



GLOBAL JOURNAL OF MANAGEMENT AND BUSINESS RESEARCH: E
MARKETING

Volume 15 Issue 5 Version 1.0 Year 2015

Type: Double Blind Peer Reviewed International Research Journal

Publisher: Global Journals Inc. (USA)

Online ISSN: 2249-4588 & Print ISSN: 0975-5853

The Usage of Lric Model Regulation for Access Relevant Markets in Economically Small Countries

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Abstract- The aim of the article was answer the main research question if ex ante regulation using LRIC ("Long run incremental costs") model is appropriate for Access relevant markets regulation on economic small markets, especially in time of NGN (next generation networks). LRIC model is the strongest regulation which can be imposed by regulators in some EU country. European Commission defined two relevant Access markets susceptible to "ex ante" regulation. The new recommendation of the European Commission (EC 2007) on relevant markets defined Market 4 (previously Market 11) as the market for wholesale (physical) network infrastructure Access (also local loop unbundling) at fixed location and market 5 as Broadband Access (include only bit stream Access).

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GJMBR - E Classification : *JEL Code : M30*



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The Usage of Lric Model Regulation for Access Relevant Markets in Economically Small Countries

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Abstract- The aim of the article was answer the main research question if ex ante regulation using LRIC ("Long run incremental costs") model is appropriate for Access relevant markets regulation on economic small markets, especially in time of NGN (next generation networks). LRIC model is the strongest regulation which can be imposed by regulators in some EU country. European Commission defined two relevant Access markets susceptible to "ex ante" regulation. The new recommendation of the European Commission (EC 2007) on relevant markets defined Market 4 (previously Market 11) as the market for wholesale (physical) network infrastructure Access (also local loop unbundling) at fixed location and market 5 as Broadband Access (include only bit stream Access). The final conclusion was that regulation via LRIC model was not appropriate remedy for small economies, especially in time when the market was close to saturation and the expectation of the investments returns uncertain. LRIC obligations to significant market power players on bigger markets also need to be a part of further discussions.

Keywords: *Lric model, regulation, market analyses, broadband, correlation, dsl technology.*

I. INTRODUCTION

In this chapter we describe the process of ex ante regulation (also regulation) starting with general description of the process. This chapter also includes the description of Access relevant markets (also markets) recommended by the European Commission. The aim of this chapter is to generally describe the process of "ex ante" regulation and the markets which were evaluated through our research.

a) Description of "ex ante" regulation

Ex ante regulation (also "regulation") is a specific sector regulation, necessary to solve competition problems in EU. It is done through market analyses process, where national regulators in every EU country define relevant geographic and product markets and check if there exists an SMP ("significant market power") operator. They impose remedies to that operator. The aim is to ensure effective competition on each relevant market. Typically the SMP operator was the national incumbent. The EU framework of the European Parliament and of the Council recommended following remedies to be imposed on SMP players to

prevent independent behaviour (EC 2002): transparency, access obligation, accounting separation, non-discrimination, price control and cost accounting separation. The new framework issued in 2009 (EP 2009) also includes the new remedy called functional separation.

b) Access markets recommended by European Commission

EC (2007) defined two wholesale markets susceptible to ex ante regulation (based on three criteria test). The wholesale broadband access market comprises non-physical or virtual network access (based on copper or optical fibre) including "bit stream" access at fixed location. With bit stream access, the wholesale product of the incumbent DSL (Digital subscriber line) technology consists of transmission capacity, which allows new entrants to offer their own services to their customers. Bit stream access may also include "backhaul" services to carry traffic to higher layers in the DSL network, where the entrant already has a point of presence (Bouckaert and van Dijk, 2010). Regulation of optical Access (also: next generation Access) was mostly not included in the analyses, because only a few regulators have started with "ex ante" regulation in the recent past and "there is perceived uncertainty about consumers' willingness to pay for next-generation Internet access services, which raises deep reservations about the viability of the business case for optical Access" (Siciliani, 2010).

