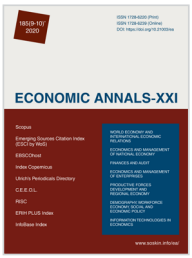

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Telecommunications sector of Armenia and Baltic countries: the impact of foreign direct investment attraction

Abstract. We examine the institutional and investment developments in the telecommunications sector of Armenia in the last two decades and compare them with those of the Baltic countries, namely, Latvia and Lithuania. In particular, directions of foreign investments made in the sector and the impacts on economic and technological systems of Armenia and the chosen Baltic countries have been thoroughly analyzed. During the analysis, an economic model has been used to assess the impact of foreign direct investments on the income (revenues) of the telecommunications sector of the countries under investigation. Econometric analysis made it possible to consider the above-mentioned links in more depth and in detail.

First, a correlation analysis has been carried out which has proved the validity of the hypotheses that there is a strong connection between FDI and the revenue of the telecommunications sector in Armenia and Latvia in the considered time period of 2009-2019. The causal roots of the relationships between the two variables have been studied.

After processing the statistical data and refining the model specifications, an econometric model for Armenia has been proposed with the help of which the key relationships have been clarified. The evaluated model, which satisfies the basic quality of econometric models, helped to draw important conclusions on the depth and nature of the impact of foreign direct investment volume on the income of the telecommunications sector in Armenia.

The model clearly shows the unstable influence of foreign direct investments on income, which confirms the riskiness of the Armenian economy as a whole, since the country has been in an economic blockade and in a state of war with a neighbouring state for more than 20 years.

Keywords: Telecommunications Sector; ICT; FDI; Investment Inflows; Sectoral Revenue; High-tech Industry; Econometric Model; Correlation; Granger Test

JEL Classification: E22; F21; L96

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Сектор телекомунікацій Вірменії та країн Балтії:
вплив залучення прямих іноземних інвестицій

Анотація. У статті розглядаються інституційні та інвестиційні зміни в телекомунікаційному секторі Вірменії за останні два десятиліття в порівнянні з прибалтійськими країнами, а саме з Латвією та Литвою. Зокрема, були ретельно проаналізовані іноземні інвестиції в секторі телекомунікацій і їх вплив на економічні й технологічні системи Вірменії та обраних прибалтійських країн.
У ході аналізу була використана економічна модель для оцінки впливу прямих іноземних інвестицій на дохід (виручку) телекомунікаційного сектора Вірменії. Економетричний аналіз дав можливість розглянути зазначені вище зв'язки більш детально. По-перше, проведено кореляційний аналіз, який довів правдивість гіпотез про те, що в розглянутому часовому відрізку (2009–2019 рр.) існував сильний зв'язок між прямими іноземними інвестиціями й виручкою телекомунікаційного сектора Вірменії та Латвії. По-друге, вивчено причинно-наслідкові зв'язки між означеними змінними. Після обробки статистичних даних й уточнення специфікацій моделі запропоновано економетричну модель для Вірменії. Оцінена модель відповідає основним критеріям економетричних моделей. Вона допомогла зробити важливі висновки про глибину й характер впливу обсягів прямих іноземних інвестицій на обсяги доходу телекомунікаційного сектора Вірменії. Модель чітко показує нестійкий вплив прямих іноземних інвестицій на дохід, що підтверджує ризикованість економіки Вірменії в цілому як країни, яка вже понад 20 років перебуває в економічній блокаді та в стані військового протистояння з сусідньою державою.
Ключові слова: телекомунікаційний сектор; ПІІ; ІКТ; приплив інвестицій; галузевий дохід; галузь високих технологій; економетрична модель; кореляція; тест Грейнджера.

