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# ECONOMICS

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*Sociology*

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*Received:* June, 2015  
*1st Revision:* July, 2015  
*Accepted:* September, 2015

**DOI: 10.14254/2071-  
789X.2015/8-3/9**

**JEL Classification:** L96, D22,  
D24, L23

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Korchagin, P., Korneeva, E., Nikitina, N. (2015), Factors that Influence the Effectiveness of Russian Telecommunication Companies, *Economics and Sociology*, Vol. 8, No 3, pp. 119-130. DOI: 10.14254/2071-789X.2015/8-3/9

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## FACTORS THAT INFLUENCE THE EFFECTIVENESS OF RUSSIAN TELECOMMUNICATION COMPANIES

**ABSTRACT** The article examines the factors that affect efficiency of enterprises in telecommunication industry in Russian Federation over the past decade on the example of three major telecommunication companies, MTS, MegaFon, and VimpelCom that control more than 80% of the market. The paper describes main characteristics of the companies and builds multiple regression models. The study is based on data from the State Statistics Committee of Russia, annual reports and websites of telecommunication companies, market surveys, for the period 2005-2013.

Our results suggest that the success of the Russian telecommunications companies is primarily associated with the size of investment in fixed assets, the expenditures on advertising, the dynamics of the average cost of cellular communication services, as well as the growth of the national telecommunications market and the level of inflation in the country. Our results are in accord with the idea that success of the operators in the current conditions is largely dependent on investment and technology opportunities for early coverage area (population) new networks 3G/3.5G/4G, and successful marketing strategies to promote mobile services data (mobile internet) on the basis of these networks in the context of growing competition in this segment of the market.

**Keywords:** telecommunications, efficiency, regression analysis, Russian Federation, competitiveness.

### Introduction

Mobile telecommunications bears the immense importance in the economy, as it can enhance development and functioning of other sectors. The introduction of telecommunication systems can dramatically improve productivity on mobile objects, save material and human resources, to provide automated control of technological processes, create a reliable vehicle control systems or mobile robots, distributed over a large area and are part of the flexible automated control systems.

It is not surprising, that mobile telecommunication market was one of the most profitable and fastest growing segments of the telecommunications market in Russia. Revenues of mobile operators were increasing, even in times of economic crisis.

Given the growing influence of the telecommunications industry in the economic development of Russia and the increasing complexity of the global external environment, we consider important to study the factors that influence efficiency of main Russian telecommunication companies.

The factors that influence productivity in telecommunication industry described in the literature most often concern the effects of capital investments in physical capital (towers, routers, computers, and fixed lines), investment in innovative technologies (software logic) and management practices (Hammond and Michaels, 2009; Sabat, 2002, 2005). These capital investments among other may influence productivity (Gruber, 2001), profitability (Futia, 1980; Zahra and Covin, 1993), and price recovery in the case of high competition (Laursen and Meliciani, 2002).

The results on the impact of capital investment on productivity and profitability are mixed. On one hand, in competitive environment investments in technology of one firm are subject to imitation and innovations by other players, which creates so called Red Queen effect and reduces the effect of investments on profitability and competitive advantage of the first investing firm (Barnett and McKendrick, 2004; Walker *et al.*, 2002). On the other hand, Banker (2013) found out, that the association of investment and profitability is positive in the future (after six quarters).

The purpose of this paper is to identify the factors that determine the effectiveness of the telecommunications companies, and to determine the extent of their influence. We employ the data from State Statistics Committee database, open source (analytical sites and portals), reports and websites of telecommunication companies, surveys of market participants to investigate the factors influencing effectiveness of three leaders of the mobile telecommunication market – "MTS", "MegaFon" and "VimpelCom" holding in aggregate more than 80% of the market share. We concentrate on the time span from 2005 through 2013.

The paper is structured as follows. First section provides short literature review on the effects of capital investments on productivity, profitability, and price recovery. Then we describe telecommunication market in Russia and characteristics of major competitors. We continue with describing our data and model. The next section states our results and interpretation. The last section closes the paper and presents the overall conclusions and policy implications.

## 1. Literature review

The factors that influence productivity in telecommunication industry described in the literature most often concern the effects of capital investments in physical capital (towers, routers, computers, and fixed lines), investment in innovative technologies (software logic) and management practices (Hammond and Michaels, 2009; Sabat, 2002, 2005; or Krejci *et al.*, 2015). These capital investments among other may influence productivity (Gruber, 2001), profitability (Futia, 1980; Zahra and Covin, 1993; or Ehrenberger *et al.*, 2015), and price recovery in the case of high competition (Laursen and Meliciani, 2002).

