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ИМПОРТ И ВЫРУЧКА ТЕЛЕКОММУНИКАЦИОННОГО СЕКТОРА В ОБЪЯСНЕНИИ МОТИВОВ АРМЯНСКИХ ОПЕРАТОРОВ В РАЗРЕЗЕ ИНВЕСТИЦИЙ В ИННОВАЦИОННЫЕ ТЕХНОЛОГИИ

Аннотация. *Оценив влияние реального импорта инновационных технологий и неинновационного оборудования на реальные доходы операторов связи, а также влияние реального импорта неинновационного оборудования и реальных доходов операторов связи на реальные доходы операторов связи в Армении со второй половины 2014 года до конца 2020 года, мы определили, какие факторы в основном приведут к росту сектора и заставят их инвестировать в инновационные технологии. Согласно анализу эконометрической модели №2, можно сказать, что компании, в среднем, увеличивают расходы на импорт инновационных технологий и оборудования на 6,11%, как только выручка снижается на 1%. Во-вторых, импорт неинновационного оборудования, как телефоны, один раз в 24 месяца, может повлечь за собой к увеличению объёмов импорта инновационных технологий и оборудования. Согласно модели №2, затраты на импорт неинновационного оборудования оказывают статистически значимое незначительное влияние на выручку телекоммуникационных компаний, но импорт телефонов нового поколения не приводит к значительному увеличению использования услуг, предлагаемых операторами. Через 11 месяцев после внедрения инновационных технологий их влияние на выручку телекоммуникационных компаний становится статистически значимым и негативным. Мы приходим к выводу, что снижение доходов от телекоммуникаций приводит к росту реального импорта инновационных технологий. Результаты модели позволят телекоммуникационным компаниям преодолеть ситуации, которые приведут к снижению выручки компаний, пересмотреть сроки, установленные для импорта оборудования и инновационных технологий.*

Ключевые слова: *инновационные технологии, оборудование, импорт, выручка, телекоммуникационный сектор, рост.*

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IMPORT AND TELECOM SECTOR REVENUE IN EXPLAINING THE MOTIVES TO INVEST IN INNOVATIVE TECHNOLOGY BY ARMENIAN OPERATORS

Abstract. *By estimating the impact of real imports of innovative technologies and non-innovative equipment on the real revenue of the telecommunications operators; and the impact of real imports of non-innovative equipment and the real revenue of the telecommunications operators on the real revenue of the telecommunications operators in Armenia from the second half of 2014 till the end of 2020, we have identified which factors will mainly lead to the growth of the sector and force them to invest in innovative technology. According to the analysis of the econometric model #1, it can be said that companies increase the cost of importing innovative technologies and*

equipment by 6.11%, on average, as soon as revenue decreases by 1%. Secondly, import of non-innovative equipment, like phones, once every 24 months, could lead to an increase in import of innovative equipment. According to the model #2 the costs of importing non-innovative equipment have a statistically significant impact on the revenue of telecom companies, however, the import of new generation phones does not lead to a huge increase in the use of services offered by operators. 11 months after the introduction of innovative technologies, their impact on the revenue of the telecom companies becomes statistically significant and negative. We conclude that the decrease of telecoms revenue leads to the growth of real imports of innovative technologies. The model results will enable telecoms to overcome the situations that would decrease companies' revenue, to revise the periods set for importing equipment and innovative technology.

Keywords: innovative technologies, equipment, import, revenue, telecommunications sector,

Introduction: The telecommunications sector is an important tool for socio-economic development around the world and plays a significant role in the development of nations and the modernization of various sectors of the economy [1, p. 8]. There are several researches, where the authors tried to reveal the relationship between the development of the telecommunications sector and economic development, the role of innovative technologies and equipment in the development of telecommunications sector.

Since 2009, a sharp increase in the number of mobile subscribers (in 2010, compared to 2009, the number of mobile subscribers increased by 480.000) and subscribers with mobile Internet (in 2012, compared to 2011, the number of subscribers increased by more than 1,500,000) has begun in Armenia [2]. In terms of the first change, the entry of the third telecom operator-Orange Armenia (currently Ucom), was of significant importance. Thanks to this, the rising competition among already 3 telecom operators (VivaCell-MTS, Beeline, Orange Armenia) contributed to the development of new services/packages for retaining existing customers and attracting new subscribers, importing innovative technologies and equipment necessary for a new generation of communications, to lowering prices. The second sharp change in increase of numbers of Internet access subscribers was caused not only by the prevailing competitive situation, but also by the introduction of innovative 4G/LTE technologies, launched in 2010.[3]

A study aimed at identifying the relationship between innovative technologies and the development of the telecommunications sector in Armenia. In the framework of the study, an attempt was made to assess the impact of real imports of innovative technologies and non-innovative equipment on the change in monthly revenue of the telecommunications sector. In order to assess the impact an econometric model with the method of the Ordinary Least-Squares was constructed.

