

Montenegrin Journal of Economics

Volume 18, Number 3

July 2022

Quarterly publication

Print edition ISSN 1800-5845

Web edition ISSN 1800-6698

COBISS.CG-ID 9275920

Publishers



**ELIT – Economic Laboratory
for Transition Research**
Dz. Washingtona 4/5,
Podgorica, Montenegro



University of Montenegro
FACULTY of ECONOMICS PODGORICA

Partnering with:



University of Szczecin, Poland



Vilnius University,
Kaunas Faculty of Humanities, Lithuania



Tomas Bata University in Zlín,
Faculty of Management and Economics,
Czech Republic

INDEXING

ESCI - Emerging sources citation index Thomson Reuters (2015)

SCOPUS (2017)

Cabell's (2012)

ECONIS Datenbank (2012)

DOAJ - Directory of Open Access Journals (2012)

Genamics Journal Seek (2012)

NewJour (2012)

ProQuest - ABI/Inform, Research Library, Social Sciences (2012)

RePEc (2012)

Scirus (2012)

Ulrich's Periodicals Directory (2012)

World-Wide Web Virtual Library (2012)

EBSCO Publishing, Inc. (2011)

Index Copernicus International S.A. database (2011)

Journal of Economics Literature (2006)

Editorial Board

Editor in Chief

Academician Professor **Veselin Draskovic**, University of Montenegro, Maritime Faculty of Kotor, Montenegro

Co-Editors

Professor **Radislav Jovovic**, University Mediterranean, Faculty of Business Studies, Podgorica, Montenegro

Assistant Professor **Milica Delibasic**, University Mediterranean, Faculty of Business Studies, Podgorica; University of Montenegro, Maritime Faculty of Kotor, Montenegro

Advisory Board

Nobel Laureate, Professor **Harry M. Markowitz**, Rady School of Management at the University of California, USA

Nobel Laureate, Professor **Oliver E. Williamson**, University of California, Berkeley, USA

Professor **Lloyd Blenman**, University of North Carolina-Charlotte, President at Midwest Finance Education Foundation, USA

Laureate of the premium L.V. Kantorovich, Academician Professor **Valeriy Makarov**, Central Economics and Mathematics Institute of the Russian Academy of Sciences/ Lomonosov's Moscow State University / New Economic School, Russia

Laureate of the premium L.V. Kantorovich, Academician **Victor Polterovich**, Central Economics and Mathematics Institute, Russian Academy of Science and Moscow School of Economics / Lomonosov's Moscow State University, Russia

Professor **Yochanan Shachmurove**, The City College of the City University of New York, Department of Economics and Business, USA

International Editorial Board

Professor **Sanja Bauk**, Maritime Studies Department, Faculty of Applied Sciences, Durban University of Technology, Durban, South Africa

Professor **Jaroslav Belás**, Tomas Bata University in Zlín, Faculty of Management and Economics, Department of Enterprise Economics, Czech Republic

Professor **Tomas Balezentis**, Lithuanian Institute of Agrarian Economics, Lithuania

Professor **Yuriy Bilan**, Rzeszów University of Technology, Faculty of Management Rzeszow, Poland

Professor **Laszlo Csaba**, Central European University, Department of International Relations and European Studies, Budapest / Budapest University of Economic Sciences and Public Administration, Hungary

Professor **Vasile Dinu**, Bucharest University of Economic Studies, Romania

Professor **Fan Gang**, Graduate School of Chinese Academy of Social Sciences (CASS) / China's National Economic Research Institute (NERI), China

Associate Professor **Agnieszka Glodowska**, Cracow University of Economics, Cracow, Poland

Professor **Janusz Grabara**, Czestochowa University of Technology Faculty of Management, Poland

Professor **Wen-jen Hsieh**, University Road, Tainan / Art Center National Cheng Kung University, Taiwan

Professor **Serhii Kozlovskiy**, Vasyl' Stus Donetsk National University, Vinnytsia, Ukraine

Professor **Siu Lee Jasmine Lam**, Nanyang Technological University, Singapore

Professor **Ludmila Malyaretz**, Simon Kuznets Kharkiv National University of Economics, Department of Higher mathematics and economic and mathematical methods, Ukraine

Professor **Asta Mikalaukiene**, Vilnius University, Vilnius, Lithuania

Professor **Jiancai Pi**, School of Business, Nanjing University, China

Professor **Dalia Streimikiene**, Mykolas Romeris University, Faculty of Public Governance and Business, Lithuania

Professor **Milos Vulcanovic**, City University of Hong Kong

Professor **Krzysztof Wach**, Cracow University of Economics, Cracow, Poland

Professor **Bagrat Yerznkyan**, Central Economics and Mathematics Institute, Russian Academy of Science / State University of Management Moscow, Russia

Regional Editorial Board

Professor **Slobodan Acimovic**, University of Belgrade, Faculty of Economics, Serbia

Professor **Niksa Alfiljevic**, Faculty of Economics, Split, Croatia

Associate Professor **Mimo Draskovic**, University of Montenegro, Maritime Faculty of Kotor, Montenegro

Academician Professor **Gordan Druzic**, Croatian Academy of Sciences and Arts, Zagreb, Croatia

Professor **Miomir Jaksic**, University of Belgrade, Faculty of Economics, Serbia

Professor **Borut Jereb**, University of Maribor, Faculty of Logistics Celje, Slovenia

Professor **Andjelko Lojpur**, University of Montenegro, Faculty of Economics Podgorica, Montenegro

Professor **Nikola Milovic**, University of Montenegro, Faculty of Economics Podgorica, Montenegro

Professor **Guste Santini**, University of Zagreb, Croatia

Associate Professor **Igor Todorovic**, University of Banja Luka, Faculty of Economics, Bosnia and Herzegovina

Technical Editors

Milojko Pusica, prof., Niksic, Montenegro and **Nikola Draskovic Jelcic**, prof. Dubrovnik, Croatia

Secretary of Editorial Boards

Associate Professor **Niksa Grgurevic**, University Adriatic Bar, Faculty of Management, Herceg Novi, Montenegro

Montenegrin Journal of Economics, Vol. 18, No. 3 (July 2022)

The journal is published four times a year

Printing: 150 copy

Journal customer service:

Tel: + 382 68 688 888; + 382 68 583 622;

E-mail: vesodraskovic@gmail.com

Web address: <http://www.mnje.com>

Montenegrin Journal of Economics, Vol. 18, No. 2 (June 2022)

Decision of the Ministry of Culture and the Media No 05-962/2 of May 23, 2005
„Montenegrin Journal of Economics“ was registered to the records media under the number 560

CIP – Каталогизacija u publikaciji
Централна народна библиотека Црне Горе
33 (051)

MONTENEGRIN Journal of Economics /
glavni i odgovorni urednik, Editor in Chief - Veselin Drašković. – God. 1. br. 1 (2005).
- Nikšić (Novaka Ramova 12) : "ELIT – ekonomska laboratorija za istraživanje tranzicije",
2005 (Podgorica: 3M Makarije) . – 30 cm

Četiri puta godišnje.

ISSN 1800-5845 = Montenegrin Journal of Economics

COBISS.CG-ID 9275920

ISSN 1800-5845



9 771800 584007



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Vol. 18, No. 3 (July, 2022)

CONTENTS

Medium and High-Tech Enterprises of Kazakhstan: Factors of Organization and Development of Innovation NURLAN KURMANOV, BOLAT ZHAGALBAYEV, WEI FENG, SAGYNGALI SEITZHANOV, ASSEL RAKHIMBEKOVA and ULUKBEK ALIYEV	7
Employment in the Hotel Industries of Croatia and Montenegro: Current State and Outlook MILICA DELIBASIC, JUSTIN PUPAVAC, HRVOJE BUDIC, JUSTAS STREIMIKIS and MARINA G. SHILINA	23
Volatility and Growth: The Role of Bank Financing in Bolivia ROGER ALEJANDRO BANEGAS RIVERO, MARCO ALBERTO NÚÑEZ RAMÍREZ and IRMA GUADALUPE ESPARZA GARCÍA	35
Affordable and Clean Energy for all: Challenges in Balkan Countries DALIA STREIMIKIENE	57
Impact of Economic Freedom on Youth Unemployment in the Gulf Cooperation Council Countries ABDESSALEM GOUIDER	67
A Study on the Time-Varying Volatility Connectedness Between the Sectors in the Indian Stock Market SHAH SAEED HASSAN CHOWDHURY and MOHAMMAD IRFAN	77
Impact of New Lease Reporting on Retailing and Wholesale Companies HANA BOHUSOVA, PATRIK SVOBODA and ALZBETA VEVERKOVA	89
Active Strategy and Other Key Factors of Mutual Funds' Performance ALEKSEI KURBATSKII	99
Determinants of Corporate Cash Holding: Evidence from an Emerging Market MISHIEL SAID SUWAIDAN	109
The Role of External Debt, Export Trade, Remittance, and Labour Force in the Economic Growth of Nepal: is Nepal Heading Towards Dutch Disease? RAMESH C. PAUDEL, KHOM KHAREL and MAJED ALHARTHI	121
Spatial Analysis of Regional Productivity Based on B-Convergence Models	

EKATERINA KADOCHNIKOVA, YULIA VARLAMOVA and JULIA KOLESNIKOVA	133
Economic Growth, Domestic Savings and Fixed Capital Investments: Analysis for Caucasus and Central Asian Countries TUNCER GOVDELI	145
Foreign Direct Investment and Export Incentive Policies: Do They Enhance Growth? VLATKA BILAS, SANJA FRANČ and MARKO JURAKIĆ	155
An Assessment of the Impact of the Drivers of Outsourcing on Service Delivery in Organisational Networks UGNE DUDE, RIMA ZITKIENE and EGLE KAZLAUSKIENE	169
How to Shift Consumer Willingness to Use the Emerging Technologies on Omnichannel SUNISA JUNSAWANG, WORNCHANOK CHAIYASOONTHORN, MARIUSZ URBAŃSKI and SINGHA CHAVEESUK	183
Mathematical Aspects of Synergy BAGRAT H. YERZUNKYAN, SERGEY T. GATAULLIN and TIMUR M. GATAULLIN	197
Author Guidelines	209



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Citation:

Kurmanov, N., Zhagalbayev, B., Feng, W., Seitzhanov, S., Rakhimbekova, A., Aliyev, U. (2022), "Medium and High-Tech Enterprises of Kazakhstan: Factors of Organization and Development of Innovation", *Montenegrin Journal of Economics*, Vol. 18, No. 3, pp. 7-22.

Medium and High-Tech Enterprises of Kazakhstan: Factors of Organization and Development of Innovation

NURLAN KURMANOV¹, BOLAT ZHAGALBAYEV², WEI FENG³, SAGYNGALI
SEITZHANOV⁴, ASSEL RAKHIMBEKOVA⁵ and ULUKBEK ALIYEV⁶

¹ Professor, L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan, e-mail: Kurmanov_NA@enu.kz

² PhD student, The College of Economy & Management, Northwest Agricultural & Forestry University, Yangling, Shaanxi, China, e-mail: bolatzhagalbayev@mail.ru

³ Professor, The College of Economy & Management, Northwest Agricultural & Forestry University, Yangling, Shaanxi, China, e-mail: weifeng@nwsuaf.edu.cn

⁴ L.N. Gumilyov Eurasian National University, Faculty of Economics, Nur-Sultan, Kazakhstan, e-mail: s.seitzhanov@gmail.com

⁵ Associate Professor, Kazakh University of Economics, Finance and International Trade, Nur-Sultan, Kazakhstan, e-mail: rahim_asel@mail.ru

⁶ Center for Scientific Strategic Research, Nur-Sultan, Kazakhstan, e-mail: aliyevo901@gmail.com

ARTICLE INFO

Received September 20, 2021

Revised from October 22, 2021

Accepted November 22, 2021

Available online July 15, 2022

JEL classification: L26, L69, O14, O31

DOI: 10.14254/1800-5845/2022.18-3.1

Keywords:

Organization of innovation activity,
medium and high-tech enterprises,
manufacturing industry,
correlation and regression analysis,
innovation in Kazakhstan

ABSTRACT

The research of innovation activity of enterprises is found at the nexus of management, economics, public administration, psychology, sociology, and technical sciences. That is because the involvement of people in this process implies a comprehensive assessment of interdependent factors operating at the level of states, industries, regions, enterprises, social groups, and individuals. In the following paper we study the influence of various factors on organization and development of innovation activities at medium and high-tech enterprises of the manufacturing industry of Kazakhstan. The purpose of this study is to analyze the factors affecting the organization and development of innovation at medium and high-tech enterprises in Kazakhstan. Based on correlation and regression analysis we study the following factors: economic development; availability of human capital; quality of the investment environment; features of the economic structure; quality of human capital; innovative development of manufacturing enterprises; scientific potential; quality of the legal environment; availability of financing; state support. We conclude that econometric modeling of innovation at enterprises in Kazakhstan is never a simple task. The study reveals that labor productivity positively affects innovation and competitiveness of enterprises, and that a human capital turns out to be a more important factor of innovation activity of enterprises in Kazakhstan than research and development costs due to their inefficiency.

INTRODUCTION

In the context of globalization and high uncertainty of prices for raw materials, the key driver of socio-economic development is the effective innovative activity. Innovative activity allows enterprises to strengthen their positions and enter new markets. Development of innovative activities can bring additional competitive advantages to enterprises and contribute to the introduction of manufactured products to foreign markets in conditions when the scale of production in the domestic market is limited.

Undoubtedly, the performance of innovative activity largely depends on effective management and organization of this process. State support and measures to stimulate innovation in Kazakhstan have increased over the past decade. However, innovative production still remains low. All this points to the inefficiency of the applied methods and tools for managing and organizing innovation at medium and high-tech manufacturing enterprises in Kazakhstan, which determines the need to find ways to improve them based on the study of factors affecting this process.

The purpose of this study is to analyze the factors affecting the organization and development of innovation at medium and high-tech enterprises in Kazakhstan.

1. LITERATURE REVIEW

Innovative activity of enterprises is an integral part of the socio-economic development of the state and its industries. In this regard, the issue of studying the factors of organization and development of innovation at medium and high-tech enterprises of Kazakhstan appears relevant.

Numerous empirical studies (see Table 1) confirm the importance of the following factors for the organization of innovation activity: the level of economic diversification, research and development costs, the knowledge spillover, the level of human capital.