Productivity is commonly defined as the amount of input used to produce desired output. In telecommunication industry in general productivity may be increased by capital investments, number of subscribers, and number of calls, data or other services per one subscriber. Here some academics suggest that economies of scale increase productivity (see e.g. Abrahám *et al.*, 2015), while others argue that capital investments of one

telecommunication firm will induce imitations of other firms and create so called Red Queen effect. In this case the overall effect of investment on productivity will be weakened (Barnett and McKendrick, 2004; Walker *et al.*, 2002). On the other hand, Gruber (2001) finds out, that the capital investment of all the players improves combined network capacity of all operators because of efficient use of wireless spectrum and leads to increased productivity of all competitors. Banker (2013) documented, that capital investments are positively associated with productivity of current and future periods in the mobile telecommunications services.

The effect of capital investment on profitability in a competitive industry largely depends on the degree of competition (Smith *et al.*, 1991). The investment of competitors in new technology in order to acquire long term competitive advantage over other players is discussed in the context of Schumpeterian race (Futia, 1980). The firms, which efficiently invest in new technologies, are documented to achieve better financial results than their competitors (Zahra and Covin, 1993; Lee, 2003; Harris and Katz, 1991). However, new technologies used by one firm induce imitations and innovations by other firms (Futia, 1980), which diminished competitive advantage of the first investor. The speed of this process largely depends on the extent and rapidity of imitation by the firm's rivals (Smith *et al.*, 1991). The extent of this process depends on the degree of competitive advantage caused by new technologies (Tirole, 1988; McGee, 2005). Finally, introducing new technologies may become a requirement for survival rather than a means of generating competitive advantage (Clemons and Row, 1991, Powell and Dent-Micallef, 1997).

The profitability of capital investment to new technology is also dependent on price recovery: the ability of the firms to charge higher prices and reduce costs (Porter, 1985; Masson *et al.*, 1994; Akan *et al.*, 2006). The prices of output are controlled by the other competitors, while the prices of inputs are dependent on the degree of competitiveness of market for inputs. If this market is competitive enough, no downstream firm will be able to utilize the advantage of lower costs (Mata *et al.*, 1995) and the value created by capital investment to new technology will be to a large extent passed to customers (Powell and Dent-Micallef, 1997). On the other hand, Banker (2013) found out, that the association of investment and profitability is positive in the future (after six quarters) in telecommunication industry.

## **2. Characteristics of major competitors at the Russian telecommunication market**

As a result of the integration processes in Russia today there are four major players in the telecommunications market: the Big three mobile operators and the national telecommunications company Rostelecom. The "Big three" mobile operators include Mobile Tele Systems (MTS), VimpelCom, and MegaFon.

These four companies form almost 80% of the Russian telecommunications market and are present in all major segments of the communications industry. At the end of 2013 four leaders jointly control (according to income): 89% of the cellular market, 78% of the local telephone market, 90% market share interurban and international communication, 58% of the market of broadband Internet access, 38% of the pay TV market (IKS-Consulting, 2013).

The company Rostelecom is the undisputed market leader in telecommunication services for Russian state authorities and corporate users of all levels. The company is a recognized technology leader in innovative solutions in the field of e-government cloud computing, health, education, security, housing and communal services. Rostelecom is also the undisputed leader of the Russian market of Internet services – one of the most competitive segments in which the company is present. The mobile business of Rostelecom is focused mainly in the regions of Urals, Siberia, the Volga region and the Far East. The share of Rostelecom in the market of cellular communication of the number of subscribers at the end

of 2011, 2012 and 2013 was 6% (Annual Report of Open Joint Stock Company of Long-distance and International Telecommunications "Rostelecom", 2013).

Mobile Tele Systems (MTS) is the leading telecommunications operator in Russia and the Commonwealth of Independent State (CIS). MTS and its subsidiaries provide services in GSM standard in all regions of Russia, as well as Armenia, Belarus, Ukraine, Uzbekistan and Turkmenistan. The company also provides fixed-line services and cable television in all federal districts of Russia. In 2014 MTS brand has entered the seventh consecutive year in the top 100 most valuable brands in the world ranking BRANDZ™, published by international research agency Millward Brown, and was recognized as the most expensive Russian telecommunications brand. The company also entered the top ten in the cost of global telecommunication brands. Since June 2000, MTS has been listed on the New York Stock Exchange (The consolidated financial report of "Mobile TeleSystems" (MTS) for 2005-2013).