Literature review: Andrzej Cies' Lik and Magdalena Kaniewska believe that investments in telecommunications infrastructure play an important role in the speed of convergence between countries and regions [4, p. 713]. Harald Gruber and Pantelis Koutroumpis believe that, despite the fact that the telecommunications sector is primarily connected to the infrastructure, significant changes in the field of mobile communications contribute to changes in various sectors of the economy [5, p. 389]. They also note that the bilateral relationship between mobile telecommunications and economic growth occupies a central place in the econometric model they have analyzed. According to them, the mobile communication is not a public good, which is being financed from the state [5, p. 389].

In her research, Caroline Lesser notes that the introduction of innovative processes in the example of Finland is mainly common in the production of computer and telecommunications equipment. About 75% of the enterprises studied by her during the study period were involved in innovative activities [6, p. 13].

By citing other authors' works in the analysis conducted by them, Raul Katz and Fernando Callorda note that since the introduction of telecommunications technologies its impact on the economy start to decrease from a specific period of time. This supports the argument that the externalities of networks decrease with the development of networks and the development of technology over time. The authors also touched upon the theory of diffusion, in which it is noted that the early bird investors of innovative technology are usually ones receiving income from innovation, on the other hand, external network effects weaken over time, and for late technology investors these effects will not have the intensity, will not provide the income that the first ones have. [7, p. 3].

Mohammed A. Hajar et al. in their research, citing various authors, highlight the role of innovation in the telecommunications sector, in particular, the stable growth and development of the telecommunications sector largely depends on innovation. The introduction of innovative technologies increases the level of profitability of organizations. Moreover, telecommunications companies are currently engaged not in attracting new subscribers, but in increasing the loyalty of their subscribers, introducing innovative technologies into the organization, offering new services [8, pp. 58-61]

And as Catherine Bentley told during the “Telecom at a Crossroad, The Role of Innovation, “Innovation 360”” seminar in 2014, “Innovation in the telecommunications sector is not a choice but an imperative”. [9]

Another thing that is also very important is that innovations in telecommunications do not remain the property of closed laboratories, but extend to the organization of social processes and change the daily life of every member of society.[10] The use of mobile technologies leads to an increase in the productivity of the economy and an increase in its efficiency, both for workers and companies.[11, p. 5]

So, taking into account the above-mentioned studies, and changes in the Armenian telecom sector starting from 2010 we attempt to estimate statistically significant changes in real imports of innovative technologies and non-innovative equipment by changes in real revenue of telecoms. These estimates would allow the telecoms to manage the periods of making decisions regarding the import, and design respective strategies for minimizing revenue decrease risk caused by the late import of innovative technology and equipment.

Model Specifications

Our first model is defined as:

Real Imports of innovative equipment = f (real revenue of telecom operators; real expenditures on non-innovative equipment import)

Our second model is defined as:

Real REVENUE = f (volume of imported innovative equipment and volume of imported non-innovative equipment)

Our original dataset contains 108 observations covering the period 2012:1-2020:12. However, for the purpose of the given research, in order to estimate both equations our dataset covered the period 2014:6-2020:12. 2012 was taken as a base years, and all nominal values of our variable were converted into real ones. Respective growth rates, released by the Statistical Committee of Armenia [12] were used to calculate the real values of the revenue of telecom operators. In the case of the volume of innovative equipment and the volume of imported non-innovative equipment, the values of thereof expressed in US dollars [13] were converted into Armenian drams by using respective monthly data released by the Central Bank of Armenia (CBA) [14]. Then these values were converted into real ones by using monthly CPI indices released by the CBA [15]. Then all real variables were seasonally adjusted by moving average method, and the logs of thereof were taken. The stationarity tests (using Augmented Dickey Fuller test) performed on the variables (lags length: 4) showed evidence on non-stationarity, and the variables are stationary at the first difference (lags length: 4). Upon testing for the existence of multicollinearity (correlation between variables is below 0.5) and finding no evidence of it, the following equations are estimated (see tables 1 and 2 for estimation output).

$$DLSPEQSA_t = \beta_0 + \beta_1 * DLREVENSA_t + \beta_2 * DLHHSPSA_t + \varepsilon_t \quad (1)$$

where:

$DLSPEQSA_t$ is the first difference of the log of the seasonally adjusted value of real imports of innovative equipment (base stations, and etc.) in period t.

$DLREVENSA$ is the first difference of the log of the seasonally adjusted value of real revenue in period t.

$DLHHSPSA_t$ is the first difference of the log of the seasonally adjusted value of the real volume of non-innovative equipment (mobile phones) imported in period t.

$\beta_0, \beta_1, \beta_2$, are model unknown parameters.

ε_t is the error term in period t.

$$DLREVENSA_t = \alpha_0 + \alpha_1 * DLHHSSPSA_t + \alpha_2 D * LSPEQSA_t + v_t \quad (2),$$

where:

DLREVENSA is the first difference of the log of the seasonally adjusted value of real revenue in period t.

DLHHSSPSA_t is the first difference of the log of the seasonally adjusted value of the real volume of non-innovative equipment (mobile phones) imported in period t.

DLSPEQSA_t is the first difference of the log of the seasonally adjusted value of real imports of innovative equipment (base stations, cables, etc.) in period t.