Table 1. Results of research on factors of innovative activity

<i>Research</i>	<i>The applied method</i>	<i>Dependent variable</i>	<i>Level of economic diversification</i>	<i>Research and development costs</i>	<i>Knowledge spillover</i>	<i>Level of human capital</i>	<i>Results</i>
1	2	3	4	5	6	7	8
Jaffe, 1989	Regression	Number of patent applications		+	+		Proves the positive influence of the location of both private and public research centers (knowledge spillover), the key role of research costs
Feldman, Florida, 1994	Regression	New products	+	+	+		Proves the effectiveness of PPP in innovation funding
Bottazzi, Peri 2003	Regression	Number of patents per one involved in innovation	+	+	+		Reveals the reduction of R&D costs in neighboring regions, the distance between which exceeds 300 km
Shterzer, 2005	Regression	Number of patent applications	+	+		-	Positive impact of R&D costs
Leslie, B Ó hUallacháin, 2007	Regression, Least Squares	Number of patents	+	+	+	+	Confirms the importance of human capital compared to the R&D costs

Suslov, 2007	Regression	Share of innovative enterprises			-	+	Reveals the dependence of patent activity on the number of researchers
Mariyev, Savin, 2010	Generalized Method of Moments	Innovative output volume		+	-		Reveals the tendency to regional concentration of innovation, the positive impact of FDI
Arkhipova, Karpov, 2012	Simultaneous equation modeling	Share of innovative enterprises and number of patents		+	+		Reveals the correlation between the level of innovation and patent activity, confirms the importance of research costs
Crescenzi, Jaax, 2015	Regression	International patent applications	+	+	+	+	Reveals the dependence of patent activity on R&D costs
Zemtsov, Muradov, Wade, Barinova, 2016	Regression	Number of commercialized patents, real internal research costs	+	+	+	+	Confirms the dependence of the number of commercialized patents on the quality of human capital, reveals the significance of the R&D costs

Note: Compiled by the authors based on the source (Zemtsov et al., 2016)

Research shows that innovation performance is positively influenced by the R&D costs, level of human capital, level of economic diversification, and the knowledge spillovers. Let us consider other factors affecting innovation performance. The scientific literature has revealed a link between the level of economic development and the level of innovation. However, it is definitely impossible to draw conclusions about its direction. The development of innovative entrepreneurship is facilitated by the growth of GDP and, in particular, GDP per capita as an indicator of the volume of consumer markets, the population solvency and the living standards (Reynolds et al., 1994). A number of studies have revealed that startup activity affects the GDP per capita (Audretsch and Keilbach, 2004; Fritsch and Storey, 2014).

A whole multitude of scientific papers confirm the ambiguity of the impact of unemployment on the entrepreneurial and innovative activity of enterprises (Verheul, 2002; Fritsch and Falck, 2007). Most studies consider unemployment and indicators of foreign and domestic trade as control variables (Dobrynskaia and Turkisch, 2010). For instance, on the one hand, high unemployment may indicate the deterioration of socio-economic conditions and a high failure risk for a startup, and on the other hand, the presence in the economy of a large number of free human resources to engage in forced entrepreneurship. A number of empirical studies conclude that investments have a positive impact on innovation. Global technology giants (Samsung, HP, Apple, Huawei, Google, etc.) invest heavily in R&D, support startups, have research units, and carry out joint innovative projects.

A study of innovation activity in Kazakhstan's conditions requires taking into account peculiarities of the economic structure. In some regions, the share of a raw materials sector is high; these are known as "raw materials regions." The dominance of the extractive industry in the economic structure, on the one hand, can cause a "Dutch disease:" a decrease in the economic activity of enterprises and monospecialization leading to a decrease in the level of entrepreneurial and innovative activity (Raposo and Do Paço, 2011). On the other hand, regions with a raw-material economy enjoy higher incomes of the population, which means a higher purchasing power, ultimately contributing to the growth of mass entrepreneurship in the service sector.

The indicator of concentration and quality of human capital is the level of education of the population. This indicator also demonstrates informal rules and norms in society. Through the education system, the government can affect the development of creative entrepreneurship and innovative activity (Djankov, 2009). Training and introduction of advanced training courses for the population contribute to the acquisition by individuals of necessary competencies to engage in innovative entrepreneurship (Nielsen, 2014; Lee et al., 2004; Anokhin and Schulze, 2008). This is why the study needs to consider this

indicator. Legal environment has a direct impact on innovation activity. Level of corruption, level of consumer and producer rights protection, and the number of economic crimes have a direct impact on the safety of innovative entrepreneurship (Xheneti and Bartlett, 2012; Yakovlev and Zhuravskaya, 2013; Aparicio et al., 2015).

The high bank interest rate is one of the main reasons for limiting the access to funding of innovative projects (EBRD, 2014). Aparicio's research shows the positive impact of simplified access to loans on startup activities of enterprises. A 2014 EBRD study reveals a negative correlation between innovation activity and limited access to bank loans (Seitzhanov et al, 2020). We conclude that a negative correlation does not necessarily mean that restricting access to bank loans leads to a decrease in innovation. Such a causal relationship between credit restrictions and innovation activity takes the opposite direction: commercial banks more willingly fund innovation activities and reduce credit restrictions if this process is successful (as in innovation emerges). Thus, the review of scientific literature has revealed a number of factors of innovation, which we shall be further investigating in detail to build an econometric model:

- Economic development (GDP, GDP per capita, inflation rate, exports, imports, salaries, labor productivity, exchange rate);
- Availability of human capital (population, employed population, unemployment rate);
- Quality of investment environment (investments in fixed assets, investments in the manufacturing industry, direct investment);
- Features of the economic structure (the share of extractive industry in GDP, professional, scientific and technical activities);
- Quality of human capital (life expectancy of the population at birth, the average expected duration of education during the coming life);
- Innovative development of manufacturing enterprises (innovative sales volume, innovation costs);
- Scientific potential (internal R&D costs, number of organizations engaged in R&D, number of employees engaged in R&D);
- Quality of legal environment (crime rate);
- Availability of funding (bank lending to the economy, loans issued to processing enterprises through STBs, the amount of loans issued by Damu EDF to processing enterprises, the weighted average interest rate of banks on loans issued);
- State support (the amount of funding of industrial and innovative development program documents.)

In accordance with the purpose of the study and based on the analysis of scientific literature, we have formulated the following hypotheses on the influence of factors on the organization and development of innovation activities of medium and high-tech manufacturing enterprises in Kazakhstan.

- *H1. Innovation of enterprises in Kazakhstan resists econometric modelling.*
- *H2. Labor productivity has a positive impact on innovation and competitiveness of enterprises.*
- *H3. Human capital is a more important factor of innovation in Kazakhstan than the R&D costs due to their inefficiency.*

2. RESEARCH METHODOLOGY

For the purposes of this paper, we selected small and medium-sized enterprises of medium and high-tech manufacturing industries as the object of research. We used the OECD methodology to determine medium and high-tech enterprises. According to the OECD, manufacturing enterprises are profiled according to the intensity of research and development costs, that is, according to the ratio of R&D costs to value added. We have identified the following groups of manufacturing enterprises: high, medium, and low-tech industries. Currently, the OECD classification is widely recognized and used in most international

organizations and countries, including the Bureau of National Statistics of Kazakhstan for statistical observation. High-tech manufacturing enterprises include the following types of activities:

- Production of computers, electronic and optical products;
- Production of other vehicles;
- Production of motor vehicles, trailers and semi-trailers;
- Repair and installation of machinery and equipment;
- Production of machinery and equipment;
- Production of chemical industry products;
- Production of electrical equipment.

Medium-tech industries include the following types of activities:

- Production of rubber and plastic products;
- Production of finished metal products;
- Production of other non-metallic mineral products;
- Metallurgical industry;
- Production of coke and refined petroleum products;
- Production of basic pharmaceutical products.

Based on the analysis of scientific literature, we are to select the innovative output volume as the effective indicator of innovation in medium and high-tech manufacturing industries. As benchmarks, the study uses an extensive list of factors that can affect innovation: economic development, quality of the investment environment, quality of the legal environment, features of the economic structure. Table 2 shows the main factors and variables of economic and mathematical model. To assess the factors of organization and development of innovation in medium and high-tech manufacturing industries, we shall use correlation and regression analysis as our main method of research.

Table 2. Factors and variables of economic and mathematical model

<i>Factors</i>	<i>Legend</i>	<i>Variables</i>	<i>Source</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
Economic development	GDP	Gross domestic product by production method, million tenge	BNS
	GDP_capita	GDP per capita, tenge	
	Infl	Inflation, %	BNS
	Export	Turnover in foreign currency (export), million US dollars	BNS
	Export_products	Export of non-raw (processed) products, million US dollars	BNS
	Import	Turnover in foreign currency (import), million US dollars	BNS
	Salary	Average monthly salary of the core staff, thousand tenge	BNS
	Labor_product	Labor productivity, thousand tenge	BNS
	Exchange_rate	Average annual exchange rate of the US dollar	NB RK
Availability of human capital	Popul	Population at the end of the period (year), thousand people	BNS
	Employed_pop	Employed population, thousand people	BNS
	Unempl	Unemployment rate, %	BNS
Quality of the investment environment	Invest	Investments in fixed assets, million tenge	BNS
	Manufact_invest	Investments in fixed assets of the manufacturing industry, billion tenge	BNS
	Direct_invest	Direct investments, million US dollars	NB RK
Features of the economic structure	Industry_GDP	Share of the extractive industry in GDP, %	BNS
	Prof_activ	Professional, scientific and technical activities, %	BNS

Quality of human capital	Life_expect	Life expectancy of the population at birth, years	BNS
	School_expect	Average expected duration of training during the coming life	UN HDI
Innovative development of manufacturing enterprises	Sold_innovprod	Innovative sales volume, million tenge	BNS
	Cost_innov	Innovation costs, million tenge	BNS
Scientific potential	R&D_costs	Internal R&D costs, million tenge	BNS
	Enterp_num	Number of organizations (enterprises) engaged in R&D, units	BNS
	Employees_num	Number of employees engaged in R&D, people	BNS
Quality of the legal environment	Crime_level	Crime rate (per 10,000 people)	BNS
Availability of funding	Bank_lend	Bank lending to the economy, million tenge	NB RK
	Loans	Loans issued to processing enterprises through STBs, billion tenge	Damu EDF
	Loans_Damu	Amount of loans issued by Damu EDF to processing enterprises, total	Damu EDF
	Interest_rate	Weighted average interest rate of banks on loans issued	NB RK
State support	Funding	Amount of funding of industrial and innovative development program documents, billion tenge	SPFIID, SPIID-1

Notes:

- Compiled by the authors.
- BNS: Bureau of National statistics, Agency for Strategic planning and reforms of the Republic of Kazakhstan
- NB RK: National Bank of the Republic of Kazakhstan
- HDI UN: the UN's Human Development Index
- Damu EDF: Damu Entrepreneurship Development Fund JSC
- SPFIID, SPIID-1: State programs of (forced) industrial and innovative development

Accordingly, a set of factors and indicators of the object of research development in modern conditions, a comprehensive analysis using qualitative and quantitative methods of scientific research and logical conclusions are the important elements of assessing the factors of organization and development of innovation in medium and high-tech manufacturing industries.

3. RESULTS

At the initial stage of our study, we chose the indicator Level of innovation activity of enterprises of medium and high-tech manufacturing industries as a dependent variable. We have built a correlation matrix in SPSS Statistics. The subsequent analysis of the correlation matrix showed that the level of innovation in medium and high-tech manufacturing industries has a correlation relationship with only two following variables: a) With an indicator of the number of organizations (enterprises) engaged in R&D (0.82), and b) With the crime rate indicator (0.78). We have also established a weak correlation with the rest of the variables selected for analysis. To further model the processes of innovation in medium and high-tech manufacturing industries, we chose the innovative output volume as a dependent variable. We chose the following factors and their variables as independent indicators affecting the dynamics of innovation activity indicators of medium and high-tech manufacturing enterprises:

- Economic development with indicators: GDP, GDP per capita, inflation rate, exports, imports, salaries, labor productivity, exchange rate.
- Availability of human capital: population, employed population, unemployment rate.
- Quality of the investment environment: investments in fixed assets, investments in the manufacturing industry, direct investment.
- Features of the economic structure: the share of the extractive industry in GDP, professional, scientific and technical activities.

- Quality of human capital: life expectancy of the population at birth, average expected duration of education during the coming life.
- Innovative development of manufacturing enterprises: innovative sales volume, innovation costs.
- Scientific potential: internal R&D costs, number of organizations engaged in R&D, number of employees engaged in R&D.
- Quality of the legal environment: crime rate.
- Availability of funding: bank lending to the economy, loans issued to processing enterprises through STBs, amount of loans issued by Damu EDF to processing enterprises, the weighted average interest rate of banks on loans issued.
- State support: the amount of funding of program documents of industrial and innovative development.

Statistical data on selected indicators is available, previously studied as part of the scientific project AP09058009 “Assessment and development of mechanisms for stimulating innovation activity of manufacturing enterprises in Kazakhstan based on the methodology of foresight and technological road mapping.” For a more comfortable calculation, we have coded the selected indicators appropriately (Table 2). Table 3 shows descriptive statistics of the variables taken for analysis.

Table 3. Descriptive statistics

	<i>Average</i>	<i>Standard deviation</i>	<i>N</i>
Activ_level	18,436	3,7300	11
GDP	40667505,964	16413063,2458	11
GDP_capita	2316130,345	835573,2606	11
Infl	7,227	2,4113	11
Export	62616,745	18339,2134	11
Export_products	15844,301	2514,9162	11
Import	35619,317	7632,1453	11
Salary	130,645	46,1592	11
Labor_product	7985,255	3180,7948	11
Exchange_rate	230,841	97,0183	11
Popul	17394,641	779,3751	11
Employed_pop	8450,430	255,6742	11
Unempl	5,264	,5278	11
Invest	7245436,364	2650903,7237	11
Manufact_invest	746,909	269,1620	11
Direct_invest	23021,364	3463,6967	11
Industry_GDP	15,764	2,5208	11
Prof_activ	4,382	,3060	11
Life_expect	70,979	1,9308	11
School_expect	14,936	,3042	11
Innov_product	352245,373	277357,6030	11
Sold_innovprod	396532,127	250324,2152	11
Cost_innov	357734,273	340920,1754	11
R&D_costs	59493,218	15481,1832	11
Enterp_num	387,000	25,8147	11
Employees_num	21340,727	3209,3894	11
Crime_level	159,480	50,1335	11
Bank_lend	7777616,909	2345931,0454	11
Loans	1038,636	471,5677	11
Loans_Damu	202,082	73,5013	11
Interest_rate	12,745	1,9460	11
Funding	486,733	384,1032	9

Note: Compiled by the authors based on SPSS Statistics data

Table 3 shows the following average values for the sample:

- Innovative activity of enterprises of medium and high-tech manufacturing industries – 18.4%.
- Innovative output volume – 352,245 million tenge.
- Innovative sales volume – 396,532 million tenge.
- Innovation costs – 357,734 million tenge.
- GDP by production method – 40,667,505.9 million tenge.
- GDP per capita – 2,316,130.3 tenge.
- Labor productivity – 7,985.2 thousand tenge.
- Investments in fixed capital of the manufacturing industry – 746.9 billion tenge.
- Bank lending to the economy – 7,777,616.9 million tenge.