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Телекоммуникационный сектор Армении:
влияние привлечения прямых иностранных инвестиций

Аннотация. В статье рассматриваются институциональные и инвестиционные изменения в телекоммуникационном секторе Армении за последние два десятилетия в сравнении с прибалтийскими странами, а именно с Латвией и Литвой. В частности, были тщательно проанализированы направления иностранных инвестиций в секторе и их влияние на экономические и технологические системы Армении и избранных прибалтийских стран.
В ходе анализа была использована экономическая модель для оценки влияния прямых иностранных инвестиций на доход (выручку) телекоммуникационного сектора Армении. Эконометрический анализ дал возможность рассмотреть указанные выше связи более детально. Во-первых, проведен корреляционный анализ, который доказал правдивость гипотез о том, что в рассмотренном временном отрезке (2009–2019 гг.) есть сильная связь между прямыми иностранными инвестициями и выручкой телекоммуникационного сектора Армении и Латвии. Во-вторых, изучены причинно-следственные связи между обозначенными переменными. После обработки статистических данных и уточнения спецификаций модели предложена эконометрическая модель для Армении. Оцененная модель удовлетворяет основным качествам эконометрических моделей. Она помогла сделать важные выводы о глубине и характере воздействия объёмов прямых иностранных инвестиций на объёмы дохода телекоммуникационного сектора Армении. Модель четко показывает неустойчивое влияние прямых иностранных инвестиций на доход, которое подтверждает рискованность экономики Армении в целом как страны, которая уже более 20 лет находится в экономической блокаде и в состоянии военного противостояния с соседним государством.
Ключевые слова: сектор телекоммуникаций; ПИИ; ИКТ; инвестиционные потоки; секторальный доход; высокотехнологическая промышленность; эконометрическая модель; корреляция; тест Грейнджера.

1. Introduction

In the current conditions, it is difficult to overestimate the importance of foreign direct investment (FDI) in ensuring the economic development of Armenia. FDI allows Armenia to integrate into the international securities markets, as well as provide the country with highly qualified specialists (World Bank Group, 2015). The telecommunications sector stood out with the volumes of FDI in the structure of the economy of Armenia. In 1998-2019, 13.83% of gross foreign investment (FI) in Armenia falls into the telecommunications sector. The corresponding indicator for FDI is 17.04% (Statistical Committee of the Republic of Armenia, 2020).

The development of the telecommunications sector depends not only on state regulation, but also on technology and capital inflows (Zubkova & Dyachkov, 2018). The latter is mostly provided at the expense of FDI, the inflow of which in its turn directly depends on the policy pursued by the state. The latter can both stimulate and hinder the implementation of foreign investment in the sector. Chun (2008), in particular, states that «historically, the opportunities for foreign investment in the telecommunications services sector have been limited by the fact that most countries had state-owned monopoly of telecommunication carriers». However, the telecommunications markets in the world are gradually moving towards liberalization (Chun, 2008).

At present, various privileges are implemented in the ICT sector in Armenia. In particular, VAT deferral of up to 3 years, and in case of change of Armenian law regulating foreign investment (FI), to be increased up to 5 years after legislation enforcement, as well as «free and unlimited property and profit repatriation» (Enterprise Incubator Foundation, 2018). Open policy creates opportunities for new players to enter the market for the implementation of FI, which in turn leads to structural and volumetric changes in the telecommunications sector.

Comparison of Armenia's telecommunications sector with the one in Lithuanian and Latvia will help to identify the tendencies and potential in the field for the countries of comparable size.

2. Brief Literature Review

Extensive experience has been gained in studying the relationship between FI and economic growth and development. From the 1960s onwards, the role of investment in economic growth and development, especially FDI, began to be widely discussed in economic frameworks (Willem, 2006). Moreover, the interaction between these indicators was observed in two directions. However, there is almost no study of interactions between FDIs and sectoral revenue. Number of works on the study of FDI determinants increased in the 1980s and 1990s due to the increase in the volume of FDI (Dellis, Sondermann, & Vansteenkiste, 2017).

Among the positive impacts of FDI are the positive shifts in a number of quantitative and qualitative indicators, including stimulation of economic growth, job creation and technology transfer (Chun, 2008). According to Borensztein, De Gregorio and Lee (1998) research results, «FDI is an important vehicle for the transfer of technology in host countries, contributing more effectively to domestic investment». FDI contributes to development in a number of areas, including employment levels, income levels, capital formation, as well as technology and skills (Sauvant, 1999).