VimpelCom started commercial activities under the brand Beeline in Moscow in June 1994. As of 2013, the Beeline was considered to be one of the most recognized brand names in Russia and CIS countries. Research agency Millward Brown Optimor included the Beeline in the prestigious list of the 100 most valuable brands in the world with a value of 8.16 billion dollars. VimpelCom is a part of a group VimpelCom Ltd., which is one of the world's largest integrated telecom operators. The group VimpelCom Ltd. includes communication companies that provide voice and data services through a range of wireless, fixed and broadband Internet access in Russia, Italy, Ukraine, Kazakhstan, Uzbekistan, Tajikistan, Armenia, Georgia, Kyrgyzstan, Laos, Algeria, Bangladesh, Pakistan, Burundi, Zimbabwe, Central African Republic and Canada (The consolidated financial report of the company "VimpelCom" (Beeline) for 2005-2013).

MegaFon is one of the leading Russian universal service providers. The company operates in all segments of the telecommunications market in Russia. MegaFon was established in June 1993 as the JSC "North-West GSM", and then in 2002 it was renamed in MegaFon. The Company and its subsidiaries have all the necessary licenses and operate in all regions of Russia and in the republics of Abkhazia, South Ossetia and Tajikistan. MegaFon was the first in Russia to put into commercial operation a 3G network, and today is the Russian leader in providing mobile Internet services, and ranks second in Russia in the number of active subscribers. In 2009, MegaFon became the General Partner of the XXII Olympic Winter Games and XI Paralympic Games in Sochi in 2014 (The consolidated financial report of "MegaFon" for 2005-2013).

These four companies above own most of valuable assets in the telecommunications market of Russia. However, according to some observers the final phase of the consolidation of the telecommunications market in Russia is still to be awaited. The big deal between the leaders of the industry in sales and the acquisition of assets is expected (IKS-Consulting, 2013).

In general, it should be noted that the barriers to entry into telecommunication market are quite high, so, even though the change of the profiles of the players presented above is theoretically possible, in practice it is quite a long process requiring significant investment. Access of new players in the Russian telecommunications sector is difficult due to its high capital intensity and considerable inertia of customers.

Throughout the 2005-2013, the company MTS remained the leader in revenues and operating income before depreciation and amortization (OIBDA). The second place belongs to the intensively developing company MegaFon, which managed to reduce the cost of mobile internet and related services in 2012 for its customers and stayed ahead of company VimpelCom in all performance indicators in 2013.

According to average revenue per user (ARPU) index VimpelCom was the market leader since 2009. Market analysts attribute this to the active development of the small screen

segment, on which the operator signed numerous partnerships with content providers for the joint promotion of services such as Facebook, LiveJournal, etc. (Maltcev, 2012)

The average value of ARPU in the global telecommunications industry is gradually being reduced. This reduction is explained by the connection of the "last billion" of subscribers in poorest developing countries, and by lower consumption of traditional communication services in developed countries due to increased penetration of mobile Internet, smart phones and tablets. Though, the experience of many countries shows that the stabilization of ARPU is possible in the case of the successful integration of traditional and new services of mobile communication.

The modern telecommunications market is subject to rapid technological change and emergence of new products and services, which requires continuous adjustment of the firms as for their product base. One of these is broadband Internet access (BBA). This kind of service bears extreme importance for competitiveness of firms in all the sectors. The leader of the Russian Internet market is the company Rostelecom.

### **3. Capital expenditures**

The telecommunications industry is capital-intensive. In 2012, cellular operators MTS, VimpelCom, and MegaFon have implemented the first joint project for the construction of a network for mobile communication highway "Amur" (Chita-Khabarovsk) along its entire length (2165 km). As part of this large-scale project operators jointly built all over the track 102 of Antennae and Support Structures (ASS) for the joint exploitation. According to the plan, 300 base stations belonging to the participants of the project will be located at ASS. Total investment in the project amounted to 4 billion rubles, of which 2 billion rubles were funded by the government, another 2 billion were provided by mobile operators. The project seemed successful, and in November 2012 the three firms described above announced a new joint project, this time in collaboration with the fourth operator – Rostelecom. The new project was aimed to provide for mobile communication of federal importance connecting "Baikal", "Caspian", "Ural" and "Ussuri" regions of total length about 9 000 km. The project was initiated in accordance with the Decree of the Government of the Russian Federation of 05.05.2012, its implementation will provide full coverage of cellular communication of key road arteries of the country (Maltcev, 2012).