Average expected duration of education during the coming life is 14.9 years. To assess the degree of closeness between the dependent variable and the independent variables taken for analysis, we used the Pearson correlation coefficient. We have built a correlation matrix in SPSS Statistics (Table 4).

The analysis of the correlation matrix showed that the volume of innovative output by enterprises of medium and high-tech manufacturing industries in Kazakhstan has a very high correlation with the following variables:

- GDP (0.82).
- GDP per capita (0.82).
- Labor productivity (0.84).
- Employed population (0.80).
- Investments in fixed assets (0.83).
- Innovative sales volume (0.96).
- A high correlation with the following variables:
- Inflation (0.68).
- Average monthly salary of the core staff (0.77).
- Population at the end of the period (year) (0.73).
- Average annual exchange rate of the US dollar (0.70).
- Investments in fixed assets of the manufacturing industry (0.78).
- Average expected duration of education during the coming life (0.74).
- Bank lending to the economy (0.75).

In addition, the analysis of the correlation matrix showed that the volume of innovative output by enterprises of medium and high-tech manufacturing industries has an average correlation with the following variables:

- Loans issued to manufacturing enterprises through second-tier banks (0.45).
- Crime rate (per 10,000 people) (0.59).
- Internal R&D costs (0.63).
- Life expectancy of the population at birth (0.66).

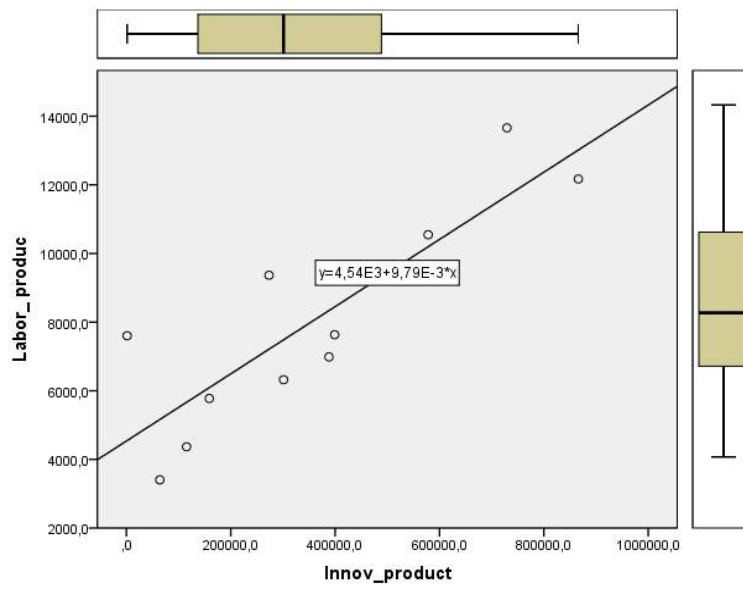
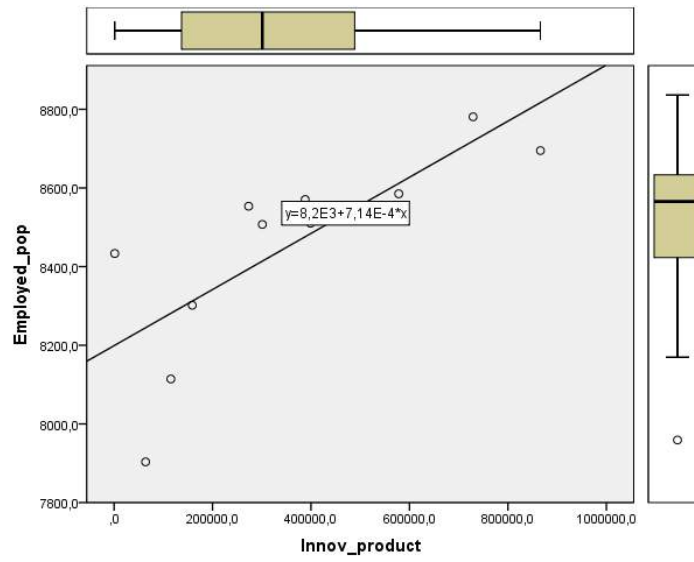
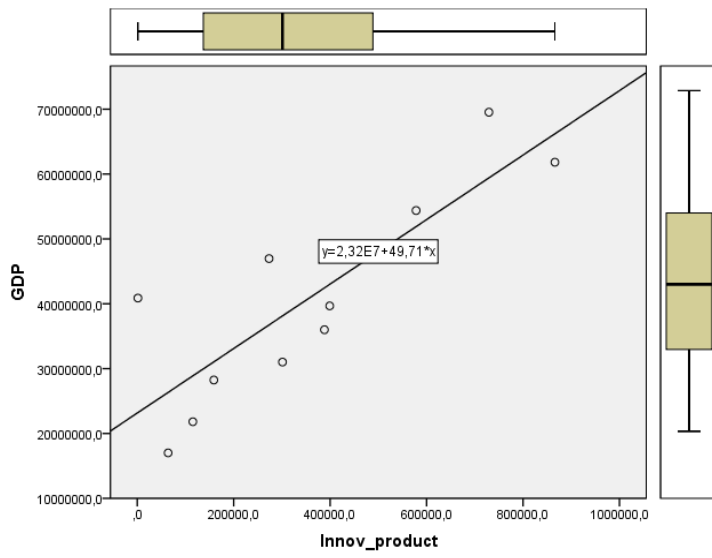
As for the rest of the selected variables, correlation is very weak and we shall not be considering them in further studies.

The simplest method of visualizing the relationship between selected variables is constructing scattering graphs (Figures 1).

Table 4. A correlation matrix

	Innov_product	GDP	GDP_capita	Infl	Export	Export_products	Import	Salary	Labor_product	Exchange_rate	Popul	Employed_pop	Unempl	Invest	Manufact_invest	Direct_invest
Innov_product	1	.840	.840	-.588	.089	.265	.229	.803	.854	.709	.764	.774	-.605	.849	.812	.337
GDP	.840	1	.999	-1.130	-.212	.066	-.003	.996	.998	.917	.975	.886	-.820	.975	.948	-.052
GDP_capita	.840	.999	1	-1.128	-1.190	.090	.017	.994	.998	.908	.977	.899	-.836	.968	.949	-.042
Infl	-.588	-1.130	-1.128	1	-.415	-.361	-.474	-.073	-.167	-.051	.015	-.175	-.110	-.195	-.055	-.758
Export	.089	-.212	-1.190	-.415	1	.901	.886	-.278	-.199	-.534	-.291	.150	-.106	-.270	-.249	.749
Export_products	.265	.066	.090	-.361	.901	1	.807	.002	.086	-.235	-.007	.419	-.391	-.025	.002	.759
Import	.229	-.003	.017	-.474	.886	.807	1	-.051	.003	-.352	-.091	.353	-.218	-.047	-.068	.650
Salary	.803	.996	.994	-.073	-.278	.002	-.051	1	.992	.933	.983	.871	-.811	.971	.952	-.113
Labor_product	.854	.998	.998	-.167	-.199	.086	.003	.992	1	.921	.967	.886	-.811	.976	.942	-.006
Exchange_rate	.709	.917	.908	-.051	-.534	-.235	-.352	.933	.921	1	.914	.691	-.635	.918	.876	-.199
Popul	.764	.975	.977	.015	-.291	-.007	-.091	.983	.967	.914	1	.880	-.857	.921	.974	-.182
Employed_pop	.774	.886	.899	-.175	.150	.419	.353	.871	.886	.691	.880	1	-.939	.792	.854	.174
Unempl	-.605	-.820	-.836	-.110	-.106	-.391	-.218	-.811	-.811	-.635	-.857	-.939	1	-.686	-.803	.001
Invest	.849	.975	.968	-.195	-.270	-.025	-.047	.971	.976	.918	.921	.792	-.686	1	.913	-.044
Manufact_invest	.812	.948	.949	-.055	-.249	.002	-.068	.952	.942	.876	.974	.854	-.803	.913	1	-.131
Direct_invest	.337	-.052	-.042	-.758	.749	.759	.650	-.113	-.006	-.199	-.182	.174	.001	-.044	-.131	1

	Innov_product	Industry_GDP	Prof_activ	Life_expect	School_expect	Solid_innovprod	R&D_costs	Cost_innov	Enterp_numbr	Employees_numbr	Crime_level	Bank_lend	Loans	Loans_Damru	Interest_rate	Funding
Innov_product	1	-.391	.165	.710	.792	.965	.882	.255	-.329	.357	.148	.782	.537	.376	-.364	-.434
Industry_GDP	-.391	1	-.779	-.887	-.771	-.579	-.882	-.689	.429	-.865	-.843	-.834	-.902	-.803	-.272	.766
Prof_activ	.165	-.779	1	.607	.566	.290	.563	.803	-.346	.482	.631	.542	.697	.638	.180	-.502
Life_expect	.710	-.887	.607	1	.896	.840	.959	.649	-.309	.743	.587	.948	.928	.654	.221	-.896
School_expect	.792	-.771	.566	.896	1	.893	.942	.409	-.509	.688	.552	.972	.881	.709	-.091	-.716
Solid_innovprod	.965	-.579	.290	.840	.893	1	.825	.315	-.381	.516	.312	.899	.692	.490	-.233	-.584
Cost_innov	.255	-.689	.803	.649	.409	.315	1	.483	-.104	.412	.465	.463	.625	.455	.354	-.623
R&D_costs	.682	-.882	.563	.959	.942	.825	.483	1	-.428	.805	.646	.978	.939	.731	.138	-.830
Enterp_numbr	-.329	.429	-.346	-.309	-.509	-.381	-.104	-.428	1	-.533	-.668	-.442	-.342	-.550	.483	-.082
Employees_numbr	.357	-.865	.482	.743	.688	.516	.412	.805	-.533	1	.916	.749	.726	.876	.211	-.611
Crime_level	.148	-.843	.631	.587	.552	.312	.465	.646	-.668	.916	1	.578	.620	.832	.124	-.297
Bank_lend	.782	-.834	.542	.948	.972	.899	.463	.978	-.442	.749	.578	1	.912	.740	-.010	-.800
Loans	.537	-.902	.697	.928	.881	.692	.625	.939	-.342	.726	.620	.912	1	.895	.232	-.919
Loans_Damru	.376	-.803	.638	.654	.709	.490	.455	.731	-.550	.876	.832	.740	.695	1	-.011	-.490
Interest_rate	-.364	-.272	.180	.221	-.091	-.233	.354	.138	.483	.211	.124	-.010	.232	-.011	1	-.662
Funding	-.434	.766	-.502	-.896	-.716	-.584	-.623	-.830	-.082	-.611	-.297	-.800	-.919	-.490	-.662	1



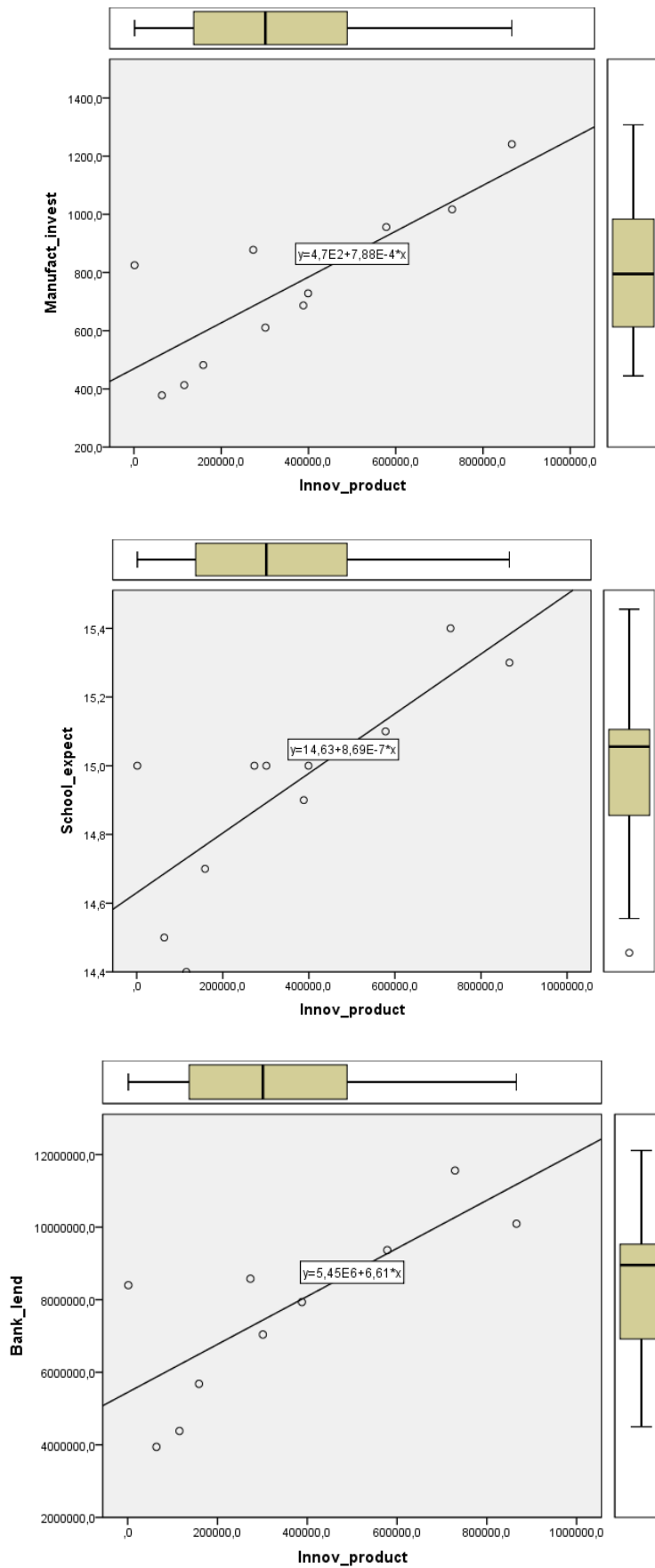


Figure 1. Scattering graphs between independent and dependent variables

A dependent variable Volume of innovative output has a positive correlation with the following indicators: GDP; GDP per capita; Labor productivity; Employed population; Investments in fixed assets; Innovative sales volume; Average monthly salary of core staff; Investments in fixed assets of manufacturing industry; Population at the end of the period; Bank lending to the economy; and Average expected duration of training during the coming life.