II. LITERATURE REVIEW

In this chapter we evaluate the literature review regarding imposing the different types of remedies to operators with significant market power. We start with description of measuring the intensity of remedies and then we evaluate the difference between price control remedies as the most commonly used remedies. We end the chapter with the proposed ranking of remedies which was used later in our analyses.

a) Description of the intensity of "ex ante" regulation

In this chapter we describe the possible ways of measuring the intensity of regulation. The intensity of regulation was measured by the percentage of MDSs (main distribution frames) with competitors present (Dippon and Ware 2010) or incumbent market share on

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regulated technology (Höffler 2005) or the number of local loop unbundling lines compared to the number of all broadband lines on the market (Koutrumpis 2009). The methods have more disadvantages because they did not include all the effects of regulation on the market, like quantity or effects of bit stream regulation. The method which is measuring the market share of incumbent on the regulated technology shows us the level of competition and in some way the effectiveness of regulation. The disadvantage of such measures is also that we can't compare directly the work of regulators with the results on the market and especially we could not separately check only ex ante regulation or the remedies which are imposed by means of ex ante regulation. It is impossible to check the effects of different remedies on the customer welfare and investment initiatives. This is valid also for other above mentioned methods. The evaluation of effects by imposing different level of obligations, especially the most intensive way of regulation (LRIC model) was the goal of our later research. So the ranking of remedies should have followed the principle, which the regulators were using in imposing the remedies. The importance of market share of incumbent and consequently the intensity of regulation in correlation with the market size was emphasized by Symeou (2009), who confirmed the importance of specific regulation in small economies.

b) Comparison of different price control remedies imposed by regulators

This chapter we evaluated the literature review regarding imposing the different types of remedies to potential SMP players. It includes the comparison of cost based and retail minus remedies as price control remedies. The other proposed remedies, like transparency, non-discrimination and Access obligation described in chapter 1.1 represent mostly only a threat to the regulated operator and they don't have really a strong influence on the behaviour of the regulated operator. If we really want to influence the market, one of the price control remedies must be imposed. Retail minus regulation remedy avoids foreclosure and leads to better results than cost-based regulation in terms of investment level and consumer surplus. Retail minus regulation allows a higher consumer surplus than deregulation and cost based regulation of access price as long as the regulator carefully defines the retail minus instruments (Brandão and Sarmiento, 2007). If the regulator carefully defines the margin between retail and access (wholesale) prices, with retail minus regulation it is possible to achieve better results than either with deregulation or cost-based regulation, in terms of protection of downstream competition and consumer surplus. The concept of cost-based regulation adopted by many telecommunication regulators is the Long Run Incremental Costs (LRIC). The implementation of LRIC involves the quantification of the incremental cost of

providing access in a forward-looking perspective. With this perspective it is necessary to consider the substitution costs of the assets that will be supported in the future. This is in contrast to historic cost accounting. Several problems can be indicated, when using LRIC model. The precise quantification of LRIC model raises many questions, namely concerning the allocation of common costs and the process of gathering the necessary information to compute appropriate replacement costs (Mason and Valletti, 2001). Evans and Guthrie (2003) suggested to regulators to use the concept of optimized deprival value, which takes into account the existing value of equipment and also the demand risk. It is necessary to take into calculation also the spare capacities in which the regulated operator invested. The efficiency of regulation must be evaluated by means of investment initiatives and also the customer welfare. It is necessary to find the maximum relation between the level of investments and prices for end users (Mihevc 2009). The investments must be distributed among operators equally and the prices for end users low as possible. The concept of LRIC mostly does not take into the consideration neither the irreversible nature of many telecommunications investments, nor costs with the development of new services that did not succeed in the market. LRIC model adopted by some European countries discourages investment in fixed networks by the incumbent firms, because they anticipate that they will be required to offer access at cost-based prices (Cave and Prosperetti, 2001). LRIC model also has a poor performance in terms of dynamic efficiency of cost-based regulation because firms do not have the incentive to innovate if they know that they will be required to offer access to their rivals at cost-based prices.

