

Muñoz, David; Rodríguez, José María; Santamaría, Juana

**Conference Paper**

## Minimum term contracts in the absence of handset subsidies

26th European Regional Conference of the International Telecommunications Society (ITS):  
"What Next for European Telecommunications?", Madrid, Spain, 24th-27th June, 2015

**Provided in Cooperation with:**

International Telecommunications Society (ITS)

*Suggested Citation:* Muñoz, David; Rodríguez, José María; Santamaría, Juana (2015) : Minimum term contracts in the absence of handset subsidies, 26th European Regional Conference of the International Telecommunications Society (ITS): "What Next for European Telecommunications?", Madrid, Spain, 24th-27th June, 2015, International Telecommunications Society (ITS), Calgary

This Version is available at:

<https://hdl.handle.net/10419/127166>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

## **Minimum term contracts in the absence of handset subsidies**

David Muñoz, José María Rodríguez and Juana Santamaría<sup>1</sup>

Frontier Economics<sup>2</sup>

---

<sup>1</sup> Corresponding author: [juana.santamaria@frontier-economics.com](mailto:juana.santamaria@frontier-economics.com)

<sup>2</sup> The views expressed in this paper are solely of the authors and do not represent Frontier's position. This is a preliminary version of the paper. Please do not quote without permission.

## **Abstract**

Minimum term contracts (“MTC”) are widely used in the communications sector. They are frequently associated with equipment subsidies. But they are also offered to customers in exchange for a discount. MTCs usually come with an early termination fee (“ETF”), a penalty the customer has to pay for leaving the company before the end of the contract period. This paper provides an economic rationale for the use of MTCs when they are not linked to handset subsidies, discusses the design of the ETF in these cases, and assesses the potential implications in terms of market efficiency. We show that MTCs can be used as a screening device to segment the market between customers with differing preferences for being able to change provider at any time. This may result in a higher level of output and lower average prices.

## 1. Introduction

Minimum term contracts (“MTC”) and early termination fees (“ETF”) are widespread in the communications sector. A report from BERE<sup>3</sup> shows that the most common minimum contract period is 12 months, and they can range from 12 to 24 months in almost all cases. In the UK, more than two-thirds of new mobile contracts had a minimum term of two years in 2012.<sup>4</sup>

MTCs are usually associated with the subsidisation of customer equipment. This has been particularly prevalent in mobile markets, where operators have traditionally offered discounted handsets subject to a commitment by the consumer to use the services of the mobile operator for a minimum period of time (i.e. a MTC). By subscribing to a MTC, a mobile customer can spread the cost of the handset over the length of the contract, avoiding incurring high upfront costs. If the customer leaves the company before the end of the contract period, there is an ETF, which covers the cost of the equipment. Thus, in this case, the ETF gets lower the longer the customer stays with the mobile operator.

MTCs are observed in other examples apart from equipment subsidies, and they may be related to discounts in the monthly bill. One of the interesting features of other MTCs is that, in many cases, the ETF the customer is paying back is the discount already received, so the ETF would get larger the longer the customer stays with the operator. This is at odds with handset subsidies and seems to be counter-intuitive and designed to harm consumers.

Usually, regulators do not feel comfortable with MTCs as they may reduce churn, by temporarily locking in customers. If the ETF is increasing with time, as in the case mentioned above, concerns are even greater. In fact, there seems to be a general trend to try and limit the MTCs, at least in telecoms.

---

<sup>3</sup> BoR (11) 25 final.

<sup>4</sup> <http://stakeholders.ofcom.org.uk/market-data-research/market-data/communications-market-reports/cmr12/uk/UK5.74>, data for the first quarter of 2012.

However, MTCs are observed in a large number of industries with low entry barriers (see the text box below). In fact, in some of these cases, the ETFs are even more extreme than in telecoms. For example, gyms usually offer a discount for customers that subscribe to annual contracts in exchange for advance payment of the annual fee. In this case, if the customer decides to leave the gym before the annual period is over, they will not get reimbursed for the remaining period.

### **MTC in other sectors**

#### Sport clubs

- Fitness Gym in Madrid offers a 21% discount for customers that subscribe to an annual plan vs. a monthly plan.<sup>5</sup>
- The discount offered by Grand Montagne in Burgos is 25%.<sup>6</sup>

#### Insurance

- (Home insurance) Helm offers a 10% discount for annual subscriptions.<sup>7</sup>
- (Health insurance) Adeslas offers a discount that increases with the duration of the contract (2%, 4% and 6% for quarterly, biannual and annual subscriptions).<sup>8</sup>

The presence of MTCs in sectors with low entry barriers indicates that there must be a competitive rationale behind these contracts and ETFs increasing with time. This paper identifies an economic rationale for the introduction of MTCs not linked to equipment subsidies and assesses the potential impact on market outcomes.