In 2013 the management of mobile operators also focused on the preparation for the Olympic Games in Sochi in 2014. The company MegaFon served as general partner for the project and invested the most on telecommunications infrastructure. The company MTS conducted a large-scale modernization of the cellular network in the Sochi region, replacing more than 50% of the equipment and organizing additional reservation of channels between the cities of Krasnodar and Sochi.

### **4. Pricing policy**

Despite the fact that the cost of services is determined by the operator, it is influenced by the market, which forces operators to review tariffs periodically. Pricing policy in cellular communication is a complicated area given a huge number of services. Operators are trying to extract all the revenue potential from each service, taking into account the entire range of factors, including the availability of end-user services, capacity and price limits of mobile technology and the ability to be different from competitors. Tariff policy significantly affect the relationship between operators and their subscribers, and the long-term impact on churn rates. Properly selected value rate for operators played a crucial role in the growth potential of revenues from voice services and data connection and can encourage subscribers to subscribe

for additional services. Incorrect pricing may create barriers for firm development. The next factor important for successful functioning of a telecommunication firm is the number of subscribers. The number of subscribers of surveyed companies is difficult to estimate given that the subscribers of VimpelCom and MTS stop to be customers only after 6 months of non-use of its SIM-card, which creates time lags in estimates. The subscribers of Megaphone stops to be the customers if within three month period no operation was charged from their SIM-cards. Thus, the number of active SIM-cards, and, consequently, subscribers is overestimated. However, these data can be very useful for analyzing the dynamics of the number of cellular subscribers

Given that the market of telecommunication in Russia is close to its saturation, and competition is tough, advertising became one of the key factors. It is worth noting that the range of services has significantly expanded, and their provision, as a rule, is grouped into batches. The number of mobile services today is very large, they are different in structure, and have different levels of pricing. All these factors intensify advertising activity of market players, forcing them to choose the best set of media channels to communicate with consumers. This tendency makes the telecommunication firms also the biggest players on the on the Russian advertising market and total advertising costs of mobile operators occupy a leading position consistently in the top 10 most advertised categories of goods and services (Karpushkin, 2011).

In conclusion, MTS can be considered the leader of the Russian cellular market according to such indicators as financial performance, capital expenditures, advertising costs, and the number of mobile subscribers among the firms described above. Together with Rostelecom, MTS, VimpelCom, and MegaFon form almost 80% of the Russian telecommunications market and are present in all major segments of the communications industry.

Among industry trends that determine the development of the Russian market of cellular communication we distinguish increased competition for subscribers in a saturated market of traditional communication services, the growth of the data segment, as well as a change in priorities, by which the quantitative growth of the subscriber base is replaced by an increase in quality and consolidation.

## 5. Data and Methods

As sources for our data we employ State Statistics Committee database, analytical sites and portals, reports and websites of telecommunication companies, surveys of market participants, mass media files.

Our data cover the period 2005-2013 during which the companies were working in dynamic, ever-changing external environment, and had to adapt to global competition and the growing scale of technological change.

As the object of study considers the three leaders of the cellular market – MTS, MegaFon and VimpelCom, which, together with the company Rostelecom, hold in aggregate more than 80% of its volume. The company Rostelecom is not included in our study, because, though the company is the undisputed leader on the Russian market of fixed communication and Internet communications, but in the cellular market it possesses only 6% of the market, which is significantly behind "big three" companies on this indicator

Part of the data, such as number of subscribers by region, the breakdown of expenditure, market share of broadband services and paid-TV, and some other data could not be found in the reports of the companies in full, so the impact of these factors on earnings has not been researched.