α_0, α_1 are model unknown parameters.

v_t is the error term in period t.

Hence, upon testing for the evidence of serial correlation the first order of MA process was in-

Dependent Variable: DLSPEQSA

Method: Least Squares

Sample: 2014:06 2020:12

Included observations: 79

Convergence achieved after 24 iterations

Backcast: 2014:05

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLREVENSA(-1)	-6.114999	1.194745	-5.118247	0.0000
DLHHSSPSA(-24)	0.418002	0.127416	3.280595	0.0016
C	-0.028846	0.006917	-4.170288	0.0001
MA(1)	-0.977453	0.015048	-64.95553	0.0000
R-squared	0.656889	Mean dependent var		0.001887
Adjusted R-squared	0.643165	S.D. dependent var		0.807622
S.E. of regression	0.482439	Akaike info criterion		1.429380
Sum squared resid	17.45603	Schwarz criterion		1.549352
Log likelihood	-52.46051	F-statistic		47.86276
Durbin-Watson stat	2.333698	Prob(F-statistic)		0.000000
Inverted MA Roots	.98			

The adjusted R-squared value is about 0.643, indicating that the independent variables included in the equation could explain about 64.3% of the variations in the real monthly spending (real imports) on the innovative equipment by the Armenian telecom companies.

Estimation #1 results indicate that, on average, if the real revenue of the telecom companies decreases by 1% in period t-1 it could cause statistically significant positive changes in the real imports of innovative equipment by 6.11 per cent in period t over the entire reported period. Meanwhile, other things being equal, if the real value of volume of non-innovative equipment (mobile phones) imported increases by 1% in period t-24 it could cause positive, statistically significant changes in the real imports of innovative equipment by 0.42 per cent in period t.

These results indicate the following:

– Telecom companies will strive to introduce innovative technologies, new equipment, on average, in a month as a result of revenue reduction. Companies are sensitive to revenue reduction, which forces them to follow the path of mastering innovations, which will ensure operational efficiency. M. Porter by touching upon the operational effectiveness, noted that all the companies must improve the operational effectiveness in their activities, and that it should be a continuous process. With the development of new technologies and management approaches, the boundaries of productivity are constantly expanding. Nowadays everything is too fast, the competitors quickly can imitate whatever they want-new technology, management techniques etc. in order to meet customer needs. [16, p 40-45]

– In general, 24 months after the import of non-innovative equipment, these costs may lead to statistically significant changes in the cost of equipment for operators, which indicates that the import of new-generation mobile phones only in two years may lead to increasing the costs and, for example, introducing systems of a new generation by the telecom operators.

Dependent Variable: DLREVENSA

Method: Least Squares

Sample: 2014:06 2020:12

Included observations: 79

Convergence achieved after 10 iterations

Backcast: 2014:05

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLHHSSPSA	0.024430	0.008910	2.741758	0.0076
DLSPEQSA(-11)	-0.022723	0.007901	-2.875728	0.0052
C	-0.003905	0.001897	-2.058689	0.0430
MA(1)	-0.566862	0.095345	-5.945346	0.0000
R-squared	0.345058	Mean dependent var		-0.003940
Adjusted R-squared	0.318860	S.D. dependent var		0.046239
S.E. of regression	0.038161	Akaike info criterion		-3.644681
Sum squared resid	0.109222	Schwarz criterion		-3.524709
Log likelihood	147.9649	F-statistic		13.17130
Durbin-Watson stat	1.879214	Prob(F-statistic)		0.000001
Inverted MA Roots	.57			

The adjusted R-squared value is about 0.345, indicating that the independent variables included in the equation could explain about 34.5% of the variations in the real monthly revenue of the Armenian telecom companies.

Estimation #1 results indicate that, on average, the real value of volume of non-innovative equipment (mobile phones) imported increases by 1% in period t it could cause positive, statistically significant and tiny changes in the real revenue of the telecom operators by 0.024 per cent in period t. Meanwhile, other things being equal, if the real value of volume of innovative equipment imported increases by 1% in period t-11 it could cause negative, statistically significant changes in the real revenue of telecom companies by 0.022 per cent in period t.

These results indicate the following:

– the costs of importing non-innovative equipment have a statistically significant and a tiny impact on the revenue of telecom companies, since the import of new generation phones does not lead to a significant increase in the use of services offered by operators. And this is due to the fact that the growth in the number of mobile phone users is very slow and after changing the phone, users do not dramatically increase the level of use of new services offered by the telecom operators.

– 11 months after the introduction of innovative technologies, their impact on the revenue of the telecom companies becomes statistically significant and negative. This may be due to the fact that other operators in the field are also introducing similar technologies, and competition leads to the fact that spending on innovative technologies begins to reduce the revenue after 11 months. Therefore, it can be noted that the decision to import innovative equipment by organizations should occur earlier than the achievement of the 11th period.

Conclusions: The decrease of telecoms revenue leads to the growth of real imports of innovative technologies. Two expenditure components that would mainly explain statistically significant changes in the revenue are the import of innovative technologies and non-innovative equipment. However, it would not lead to big changes since the revenue depends also on other factors such as income from

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