The results of the researches conducted within the framework of the problem studied are unambiguous. In one case, the positive impact of FDI involvement on efficiency is not observed in all countries (Bitzer & Görg, 2005). In the other case, the impact of their involvement on economic growth is not independent at all (Carkovic & Levine, 2002). Moreover, the impact of FDI on economic growth in the service sector is undetermined, in contrast to the main sector of the economy, the manufacturing sector (Alfaro, 2003).

Studying the determinants of FDI, Willem (2006) states the following: «There have been trends in all of these factors over the past decades and they can extensively explain why FDI was implemented more in some countries and regions than others. There have also been changes in their relative importance». The author classifies FDI involvement factors by categories (key policy factors, specific FDI policies, macroeconomic factors, organizational level factors). The weight of each of the factors depends on the sector (Willem, 2006).

The level of development of infrastructure, which is a macroeconomic factor in the telecommunications sector, generally has a significant impact on the involvement of FDI in other sectors of the economy (Zeb, Qiang, & Shabbir, 2014). According to a number of authors, the key factors of FDI inflow (in the field of services) include the quality of infrastructure (Lydon & Williams, 2005,

Walsh & Yu, 2010,). Yuko and Nauro (2003), studying the investment policies of transition countries, comes to the following conclusion: «Foreign investors prefer transition countries that are more open to trade and with fewer restrictions on FDI». Aykut and Sayek (2007) state that the primary and possible step is to establish an optimal legislative framework, thus managing investment flows, rather than ensuring a direct inflow of FDI.

3. Research Methodology

The official statistics series on telecommunications revenues, general FI and FDI, various scientific publications on their role and relationships, international reports, local statistics have been used as research sources. Telecommunications include wired telecommunication activities, wireless telecommunications activities, satellite telecommunications activities and other telecommunications activities, such as provision of telephone and Internet access in facilities open to the public and provision of telecommunications services via existing telecom connections (European Commission, 2008, pp. 252-253).

Until 2009, in the telecommunications sector, there are no separate data on FI and FDI in Armenia. They are presented in the form of investments in the field of general communications, according to the classification of types of economic activities (Armenian Legal Information System, 2006). Therefore, the data of Statistical Committee of the Republic of Armenia (2010-2020) as well as the data published by the Central Bank of the Republic of Armenia (2020b) have been used to examine the correlation between FI and FDI and revenue in telecommunications sector. FI and FDI indicators have been presented in drams since 2014. According to that, corresponding indicators from 2014 to 2019 have been conversed according to the average exchange rate of the US dollar for the given year. In order to obtain the FI and FDI indicators in the telecommunications sector, the corresponding index of the previous year was subtracted from the gross investment flows of the given year. The indicator calculations done this way are conditioned by a new methodology applied in 2014, according to which the gross inflows of FI by sectors are presented. Circulation indicators have also been presented in US dollars.

The indicators in the telecommunications sector of Latvia and Lithuania over the last decade have also been analyzed. (OECD Stat; Central Statistical Bureau of Latvia; Statistics Lithuania, 2009-2020). The FDI indicator was presented in the form of FDI positions, and the revenue from telecommunications activities was presented in US dollars according to the average exchange rate of the currency (Central Bank of the Republic of Armenia, 2020a).

A comparative analysis has been carried out with the help of correlation coefficients based on the data of Armenian, Latvian and Lithuanian telecommunications market. The data of Armenian telecommunications sector have been used to develop an econometric model. According to the results, the Granger test has been conducted for the selected variables, based on the results of which an econometric model has been developed. The rows have been aligned before performing the econometric model evaluation. The econometric model has been evaluated with the least squares method.

4. Results

4.1. Analysis

In 2009-2019, revenue from the activity of the telecommunications sector in Armenia decreased approximately by 171 million dollars, or by 38.3% (Figure 1). Thus, the revenue of 36 organizations operating in the sector in 2019 compiled 275.1 million dollars (Enterprise Incubator Foundation, 2018). In 2009, the entry of Orange Armenia LTD into the telecommunications market in Armenia was accompanied by an increase in investment flows until 2012. In 2012, the volume of FDI reached its maximum level, amounting to 282.67 million dollars. In recent years, certain «stagnation» has developed in terms of FI involvement.