As a key performance indicator was selected operating income before depreciation and amortization (OIBDA) index, which is defined as "Operating profit" minus "Depreciation and impairment losses on non-current assets" in the consolidated statement of comprehensive income in the same period (Annual Report of Open Joint Stock Company of Long-distance and International Telecommunications "Rostelecom", 2013). This indicator is found to have the highest correlation with the selected factors of external and internal environment of companies. In addition, not all the data on the net profit of companies surveyed may be taken into account when assessing their performance. For example, it is known that due to write-downs in the Ukraine and Canada, the company VimpelCom received a "paper" net loss of \$ 45.8 billion. Rubles. The existing explanation suggests, that VimpelCom, having established in 2009 control of the Ukrainian "Kyivstar", had to assess this asset, and now – in view of the deterioration of the macroeconomic situation – change this assessment (CNews, 2015).

## 6. Empirical regression model: specification and interpretation

In this study we estimate the following regression model:

$$y_k = \beta_0 + \beta_1 x_{1k} + \beta_2 x_{2k} + \dots + \beta_{mr} x_{mk} + \varepsilon_k \quad (1)$$

where the dependent variables are the indicators of efficiency of the companies. The independent variables are indicators of internal and external to companies. The list of indicators is presented in *Table 1*.

Table 1. Indicators used in regression model

Y <sub>1</sub>	Revenues for mobile services, bln. rubles
Y <sub>2</sub>	OIBDA, bln. rubles
Y <sub>3</sub>	Net profit bln. rubles
X <sub>1</sub>	Mobile phone subscribers, million people.
X <sub>2</sub>	Earnings per unit of user equipment ARPU, rubles
X <sub>3</sub>	Company's share in the market of cellular communication
X <sub>4</sub>	Capital expenditures (CAPEX), bln. rubles
X <sub>5</sub>	The average number of employees, thousands people
X <sub>6</sub>	Advertising costs bln. rubles
X <sub>7</sub>	Exchange rate Rub/USD
X <sub>8</sub>	Inflation, %
X <sub>9</sub>	GDP growth, %
X <sub>10</sub>	Volume of the Russian telecommunications market, bln. rubles
X <sub>11</sub>	Volume of the Russian telecommunications market. Billion Euros
X <sub>12</sub>	Mobile penetration in Russia, %
X <sub>13</sub>	Growth rate of the Russian cellular market, %
X <sub>14</sub>	Real disposable cash incomes of population, % to previous year
X <sub>15</sub>	The average cost of one minute (APPM) for customers, rubles

Source: Own results.

We performed the correlation analysis in order to determine the best dependent variable. Indicator Y2 has the highest correlation with the independent variables, and was selected as an indicator of efficiency of telecommunication firms.

Next we explored the correlations between variables. We formed a matrix of pairwise correlation coefficients according to formula 2.

$$R = \begin{pmatrix} 1 & r_{12} & \dots & r_{1m} \\ r_{21} & 1 & \dots & r_{2m} \\ \dots & & \ddots & \\ r_{m1} & r_{m2} & \dots & 1 \end{pmatrix}. \quad (2)$$

We also calculated bivariate correlation coefficients between Y2 and Xi. Following the results of correlation analysis, X2, X3 and X9 have been excluded from the model because of low impact on the dependent variable.

Correlation analysis also revealed high correlation between X10, X11 and X12 which will cause multicollinearity in regression analysis. These variables have a strong correlation with each other and with other variables. These variables were also excluded from the analysis. In the next step of the analysis we checked multicollinearity using determinant  $|R|$  and criterion  $\chi^2$ .

$$|R| = 0,1342 \cdot 0,000198 \quad (3)$$

The determinant of the matrix is sufficiently close to zero.

$$\chi^2_{\text{факт.}} = -\left(n - 1 - \frac{2m + 5}{6}\right) \lg |R| = 19,6 \cdot 0,82,09352 \quad (4)$$

The critical value of  $\chi = 50,995$ , consequently, the actual value  $\chi^2_{\text{факт.}}$  is significantly greater than the critical, and the model is present multicollinearity. In order to improve the quality of the model we excluded from the analysis factors X1 (number of mobile subscribers), X7 (exchange rate to dollar), X14 (real disposable income). This type of incremental analysis of the model quality and consistent exclusion of variables allowed us to get the actual value of  $\chi^2_{\text{факт.}}$  below the critical value.

The quality of the model was tested using the F-test, the model proved to be satisfactory. The calculated t-statistics for the parameters of the regression equation has shown that some of the variables included in the model were not statistically significant, and should be deleted from the model. This was the case of X5 (average number of employees of the company).