c) Ranking of remedies

After the description of different types of remedies and analyse it through literature review we need to commit the proper ranking of remedies, which was the basis for our research. The influence of imposed remedies by regulators could be measured by the ranking of imposed remedies by regulators and its influence on other parameters on the market (Mihevc 2011). If some regulator did not complete the analyses or did not impose any obligation to the incumbent then its ranking is 1. If the regulator did not impose any of the price control remedies then its ranking is 2. The possible non price controls are transparency, non-discrimination and access obligation. Those remedies allow a lot of freedom to incumbent regarding setting its wholesale prices. Obligation of retail minus only imposes the difference between retail and wholesale price to the incumbent operator. So it allows still some freedom to the incumbent regarding setting its wholesale prices. The last and most intensive regulation is cost based regulation. It is divided in two groups, one for cost

based regulation which is based on the actual network of the SMP player and the most intensive regulation which is based on the optimal network, built now and with current prices. The most intensive regulation is

definitely based on imposed LRIC model, which is quite a common practice in EU, despite the fact that the network was built in the past. Summarized ranking is presented in Table 1.

Table 1 : Ranking of remedies, Source: Mihevc 2011.

Remedy	Rank
No regulation	1
Remedies except cost price control	2
Price control with the retail minus remedy	3
Cost based prices (FDC ...) except LRIC model	4
LRIC, LRAIC model	5

III. RESEARCH METHODOLOGY

The research methodology consists of three parts: case study of small national markets, quantitative analyse trough correlation matrix and critical analyse and synthesis of the facts.

a) Case study of small national markets and conclusions based on case studies

In the first part, we evaluated the existing situation in some national small markets compare the situations on those markets as case study and came to some conclusion for specific markets or general. The countries under the observations are small EU countries, which adopted EU recommendation. We assumed that regulation in small countries should be different than in bigger countries. The economy of size definitely plays an important role in regulation process, especially in small economies where the growth and investment initiatives are limited. The observation period was from January 2008 till January 2010. The importance of incumbent is very high in small economies, where are specific limitations regarding infrastructure competition and competition development. From this purpose it was necessary to evaluate the process of market development in small economies and the existing process of regulation separately from bigger economies. It was not possible to do the quantitative analyse just for small economies, because of limited number of small countries in EU. The results of case studies showed us some specifics in small countries and it helped in critical analyse and synthesis of the facts to develop the final conclusions.

b) Quantitative analyse trough correlations matrix

Qualitative analyse in second part was done based on the data of 27 European countries and Switzerland and Norway (total 29 countries), which implemented the Electronic Communications Law based on EU Directives irrespectively of their sizes for the period 2003-2010. We could define five level of regulation intensity as it is shown in table 1. The relevant data we got from EC Reports (2010) and ERG 2009 or CIA world factbook (regarding specific characteristics of the national markets). To get the answer on question

how the increasing intensity of regulation from 1 to 5 influenced the other factors on the market, we needed to calculate the Pearson's coefficient. The result we got from SPSS 15 program. All the variables followed the normal distribution. We checked the correlations between the intensity of regulation and level of sector investments for electronic communications in GDP for 2008, level of penetration (measured by number of inhabitants using broadband Access compared to all inhabitants in a country), the level of penetration increase in the observation period (January 2008-January 2010), market share of incumbent in retail market and on regulated DSL technology, share of regulated technology among all existing Broadband technologies and the size of the national market (measured by mill. of inhabitants living in a national market). The data are valid for the beginning of the year 2010, except for investment level as mentioned. We took into the analyse only fixed Broadband, while mobile Broadband was not spread enough and it couldn't be compared to fixed one by means of coverage and speeds offering.

c) Critical analyse and synthesis of the facts

The critical analyse and synthesis of facts regarding correlation, case studies and the influence of intensity of regulation (especially the imposition of LRIC model as the highest level of intensity) on investments initiatives and customer welfare was done at the end. For the purpose of analyse, we evaluated the influence of intensity of regulation on the penetration growth taking into the consideration the size of the economy. We also checked the influence of the intensity of regulation on the other parameters. We summarized the above mentioned facts from quantitative analyse and the results of case studies, where we suggested the appropriate regulation strategies in small countries. The critical synthesis of the facts came from quantitative analyse and case studies, which influence on the intensity of regulation and especially on the regulation via LRIC model was done. It gave us the answer regarding the justification of using LRIC model and imposing it on the SMP player.