In the context of the study, the indicators of the telecommunications sector of the Baltic countries, Latvia and Lithuania, have been studied. The expediency of the study of telecommunications indicators in Latvia and Lithuania is conditioned by the fact that telecommunications markets are compatible with the Armenian market. During the last decade, the revenue from the sales of telecommunications services in Lithuania has fallen by about 174 million dollars, or 13.4%, to 1,120.11 million dollars (Figure 2).

In Latvia, by contrast, growth has been 24.8 million dollars, or 2.3%, comprising 1,191.1 million dollars for the same time period (Figure 2). Latvia's telecommunications sector surpassed the neighbouring country in terms of revenue only in 2018. Inward FDI positions in 2009-2018 remained relatively at the same level in both Baltic countries.

Major part of the foreign investments in the telecommunications sector of Armenia falls to the mobile operators: Telecom Armenia CJSC, MTS Armenia CJSC, Ucom CJSC. Until 2015, large-scale investments have been made in Orange Armenia CJSC from France. Apart from France, in the last decade, foreign investments in the sector have been made mainly from Russia, Lebanon, as well as Austria, Seychelles, Cyprus and the Netherlands (Statistical Committee of the Republic of Armenia, 2020)

In 2012-2019, the volume of FI in the sector has remained relatively high, which cannot be said about the volume of FDI which amounted to only 35.75 million dollars in 2019 (Figure 3).

As a result, a sharp decrease of 246.92 million dollars, or 87.4%, has been registered in the same period. It should be noted that in the last 4 years this index has been maintained at almost the same level, and the lowest index was registered in 2014 - 19.61 million dollars.

According to the Central Bank of Armenia (2020), since 2014 onwards, the volume of gross FDI in the spheres of activity of the main economy has decreased only in the telecommunications sector, moreover, on a rather large scale. Since 2014, the volume of FDI in the form of repayments in the sector decreased by 124.1 million dollars. The decline in the volume of FI in the telecommunications sector was also reflected in the share of FI structure in the sector. As was mentioned, 2012 stood out with the growth of investment flows in the sector. FI comprised 37.6% of the total volume of investments in the telecommunications sector. In terms of FDI, the indicator was about half of total FDI - 49.82% (Figure 4).

The indicator shows a decline in both the FI and the FDI in 2019. There was a sharp decline in share of FDI in 2012, which comprised 6.05% in 2019, and the lowest indicator was registered in 2014 - 2.6% (Statistical Committee of the Republic of Armenia, 2020). The dynamics of

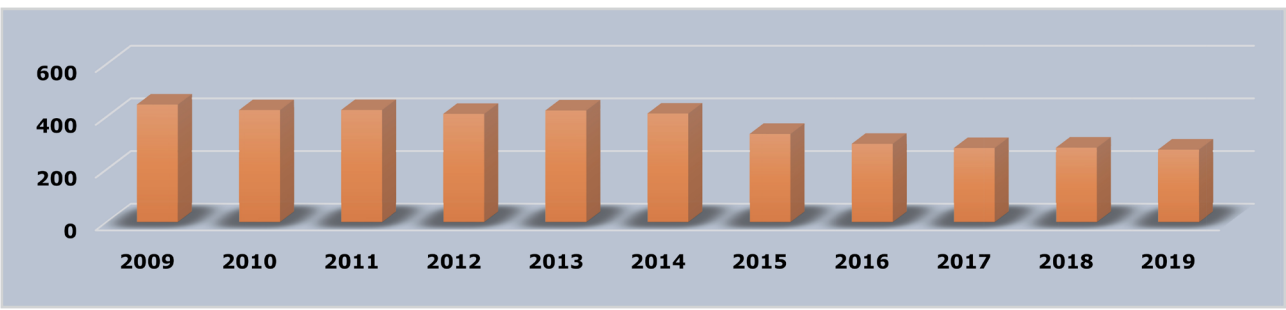

Figure 1:
Revenue in telecommunications sector of Armenia (2009-2019)
Source: Compiled by the authors based on data of Statistical Committee of the Republic of Armenia: https://www.armstat.am/en/?nid=80&ptid=7&year=0&submit=Search