## 7. Main results

The resulting estimated model can be shown as follows:

$$Y2 = 151,18 + 0,31X4 + 6,23X6 - 5,095X8 - 0,28X13 - 20,58X15, R^2 = 0.88 \quad (5)$$

where

Y2 – OIBDA, bln. Rubles,

X4 – capital expenditures (CAPEX), bln. Rubles,



X6 – Expenses for advertising, bn. Rubles,

X8 – Inflation, (in %),

X13 – The growth rate of the Russian cellular market (in %),

X15 – The average price per minute (APPM) for the user of cellular services (in rubles).

The resulting model describes 88% of the variability of initial data. The other 12% of variability are attributed to occasional deviations. The exact values of parameters and elasticities are shown in *Table 2*.

Table 2. Parameters and elasticities for regression analysis

	coef.	p-values	elasticity
Constant	151.178	0.024	
CAPEX	0.314	0.051	0.16
Advertising costs	6.230	0.004	0.42
Inflation	-5.095	0.002	-0.48
Market growth rate	-0.280	0.012	-0.39
APPM	-20.578	0.001	-0.28
R <sup>2</sup>		0.88	
N			

Source: Own results.

The obtained values of the elasticities lead to the following practical conclusions: if the volume of funds invested in fixed assets (CAPEX) is increased by 1%, the average OIBDA will increase by 0.16. By increasing the size of spending on advertising by 1%, the average OIBDA can be increased by 0.42. With an increase in the inflation rate by 1%, the average value of OIBDA will decline by 0.48. By increasing the rate of growth of the Russian market by 1%, the average value of OIBDA will be reduced by 0.39. With an increase in the average price per minute (APPM) by 1%, the average OIBDA can be reduced by 0.28%

Thus, OIBDA, measured as "Operating income", net of indicator "Depreciation and impairment losses on non-current assets", is statistically significantly associated with the indicators such as investment in fixed assets (CAPEX), advertising costs, inflation, the rate of growth of the Russian market of cellular communication and the average price per one minute of call (APPM).

The greatest negative impact on OIBDA is caused by inflation. The increase in inflation reduces the efficiency of the investigated companies. The largest positive impact on OIBDA has a level of spending on advertising. The increase in advertising expenditure results in a significant increase in the efficiency of the investigated companies.

## Conclusions and discussions

The paper examined the factors affecting efficiency of enterprises in telecommunication industry in Russia over the past decade on the example of three major telecommunication companies – "MTS", "MegaFon" and "VimpelCom" holding in aggregate more than 80% of the market. We described main characteristics of the companies and built multiple regression models to detect the priority factors influencing the effectiveness of the telecommunications companies, and to determine the degree of influence of these factors. The results of our study show that the success of Russian telecommunications companies is primarily associated with the size of investment in fixed assets, the cost of advertising, the dynamics of the average price of cellular communication services, as well as the growth of the national telecommunications market and the level of inflation in the country.

Our work provides empirical evidence that are in line with the findings of other researchers of the telecommunications market, namely that the success of the operators in the current conditions is largely dependent on investment in technology to cover area (and population) with new networks 3G/3.5G/4G, and successful marketing strategies to promote mobile services data (mobile internet) on the basis of these networks in the context of growing competition in this segment of the market. In this regard, the business development strategy of telecommunication companies should be based primarily on functional strategies such as advertising and investment.

The study found that factors related to the macro environment, such as GDP growth and the dynamics of the real income of the population, is not particularly important to the success of telecommunications companies. It differs from the widespread view according to which large companies have a significant impact of the macro, and especially its economic component in the form of the dynamics of macroeconomic indicators.

Conclusions regarding the positive effect of reducing the average price of mobile communication services on the effectiveness of the investigated companies in conjunction with the data on the high degree of concentration of the Russian telecommunications market suggest the appropriateness of state regulation of the sector.

Our study also has revealed a negative relationship between the growth of the national market of cellular communication and business efficiency of its key players. This is in contradiction with the marketing model, according to which the growth of the market is beneficial to the performance of the companies. The causes and mechanisms of this association requires additional research.

Our results are in line with the idea, that success of the operators in the current conditions is largely dependent on investment and technology opportunities for early coverage area (population) new networks 3G/3.5G/4G, and successful marketing strategies to promote mobile services data (mobile internet) on the basis of these networks in the context of growing competition in this segment of the market.

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