The correlation between variables Volume of innovative output by medium and high-tech manufacturing industries and Inflation is negative.

Both independent and dependent variables displayed on the scattering graphs have a linear type of dependence, which further allows us to construct a linear multiple regression equation.

The analysis of the correlation matrix (Table 4) showed a close correlation between the volume of innovative output by enterprises of medium and high-tech manufacturing industries with GDP and GDP per capita (multicollinearity), which excludes the possibility of including these two factors in the regression model. Indicators of a paired correlation of labor productivity and GDP have similar values, i.e. they depend on each other. In this regard, for the further construction of the regression model, we chose one factor - Labor_product.

Next, using the statistical data analysis package within SPSS Statistics, we have calculated the parameters of correlation and regression analysis (Table 5).

Table 5. Results of correlation and regression analysis

Model summary									
Model	R	R-Square	R-Square adjusted	Standard estimation error	Variation statistics				
					R-Square variation	F variation	Degree of freedom 1	Degree of freedom 2	Sig. F variation
1	,951 ^b	,904	,880	96175,25 17	,904	37,584	2	8	,000
ANOVA ^a									
Model		Sum of squares		Degree of freedom	Mean square	F	Significance		
1	Regression	695274967134,069		2	347637483567,035	37,584	,000 ^b		
	Excess	73997432317,493		8	9249679039,687				
	Total	769272399451,562		10					
Coefficients ^a									
Model		Unstandardized coefficients		Standardized coefficients	t	Significance	Correlations		
		B	Standard error	Beta			Zeroth-order	Partial	Component
1	(Invariable)	-237901,454	81680,194		-2,913	,020			
	Labor_product	138,844	19,400	1,592	7,157	,000	,854	,930	,785
	Loans	-499,265	130,858	-,849	-3,815	,005	,537	-,803	-,418
Excess statistics									
		Minimum	Maximum	Mean	Standard deviation	N			
Projected value		37347,762	814556,250	352245,37	263680,671	11			
Excess		-105641,835	140687,843	,0000	86021,7602	11			
Standard projected value		-1,194	1,753	,000	1,000	11			
Standard excess		-1,098	1,463	,000	,894	11			

Note: Compiled by the authors based on SPSS Statistics data

a) Dependent variable: Innov_product

b) Predictors: (invariable), Loans, Labor_product

Table 5 shows that correlation coefficient $R = 0.85$. This indicates a close linear relationship between regression model variables. Coefficient of determination $r^2 = 0.90$ shows that linear equation of multiple regression explains 90% of the variance of the influence of independent variables, and the volume of innovative output of enterprises of medium and high-tech manufacturing industries accounts for 10%.

A linear multiple regression equation can represent the general view of the model:

$$\text{Innov_product} = -237901 + 138 \text{ Labor_product} - 499 \text{ Loans} \quad (1)$$

where:

Innov_product is the volume of innovative output of enterprises of medium and high-tech manufacturing industries in million tenge;

Labor_product is labor productivity is thousand tenge;

Loans are loans issued to manufacturing enterprises through STBs in billion tenge.

Evaluating the quality of the multiple regression equation using the Fisher criterion allows us to recognize the statistical significance of the equation:

$$F = 37,584; F_{table.} = 2,61 (F_{fact} > F_{table}) \quad (2)$$

Table 5 shows that the following actual values of t-statistics (Student's t-criterion):

$$t_a = -2,91; t_b = 7,15; t_c = -3,81 \quad (3)$$

demonstrate statistical significance of the regression model parameters and the indicator of the connection closeness (modulo $t_a > t_{table}$, $t_b > t_{table}$, $t_c > t_{table}$).

The constructed regression model allows us to conclude the following:

- With an increase in labor productivity by each unit, the value of the variable innovative output volume increases by 138 units.
- A decrease in the indicator of loans issued to manufacturing enterprises through STBs by each unit will lead to an increase in the innovative output volume of enterprises of medium and high-tech manufacturing industries by 499 units.

4. RESULT DISCUSSIONS

Modeling the innovation processes did not allow to reject any of the suggested research hypotheses.

For the initial stage of our study, we chose the level of innovation activity of enterprises of medium and high-tech manufacturing industries as a dependent variable. However, it showed a correlation with only two variables: number of organizations (enterprises) engaged in R&D and crime rate. In this regard, for further modeling of the processes of organization and development of innovation, we chose the innovative output volume as a dependent variable.

Productivity is the defining concept of the phenomenon of competitiveness while improving national competitiveness appears impossible without productivity and innovation (Carayannis and Grigoroudis, 2016). Consequently, at both macro and micro levels, productivity is closely related to competitiveness and innovation, as it is a key factor in accumulation and increase of national income. Depending on the level of analysis, the strength of the relationship between competitiveness, productivity and innovation may vary, but the existence of such a relationship in economics is generally recognized (Carayannis and Campbell, 2010).

Previous studies (Kurmanov et al., 2016; 2019) have shown that significant amounts allocated from the republican budget for measures to support and stimulate innovation activities of manufacturing enterprises have zero effect. Innovation cost efficiency (2.7% in the best years) and the share of innovative

products in GDP (1.6%) remain extremely low. Kazakhstan still lags behind many developed and a number of developing countries in terms of innovative output and sales. In other words, performance of innovative activity of manufacturing enterprises still remains low. Our research also confirms the inefficiency of R&D costs.

Thuswise, we have confirmed the bigger importance of labor productivity in innovation and competitiveness of enterprises (H1), as well as a more positive impact of human capital than research and development costs (H1). We feel important to note that statistical data on medium and high-tech industries of Kazakhstan shows gaps associated with incomplete information. As a result, econometric modeling of innovation at enterprises in Kazakhstan is not easy (H3).

Our study reveals that a decrease in the indicator of loans issued to manufacturing enterprises through second-tier banks by each unit leads to an increase in the innovative output volume in enterprises of medium and high-tech manufacturing industries by 499 units. In this case, EBRD expert conclusions (EBRD, 2014) that restricting access to bank loans leads to a decrease in the innovation appear true. However, such a causal relationship between credit restrictions and innovation requires further research.

CONCLUSION AND RECOMMENDATIONS

A dynamic and successful innovation activity at knowledge-intensive enterprises requires a wide application of modern methods and technologies for organizing this process, including the coordinated and simultaneous use of scientific, technological, personnel, financial, and other policies.

The focus of most modern research is to create favorable conditions for innovation, as well as to study the management mechanisms of the organization of all stages of the innovation process: from the idea to the final innovative product. However, despite a fairly large number of studies devoted to innovation, it is necessary to note a gap in the methodology of organizing innovation in entrepreneurship, in particular, in the methodology for assessing the factors of organization and development of this process in Kazakhstan.

Numerous studies show that encouraging of innovation activity at the enterprise level requires a competent innovation policy contributing to a chain reaction of creation and implementation of innovations at macroeconomic level. The result of this process is an increase in competitiveness.

Further research will focus on identifying the causal relationship between credit restrictions and innovation activities of medium and high-tech manufacturing enterprises in Kazakhstan.

ACKNOWLEDGMENT

This research has been funded by the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan (Grant No. AP09058009).

REFERENCES

- Anokhin, S., Schulze, W. S. (2008), "Entrepreneurship, innovation, and corruption", *Journal of Business Venturing*, Vol. 24, No. 5, pp. 465-476.
- Aparicio, S., Urbano, D., Audretsch, D. (2015), "Institutional factors, opportunity entrepreneurship and economic growth: Panel data evidence", *Technological Forecasting and Social Change*, No. 102, pp. 45-61.
- Arkipova, M.U., Karpov, E.S. (2012), "Analysis and modeling of patent activity in Russia and developed countries of the world", *RISK: Resources, Information, Procurement, Competition*, No. 4, pp. 286-293 (in Russian).

- Audretsch, D. B., Keilbach, M. (2004), "Entrepreneurship and regional growth: An evolutionary interpretation", *Journal of Evolutionary Economics*, Vol. 14, No. 5, pp. 605-616.
- Bottazzi, L., Peri, G. (2003), "Innovation and spillovers in regions: Evidence from European patent data", *European Economic Review*, Vol. 47 No. 4, pp. 687–710.
- Carayannis, E., Grigoroudis, E. (2016), "Quadruple Innovation Helix and Smart Specialization: Knowledge Production and National Competitiveness", *Foresight and STI Governance*, Vol. 10, No 1, pp. 31–42.
- Carayannis, E.G., Campbell, D.F.J. (2010), "Triple Helix, Quadruple Helix and Quintuple Helix, and how do knowledge, innovation and the environment relate to each other? A proposed framework for a transdisciplinary analysis of sustainable development and social ecology", *International Journal of Social Ecology and Sustainable Development*, Vol. 1, No 1, pp. 41–69.
- Crescenzi, R., Jaax, A. (2015), "Innovation in Russia: The territorial dimension", *Papers in Evolutionary Economic Geography*, № 1509, Utrecht University, Utrecht.
- Djankov, S. (2009), "The regulation of entry: A survey", *The World Bank Research Observer*, Vol. 24, No 2, pp. 183-203.
- Dobrynskaya, V., Turkisch, E. (2010), "Economic diversification and the Dutch disease in Russia", *Post-Communist Economies*, Vol. 22, No 3, pp. 283-302 (in Russian).
- EBRD (2014), *Financing Innovation: Transition Report 2014*, EBRD (in Russian).
- Feldman, M.P., Florida, R. (1994), "The geographic sources of innovation: Technological infrastructure and product innovation in the United States", *Annals of the Association of American Geographers*, Vol. 84, No. 2, pp. 210–229.
- Fritsch, M., Falck, O. (2007), "New business formation by industry over space and time: A multidimensional analysis", *Regional Studies*, Vol. 41, No. 2, pp. 157-172.
- Fritsch, M., Storey, D. J. (2014), "Entrepreneurship in a regional context: Historical roots, recent developments and future challenges", *Regional Studies*, Vol. 48, No. 6, pp. 939-954.
- Jaffe, A.B. (1989), "Real effects of academic research", *The American Economic Review*, Vol. 79, No. 5, pp. 957–970.
- Kurmanov, N., Aliev, U., Suleimenov, Sh. (2019), "Analysis of the Efficiency of Innovation Management in the Countries of the Eurasian Economic", *Polish Journal of Management Studies*, Vol. 19, No. 1, pp. 204-214.
- Kurmanov, N., Tolysbayev, B., Aibossynova, D., Parmanov, N. (2016), "Innovative activity of small and medium-sized enterprises in Kazakhstan and factors of its development", *Economic Annals-XXI*, Vol. 158, No. 3-4 (2), pp. 57-60.
- Lee, S.Y., Florida, R., Acs, Z. (2004), "Creativity and entrepreneurship: A regional analysis of new firm formation", *Regional Studies*, Vol. 38, No. 8, pp. 879-891.
- Leslie, T.F., O'hUallacháin, B. (2007), "Rethinking the regional knowledge production function", *Journal of Economic Geography*, No. 7, pp. 737–752.
- Mariyev, O.S., Savin, I.V. (2010), "Factors of innovative activity in Russian regions: modeling and empirical analysis", *Economy of Region*, No. 3, pp. 235–244 (in Russian).
- Nielsen, G. (2014), "Determinants of cross-national entrepreneurial activity", *Journal of Politics and Society*, Vol. 25, No. 2, pp. 46-72.
- Raposo, M., Do Paço, A. (2011), "Entrepreneurship education: Relationship between education and entrepreneurial activity", *Psicothema*, Vol. 23, No. 3, pp. 453-457.
- Reynolds, P., Storey, D., Westhead, P. (1994), "Cross-national comparisons of the variation in new firm formation rates", *Regional Studies*, Vol. 28, No. 4, pp. 443-456.
- Seitzhanov, S., Kurmanov, N., Petrova, M., Aliyev, U., Aidargaliyeva, N. (2020), "Stimulation of entrepreneurs' innovative activity: Evidence from Kazakhstan", *Entrepreneurship and Sustainability Issues*, Vol. 7, No., 4, pp. 2615-2629.
- Shterzer, T.A. (2005), "Empirical analysis of the factors of innovative activity in the constituent entities of the Russian Federation", *NSU Bulletin, Series "Socio-economic Sciences"*, Vol. 5, No. 2, pp. 100–109 (in Russian).
- Suslov, V.I. (2007), *Innovation potential of the scientific center: methodological problems of analysis and assessment*, IEOPP SB RAS, Novosibirsk (in Russian).
- Verheul, I., Wennekers, S., Audretsch, D., Thurik, R. (2002), "An eclectic theory of entrepreneurship: Policies, institutions and culture" in: D.B. Audretsch, R. Thurik, I. Verheul, S. Wennekers (eds.), *Entrepreneurship: Determinants and policy in a European-US comparison*, Springer US, pp. 11-81.

- Xheneti, M., Bartlett, W. (2012), "Institutional constraints and SME growth in postcommunist Albania", *Journal of Small Business and Enterprise Development*, Vol. 19, No. 4, pp. 607-626.
- Yakovlev, E., Zhuravskaya, E. (2013), "The unequal enforcement of liberalization: Evidence from Russia's reform of business regulation", *Journal of the European Economic Association*, Vol. 11, No. 4, pp. 808-838.
- Zemtsov, S., Muradov, A., Wade, I., Baranova, V. (2016), "Determinants of regional innovation in Russia: Are People or Capital More Important?", *Foresight and STI Governance*, Vol. 10, No. 2, pp. 29-42.