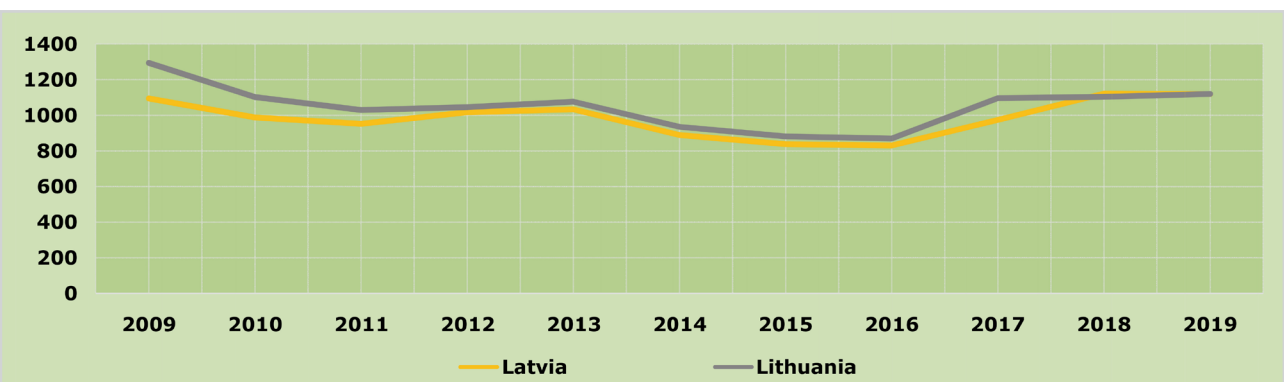

Figure 2:
Revenue in telecommunications sector in Latvia and Lithuania (2009-2019)
Source: Compiled by the authors based on data of Central Statistical Bureau of Latvia and Statistics Lithuania: https://data.csb.gov.lv/pxweb/en/zin/zin__ikt_sektors/ITG230.px/ https://osp.stat.gov.lt/en_GB/statistiniu-rodikliu-analize#

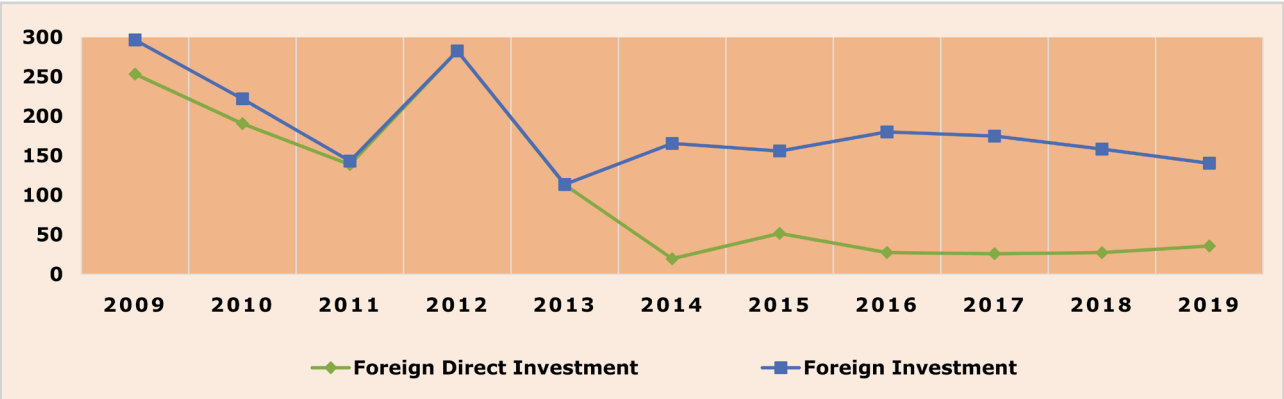

Figure 3:
FI and FDI in telecommunications sector of Armenia (2009-2019)
Source: Compiled by the authors based on data of Statistical Committee of the Republic of Armenia: https://www.armstat.am/en/?nid=80&ptid=7&year=0&submit=Search