These discounts are designed around the willingness of consumers to accept a minimum time commitment. There will be consumers who are willing to commit to stay with an operator in exchange for lower prices, whilst others will prefer the ability to switch at any time, even if

---

<sup>5</sup> <http://www.fitnessnaranjo.es/imagenes/tarifas.pdf>

<sup>6</sup> [http://www.grandmontagne.es/tarifas\\_9020.htm](http://www.grandmontagne.es/tarifas_9020.htm)

<sup>7</sup> <https://www.grupohelm.com/personal/seguros/helm-vivir-hogar-seguro/>

<sup>8</sup> [https://portal.lacaixa.es/seguros/saludesencial\\_es.html](https://portal.lacaixa.es/seguros/saludesencial_es.html)

this implies paying higher prices. Thus, in this paper, we show that MTCs can be used as a screening mechanism to segment the market between customers with differing levels of willingness to pay for the service and disutility from being locked in a MTC, in a similar way as airline companies set lower prices for advanced booking.<sup>9</sup>

The design of the ETF is key to ensuring that the above policy is effective. In the absence of an ETF, all customers would subscribe to a MTC to benefit from the discounted price but could leave at any time, so the discounts would not be offered in the first place. We show that, for MTCs like this to be effective, an increasing ETF is a proportionate alternative when compared with constant and decreasing ETFs. In the paper we also develop an economic model showing that the provision of discounted prices via MTCs may lead to higher output and lower average prices.

In view of this, we conclude that competition authorities and regulators should consider MTCs on a case by case basis, acknowledging their competitive rationale and the potential benefits they may bring.

The article is structured as follows. The next section discusses the recent reductions in the caps applied to MTCs in telecommunications markets in Belgium and Canada. We then consider the rationale for the use of MTCs when there is not equipment subsidy, and the design of the ETF. Section 4 concludes. An annex, at the end of the paper, contains a simple model that shows how MTCs can be used as a screening device to segment a market with heterogeneous customers.

---

<sup>9</sup> This is similar to airline companies offering lower prices for advanced booking See <http://www2.wiwi.hu-berlin.de/institute/wt1/studying/WS2008-2009/DIW/price-discr-2nd.pdf>

## **2. MTCs' length caps in the international experience**

MTCs are generally viewed with suspicion by regulators and competition authorities. The main concern is that their use may lock-in customers and reduce competition. As a result, in a number of instances regulators have limited the length of MTCs.

In September 2013, the European Commission proposed legislative changes in the context of the Connected Continent package and included a proposal allowing customers to terminate any contract after 6 months without penalty, with a one-month notice period.

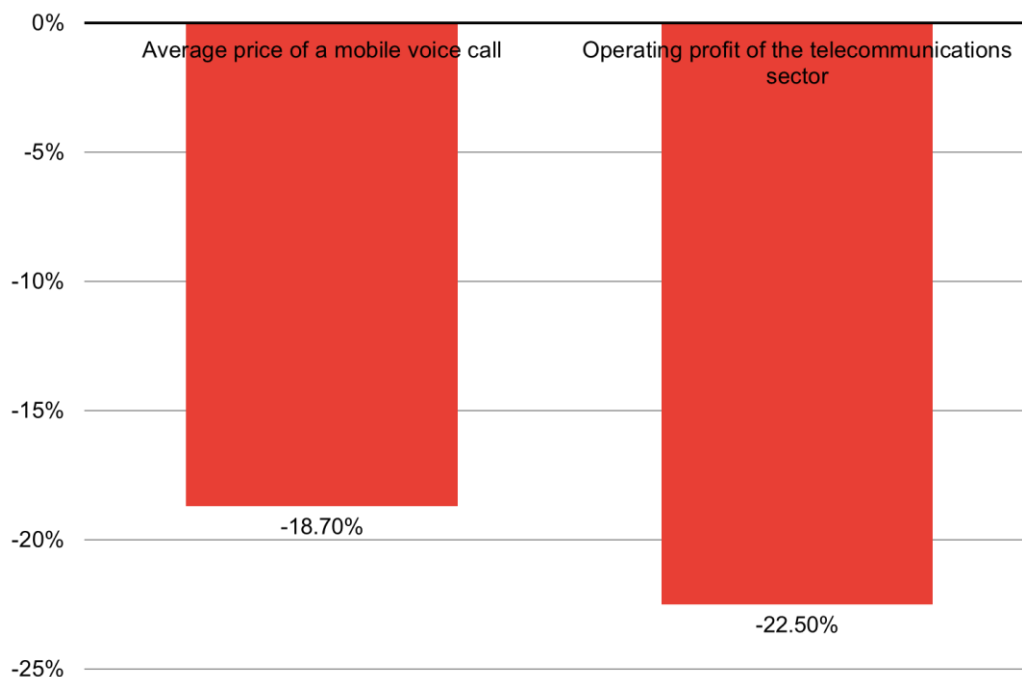
In Belgium, the maximum contract length was reduced to 6 months in 2012, when the revised EU telecom regulations was transposed<sup>10</sup>. Immediately after the measure was implemented, the churn rate increased from around 20% to 30-40%. This was considered an effect of the cap imposed over MTCs.<sup>11</sup>

In addition to the increase in the churn rate, prices and operators' revenues went down. The figure below shows that the average price of a mobile voice call decreased by 18.7% between 2012 and 2013, while profits of the telecommunication sector went down further, by 22.5%, in the same period.

---

<sup>10</sup> Telegeography.  
<sup>11</sup> TEFFICIENT (2013).

**Figure 1.** Annual percentage change, 2012-2013 period



Source: BIPT Annual Report 2013

At first sight, and without further analysis, many would conclude that MTCs reduce churn and lead to higher prices.