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Citation:

Delibasic, M., Pupavac, J., Budic, H., Streimikis, J., Shilina, M.G. (2022), "Employment in the Hotel Industries of Croatia and Montenegro: Current State and Outlook", *Montenegrin Journal of Economics*, Vol. 18, No. 3, pp. 23-34.

Employment in the Hotel Industries of Croatia and Montenegro: Current State and Outlook

MILICA DELIBASIC¹, JUSTIN PUPAVAC², HRVOJE BUDIC³, JUSTAS STREIMIKIS⁴
and MARINA G. SHILINA⁵

¹ Assistant Professor, University Mediterranean, Faculty of Business Studies, Podgorica, Montenegro; University of Montenegro, Maritime Faculty of Kotor, Montenegro; e-mail: 23.mildel@gmail.com. ORCID: 0000-0003-1036-3836.

² PhD student, University of Rijeka, Faculty of Tourism and Hospitality Management, Opatija, Croatia; e-mail: pupavacjustin@gmail.com

³ PhD, senior lecturer, Polytechnic of Pozega, Pozega, Croatia, e-mail: hbudic@vup.hr

⁴ Lithuanian Centre for Social Sciences, Institute of Economics and Rural Development, A. Vivulskio g. 4A-13, LT-03220 Vilnius, Lithuania; Faculty of Management and Finances, University of Economics and Human Science in Warsaw, Okopowa 59, 01-043 Warsaw, Poland, e-mail: Justas.streimikis@gmail.com

⁵ Professor, Plekhanov Russian University of Economics, Moscow, Russia, e-mail: SHilina.MG@rea.ru

ARTICLE INFO

Received October 11, 2021
Revised from November 11, 2021
Accepted December 11, 2021
Available online July 15, 2022

JEL classification: J21, C32

DOI: 10.14254/1800-5845/2022.18-3.2

Keywords:

Hotel industry,
employment,
trends,
forecast.

ABSTRACT

The subject of this article is an analysis of current state and employment perspectives in the hotel industry of Croatia and Montenegro. This paper aims to investigate the role of the hotel industry in direct and indirect employment. To correctly assess the importance of the hotel industry in employment, the paper analyses the factors upon which hotel industry employment is dependent and develops an econometric model to estimate the number of hotel industry employees and the capacity of the hotel industry to create the total number of jobs. The starting point of this paper is that it is necessary to maintain high level of employment as well as high level of provided services and management for the realization of tourist advantages possessed by Croatia and Montenegro. The results of research are based on data from secondary sources. Several scientific methods, such as descriptive statistics, the trends method, and correlation and regression analysis, were applied to accomplish the study's objective. The paper's main finding points to the future growth of employment in the hotel industries of Croatia and Montenegro and to the ever-greater contribution of the hotel industry to total employment. The hypothesis is confirmed in the paper.

INTRODUCTION

Employment refers to the number of jobs in an economy, economic sector, or individual economic branch during the period of one year (Stricker and Baruffini, 2020). Employment in the hotel industry shows the structuring of the national economy and the level of recruitment and distribution of human

resources. It is, however, very difficult or almost impossible to calculate the exact number of employees in the hotel industry due to the industry's high level of fragmentation (Galacic and Laskarin, 2016). The effect that the hotel industry has on employment surpasses the boundaries of the industry itself (Radjenovic et al., 2020; Skare and Kukurin, 2020; Kaliappen et al., 2019). To correctly assess the importance and role of the hotel industry in new job creation, the hotel industry's indirect effects should also be taken into consideration. Direct employment in the hotel industry refers to jobs in hospitality, tourism agencies, transport and the retail business, in which employees come into direct contact with visitors. According to S. Kot and K. Kozicka (2018) Indirect employment in the hotel industry refers to jobs in all other economic branches and industries, such as the manufacturing industry, power industry, water supply, construction industry, IT support services, financial operations, and public administration, the activities of which are focused to lesser or greater extent on tourism development and tourism-generated income.

Given the importance that the hotel industry has for the economies of Croatia and Montenegro and the comparative advantages it possesses relative to the international environment, it was deemed pertinent to develop an econometric model based on which it would be possible to realistically identify employment trends in the hotel industry as well as the capacity of the hotel industry to create new jobs in the future period. A multiple regression model was developed for the science-based assessment of the number of employees in the hotel industry (NE) and the capacity of the hotel industry to create new jobs. The number of tourist arrivals, the number of overnights, the average number of overnights per arrival, and the number of beds were tested as the independent variables of the potential model for assessing the number of employees in tourism.

1. LITERATURE REVIEW

The hotel industry is a business sector, the main focus of which is providing accommodation to persons without permanent residence in a given area, that is, travelers. The hotel industry provides services that are realized in the tourism market through the sales of accommodation services and other services, as well as special goods and services, to tourists and residents, thus generating tourist consumption (Mura and Kljucnikov, 2018; Kostynets et al., 2020). The hotel industry is a service activity that involves hospitality and catering, retail trade, transport services and destinations (Cerovic et al., 2005). The hotel industry is a sector that generates high amounts of revenue, boosts the growth and development of the national economy, and represents an important source of employment (Van der Schyff et al., 2019).

Many foreign and domestic authors have researched the role of the hotel industry in creating new jobs and increasing overall employment. In their analysis of the basis of sustainable tourism management, B. Blazevic et al. (2013) highlight the direct and overall contribution of tourism to GDP and employment, and they view labor, that is, human resources in the hotel industry, as a vital indicator of sustainable tourism, based on the number of employees in the HORECA sector, the number of permanently employed workers, the number of seasonally employed workers, and the educational structure of the employees. A. Obadic and L. Pehar (2016) argue that seasonality is a major constraint to employment in the hotel industry, and they underscore the importance of the hotel industry in creating new jobs, in particular in post-crisis periods.

M. Resetar and A. Ceh Casni (2014) stress the importance that employment in the tourist accommodation sector has for the quality of life of residents and in preserving the demographic structure in regions where the hotel industry is the main branch of activity. I. Pavlic et al. (2014) and V. Draskovic et al. (2021) investigated the direct and indirect contribution of the hotel industry in increasing employment in Croatia, while C. Beneki et al. (2016) used a linear logarithmic model to study the potential for boosting employment in the hotel industry of Greece. Their empirical findings suggest that the capacities of the Greek hotel industry are a fundamental factor in increasing employment in this sector of the economy. It is also confirmed by Szymanik (2020). The research of Baum et al. (2016) focuses on sustainability and the work force in the hotel industry, with special emphasis on the contribution of the hotel industry to achieving full and productive employment and decent work, one of the 17 sustainable development goals of the UN's 2030 Agenda. In their study of the constraints in attracting new workers to the hotel

industry, S. McGinley et al. (2017) point out that high employee turnover rates are a particular problem in the hotel industry. In the U.S.A., the employee turnover rate in the hotel industry rose from 58.1% to 67.6% in 2014. Particularly interesting is the fact that the American Hotel & Lodging Association (AHLA) is lobbying for measures to facilitate the entry of migrants into the U.S.A., as it is estimated that in the next ten years it will be necessary to employ 1.3 million more people in the hotel and lodging industry. E. Darabos and E. Konyves (2015) examined the vital role of the hotel industry in the long term in stabilizing the labor market and increasing total employment at both the global level and EU Member State level.

In the past five years, the tourism and travel sector has created one in four new jobs in the global economy, thus becoming the best ally of governments in addressing the issue of unemployment. In 2019, about 330 million people – or one in ten people in total world employment– were employed, either directly or indirectly, in this sector. The tourism and travel sector accounts for 10.3% of the world’s GDP. For ten consecutive years since 2011, the tourism growth rate has exceeded the annual GDP growth rate. For example, the annual growth rate of tourism in 2019 relative to the previous year was 3.5%, while the GDP growth rate came to only 2.4%. The EU economy grew at a rate of 1.3%, while the travel sector saw a growth rate of 2.4%. Thus, this sector has evolved from being the outcome of economic development to becoming an active driver of economic growth.

2. RESEARCH PROBLEM, DATA AND METHODOLOGY

Eurostat estimates that the EU hotel industry employs more than 13.3 million people or one-fifth (21%) of the people employed in the service sector and 9% of the people employed in the business sector. At the head of the list in absolute indicators, per number of people employed in the hotel industry, are the large European countries: Germany (2.5 mln), Great Britain (2.3 mln), Italy (1.5 mln), Spain (1.4 mln) and France (1.1 mln). Employment in these five countries accounts for about 66% of employment in the EU hotel industry. According to Eurostat, employees in the hotel industry of Montenegro account for 17% of people employed in the national economy. In Croatia, this share is 13% (see Figure 1).

Figure 1 shows that Montenegro belongs to the group of leading European countries as per relative number of employees in the hotel industry. The number of people employed in the hotel industry in Montenegro doubled in 2019, relative to 2010. The percentage of employees in the Croatian hotel industry may not seem very large in comparison with some other European countries. These facts could blur the importance of the hotel industry in the economies of Croatia and Montenegro, as a significant number of people earning income from the hotel industry are not formally and legally employed. A number smaller than the possible number of employees in the hotel industries of Croatia and Montenegro is foremost the result of the lower share of hotels (only 15%) in the structure of accommodation facilities. Namely, hotels are the main generator of employment in the hotel industry. Hotels, as major sources of employment, accounted for about 28% of overnights in Croatia and Montenegro in 2019.

In 1987, the number of employees in the hotel industry of former Yugoslavia amounted to 274,000 or 4.8% of total employment (Cicvaric, 1990, p. 169). In 1989, the Socialist Republic of Croatia had the largest number of people employed in the hotel industry (108,026), accounting for about 40% of the total number of employees in the former country’s hotel industry (Dulcic, 1991, 147). The number of hotel industry employees in the independent Republic of Croatia, however, did not reach that level until the year 2018. Table 1 illustrates the trends in hotel industry employee numbers in Croatia in the period 1967-2019.

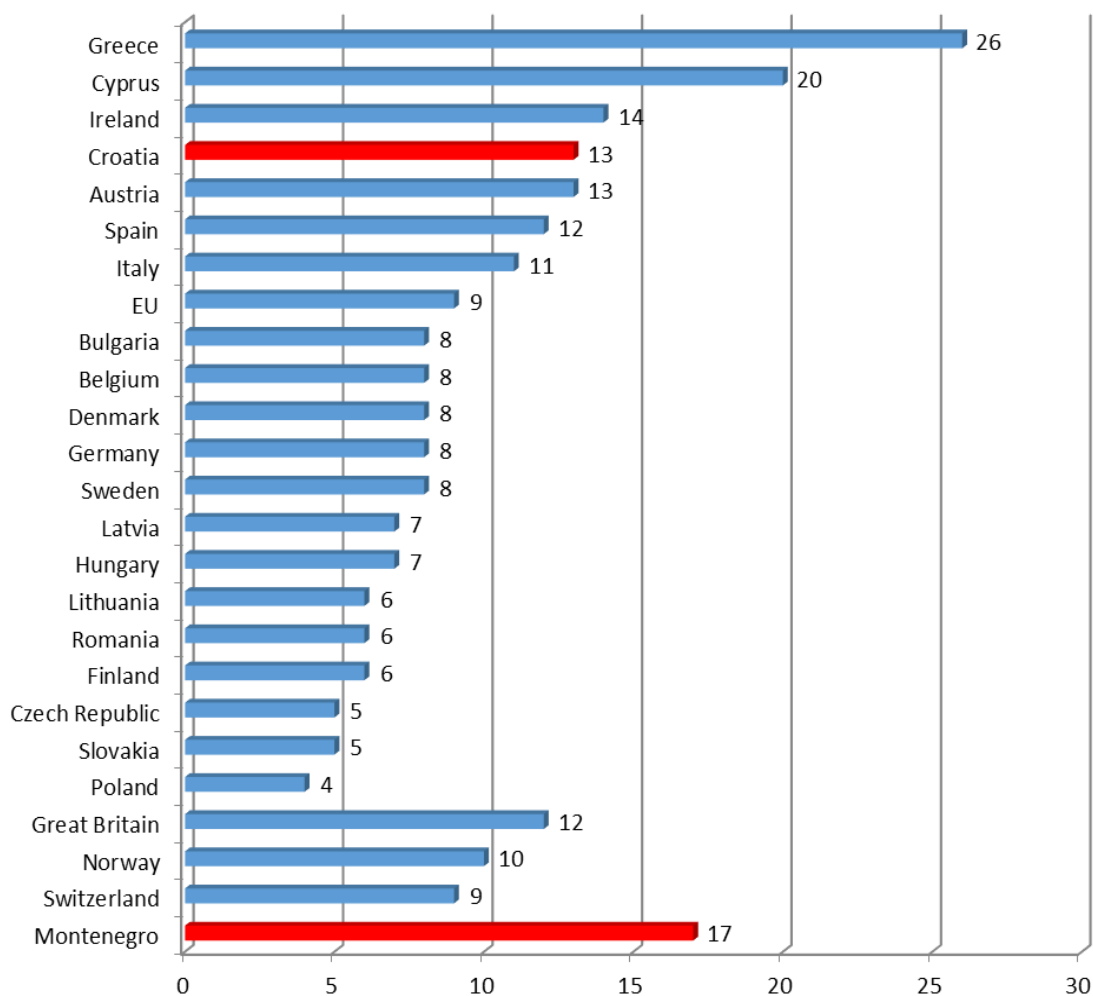


Figure 1. Share of hotel industry employment in overall national employment

Source: Authors prepared according: ec.europa.eu/eurostat

Table 1. Trends in number of employees and basic indicators of the hotel industry in Croatia

Years	Number of person employed	Tourist arrivals (000)	Number of overnights (000)	Average number of evernights per tourist	Number of beds (000)
1967.	38572	3630	20906	5,76	352
1968.	42615	3810	22281	5,85	375
1969.	44041	4650	28082	6,04	415
1970.	47768	4805	28552	5,94	453
1971.	53065	5302	32210	6,08	511
1972.	56234	5426	33327	6,14	534
1973.	62169	6122	39000	6,37	555
1974.	66066	5928	38941	6,57	569
1975.	67930	6454	42411	6,57	616
1976.	70153	6392	40947	6,41	635
1977.	72292	6994	43111	6,16	632
1978.	74132	7851	49389	6,29	647
1979.	77842	7912	52117	6,59	669
1980.	80071	7930	53600	6,76	692
1981.	81370	8333	56574	6,79	728
1982.	83981	8042	54436	6,77	769

