2 = \eta_2 \frac{\eta_1\eta_1 - \eta_{12}\eta_{21}}{\eta_1\eta_2 + \eta_2\eta_{21}} < \eta_2$ where $\eta_k \equiv -\frac{\partial q_k}{\partial p_k}\frac{p_k}{q_k}$ denote the own-price elasticity of good k, and $\eta_{kl} \equiv -\frac{\partial q_k}{\partial p_l}\frac{p_l}{q_k}$ denote the cross-price elasticity.

7.3 QAIDS model elasticities formulas

The QAIDS budget share equations system is[61]:

$$w_i = \alpha_i + \sum_{j=1}^{K} \gamma_{ij} \ln p_j + \beta_i \ln\left(\frac{x}{a(p)}\right) + \frac{\lambda_i}{b(p)} \cdot \left[\ln\left(\frac{x}{a(p)}\right)\right]^2$$

where:

$$\ln a(p) = \alpha_0 + \sum_{i=1}^{K} \alpha_i \ln p_i + \frac{1}{2} \sum_{i=1}^{K} \sum_{j=1}^{K} \gamma_{ij} \ln p_i \ln p_j \ ,$$

$$b(p) = \prod_{i=1}^{K} p_i^{\beta_i} \ ,$$

and $\sum_{i=1}^{K} \lambda_i = 0$

with the following constraints:

$$\sum_j \gamma_{ij} = 0 \ , \ \sum_i \beta_i = 0 \ , \ \sum_i \gamma_{ij} = 0 \ , \ \gamma_{ij} = \gamma_{ji} \ , \ \sum_i \alpha_i = 0 \ , \ \sum_i \lambda_i = 0$$

Then, formulas for the QAIDS expenditure and price elasticities are derived by differentiating the budget share equations.

The expressions for the elasticity formulas are simplified by using the intermediate results:

$$\mu_i = \frac{\partial w_i}{\partial \ln x} = \beta_i + \frac{2\lambda_i}{b(p)} \left\{\ln\left(\frac{x}{a(p)}\right)\right\}$$

$$\mu_{ij} = \frac{\partial w_i}{\partial \ln p_j} = \gamma_{ij} - \mu_i \left(\alpha_j + \sum_{l=1}^{K} \gamma_{jl} \ln p_l\right) - \frac{\lambda_i \beta_j}{b(p)} \left\{\ln\left(\frac{x}{a(p)}\right)\right\}^2$$

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61 It seems that Indecon's report annex QAIDS model equation contains a type error: the right equation to be estimated is $w_i = \alpha_i + \sum_{j=1}^{K} \gamma_{ij} \ln p_j + \beta_i \ln\left(\frac{x}{a(p)}\right) + \frac{\lambda_i}{b(p)} \cdot \left[\ln\left(\frac{x}{a(p)}\right)\right]^2$ *instead of* $w_i = \alpha_i + \sum_{j=1}^{K} \gamma_{ij} \ln p_j + \beta_i \ln\left(\frac{x}{a(p)}\right) + \frac{\lambda_i}{b(p)} + \left[\ln\left(\frac{x}{a(p)}\right)\right]^2 \cdot$

In terms of the μ_i, the formula of expenditure elasticities can be written as:

$$\varepsilon_i = 1 + \frac{\mu_i}{w_i}.$$

The expression for the price elasticities can be written as:

$\eta_{ij} = \frac{\mu_{ij}}{w_i} - \delta_{ij}$ where δ_{ij} is the Kronecker delta tacking the value $\delta_{ij} = 1$ if $i = j$ and $\delta_{ij} = 0$ if $i \neq j$.

7.4 Opinions of NRAs regarding the Ramsey-pricing

These issues analysed in the present report echoes the assessments produced by most NRAs and may justify why no regulator, even in larger countries like the USA, France, Germany, etc, has ever tried to calculate Ramsey prices in the specific case of LS:

For example, the Australian Competition and Consumer Commission (ACCC) considered that, while Ramsey-pricing is in theory an efficient and appropriate approach for LS pricing, there are "significant informational and practical difficulties. Telstra, the Australian incumbent also agrees[62],

Some complementary detailed arguments have been gathered by the Office of Telecommunications (Oftel)[63], especially as regards the econometrics of price elasticities[64]:

- Ramsey prices cannot be set because the estimates of elasticities are too uncertain, as past behaviour may be based on rapid growth and, thus, may not represent future behaviour in a context of greater price changes.
- More generally speaking, using historical data to calculate price elasticities might not be effective: the penetration rates differ, the early adopters had different characteristics from those who subscribed later (i.e. selectivity bias).
- Further, price is not the only driver of a market growth: for example quality is not necessarily integrated in the price elasticity.