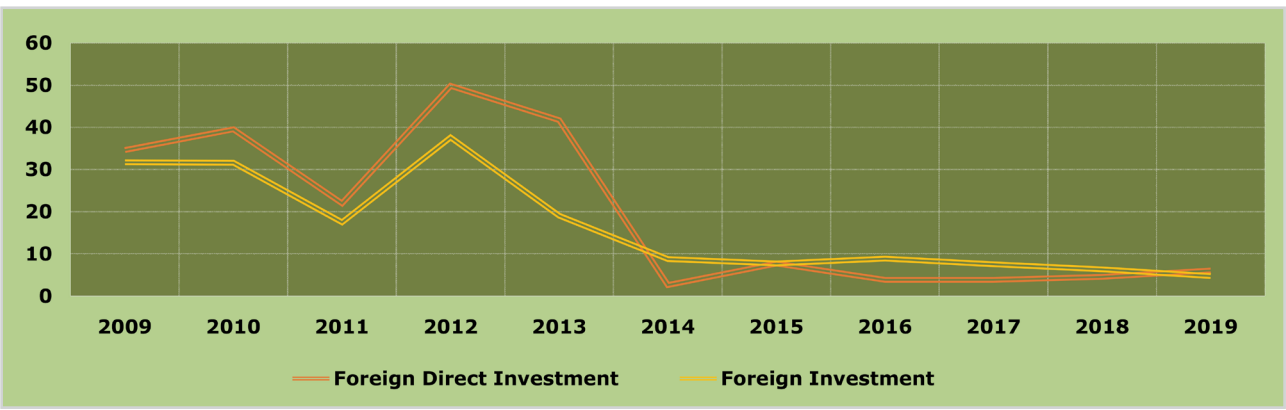

Figure 4:
Share of FI and FDI in telecommunications sector in total FI and FDI in Armenia (2009-2019)
Source: Compiled by the authors based on data of Statistical Committee of the Republic of Armenia: https://www.armstat.am/en/?nid=80&ptid=7&year=0&submit=Search

revenue from the activity in the sector and «the declining trajectories» of FI and FDI clearly characterize the current situation in the telecommunications market.

Taking into account the «peculiarity» of the telecommunications sector in Armenia, the products of which are mostly consumed in the domestic markets, it can be noted that the telecommunications sector in Armenia is oversaturated. This circumstance directly hinders the involvement and implementation of FI in the direction of entering the telecommunications market in Armenia.

4.2. Model Evaluation

The calculation of the correlation coefficients between revenue and FDI indicators in telecommunications sector of Latvia, Lithuania and Armenia are given in Table 1.

While comparing the results of the above-mentioned countries, we see that the strongest ties between the indicators of the revenue and FDI exist in Latvia. The weakest correlation is that for Lithuania.

Based on the results of the above-mentioned analysis, which covers the period of 2009-2019, the foreign investment-revenue dependence in the telecommunications sector of Armenia was studied using econometric models. In terms of econometric analysis, the possibilities of expansion, such as the observation of a large number of variables, the use of longer lags, as well as the performance of some tests, are severely limited, as statistics for objective study of telecommunications are limited to the last 11 years. However, even under such conditions, by choosing the right model, you can ensure the most acceptable and reliable results. Note that the revenues of the telecommunications sector (hereinafter referred to as H) were observed, as well as the FI-FDI indicators in a logarithmic form. In order to identify the links between these indicators, a correlation analysis was first performed, the results of which are presented in Table 2.