1983.	86352	8268	54632	6,61	775
1984.	90687	9146	59465	6,50	800
1985.	97815	10125	67665	6,68	820
1986.	102137	10151	68216	6,72	849
1987.	105107	10847	68160	6,28	886
1988.	106192	10354	67298	6,50	926
1989.	108026	9670	61849	6,40	923
1990.	98586	8497	52523	6,18	860
1991.	66975	2146	10158	4,73	597
1992.	50768	2010	10725	5,34	535
1993.	51174	2363	12908	5,46	570
1994.	53915	3402	19977	5,87	620
1995.	51440	2438	12885	5,29	609
1996.	54824	3899	21455	5,50	646
1997.	65000	5206	30314	5,82	683
1998.	65563	5449	31287	5,74	725
1999.	66778	4751	26564	5,59	671
2000.	73771	6620	38406	5,80	710
2001.	73672	7279	42579	5,85	736
2002.	80957	7694	43805	5,69	752
2003.	81175	8189	45635	5,57	786
2004.	83504	8629	46668	5,41	812
2005.	82628	9222	50282	5,45	851
2006.	84327	9660	51797	5,36	864
2007.	90274	10351	54627	5,28	882
2008.	91430	10454	55669	5,33	906
2009.	89038	10270	54988	5,35	909
2010.	89555	10405	56217	5,40	907
2011.	89700	11211	60110	5,36	933
2012.	89300	11599	62507	5,39	878
2013.	94000	12233	64617	5,28	924
2014.	95500	12914	66270	5,13	976
2015.	102300	14175	71437	5,04	1028
2016.	108500	15463	77919	5,04	1132
2017.	104981	17431	86200	4,95	1201
2018.	110755	18667	89652	4,80	1267
2019.	107500	19566	91243	4,66	1319

Source: Authors prepared according to Croatian Bureau of Statistics, Statistical Yearbook, different years

Similar trends are present in the basic indicators of the hotel industry of Montenegro, the only difference being that the recovery of the Montenegrin hotel industry occurred with a time lag of some ten years (Bicker et al., 2011). With the turn of the new millennium, the hotel industry of Montenegro once again experienced a burst of growth, becoming the country with the highest growth rate in the world in 2007 (Mildner, 2009, p. 13). Accordingly, in this scientific discussion, the results of research based on the data for Croatia can serve as a reliable indicator for the future of the Montenegrin hotel industry.

The collected data were analyzed using a number of scientific methods. First, analysis focused on spotting, mathematically formulating, and comparing identified trends in hotel industry employment numbers in Croatia. Then, to obtain detailed insight into hotel industry employment trends in Croatia, the descriptive statistics method was applied to the collected data. Next, the correlations among the number of people employed in the Croatian hotel industry, number of tourist arrivals, number of overnights, average number of overnights per arrival, and number of beds, in the period 1967-2019, were examined. Finally, a regression model was developed, based on which the number of employees in the Croatian hotel industry and the contribution of the hotel industry to the country's total employment by 2030 was estimated.

3. RESEARCH RESULTS AND DISCUSSION

Figure 2 illustrates the trends in hotel industry employment in Croatia in the period 1967-2019.

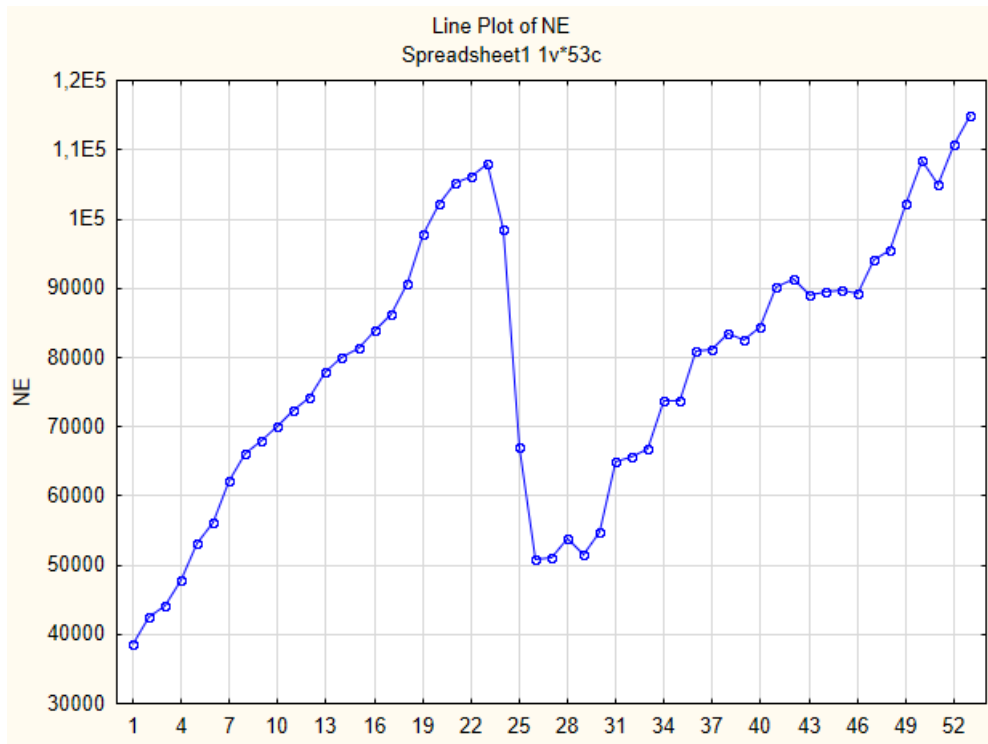


Figure 2. Trends in hotel industry employment in Croatia in the period 1967-2019

Source: Authors prepared according to Croatian Bureau of Statistics, Statistical Yearbook, different years

Employment in the Croatian hotel industry grew almost three-fold (2.98 times) in the period 1967-2019. Three periods in Croatian hotel industry employment trends can be discerned in the graph: 1) hotel industry employment trends in the pre-war period, 2) hotel industry employment trends in the war period, and 3) hotel industry employment trends in the post-war period. The trend curves of hotel industry employment in the pre-war and post-war periods are almost identical (parallel), so it is not surprising that more than 20 years had to pass for employment in the hotel industry in Croatia to reach pre-war levels. In the pre-war period, there is a steady upward trend in employment in the Croatian hotel industry, up to the record-breaking year of 1989. The disruption of political security in former Yugoslavia exposed the fragility of the hotel industry; employment in the Croatian hotel industry first dropped slightly in 1990 but then plummeted over the next two years. In the years that followed, the hotel industry slowly began to recover and employment began to grow, with the exception of 1995 that saw another drop in hotel industry employment. In the post-war period, employment in the Croatian hotel industry has continued to grow, except during the global economic crisis when hotel industry employment stagnated and dropped slightly. The most recent COVID-19 crisis has resulted in the loss of 100.8 mln jobs in the hotel industry worldwide.

The average annual growth rate of employment in the Croatian hotel industry in the observed period 1967-2019 was 2.08%, one whole index point higher than the average growth rate of total employment in the Croatian economy (1.06%). The average annual growth rate of employment in the hotel industry was 4.58% in the period 1967-1989, and 3.27% in the post-war period 1996-2019. In conclusion, em-

ployment in the hotel industry grew continuously, regardless of energy-related, economic, political, financial or other crises.

Hotel industry employment trends in Croatia in the two above-mentioned periods are illustrated in Figure 3 and Figure 4.

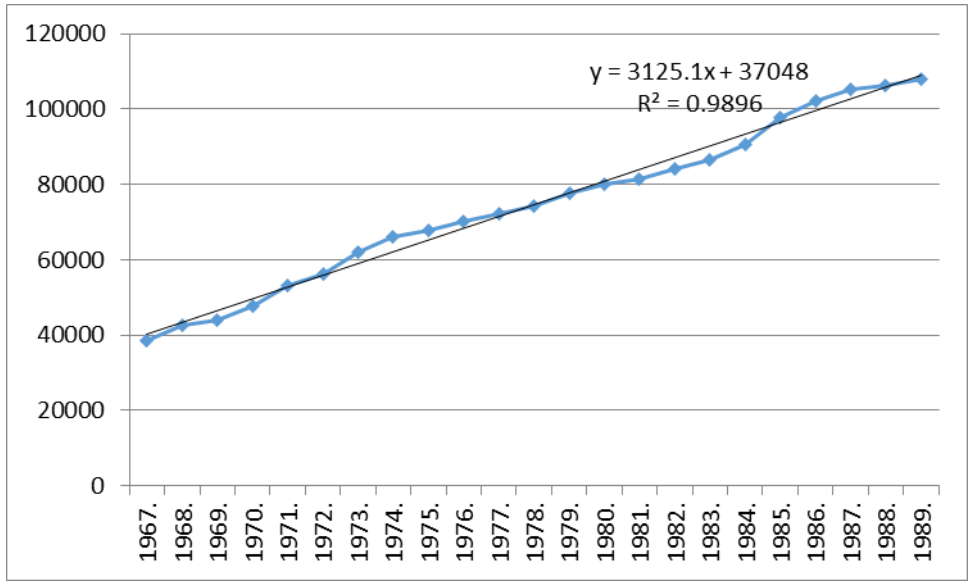


Figure 3. Hotel employment trends in Croatia, 1967-1989

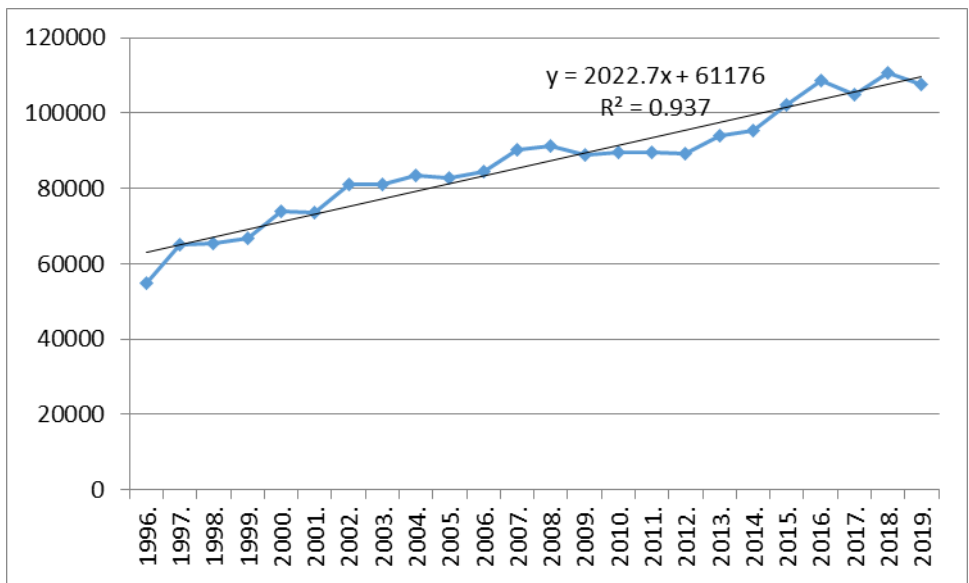


Figure 4. Hotel employment trends in Croatia, 1996-2019

Based on the trend equation in Figure 3, it can be concluded that were it not for the political crisis and war events in the territory of former Yugoslavia, the number of employees in the Croatian hotel industry would have amounted to 202,678 in 2019. The trend equation in Figure 4 indicates that, due to the disruption of the upward trend in employment caused by the political

crisis and war events, hotel industry employment in Croatia cannot be expected to reach that number of employees earlier than 2065, that is, in 46 years.

To fully elucidate employment in the Croatian hotel industry, a brief descriptive statistics analysis was made for the period 1967-2019 (see Table 2).

Table 2. Descriptive statistics of employment (NE) in the Croatian hotel industry, 1967-2019 (in '000)

	<i>NE</i>
MEAN case 1-53	78679
MEDIAN case 1-53	81175
SD case 1-53	19984
VALID_N case 1-53	53
SUM case 1-53	4170007
MIN case 1-53	38572
MAX case 1-53	115000
_25th% case 1-53	65563
_75th% case 1-53	91430

Source: own

The average number of people employed in the hotel industry in the observed period is 78,679 (SD=19,984). The year 1967 saw the lowest number of employees (38,572) in the Croatian hotel industry. Even during the war years (1991-1995), the number of hotel industry employees never dropped below 50,000. The highest number (115,000 employees) was recorded in 2019. The first quartile comprises the years in which average annual employment in the hotel industry was less than 65,563 employees, and the last quartile, the years in which average annual employment in the hotel industry was more than 91,430 employees. In the remaining 50% of years, the average annual employment in the hotel industry ranges from 65,563 to 91,430 employees. The calculated median (M=81,175) indicates that the average number of employees was lower than 81,175 in the first half of the observed period, and higher than 81,175 in the second half. It is evident that employment in tourism is continuously growing and that tourism has a very important role in addressing the issue of unemployment.

Considering the seasonal character of business operations in the hotel industry, along with seasonal employment, this function of tourism is particularly important in countries with high unemployment rates. The importance of the hotel industry in addressing unemployment in Croatia is confirmed by the fact that, at the annual level, the number of unemployed persons in Croatia in August 2020 was higher by 32% or 36,870 people, and amounted to 151,368 people (<https://www.hzz.hr/statistika>). An illustrative example is provided by Montenegro where there were about 41,000 unemployed persons more in July 2020 than in July 2019. On 31 August 2020, the number of unemployed persons in Montenegro had grown to 43,065. Hit the hardest were the service, accommodation and catering sector which lost 12,254 employed persons, the trade sector in which the number of employed persons dropped by 7,785, and the administrative and auxiliary service sector, which lost 6,422 employed persons. The greatest increase in unemployment (<http://www.zzzcg.me>) was recorded in the popular tourist destinations Budva (-35.2%), Herceg Novi and Tivat (-29%). The main reason behind the increase in unemployment was the crisis caused by COVID-19, which dealt a strong blow to the tourism sector that is the dominant sector in the economies of both countries.

The following section of this scientific discussion explores the correlations among the number of employees (NE) in the Croatian hotel industry, the number of tourist arrivals (TA), the number of overnights (TO), the average number of overnights per arrival (ATO), and the number of beds (NB) in the period 1967-2019 (see Table 3).