However, others could use the experience in Canada to argue exactly the opposite. The new code of conduct introduced in 2013<sup>12</sup> by the telecommunications regulator in Canada gave the right to users to break their contracts, free of charge, after two years (one year less than in the previous code). In 2014, a study<sup>13</sup> showed that some prices in Canada had increased in 2014 when compared to G7 countries. The figure below shows the annual growth rate of prices in

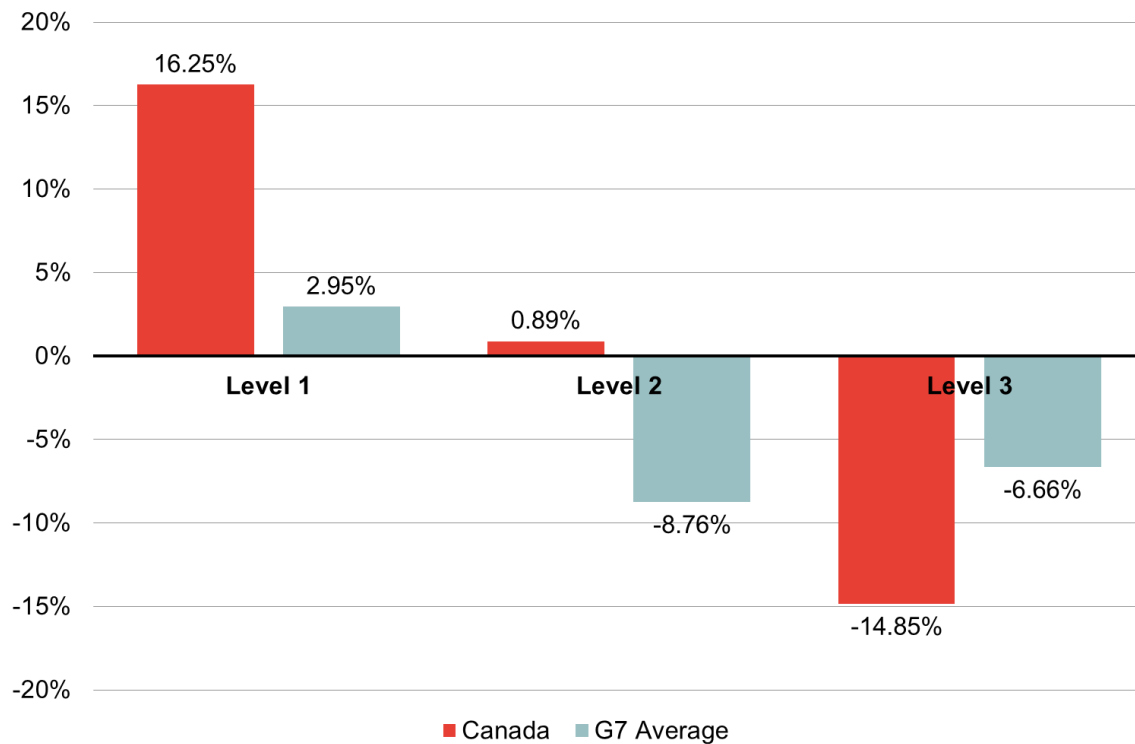
<sup>12</sup> <http://www.crtc.gc.ca/eng/com100/2013/r130603.htm>

<sup>13</sup> Wall Communications Inc (2014).



different plans<sup>14</sup>, both in Canada and the G7 average without Canada (Germany and Italy were not included in the study).