Table 1:
Correlation coefficients

Country	Correlation Coefficient
Latvia	0.86
Lithuania	0.43
Armenia	0.73

Source: Own calculations

Table 2:
Correlation analysis results

	LINV	LINVD	LREV
LINV	1		
LINVD	0.29	1	
LREV	0.001	0.73	1

Source: Own calculations

When studying the correlation coefficients, we notice that a rather interesting picture is obtained. For example, it turned out that direct investment-income relationships are much closer (0.69) than total investment-income relationships (-0.13). Even in terms of total investment-income relationship, a negative dependence was registered. Based on the results of the correlation analysis, further research was conducted on FDI-revenue indicators. However, the question arises as to which side of these connections to consider: to consider the impact of direct investment on revenue or vice versa. Theoretically, neither can be ruled out. However, in order to make the problem more specific, the Granger test was carried out which will allow us to find out the existing causal links between direct investments and income variables. Given the scarcity of available statistics on both variables, the Granger test was performed for one lag of variables. Moreover, the Granger test was performed for already logged series. The test results are shown in Table 3.

Table 3:
Granger test results

Pairwise Granger Causality Tests
Sample: 2009-2019
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
LINVD does not Granger Cause LREV	10	7.75	0.0272
LREV does not Granger Cause LINVD		0.35	0.5738

Source: Own calculations

According to the obtained results, at the level of 5% significance, the hypothesis of the independence of the FDI and H is rejected. On the other hand, it is accepted that the FDI hypothesis stays unchanged due to the change in revenue.

Therefore, in the case of 1 lag, we record that FDI is the reason for the change in revenue, and the opposite is not true. In the context of obtained data, it is advisable to consider an econometric model that will show how changes in foreign direct investment affect changes in earnings.

The other hypothesis underlying the design of the econometric model is that FDI has a certain lag on revenue. On the other hand, it is not possible to include many variables in the model due to data constraints. In addition, the problem of stationarity of logarithmic series was considered, as a result of which it became clear that they do not become stationary, with stationary second- or third-order differences. Based on all of the above-mentioned considerations, the model with the following specification was evaluated:

$$D(D(D(LREV_t))) = \beta_0 + \beta_1 * D(D(LINVD_{t-1})) + \varepsilon_t,$$

where:

$D(D(D(LREV_t)))$ is the volume of revenue which in the field of telecommunications is a logarithmic state with third-order differences in the year t;

$D(D(LINVD_{t-1}))$ is the volume of foreign direct investment in the telecommunications sector in a logarithmic state, with second-order differences in the previous year;

β_0, β_1 are unknown model parameters;

ε_t is a random error of the model in the case of the t-th view, $\overline{t = 2009, 2019}$.

The above-mentioned model was evaluated using the least squares method. The following evaluated model was obtained:

$$D(D(D(LREV_t))) = 3.9 + \underbrace{0.08}_{(0.0066)} * D(D(LINVD_{t-1})).$$

The evaluated model is of good quality because the coefficient of determination is 0.73. The Durbin-Watson test is 1.6. The separate coefficients, as in the model, are generally significant.

The results of the evaluated model can be interpreted as follows: 1% change in FDI in the previous year, under other equal conditions, will bring positive change in revenue on average of 0.08% in the current year.

5. Conclusions

From the study of investment processes in the telecommunications sector in Armenia, it becomes clear that FDI are effective funnels for innovative and technological modernization and transfer of new generation technologies in this sector during the last decade. Based on it, there has been an increase in both quantitative and qualitative services provided by this sector, which has significantly increased the productivity of the sector and output volumes.

The study revealed that a clear pattern is observed in the investment processes of the ICT sector of Armenia. The investment boom in the sector in the 2000s, which was a consequence of the liberalization of the sector and liberal reforms, was followed by the stabilization of investment flows in it over the last decade. At the same time, there is a significant increase in revenues from economic activities in the sector which is a result of the exponential growth in demand for telecommunication services.

The Baltic countries show significantly higher volumes of FDI comparing to Armenia, while the tendencies regarding the generated revenues are alike.

The econometric analysis of the impacts of investment processes in the ICT sector of Armenia allows us to conclude that the their effectiveness is significantly felt in the medium term, which is quite logical if taken into account the transfer and adaptation of the latest technologies to the new economic environment. The formation of modern culture of their assimilation requires a certain period of time.

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