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[62] *See Review of the Line Sharing Service – Declaration - Final Decision - October 2007 – Australian Competition and Consumer Commission: "Ramsey pricing argues that welfare is maximised where common costs are recovered in a way that minimises distortions to demand. Ramsey pricing does this by distributing a greater proportion of common costs to goods that are more price inelastic. The ACCC agrees that, in theory, Ramsey pricing would be an efficient and appropriate approach to distributing common line costs. However, the ACCC has noted in the past in the context of MTAS prices that Ramsey pricing has significant informational and practical difficulties.240 Telstra submits the same point in the context of this review.241 Notably, Ramsey pricing requires robust and up-to-date price elasticity information. Robust and up-to-date price elasticity information has not been provided to the ACCC and it is unaware of any alternative sources for such information. Given the likely price elasticities of ADSL and of PSTN voice services, it could be expected that any allocation of line costs to the LSS would be a relatively small amount and close to 0 per cent under a Ramsey pricing method. As noted above, VoIP and mobile voice services do not provide a sufficient alternative to fixed voice services at present, although this might change over time. Overall, the ACCC is unable to draw any further conclusions absent robust elasticity information."*

[63] *The duties of Oftel have now been inherited by Ofcom in the United Kingdom*

[64] *OFTEL (2002) Ramsey pricing – Oftel's response to letter of 4 July.* http://www.ofcom.org.uk/static/archive/oftel/publications/mobile/ctm_2002/ramsey0702.pdf

- In the field of telecommunications pricing sometimes various services are bundled together. Therefore considering models where consumers base decisions on separate services might not be relevant when, in reality, consumers might base their decision on aggregated prices.
- Using Ramsey prices is likely to lead to disputes on the elasticities real levels, with induced costs. Given the difficulties of deriving robust econometric results, there is a risk of unproductive econometric 'battles'.

The Competition Commission in the UK in 2003 also stated that *"Ramsey pricing should not be used in the regulation of termination charges"*[65] in the case of mobile tariffs for interconnection. However, the arguments raised by the Competition Commission also fully apply to LS pricing. Also, the Competition Commission refers to a price elasticity model completed by Telewest which is "*based upon such incomplete models, flawed modelling assumptions, and questionable empirical estimates of key parameters that they were probably unusable for any practical regulatory purpose".*

In its decision 05-0118, the ARCEP rejected in 2005 this methodology in the case of interconnection price setting.

One may say that NRAs' statements that Ramsey pricing is not a feasible option are a way for them to avoid their obligations. However, some economists have also highlighted the substantial difficulties of the implementation of Ramsey pricing:

[65] *Competition Commission, Reports on References under Section 13 of the Telecommunications Act 1984 on Charges made by Vodafone, O2, Orange and T-Mobile for Termination Calls from Fixed and Mobile Networks, UK, January 2003. See 8. Ramsey Prices and externalities. "As shown earlier, estimates of elasticities are required in order to be able to set Ramsey prices. It may be argued, however, that, because estimates of elasticities are uncertain, Indeed the IRG (the group of EC telecommunications regulators, to which Oftel belonged) said that, whilst, from an economic point of view, distortion was minimized by the recovery of common costs according to Ramsey pricing, the method required robust and detailed information on elasticities, which was often hard to find. Oftel said that the informational requirements were too onerous for Ramsey pricing to provide a reliable basis for regulated termination charges. A full calculation of Ramsey prices for mobile services would require own- and cross-price elasticity estimates for a wide range of mobile services such as SMS and mobile Internet access, for example. Telewest said that the Ramsey pricing analyses which had been presented to the CC, and the empirical estimates of prices and externality adjustments the MNOs had produced, were based upon such incomplete models, flawed modelling assumptions, and questionable empirical estimates of key parameters that they were probably unusable for any practical regulatory purpose. Moreover, Telewest said that even if the analyses were done properly, and based upon robust empirical parameter estimates, it seemed likely that key parameters would change over time, casting further doubt on the usefulness of Ramsey pricing as an appropriate regulatory tool."*

Miller[66], quoted by Indecon/London Economics in their report, states that *"It has been well established in the economic literature that information requirements for Ramsey or second best optimal pricing for regulated firms can be substantial except in the simplest cases. This is especially true in mixed oligopoly situations where a regulated firm competes against one or more unregulated firms offering substitute or complementary products or services"*.

But the present case (LS pricing) falls into this category since Eircom is a regulated firm, which competes with many unregulated firms (UPC, FWA operators, etc) which offer substitutes and complements to Eircom's products and services. Indecon/London Economics quotes are seemingly so selective as to be misleading."

Kennet and Ralph[67], while assessing the merits of Capacity Based Charging in telecommunications, highlights the fact that estimating elasticities is difficult or almost impossible to achieve: *"The Boiteux-Ramsey problem, when expanded to include wholesale prices, is considerably more complex than setting only Boiteux-Ramsey retail prices (for an illustration see Laffont and Tirole, 1993, pp. 255 ff). This is all the more so when there is market power downstream, since upstream prices have to be set allowing for downstream mark-ups (for a discussion see Laffont and Tirole, 2000, pp. 124-127). Since we have previously argued that setting retail Boiteux-Ramsey prices is unrealistic, this implies that setting wholesale, including interconnection, prices that are consistent with retail Boiteux-Ramsey prices is even less achievable."* This is here the case since the LS product is a wholesale product.

[66] *Ramsey pricing with long run competition, W.C.Miller, 2007.*

[67] *Mark Kennet & Eric K. Ralph, Efficient Interconnection Charges and Capacity-Based Pricing, Telecommunications Policy Research Conference, George Mason University, VA, USA, 8 February 2007*