IV. RESULTS AND DISCUSSION

a) Case studies

As mentioned in the literature review, Symeou (2009) emphasized that small economies maintain

higher concentration levels after competition in all technologies. The countries included in table 2 are small sized countries in EU and they were used based on its size of population (under 4 million).

Table 2 : Summarized facts for case studies in small countries

Country	Specifics	General conclusions
<i>Cyprus</i>	<i>Low infrastructure competition High market share of incumbent Low Broadband speeds</i>	<i>Regulations should not be too strong and should allow incumbent as the market driver to invest.</i>
<i>Luxemburg</i>	<i>High penetration rate High market share of incumbent Soft regulation</i>	<i>Appropriate regulation for small markets. It is necessary only to improve the share of high bandwidths (retail minus approach is recommended)</i>
<i>Ireland</i>	<i>Strong regulation (local loop unbundling) Quite low penetration (high GDP per capita), Low share of high bandwidths High market share of mobile internet</i>	<i>Regulation should be a little bit weaker (LLU) to encourage the incumbent to invest in this relatively small market.</i>
<i>Latvia</i>	<i>Low penetration level Quite high share of high bandwidths High infrastructure competition Lack of regulation</i>	<i>Necessary to impose the appropriate model of regulation (High infrastructure competition might not be the right solution for small countries)</i>
<i>Malta</i>	<i>High penetration level Two infrastructures (cable and DSL)/ market share divided by those two. High share of high bandwidths Soft regulation</i>	<i>Soft ex ante regulation on both infrastructures should also be in place, while duopoly might have negative effect in the future.</i>
<i>Estonia</i>	<i>High penetration level High infrastructure competition Low service competition</i>	<i>Regulation is still necessary, but it must be carefully planned, because of high infrastructure competition</i>
<i>Lithuania</i>	<i>Low penetration rate High share of high bandwidths High infrastructure competition and low service competition</i>	<i>Ex ante regulation is still necessary especially in bit stream regulation, where regulator was not active till now to increase the penetration.</i>
<i>Slovenia</i>	<i>High infrastructure competition Quite low market share of incumbent Penetration rate is not high High bandwidths below the EU average Strong regulation (also fibre)</i>	<i>The regulation on such market should not be too strong to discourage the incumbent to invest into new services.</i>

Source: EC, 2010

Based on the case studies we could conclude that the best strategy of “ex ante” regulation could be the imposition of regulation, which does not limit the investments of incumbent and allow the development of competition on retail market on other side. Small operators must be allowed to compete especially on offering small speeds, while the higher speeds should be under the control of the incumbent which is investing into the access markets. Following that strategy we could ensure the development and increasing investments from the incumbent to build or upgrade the Access networks. Ex ante regulation should not be too

strong to limit the incumbent in its investment activities. On the other side it should allow and not limit service competition too much, because infrastructure competition based on high parallel investments is not convenient for small countries. The results of case studies shows us that using the strongest level of regulation is not convenient for small countries and that using the strongest level of regulation could harm the market more than in bigger economies. The results of correlations in the next section will additionally justify or not justify the using of the strongest level of regulation (LRIC model) in the regulation process. It is not possible

to do the separate analyse for big and small economies, because of small data and limited number of countries in EU.

b) Quantitative analyse

It is crucial for our research to find the statistical correlations between the intensity of regulation and other characteristics of the market, as mentioned in the methodology. The results of case studies showed us that also smallness affects the imposed regulation. From this purpose it also necessary to check the correlations between the size of the national economy (measured in the number of population) and the market share of the regulated operator or regulated technology. Those elements are also very important in judging the appropriate intensity of regulation. We could summarize facts, which we got from correlation matrix based on sample of 29 countries regarding choosing the LRIC model as a regulation toll:

- We found significant statistical correlation between the size of the national market and market share of the leading operator on the regulated technology ($r=-0,666^{**}$, $\alpha = 0,00$),
- The influence of bit-stream regulation had stronger influence on the market than local loop unbundling regulation,
- The statistical correlation between both types of regulation (bit-stream and local loop unbundling) was very strong and significant ($r=0,569^{**}$, $\alpha = 0,001$),
- Between the size of the national economy and market share of the regulated technology was also a positive significant statistical correlation ($r=0,49^{**}$, $\alpha = 0,009$),
- Between the GDP per capita and the intensity of bit-stream regulation was also a positive significant correlation ($r=0,414^{*}$, $\alpha = 0,026$), but there was no significant statistical correlation between GDP per capita and intensity of local loop unbundling regulation,
- The intensity of regulation (local loop unbundling and bit-stream) had negative influence ($r=-0,491^{**}$, $\alpha = 0,009$ and $r=-0,411^{*}$, $\alpha = 0,033$) on the initiative on the investments (percentage of the sector investments in the GDP),
- Between the intensity of regulation (including the length of regulation) and the relative change of penetration was a negative statistical correlation ($r=-0,403^{*}$, $\alpha = 0,037$ and $r=-0,479^{*}$, $\alpha = 0,011$),
- The intensity of regulation (especially bit-stream regulation) had positive effect on the development of the regulated technology ($r=0,434^{*}$, $\alpha = 0,024$),
- The intensity of regulation (both local loop unbundling and bit-stream) had statistically

significant influence on the competition level on the regulated technology. The negative statistical correlation existed between both types of regulation and market share of the incumbent on the regulated technology ($r=-0,515^{**}$, $\alpha = 0,006$ and $r=-0,389^{*}$, $\alpha = 0,045$). If we included the length of regulation the correlation was even more significant ($r=-0,652^{**}$, $\alpha = 0,000$ and $r=-0,633^{**}$, $\alpha = 0,000$)

- It was no significant statistical correlation between the relative increase of penetration and share of incumbent on the regulated technology and the size of the economy, measured by the number of inhabitants on other side
- There was a significant positive correlation between the intensity of bit-stream regulation and level of penetration ($r=-0,436^{*}$, $\alpha = 0,018$), while the correlation between the intensity of local loop unbundling and level of penetration was also positive but not significant,
- Based on negative correlation between the intensity of regulation (including the length) and relative change of penetration, we could predict a negative curve between the Intensity of regulation and relative change of penetration. The curve could be inverse or linear with negative coefficient.

Smaller economies had higher share of incumbent on the regulated technology and lower share of DSL technology among the all Access technologies. On the other side the intensity of regulation had a positive impact on the development of the regulated technology or market share of DSL technology among all the other technologies and had positive impact on the competition on the regulated technology. The market share of incumbent was decreasing with the intensity of regulation. We could assume that market share of incumbent on the regulated technology represented the intensity of regulation if we did not include the influence of infrastructure competition on the behaviour of incumbent regarding offering the Access to other operators.

The significant positive correlation between the GDP per capita and intensity of bit-stream regulation showed, that the rich countries had stronger regulation. This fact confirmed that deregulation had not started yet and the countries which joined EU earlier had been increasing the intensity of regulation through time. This was additionally confirmed by the fact, that intensity of regulation had a positive impact on the level of penetration. There was a significant correlation between the intensity of bit-stream regulation and GDP per capita ($r=0,436^{*}$, $\alpha = 0,018$), while between the intensity of local loop unbundling regulation and GDP per capita was only positive, but statistically not significant correlation. Also other factors influenced the level of penetration (like GDP per capita, share of incumbent on

DSL). Those factors needed to be evaluated in deciding which intensity of regulation to use.