Table 3. Correlation analysis

<i>Correlations (Turisti_model) Marked correlations are significant at $p < ,05000$ N=53 (Casewise deletion of missing data)</i>							
	<i>Means</i>	<i>Std.Dev.</i>	<i>TA</i>	<i>TO</i>	<i>ATO</i>	<i>NB</i>	<i>NE</i>
TA	8308,21	3993,15	1,000000	0,963031	-0,324289	0,930593	0,884264
TO	47596,09	19956,53	0,963031	1,000000	-0,072250	0,878013	0,924966
ATO	5,82	0,60	-0,324289	-0,072250	1,000000	-0,425840	-0,131731
TB	762,64	209,08	0,930593	0,878013	-0,425840	1,000000	0,922977
NE	78679,38	19984,03	0,884264	0,924966	-0,131731	0,922977	1,000000

Source: own

It is apparent from the data in Table 3 that there is a strong positive correlation ($r \geq 0.87$; $p < 0.05$) between the number of tourist arrivals, number of overnights, and number of beds, on the one hand, and the number of hotel industry employees, on the other, as well as a moderate negative correlation between the average number of overnights per arrivals and the number of hotel industry employees. Based on the results of correlation analysis, the trial-and-error method was applied in an attempt to construct a suitable econometric model to estimate employment in the hotel industry. Table 4 presents the outcome of regression analysis that resulted in a conclusive multiple regression model.

Table 4. Results of regression analysis

<i>Regression Summary for Dependent Variable: BZ (Turisti_model) R= ,96710552 R²= ,93529308 Adjusted R²= ,93270481 F(2,50)=361,36 p</i>						
	<i>b*</i>	<i>Std.Err. - of b*</i>	<i>b</i>	<i>Std.Err. - of b</i>	<i>t(50)</i>	<i>p-value</i>
Intercept			-60804,5	9395,366	-6,47176	0,000000
ATO	0,319191	0,039759	10703,7	1333,287	8,02808	0,000000
NB	1,058901	0,039759	101,2	3,800	26,63280	0,000000

Source: own

Based on the data in Table 4, a multiple regression analysis model to estimate the number of persons employed in the Croatia hotel industry can be written in the following form:

$$BZ = -60,804.5 + 10,703.7 ATO + 101.2 NB \quad (1)$$

The estimation of the average number of employees in the Croatian hotel industry by 2030 is based on the following assumptions: 1) the number of beds will continue to grow at an average annual rate of 2.52%, as recorded in the observed period 1967-2019; and 2) the downward trend in the average number of overnights per arrival, witnessed since 2001, will continue into the future period at the same average annual rate of 0.988%. Both assumptions seem realistic as they are based on identified trends and on ever greater investment into the hotel industry, particularly into the construction of new hotels and hotel capacities. A forecast of the number of employees in the Croatian hotel industry by 2030 was made based on the above assumptions (see Table 5).

The data in Table 5 show that the number of persons directly employed in the Croatian hotel industry will amount to 158,470, or it can be said with 95% confidence that direct employment in the Croatian hotel industry will range between 151,443 and 165,498 employees in 2030. Regarding the forecast based on the extrapolation of trends in Figure 4, the estimated number of employees in the Croatia hotel industry would amount to 131,971 in 2030. This estimate can be considered the pessimistic version of the forecast number of Croatian hotel industry employees.

Table 5. Forecast of the number of employees in the Croatian hotel industry by 2030

<i>Predicting Values for (Turisti_model) variable: BZ</i>			
	<i>b-Weight</i>	<i>Value</i>	<i>b-Weight - * Value</i>
ATO	10703,74	4,080	43671,3
NB	101,21	1735,000	175603,7
Intercept			-60804,5
Predicted			158470,4
-95,0%CL			151442,5
+95,0%CL			165498,3

Source: own

In accordance with the above and based on the estimations (Pupavac & Pupavac, 2018) that for every two workers employed in the Croatian hotel industry there is one seasonal worker and that for every employee in the hotel industry there are 2.5 workers in hotel industry-related jobs, it can be estimated that in 2030 the Croatian hotel industry will need 79,235 seasonal workers and that the total (direct and indirect) contribution of the hotel industry to employment will amount to 554,645 employed persons.

CONCLUSION

The hotel industry is a dynamic economic activity in which Croatia and Montenegro possess many competitive advantages. The importance of the hotel industry for the economy of both countries is underlined by the high share of hotel industry employees in total employment as well as by the significant number of people gaining income from the hotel industry without being formally/legally employed. In recent times, the hotel industry has generated one in four new jobs in the global economy, thus becoming a vital factor in addressing the issue of unemployment. With the construction of new hotel accommodation facilities and the expansion of existing ones, the number of employees in the hotel industries of Croatia and Montenegro could grow considerably in the future. This is an important fact considering that the effect of the hotel industry on employment is felt beyond the boundaries of the hotel industry itself. In addition to its direct contribution to employment, the hotel industry strongly affects indirect employment in related activities.

The fragility of the hotel industry is evident in times of crises, such as the most recent one caused by the COVID-19 virus, which can have devastating effects on global, regional and national hotel industries but which are generally short-lived. The hotel industries of Croatia and Montenegro have demonstrated their resilience and vigor by surviving, growing and developing despite energy-related, economic, political, military, financial, and other crises. In the aftermath of crises, the hotel industry rebounds, recovering quickly and powerfully, to once again assume its vital role in the global economy and in many national economies.

The potential of the hotel industry to increase employment in Croatia and Montenegro has not been fully harnessed due to the low share of hotels in the countries' accommodation capacities. Namely, hotels are major generators of employment in the hotel industry, and a higher share of hotels in accommodation capacities results in greater quality, higher employment, and lower average number of overnights per tourist arrival. Accordingly, a suitable econometric model was developed, which forecasts that employment in the Croatian hotel industry will continue to grow by an estimated 47.4% by 2030, while the share of the hotel industry in total employment will also continue to increase. The contribution of tourism to total employment by 2030 is estimated at 554,645 jobs.

LITERATURE

- Baum, T. et al (2016), "Sustainability and the Tourism and Hospitality Workforce: A Thematic Analysis", *Sustainability*, Vol. 8, No. 8, 809; <https://doi.org/10.3390/su8080809>.
- Beneki, C. et al. (2016), "How to stimulate employment growth in the Greek hotel industry", *Tourism Economics*, Vol. 22, Issue 5, pp 865-883.
- Bickert, M., Göler, D., Lehmeier H. (2011), "Coastal Tourism in Montenegro – Economic Dynamics, Spatial Developments and Future Perspectives", *Croatian Geographical Bulletin*, Vol. 73, No. 1, pp. 165–180 (in Croatian).
- Blazevic, B., Maskarin Ribaric, H., Smolcic Jurdana, D. (2013), "The Analytical Base for Management of Sustainable Tourism", *Economic Review*, Vol. 64, No. 2, pp. 143-158 (in Croatian).
- Cerovic, Z., Pavia, N., Galicic, V. (2005.), *Organization and categorization of hospitality object*, University of Rijeka, Faculty of Tourism and Hospitality Management (in Croatian).
- Cicvaric, A. (1990), *Tourism Economics*, Samobor, Zagreb (in Croatian).
- Darabos, E., Konyves, E. (2015), "Significance of Tourism in Economy of the EU's Member States, Particularly Concerning the Employment", *Annals of the University of Oradea*, Vol. 1, No. 1, pp. 689 - 695.
- Draskovic, V., Pupavac, J., Delibasic, M., Koltun, L. (2021), "Employment in Croatia: Insights into the past and the future", *Journal of International Studies*, Vol. 14, No. 1, pp. 117-128. doi:10.14254/2071-8330.2021/14-1/8.
- Croatian Bureau of Statistics, *Statistical Yearbook*, different years, ec.europa.eu/eurostat
- Galicic, V., Laskarin, M. (2016), *Principle and practice of tourism and hotel industry*, University of Rijeka, Faculty of Tourism and Hospitality Management 8in Croatian).
- Global Economic Impact & Trends 2020*, <https://knoema.com/WTTC2019/world-travel-and-tourism-council-data>, access: 11.09.2020).
- Kaliappen, N., Suan, C.L., Almutairi, S.S., Almutairi, M.A. (2019), "Strategic management role in boosting hotel performance", *Polish Journal of Management Studies*, Vol. 20, No. 1, pp. 223-242.
- Kostynets, I., Kostynets, V., Baranov V. (2020), „Pent-up demand effect at the tourist market”, *Economics and Sociology*, Vol. 13, No. 2, pp. 279-288. doi: 10.14254/2071-789X.2020/13-2/18.
- Kot, S., Kozicka, K. (2018), "Supply chain management evidence from tourism industry in Greece", *Journal of Environmental Management and Tourism*, Vol. 9, No. 4, pp. 683-693.
- McGinley, S., Hanks, L., Line, N.D. (2017), "Constraints to attracting new hotel workers: A study on industrial recruitment", *International Journal of Hospitality Management*, Vol. 60, pp. 114-122.
- Mildner, K. (2009), "Der westliche Balkan in den Fängen der Finanzkrise". *Südosteuropa-Mitteilungen*, Vol. 1, pp. 6-15.
- Mura, L., Kljucnikov, A. (2018), "Small Businesses in Rural Tourism and Agrotourism: Study from Slovakia". *Economics and Sociology*, Vol. 11, No. 3, pp. 286-300. doi:10.14254/2071-789X.2018/11-3/17.
- Obadic, A., Pehar, L. (2016), "Employment, Capital ana Seasonality in Selected Mediterranean Countries", *International Review of Economics & Business*, Vol 19, Special Conference Issue, pp, 43-58.
- Pavlic, I., Suman Tolic, M., Svilokos, T. (2014), *Impact of Tourism on the Employment in Croatia, Recent Advances in Business Management and Marketing*, <http://www.wseas.us/e-library/conferences/2013/Dubrovnik/MATREFC/MATREFC-34.pdf>
- Pupavac, J., Pupavac, D. (2018), "Tourism – the factor of employment sustainability in croatian economy", *Proceedings of Papers ITISE 2018*, Valenzuela, O., Rojas, F., Pomares, H. & Rojas, I. (ed.), Granada, pp. 362-372.
- Radjenovic, M., Draskovic, M., Pupavac, J. (2020), "Analysis of the Southeastern European Countries' Cultural and Creative Tourism Competitiveness", *Transformations in Business & Economics*, Vol. 19, No 2 (50), pp. 259-270.
- Resetar, M., Ceh Casni, A. (2014), "Forecasting Level of Employment in Tourist Accommodation Section for Selected EU Countries Using Smoothing Models", *Proceedings of the Faculty of Economics in Zagreb*, Vol. 12, No. 2, pp. 39-54.
- Skare, M., Kukurin, Z. (2020), "Measuring the Effects of VAT Changes on the Tourism Industry: the Case of Croatia", *Transformations in Business & Economics*, Vol. 19, No 2 (50), pp. 271-282.

- Stricker, L., Baruffini, M. (2020), "Impact of labour market liberalisation on minimum wage effects: The case of the construction sector in a small open economy", *Entrepreneurial Business and Economics Review*, Vol. 8, No. 3, pp. 155-174. doi:10.15678/EBER.2020.08
- Szymanik, E. (2020), "Greece's economy during the crisis 2007-2008 and its development prospects", *International Entrepreneurship Review*, Vol. 6, No. 4, pp. 7-19. doi:10.15678/IER.2020.0604.01
- Van der Schyff, T., Meyer, D., Ferreira, L. (2019), "An analysis of impact of the tourism sector as a viable response to South Africa's growth and development challenges", *Journal of International Studies*, Vol. 12, No. 1, pp. 168-183. doi:10.14254/2071-8330.2019/12-1/11



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Citation:

Rivero, R.A.B., Ramirez, M.A.N., Garcia, I.G.E. (2022), "Volatility and Growth: The Role of Bank Financing in Bolivia", *Montenegrin Journal of Economics*, Vol. 18, No. 3, pp. 35-56.

Volatility and Growth: The Role of Bank Financing in Bolivia

ROGER ALEJANDRO BANEGAS RIVERO¹, MARCO ALBERTO NÚÑEZ RAMÍREZ²
and IRMA GUADALUPE ESPARZA GARCÍA³,

¹ Professor, Department of Economics, Universidad Autónoma Gabriel René Moreno, Santa Cruz de la Sierra, Bolivia
e-mail: rbanegas@uagrm.edu.bo, <https://orcid.org/0000-0002-3841-786X>

² Professor, Department of Management, Instituto Tecnológico de Sonora, Ciudad Obregón, Mexico.
e-mail: marco.nunez@itson.edu.mx, <https://orcid.org/0000-0001-5825-4482>

³ Professor, Department of Management, Instituto Tecnológico de Sonora, Ciudad Obregón, Mexico.
e-mail: iesparza@itson.edu.mx, <https://orcid.org/0000-0002-3715-0761>

ARTICLE INFO

Received November 24, 2021
Revised from December 21 2021
Accepted January 21, 2022
Available online July 15, 2022

JEL classification: G10, G21

DOI: 10.14254/1800-5845/2022.18-3.3

Keywords:

Credit Volatility,
saving-Investment,
Economic Growth,
Fluctuations

ABSTRACT

The main purpose of the paper is to explain the propagation mechanisms from the credit volatility of banking system. For this, two questions are offered: What determines credit volatility? How does the volatility of bank system affect economic growth? The emphasis is given to a measure of variability of bank credit to the private sector, with differentiated effects between short and long term, by an estimate of one vector corrector error model (VCEM) for the period 1965-2017, based on the Bolivian economy. The results reveal the relevance of aggregate investment as a determinant of credit volatility, since it explains about 1/4 of the variance of bank financing. Therefore, for the first question, the aggregated investment and domestic savings cause credit volatility. Through the approach of one shock of credit volatility, negative fluctuations are generated on the level of savings up to -4%, investment (-3, -5%), trade opening (-2, -3%) and economic growth, between -1 and -5% from the second year to the mid-horizon. Likewise, the disturbances of the volatility in the credit supply could explain about 25% of the variance of economic growth in the medium time horizon, highlighting the importance in the role of bank financing in Bolivia.