**Figure 2. Mobile wireless prices (in PPP) growth, period 2013-2014**



Source: Wall Communications Inc

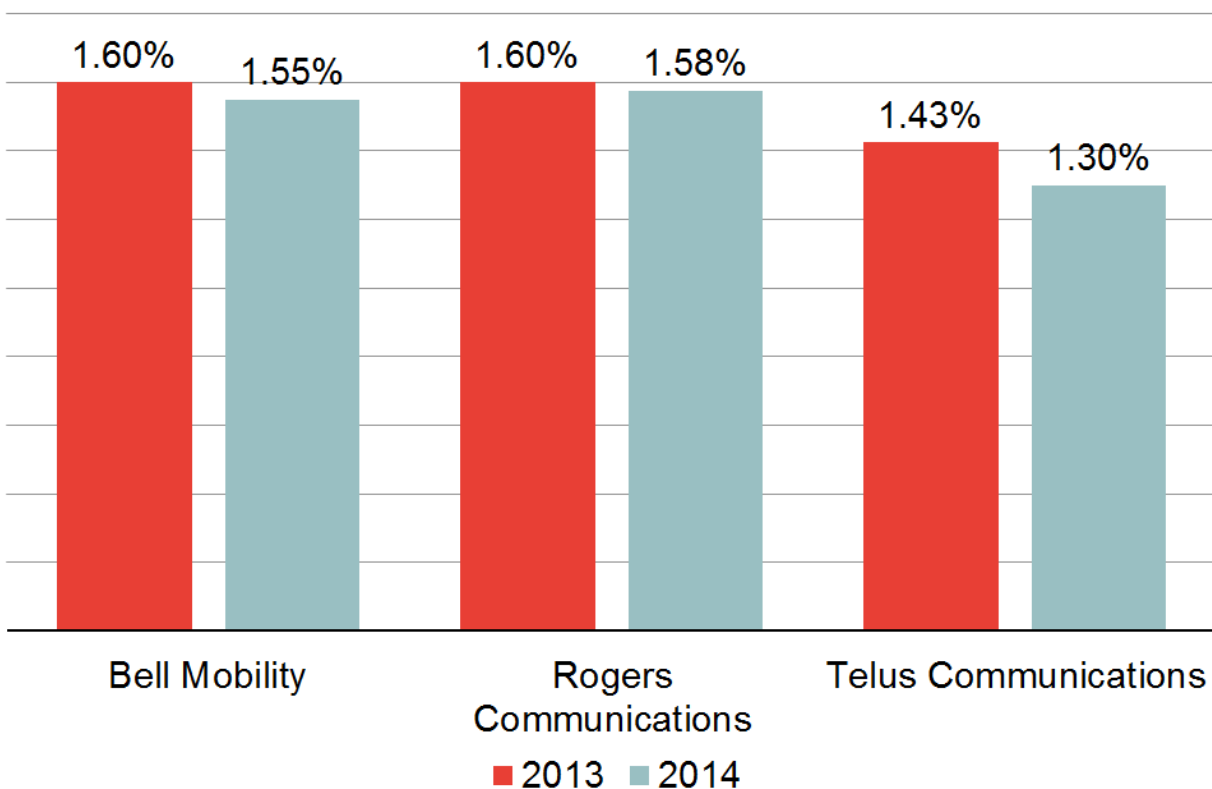
For levels 1 and 2, prices suffered a significant increase compared to those in G7 countries (level 2 prices decreased by 8.76% in G7 countries). The Canadian

<sup>14</sup> Level 1 includes plans with low local and long distance calls volumes; level 2 includes plans with average call volumes plus 2 features and 300 texts; and level 3 includes plans with high call volumes plus a full set of features, 300 texts and 1GB of data usage per month

WirelessTelecommunications Association attributed this price increase to the changes in the code of conduct<sup>15</sup>.

In terms of churn, the data shows that despite the reduction in the maximum length of MTCs, there was a slight decrease in the churn rate of the three major wireless operators in Canada. This evidence would be consistent with MTCs having little impact on switching.

**Figure 3.** Average monthly blended churn rate for years 2013-2014



Source: Telegeography

Assessing the true impact of these regulations on prices and competition is beyond the purpose of this paper. However, they show that the impact is not evident and that further analysis

<sup>15</sup> See News 1130. Cell phone plan price increases are due to contract length caps: industry insider. Published in 20 August 2014.

would be required. For the purposes of our paper, the examples above show that if one has to rely on simple data to assess the impact of MTCs, the impact is not clear at all. In fact, as we observe MTCs in sectors with low entry barriers, the rationale can't always be anti-competitive. The purpose of our paper is to identify one competitive rationale for MTCs that, because the way in which they are designed, would *a priori* raise the alarms of policy makers.

### **3. Economic rationale of minimum term contracts**

In telecoms, as in many other sectors, consumers are heterogeneous in a number of dimensions. Some customers are more price sensitive (their demand is more elastic) than others, there are customers with a preference for a given provider, there are different valuations of quality, etc.

In industries with high fixed costs, such as the telecommunications sector, it is key to be able to set different prices for different customers in order to serve the largest number of customers, while at the same time, being able to recover the fixed costs incurred.

In a sector with low marginal costs and high fixed costs, like telecoms, a uniform price close to the marginal cost of serving the customer will not be sufficient for the operator to recover the fixed costs of the network. On the other hand, setting a higher uniform price may result in a too low level of demand to allow the recovery of the fixed costs. The possibility of setting different prices for different customer types emerges as a natural alternative.

Implementing a pricing policy based on the underlying valuation of the service/or their demand elasticity by the different customer types is not feasible unless the operator can observe customers' valuations. If low elasticity customers pretended to be high elasticity customers, segmentation would not be possible.

Sometimes there are attributes, such as being a student or a company (vs. a residential customer) which may provide information on customers' preferences (such as willingness to pay). This is why we observe tariffs targeted at specific customers segments, such as students<sup>16</sup> or business customers. These are classic examples of third degree price discrimination, where different prices are set for different customer groups.

In the absence of observable attributes linked to the elasticity of demand of the different customer types, companies may set up a menu of contracts which induce the self-selection of customers into different contracts. In other words, each customer chooses the contract that has been designed for him/her. This is known as “screening” and is observed in a wide range of sectors. For example, in the airline industry, companies set different prices depending on how much in advance the ticket is acquired.<sup>17</sup>

In this context, minimum term contracts become a tool that operators can use in order to segment the market between customers with different preferences for the service and for being locked in a MTC. Providing discounts only to customers that subscribe to a MTC allows the operator to offer lower prices to customers with a lower preference for the service and valuation of being locked in a MTC. Hence, MTCs become a screening mechanism to differentiate between customers with different valuations of the service. The text box below shows a simple example.

#### *MTCs as a screening device*

Consider a provider with zero marginal cost. There are two customers in the market.