The relative change of penetration was statistically negatively correlated with the intensity of regulation. This fact proves that more the regulation was intensive less was the relative increase of penetration. Based on that fact and the fact that intensity of regulation was positively correlated with the level of penetration we could conclude that high intensity of regulation in EU led to high level of penetration, but also to a lower increase of penetration. EU market is at the stage where additional imposing of intensive regulation (especially LRIC model) would lead to a slower penetration increase or even no increase. Through two regression models between significantly correlated parameters intensity of regulation (including

the length) and the relative change of penetration in the observation period from 2008 to 2010, we could get the point when positive increase turns into the negative one. We looked separately for the intensity of bit-stream regulation and local loop unbundling regulation, while both were significantly correlated. The regression models were constructed in such a manner, that we could explain 12, 9 % and 19, 9 % of relative change of penetration by the intensity of local loop unbundling and bit-stream intensity of regulation. We could assume linear regression model between the independent variable intensity of regulation and dependent variable relative change of penetration. Regression models showed following linear approximation (table 2 and 3 contain the regression coefficients):

Table 3 : Regression ENTER model

Model/ bit-stream	Unstandardized Beta	Std. Error	Standardized Beta (r)	t	α
Constant	,494	,079		6,291	,000
Intensity of regulation (bitstream)	-,019	,007	-,479	-2,730	,011

a. Dependent variable: relative change of penetration

$$\frac{\Delta p}{p} = -0,019 * I + 0,494$$

Table 4 : Regression ENTER model

Model/ local loop unbundling	Unstandardized Beta	Std. Error	Standardized Beta (r)	t	α
Constant	,464	,081		5,691	,000
Intensity of regulation (local loop unbundling)	-,012	,005	-,403	-2,204	,037

a. Dependent variable: relative change of penetration

$$\frac{\Delta p}{p} = -0,012 * I + 0,464$$

The risk to accept this relation was very low, especially in case of Bit stream regulation ($\alpha = 0,011$). From this equation we calculated the point when positive increase turns into negative. For bit-stream regulation, it appeared at value of $I = 26$. This figure means that on average if the market was regulated 5, 2 years by LRIC model, the relative increase of penetration would be 0. We could assume that intensity of bit stream regulation has strong influence on relative change of penetration. It was important to take into the consideration also the fact that richest countries were using stronger regulation. We calculated the break-even point at the value of $I = 38,7$ for local loop unbundling regulation. This meant that the influence of local loop unbundling had been much weaker. Size of the economy was not statistically significant correlated with

the intensity of regulation, but for linear approximation we used the significant statistical correlation between the size of the national market and market share of incumbent on the regulated technology:

$$DSL = -0,005 * v + 0,847$$

Where DSL meant the share of regulated incumbent on the regulated technology and v was measured in millions of inhabitants in a country. Smaller markets had higher share of incumbent.

c) Critical analyse and synthesis of the facts

Based on the fact that intensity of regulation had positive effect on the competition level on the regulated technology, we concluded that intensity of regulation could be also presented by the share of incumbent on the regulated technology. We had to

exclude the fact that open Access could be also influenced by infrastructure competition. This meant, that in case of high infrastructure competition, incumbent could be interested in opening its Access.

Less intensive regulation should have been imposed on smaller markets (negative correlation). This conclusion we could derive from the fact in previous chapter, that bigger economies had smaller market share of the incumbent on DSL technology. That meant that small economies were more sensitive to regulation and less intensive regulation should have been imposed to achieve the same results regarding customer welfare and investment initiatives. From the perspective of relative change of penetration, we had to include in our calculations also the factor, which represented the size of the market. It is important to emphasize as mentioned in previous chapter, that it was no significant statistical correlation between the relative increase of penetration and share of incumbent on the regulated technology and the size of the economy, measured by the number of inhabitants on other side. More intensive regulation in small economies could reach the break-even point between positive and negative increase of penetration faster than in bigger economies.

To evaluate the influence of LRIC method, it was also important to check the correlations between the intensity of regulation and the initiative for investments, measured as the percentage of investments in Electronic Communications sector in GDP. Based on strong negative correlations, as mentioned in previous chapter between the size of the economy and the market share of the incumbent on the regulated technology and strong negative correlations between the intensity of regulation and the share of investments in GDP we could come to conclusion, that the strongest level of intensity of regulation had extremely negative influence on the level of investments, while incumbent was the most important actor on the market. Strong regulation had extremely negative impact on its investments. It is extremely important for small countries, where the market share of incumbent is very high.

For the purpose of evaluating LRIC model in small economies, it was necessary to take into the consideration also the correlation between the size of the economy and market share of the regulated technology. The correlation as mentioned in previous chapter showed that small economies in EU had smaller percentage of DSL technology among all the Access technologies. Intensive regulation (LRIC model) on that technology would have additional negative impact on investments initiatives of regulated operators, while DSL technology was the only regulated one.

Increasing intensity of regulation caused decreasing share of regulated operator on regulated technology. This was especially important in the period of NGN networks via optical Access. The implementation of optical Access was/is very expensive

and the imposing of strong regulation on optical Access would additionally harm the initiatives for investments.

To summarize at the end, following facts were important to answer the main question in our research:

- The penetration growth was negatively correlated with the intensity of regulation (LRIC model is the most intensive way of regulation),
- Market share of incumbent on the regulated DSL technology as a key indicator of the regulation level was negatively correlated with the size of the market. This meant that regulation was very sensitive in small economies, where the market share of the incumbent of regulated technology was very high and regulated operator was the investment leader,
- The intensity of regulation was negatively correlated with the percentage of sector investments in GDP,
- The situation was additionally confirmed by the existing fact, that small economies had lower share of regulated technology,
- The only positive effect of intensity of regulation was that the intensity of regulation was positively correlated with the level of penetration reached in 2010, but this is/was out-weighted by the negative effects mentioned above.

LRIC Model is definitely in-appropriate model for the regulation of Access networks in small economies. It is in-appropriate from perspective of customer welfare and also the investment initiatives. It is also necessary to precisely evaluate the imposition of LRIC model in bigger economies. The above mentioned facts show also negative elements for all sized economies.

V. CONCLUSION

The final Conclusion was that ex ante regulation in EU should have been planned precisely not to decrease initiative for investments and customer welfare. Regulators all around EU should have taken the facts in this article into their decisions and not use LRIC model too often, especially in Access regulation. The results in this article showed the negative impact of LRIC regulation on initiative for investments and relative increase of penetration. This was especially obvious in case of small economies, where the incumbent market share was very high on the regulated technology and the development of infrastructure competition was/is mostly economically not justified. The correlation in EU also showed that the share of regulated DSL technology was lower in smaller countries. This correlation showed that other Access technologies were also developed and regulation via LRIC model would additionally hamper the incumbent, who built the DSL technology to access the end users. On the other hand intensity of regulation also had negative impact on penetration growth. All those facts confirmed that regulation of Access via LRIC model was/is not appropriate in small

sized economies, but also showed negative impacts, which regulators should have taken into the account, when imposing remedies in economically bigger countries.. As mentioned retail minus regulation allows a higher consumer surplus than deregulation and cost based regulation of access price as long as the regulator carefully defines the retail minus instruments (Brandão and Sarmento, 2007). Cost based regulation was defined in article mostly as LRIC model, based on incremental costs. Mason and Valletti (2001) emphasized, that the precise quantification of LRIC model raised many questions, namely concerning the allocation of common costs and the process of gathering the necessary information to compute appropriate replacement costs necessary to build the model. Cave and Prosperetti (2001) also found out that LRIC model adopted by some European countries discourages investment in fixed networks by the incumbent firms, because they anticipate that they will be required to offer access at cost-based prices. All those authors in the past pointed out the negative effects of LRIC model-, but no analyse was done based on facts through the regulation process on Access markets and comparison the intensity of regulation with other parameters on the market to prove or not to prove the economically justified usage of LRIC model or any other model of regulation used by regulators. So the analyse in this article proved, that conclusions of the authors in the past were valid also for Access markets and especially for economically small national markets. Additionally, this article proved, based on quantitative analyse and case studies the conclusions of previous authors and pointed out all the negative effects of using LRIC model in EU market.