<sup>16</sup>

<http://www.o2.co.uk/studentoffer>

<sup>17</sup>

See <http://www2.wiwi.hu-berlin.de/institute/wt1/studying/WS2008-2009/DIW/price-discr-2nd.pdf>.

Customer H has a high valuation of the service and customer L has a low valuation. Customers also differ in their willingness to subscribe to a MTC. Customer H is less willing to commit to a MTC than customer L. Customers' valuations are private information.

To sum up:

$$V_H = 5, CH_{MTC}(m) = 0.6 * m$$

$$V_L = 2, CL_{MTC}(m) = 0.1 * m$$

Where,  $V_i$  is the valuation of the service by customer  $i$ ,  $Ci_{MTC}(m)$  is the disutility that customer  $i$  gets from subscribing a MTC of duration  $m$ .

If the provider observed the valuation of each customer, it would charge a price of 5 to H and 2 to customer L, getting a profit of 7. As valuations are not observable, this pricing policy is not feasible. Setting a uniform price for both customers would require, for profit maximisation, charging a price of 5 and selling only to type H, getting a profit of 5 and extracting the whole consumer surplus from customer H.

The company can do better than setting a uniform price by taking into account the different willingness to subscribe to a MTC by both customer types. Let us consider a menu of contracts  $\{(4.5,0), (1.5,5)\}$ , where the first component of each vector  $(x,y)$  is the price and the second component  $(y)$  is the number of months of the MTC.

Under this menu of contracts, the provider manages to sell the service to both customer types, increase its profits (to 6) and consumer surplus (now customer H gets a surplus of 0.5).

In this context, the self-selection of customers occurs voluntarily. Only customers that are willing to subscribe to a MTC do so in order to benefit from lower tariffs.

The annex contains a mathematical model which formalizes this idea.

### *The role of early termination fees*

MTCs will serve their purpose as long as customers fulfil their commitment. This requires the existence of early termination fees. Otherwise, all customers would subscribe to MTCs to get a discount and leave the company at any time.

The early termination fee shall be designed to guarantee that customers that subscribe to a MTC comply with the terms of the contract. That is, those who get the discount stay with the company during the agreed period or if they leave, they compensate the company for the discount granted.

Early termination fees can take different forms. These can be constant (e.g. implying the payment of a fixed amount if the customer breaks the MTC), decreasing (as it is standard in the case of handset subsidies) or increasing over time.

Amongst the three options considered, an increasing early termination fee is the most proportionate alternative as long as the incentives for the customer to switch provider increase over time. This is a fair assumption. When a customer joins a company, it is likely that they have compared existing offers and decided that the one they have joined is the best alternative for them. As time passes, market dynamics will bring new offers to the market. Thus switching will occur more at the end of the commitment period than at the beginning, as market changes will have been more significant. Hence, to be effective, the ETF shall increase over time. Otherwise, under a constant or decreasing ETF, the penalty should be sufficiently high from the very beginning to be effective during the whole period of the contract. This is shown with a numerical example in the text box below.

### *Constant, decreasing and increasing early termination fees*

Consider a consumer that attains a constant benefit (utility) of 100 each month from subscribing a contract with operator X.

Assume that the benefit the consumer gets from switching to another operator increases on time, as per the function below:

$$\text{Utility from switching } (t) = 50 + (25/3)*t,$$

Where  $t$  is the month and  $t = 0$  in the first month of the contract with operator X.

In the absence of ETF, the consumer will have incentives to switch operator since the sixth month, when the benefits from migrating to another operator are higher than staying with operator X.