LITERATURE

1. Bouckaert J. and van Dijk T. (2010). Access regulation, competition, and broadband penetration: An international study. *Telecommunications Policy* 34, 661-671. DOI:10.1016/j.telpol.2010.09.001
2. Brandão A. and Sarmento P. (2007). Access pricing: A comparison between full deregulation and two alternative instruments of access price regulation, cost based and retail minus. *Telecommunications Policy* 31, 236-250. DOI: 10.1016 / j.telpol. 2007. 03.003
3. Cave M. and Prosperetti L. (2001). European telecommunications infrastructure. *Oxford Review of Economic Policy* 17, 416-431. DOI: 10.1093/oxrep/17.3.416
4. CIA. (2011). The World Factbook. Available on: <https://www.cia.gov/library/publications/the-world-factbook/geos/ee.html>
5. Commission of the European Communities (2007). Explanatory note to the Commission recommendation On Relevant Product and Service Markets within the electronic communications sector susceptible to ex ante regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communication networks and services: Commission of the European Communities. Available on: http://ec.europa.eu/information_society/policy/ecom/library/recomm_guidelines/index_en.htm
6. Commission of the European Communities (2010). Progress report on the single European Electronic Communications Market 2009 (15TH Report) SEC(2010) 630. Available on: http://ec.europa.eu/information_society/policy/ecom/doc/implementation_enforcement/annualreports/15threport/comm_en.pdf
7. Dippon C.H. and Ware H. (2010). Wholesale unbundling and intermodal competition: *Telecommunications Policy* 34, 54-64. DOI: 10.1016/j.telpol.2009.11.002
8. Evans, T. L. in G. Guthrie. (2003). *Risk, Price Regulation, and Irreversible Investment*. University of Wellington. Available on : [Http:// ssrn.com/ abstract=482647](http://ssrn.com/abstract=482647) (4. 10. 2010).
9. European Parliament and of the Council (2002). Directive 2002/21/EC of the European Parliament and of the council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (Framework Directive), Official Journal L108. Available on: http://ec.europa.eu/information_society/policy/ecom/library/legislation/index_en.htm.
10. European Parliament and of the Council (2009). Directive 2009/140/EC of the European Parliament and of the Council of 25 November 2009 amending Directives 2002/21/EC on a common regulatory framework for electronic communications networks and services, 2002/19/EC on access to, and interconnection of, electronic communications networks and associated facilities, and 2002/20/EC on the authorisation of electronic communications networks and services (Text with EEA relevance), Official Journal L337. Available on: http://ec.europa.eu/information_society/policy/ecom/library/legislation/index_en.htm.
11. ERG (2009). ERG Report: Regulatory Accounting in Practice 2009, ERG (09) 41, 1-41. Available on: http://www.erg.eu.int/doc/publications/2009/erg_09_41_regulatory_accounting_report_in_practice_2009_final.pdf
12. ERG (2009). Report on Next Generation Access – Economic Analysis and Regulatory Principles, ERG (09)17, 2009. Available on: http://www.erg.eu.int/documents/erg/index_en.htm
13. Höffler F. (2005). Cost and Benefits from infrastructure competition. Estimating Welfare Effects from Broadband Access Competition, Max

- Planck Institute,1-23.DOI: 10.1016/j.telpol.2007.05.004
14. Koutroumpis, P. (2009). The economic impact of Broadband on growth: A simultaneous approach. *Telecommunications Policy* 33 (9): 471–485.
 15. Laffont J.J. and Tirole J.(2000). *Competition in Telecommunications*. London, The MIT Press, 2000.
 16. Mason R. and Valetti T.M. (2001). Competition in communications networks: Pricing and regulation. *Oxford Review of Economic Policy* 17, 389-415. DOI: 10.1093/oxrep/17.3.389
 17. Mihevc, A. (2009). Analiza regulacije trga mobilnih komunikacij iz vidika korelacij med storitvami. Organizacija: revija za management, informatiko in kadre 42 (5): A209–A216.
 18. Mihevc A. (2011). The influence of broadband regulation in EU on the development of the regulated technology. Organizacija: revija za management, informatiko in kadre 44 (4): 128-136.
 19. Symeou C.P.(2009). Does smallness affect the liberalisation of telecommunications? Case of Cyprus, *Telecommunications Policy* 33, 215-229. DOI: 10.1016/j.telpol.2008.12.006
 20. Siciliani P. (2010). Access regulation on NGA-A financial, market lead solution to bridge the gap between US and European diverging regulatory approaches, *Telecommunications Policy* 34, 287-298. DOI: 10.1016/j.telpol.2009.12.004.