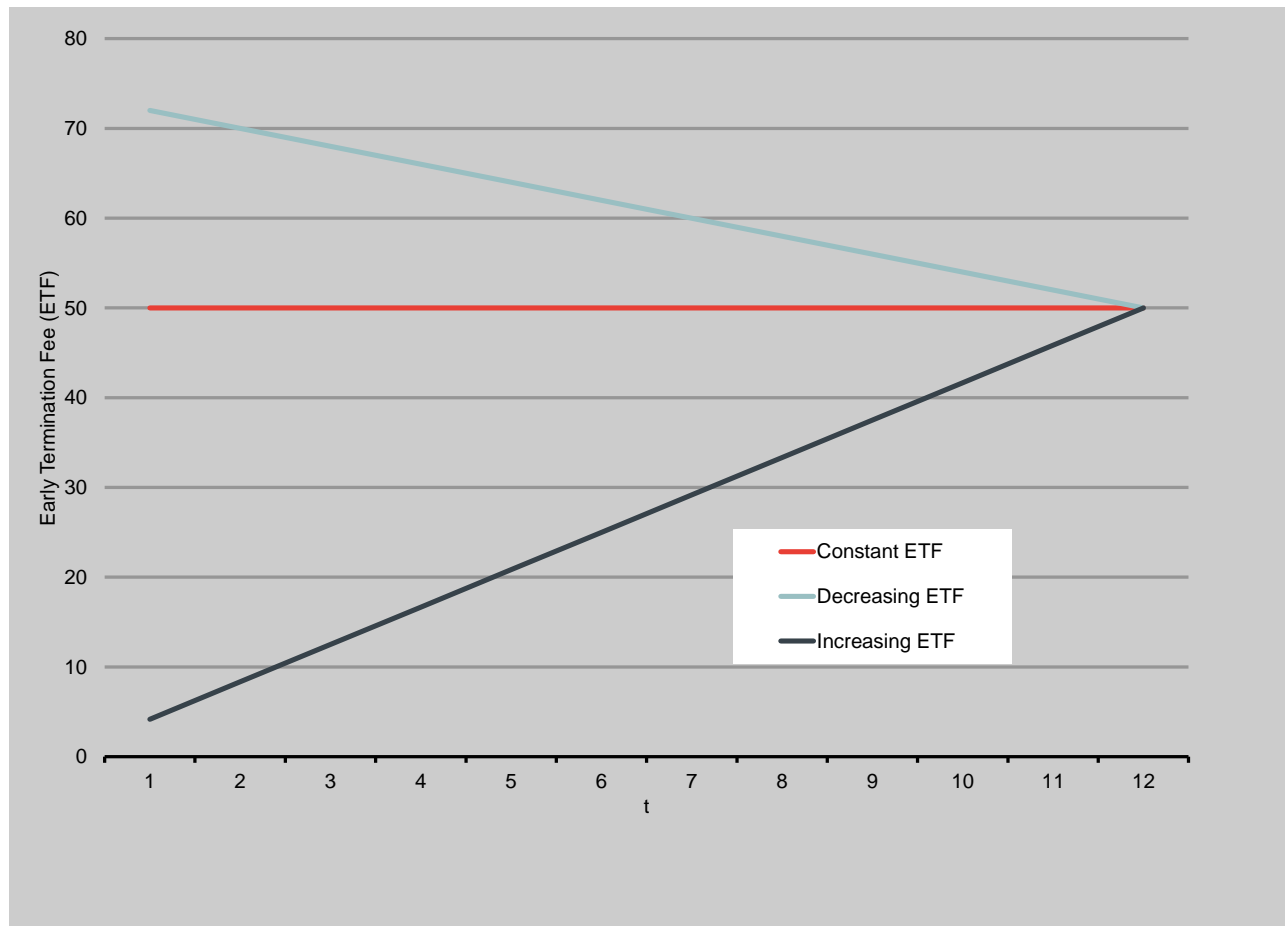
Now let's consider the different alternatives for setting the ETF that guarantee the compliance with the contract.

In  $t = 12$  the utility that the consumer derives from switching is 150. A constant ETF requires the ETF being 50 from the first to the last month.

Let's now consider a decreasing ETF mechanism of the type:  $\text{ETF}(t) = x - y*t$ , where  $x$  is a constant while  $y$  is the amount by which the ETF is reduced each month.  $\text{ETF}(12)$  must be at least 50. Therefore, the ETF must be 50 or higher in each month.

Under an increasing ETF scheme requires  $\text{ETF}(12)$  must be at least 50. If we consider a linear scheme, such as  $\text{ETF}(t) = z * t$ , and  $\text{ETF}(12) = 50$ , we get a value of  $50/12$  for " $z$ ".

The following figure represents the three ETF schemes (constant, decreasing and increasing). The results clearly show that the increasing ETF scheme allows opting out of the contract with a lower ETF when compared with any of the other schemes.



This does not mean that early termination fees shall all be increasing. In the case of MTCs linked to handset or equipment subsidies, a decreasing early termination fee makes more sense. This is because the duration of the contract is associated to the amortization of the equipment. The longer the period a customer stays with an operator, the lower the amount needed to settle the payment associated to the subsidy.

Therefore, while MTC may create customer lock-in (customers attached to the MTC face a cost of switching provider during the period of the contract), this does not necessarily imply they will distort competition (e.g. leading to higher prices or reduced churn). MTCs allow providers to enrich their commercial offer by introducing specific discounts for customers that are willing to subscribe to a MTC. These discounts would not be available if MTCs were not allowed. The



example shown earlier indicates that the use of MTCs not linked to handset subsidies may result in a higher level of output compared to a situation where the operator is not allowed to do so.

#### **4. Conclusion**

Whilst MTCs are seen with suspicion by regulators and competition authorities, they are widespread in sectors with low entry barriers. This paper identifies a competitive rationale and considers the potential impact in terms of market outcomes for MTCs not linked to handset subsidies and increasing ETFs.

In sectors with high fixed costs, such as telecommunications, MTCs can be used as a tool to segment the market between customers which are heterogeneous in their willingness to commit to a MTC. This allows operators to enrich their commercial policy and make the services accessible to a wider group of customers. Our numerical simulations show that MTCs may lead to lower prices and a higher level of consumption.

ETFs are a key component of MTCs. When MTCs are linked to discounts (instead of handset subsidies), an ETF that increases over time is a proportionate vis a vis constant or decreasing ETF. This logic does not apply to MTCs associated with handset subsidies, where the ETF is usually linked to the value of the equipment still to be paid at the moment of breaking the contract.

Canada and Belgium have recently reduced the caps applied to MTCs for mobile services (two years in the case of Canada and six months in the case of Belgium). A high level analysis of existing evidence shows mixed results: with prices increasing and churn decreasing in Canada; and, prices decreasing and churn increasing in Belgium. Although full analysis of the impact of these measures is yet to be done, they show that it is not evident that MTCs reduce welfare. In this paper we have shown that there are good competitive reasons to introduce MTCs even with

increasing ETFs. Therefore, regulators and competition authorities should assess MTCs carefully on a case by case basis before introducing any type of regulation.

## 5. References

- [1] BEREC (2011), *BEREC report on specific aspects of broadband commercialization*, BoR (11) 25 final.
- [2] CRTC. Canadians can cancel their wireless contracts after two years under new CRTC wireless code. Published 3 June 2014. Available at [this link](#).
- [3] Dubé, J. P., Hitsch, G. J., & Rossi, P. E. (2009). Do switching costs make markets less competitive? *Journal of Marketing research*, 46(4), 435-445. Available at [this link](#).
- [4] PTS (2006), “Competition and Regulation in the Nordic mobile markets”, PTS-ER-2006:40. Available at [this link](#).
- [5] TEFFICIENT (2013). How six months contracts changed mobile in Belgium and Denmark.
- [6] VARIAN, Hal R. “Differential Pricing and Efficiency”. *First Monday*, [S.l.], aug. 1996. ISSN 13960466. Available at:  
<http://firstmonday.org/ojs/index.php/fm/article/view/473/394> . Date accessed: 11 Jun. 2015. doi:10.5210/fm.v1i2.473.
- [7] Wall Communications Inc. (2014). “Price Comparisons of Wireline, Wireless and Internet Services in Canada and with Foreign Jurisdictions: 2014 Update (March 2014)”, prepared for the CRTC and Industry Canada. Available at [this link](#).

- [8] Wolfstetter, E. “Hidden Information and Price Discrimination”, included in *Topics in Microeconomics: Industrial Organization, Auctions, and Incentives*. Cambridge University Press, new edition, forthcoming. Available at [this link](#).

### **Annex: MTCs as a tool to segment the market (a mathematical example)**

Consider a firm that provides a service with demand  $q$  in a market with two types of consumers, A and B. They differ in two dimensions: demand elasticity (B is more price elastic) and disutility from being locked into a contract of length  $m$ .

Consumers have quasi-linear preferences, as per the utility functions below.

$$u_A = q^a + I - pq - \frac{m}{a}$$
$$u_B = q^{ba} + I - pq - \frac{m}{b \cdot a}$$

Where  $I$  is the income,  $a$  and  $b$  are parameters related to the price demand elasticity (see the expression below): with  $0 < a < 1$ ,  $b > 1$ , and  $a \cdot b < 1$ ; and  $p$  is the price of the service.

Quasi-linear preferences imply that: consumption is independent of income; and, customers have a constant price elasticity, as per the expressions below:

$$\varepsilon_A = \frac{1}{a - 1}$$
$$\varepsilon_B = \frac{1}{b \cdot a - 1}$$

In absolute terms,  $\varepsilon_A < \varepsilon_B$ , as  $b > 1$  and  $a \cdot b < 1$ . This implies that a consumer of type B is more sensitive to price changes than a type A consumer.

*Part 1: Customer segmentation allows firms to increase their profits in the short-term*

Firm's profits,  $\pi$ , can be expressed as follows:

$$\pi = (p_A - c) \cdot q_A + (p_B - c)q_B$$

Where  $c$  is the marginal cost of providing the service;  $p_i$  is the price charged to consumer  $i$ ; and,  $q_i$  is the demand of consumer  $i$ .

If the firm could set a price,  $p_i$ , for each customer type, it would choose the following profit-maximizing prices:

$$p_A = \frac{c}{a}$$

$$p_B = \frac{c}{b \cdot a}$$

The price would be higher for type A customers, holding a less elastic demand.

Firm's output,  $Q$ , would be:

$$Q = q_A + q_B = \left(\frac{c}{a^2}\right)^{\frac{1}{a-1}} + \left(\frac{c}{b^2 \cdot a^2}\right)^{\frac{1}{b \cdot a - 1}}$$

This pricing policy is not feasible unless the firm can differentiate between the two types of consumers.

Let's consider that the firm is not able to set different prices for A and B customers, and sets a uniform price based on the average consumer type, with a demand elasticity equal to:

$$\varepsilon_M = \frac{1}{\frac{a(1+b)}{2} - 1}$$

This would lead to the following uniform price,  $p_u$ :

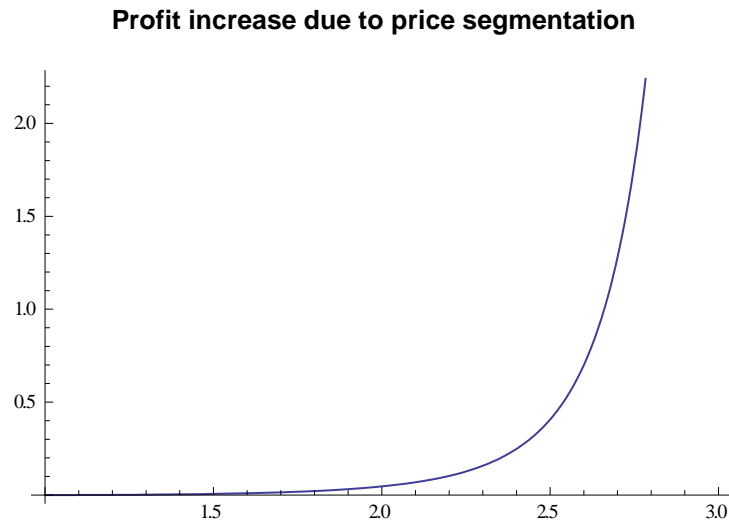
$$P_u = \frac{2c}{a(1+b)}$$

The figure below shows the difference between firms' profits in the scenario where it can set different prices for A and B customers and the profits it would attain under uniform pricing policy<sup>18</sup>. Profits are higher when the firm can set a lower price for type A customers. The

---

<sup>18</sup> We have assumed that  $c=1/10$ ,  $a=1/4$  and  $I = 10$

difference in profits from segmentation are also higher the larger the difference in the demand elasticity between both customer types.



Assumptions:  $c = 0.1$ ,  $a = \frac{1}{4}$ ,  $l = 10$ .

### *Part 2: MTC as a mechanism to segment the market*

The previous analysis shows that a firm facing consumers with different demand elasticities can increase its profits setting a different price for each customer (lower prices for higher elasticity customers).

The main obstacle is that the firm cannot easily observe the elasticity of each customer. Hence, setting differentiated prices is not feasible unless there is a mechanism that provides incentives to consumers to reveal their actual price elasticity (in economics this is known as *screening*).

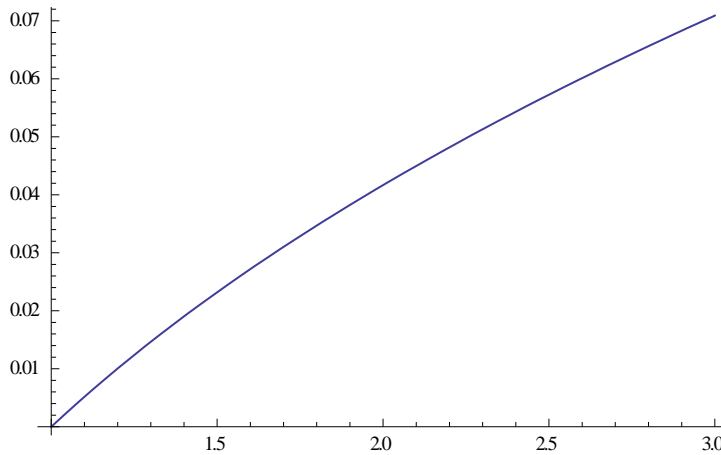
A way to make consumers convey their elasticity voluntarily (self-selection) is the introduction of a menu of contracts. The firm could offer a MTC with a price discount that makes consumers of type B -i.e. those with high demand elasticity- to sign the contract while consumers of type A -i.e. those with low demand elasticity- prefer to pay a higher price in order to avoid the minimum contract length.

The company would therefore set a MCT with a price discount ( $P_A - P_B$ ) in which:

1. Consumers with high demand elasticity (type B) subscribe the MCT and benefit from the price discount; and
2. Consumers with low demand elasticity (type A) pay a higher price ( $P_A$ ) so that they can freely opt out the market or switch to another provider.

The minimum contract period that fulfils these constraints increases with parameter  $b$ , i.e. it is higher the larger is the difference between the elasticity of the two customer types. This is shown in the figure below:

**Minimum contract period as a function of the difference in the elasticities of two customer types**



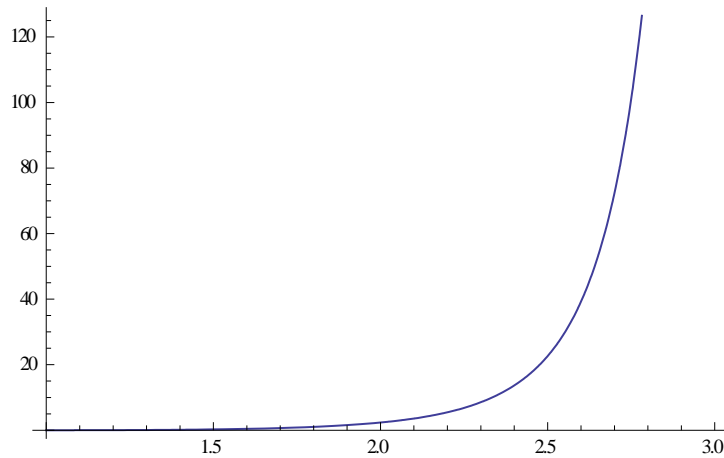
Assumptions:  $c = 0.1$ ,  $a = \frac{1}{4}$ ,  $l = 10$ .

X-axis shows the value of  $b$  and Y-axis shows the minimum contract period that guarantees consumer segmentation.

If we compare the output levels in the scenario with a uniform price,  $P_U$ , and the scenario described recently, a pricing policy that sets different prices as a function of the minimum contract period signed by the consumer increases the output, therefore enhancing allocative

efficiency. The following figure shows the increase in output level depending on the degree of customer heterogeneity, measured by parameter  $b$ .

**Figure 4. Output increase due to price differentiation**



Assumptions:  $c = 0.1$ ,  $a = \frac{1}{4}$ ,  $l = 10$ .

X-axis shows the value of  $b$  and Y-axis represents the rise in output due to price segmentation (versus a uniform price).

For the parameter values considered, the average price is lower when the company uses MTCs to segment the market.