INTRODUCTION

At the beginning of the 20th century, the importance of financial development based on credit, risk, uncertainty, and its role in the economy was emphasized (Veblen, 2005; Knight, 1921, Schumpeter, 1967). More recently, the relevance of linking financial market shocks, their amplifications and propagation mechanisms on the real sector was focused on (Nakatani, 2019; Daly, 1999; Bernanke et al., 1999). In addition, the literature raises two related debates: first, the role of financial development (depth) on macroeconomic aggregates; and second, how volatility or the incidence of financial fragility

(Minsky, 1982; 1996) can generate adverse effects on aggregate fluctuations (Loayza and Ranciere, 2002).

On the other hand, one of the macro-aggregate variables, of greater emphasis in the study is economic growth, therefore, it is evidenced that domestic credit and financial volatility—measured as a standard deviation of financing to the private sector—has a direct and negative impact on economic growth, both for a sample of countries (Rajan and Zingales, 1998) and at the sectoral level (industries).

Since seminal papers that have addressed the relationship between financial deepening and economic growth King and Levine (1993a, 1993b), the debate between the role of the financial system and economic growth has been exacerbated; on the one hand, a positive relationship is found (Levine, 1997; Levine, and Zervos, 1998; Denizer et al., 2000; Khan, and Senhadji, 2000; Jahfer, and Inoue, 2014), others negatively (De Gregorio and Guidotti, 1992), concluding that there is no clear evidence that financial development leads to economic growth (Venegas, and Rodríguez, 2014) or that the relationship between financial structure and economic growth is not yet clear and determined (Zhang et al., 2020).

In accordance with the above, this document seeks to answer the following questions: *What determines credit volatility? How does the volatility of bank financing affect economic growth?* In order to respond to these questions, the focus is on the main effect on economic growth and its propagation mechanisms: *savings, investment and trade openness*. In this sense, the main objective of this research is to explain the propagation mechanism of a *credit volatility shock*, with the main emphasis on economic growth; likewise, the factors that move or determine credit volatility are pointed out.

Thus, this empirical research aims to expand previous analyses, which have been oriented towards developed economies; in this context, for emerging economies (Bolivia). For this purpose, annual information is considered for the period 1965-2013 with a long-term approach (Vector with Error Corrector, VECM). The relevance of the considered period is based on the fact that in the 1960s, it was a relevant starting point for the authorization of the entry of several national banks (ASFI, 2003), for example: Banco de Crédito de Oruro (1960), Banco de Cochabamba (1962), Banco Industrial S.A. (1963), Banco Santa Cruz (1966). Consequently, the remainder of this document is structured in three sections: the first section presents the theoretical foundation; the second one presents a review of the state of the art and financial context; the third section defines the applied data, methodology, results and their respective discussion; and finally, the general conclusions.

1. THEORETICAL FOUNDATION

Based on the financial framework that accelerates the economy, it is hypothesized that credit market developments amplify and propagate shocks in the economy (Bernanke et al., 1999). Agency theory is a field of organizational theory that addresses two types of problems related to information availability (asymmetry) and risk perspectives among principals (directors) and agents (managers, executives, administrators) in organizations (Eisenhard, 1989). There are two types of agency types: the positivist and the principal-agent theory. The positivist proposal is that performance-based contracts reduce agent (manager) opportunism, as well as information systems are an important source for controlling agent opportunism. The principal-agent theory indicates that the contract is more efficient in scenarios of uncertainty, risk aversion and information. In these approaches, the first one is the importance of information, which must be used in order to control the agents. The second contribution is focused on the issue of risk, the implication is that uncertainty must be accepted within the contract (behavioral contract-based or results contract-based) between the principal and the agent. The subsequent challenge for researchers will focus on analyzing mediating variables (information systems, uncertainty of outcomes, and risk) in order to make further contributions to organizational research (there is little empirical work on this topic).

Now then, how does the agents and principals approach apply to the theoretical accelerator framework of financing? The first is based on the fact that the banking system or the general financial system possesses information (agents), that the rest of the population does not possess in terms of principals, macroeconomic evaluation, behavior of the fiscal, real, monetary-financial sector, expectations of future

growth, internal and external shocks, etc.; consequently, it can take measures to direct the credit supply. The lack of knowledge among the population and loan borrowers, by distorting the variability of financing, leads to an imbalance between planned and executed investments, which has a negative impact on consumption and investment levels, slowing down real output as a negative effect. What is usually mentioned in the theory of accelerator financing is associated to the problem of agents and principals in the credit market, whereby loan borrowers or borrowers of funds do not consider opportunistic actions and behaviors of the entities that offer financial resources for the granting of credit, such as the rationalization of credit, contract tightening and unexpected changes in credit policies based on expectations of economic growth or future shocks that may affect the economy.

The theoretical argumentation of agents and principals is based on Bernanke and Gertler (1989), while the main justification of the addressed topic focuses on the relationship between variability of bank financing, its role on investment under asymmetric information, and the propagation mechanisms among aggregate fluctuations. Subsequently, the following central hypothesis is generated: *the greater the volatility in the credit supply of the banking system, the greater the aggregate future fluctuations on the level of investment, trade openness and savings as propagation mechanisms; therefore, the relationship is negative on economic growth: interpreted as a contractionary shock in a generalized way:*

\uparrow Credit volatility shock \rightarrow \downarrow Investment \rightarrow \downarrow Trade Openness \rightarrow \downarrow Domestic savings \rightarrow \downarrow Economic Growth.

The established hypothesis is based on the premise that *shocks* in the credit supply or financial sector can affect the economy as sources of economic fluctuations, therefore, it is interpreted that microeconomic relocation of financial resources can generate macroeconomic results (Khan and Thomas, 2013), as well as the role of credit cycles and their propagation shocks (Azariadis et al., 2015; Kiyotaki, and Moore, 1997). On the other hand, in line with the *Minsky moment* approach, the credit cycle is also related to economic activity, but this time, it is adapted to domestic savings and trade flows:

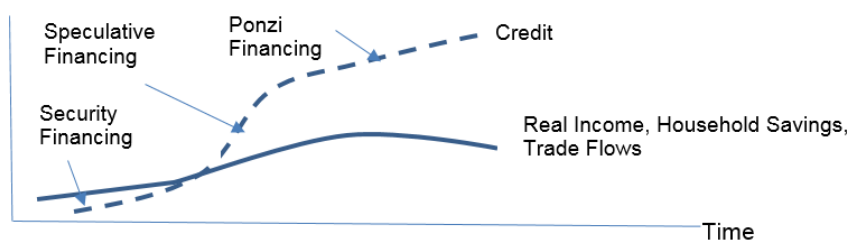


Figure 1. Minsky Momentum adapted to income and financial flows

Consequently, when the growth of real economic activity, domestic savings or trade flows is higher than the path of credit expansion, it is interpreted as security financing; when it is slightly higher, it is speculative financing; finally, when credit expansion is higher than income flows, it is considered a Ponzi financing mechanism.

2. REVIEW OF FINANCIAL DEVELOPMENT AND ITS VOLATILITY, EVIDENCE FOR GROWTH IN LATIN AMERICA AND BOLIVIA

In the case of Latin America: Argentina, Brazil, Chile, Colombia, México, Uruguay and Venezuela for the period of 1990-2011, it was concluded that the first principal component (construct) of certain financial variables such as Bank deposits, cash and cash equivalents, equity capitalization market, central bank assets and financial system deposits, as a proportion of GDP. did not have a consistent and significant impact on economic growth (variation in per capita income) (Venegas, and Rodríguez, 2014).

On the contrary, the role of financial development during 1980 to 2007 was highlighted based on panel data in four countries (Argentina, Peru, Bolivia and Brazil) Financial development is., together with the relevance of macroeconomic stability (e.g. low inflation rates), and the institutional framework (cen-

tral bank independence, fiscal responsibility and deregulation of financial markets); likewise, it was also considered that the financial sector measure M2, which includes liquid assets as a proportion of GDP, has a positive impact on economic growth (Bittencourt, 2012). During 1996-2011, there is negative evidence between financial depth and sectoral economic growth, non-linear relationship, positive incidence in sectors of nine Latin American countries (finance, insurance, public sector) and negative incidence in the construction sector (Aizenman et al., 2015). Also, De Gregorio and Guidotti (1992) examine the relationship between economic growth and degree of financial development, using panel data for Latin America; their results indicate that there is a negative relationship. Similarly, it shows that 1% in the frequency of six types of crises, including financial crises (threshold criteria, 15% in currencies, 20% in inflation, bank failures) presented a negative association in 49% in economic growth for Latin American countries during the period of 1955-2014 (Reinhart and Reinhart, 2015). Consequently, it is evident that uncertainty and credit restrictions negatively affect the investment cycle, both in the short and long term; therefore, the variability of bank financing has a negative impact on economic growth, based on estimates for 21 countries during the period 1960 – 2000 (Aghion et al., 2010).

In the case of financial development in Bolivia, the economic history of credit volatility indicates that its periods of greater volatility, low or high financing in relation to the average, were reflected in the mid-80s (public debt crisis and hyperinflation), mid 90s, and since 2013 (credit financing of social housing) according to Figure 2, which shows a possible negative relationship between the variability of bank financing and economic growth (Figure 3).

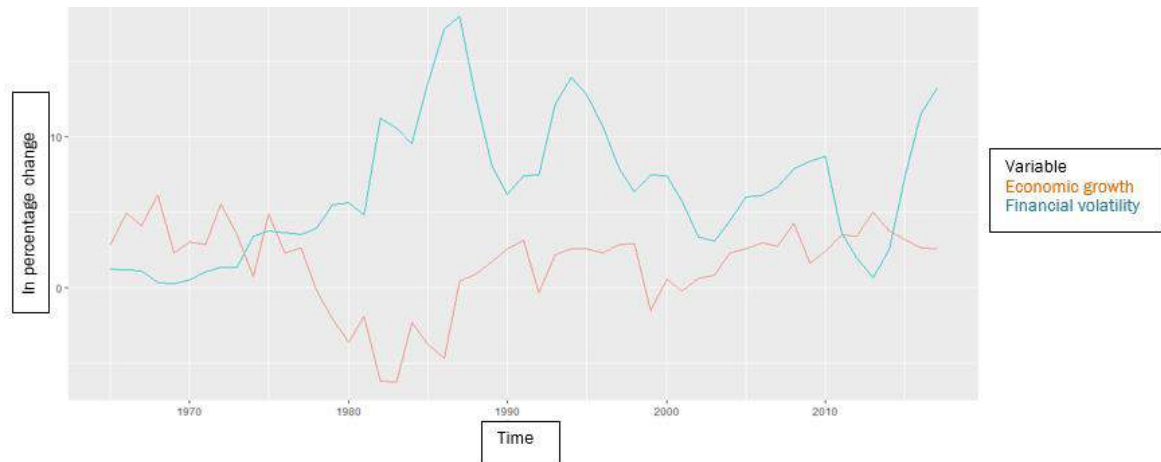


Figure 2. Credit volatility and economic growth in Bolivia 1965-2017

Source: World Bank data

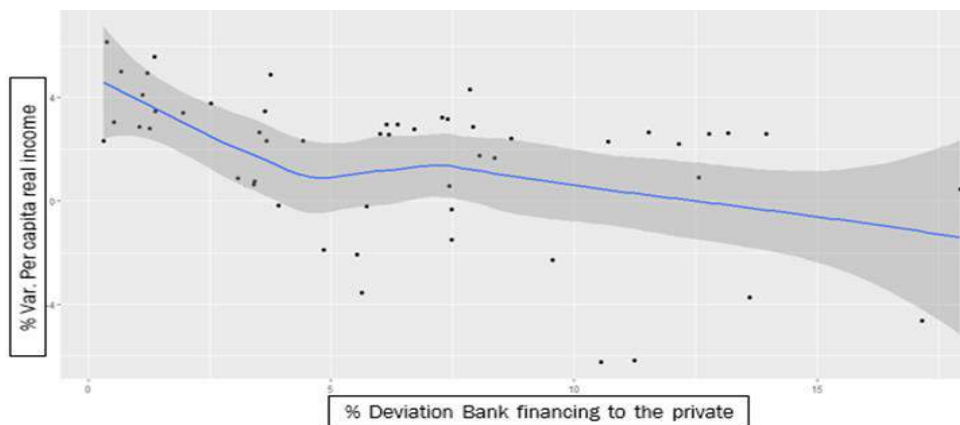


Figure 3. Scatter plot between credit volatility and economic growth in Bolivia, 1965-2017

Source: World Bank data.

In sum, based on the scatter plot presented in Figure 3, one would expect a negative relationship between the variability of bank financing to the private sector, as a *proxy* variable for credit volatility, and the variation in real per capita income.

3. ESTIMATION AND DISCUSSION OF RESULTS - DATA AND METHODOLOGY

From World Bank data, annual information was obtained from 1960 to 2017. To calculate the measure of financial volatility, a dynamic standard deviation was considered for a period of every five years:

$$VolCredit_t = \sigma_{credit_t} = \sqrt{\frac{(CBSP_t - \mu)^2}{n-1}} \quad (1)$$

Where *CBSP* denotes bank financing to the private sector (as a percentage of GDP) and μ represents the representative average of the entire full sample: the moving standard deviation considered every five periods (moving window), the final adjusted sample contemplated 52 years of evaluation: 1965-2017 (the first five observations were lost). Likewise, a vector of endogenous variables (Z_t) was considered, consisting of credit volatility ($VolCredit_t$), domestic savings as a percentage of GDP ($Dom.Saving./y_t$), aggregate investment as a percentage of GDP (public and private) ($Inv./y_t$), trade openness as a percentage of GDP, which is a ratio of exports and imports ($Trade Openn./y$), and economic growth, which is measured and operationalized by real per capita income ($GDPpC_t$);

$$Z_t = \{VolCredit_t, Dom.Saving./y_t, Inv./y_t, Trade Opp/y_t, GDPpC_t\} \quad (2)$$

All variables, except credit volatility, were expressed in logarithmic scale; equally, all variables were assumed to be $I(1)$ (Annex 1). The size of the VECM vector was $p - 1$ lags, compared to an Autoregressive Vector VAR model ($p=lags$) with stationary variables (Annex 2). In this sense, a Vector Error Corrector Model (VECM) was estimated:

$$\Delta Z_t = \sum_{\ell=1}^{p-1} \Gamma(\ell) \Delta Z_{t-\ell} + \Pi(\hat{h}) Z_{\xi t-1} + \Phi(q) D_t + \epsilon_t \quad (3)$$

$$\text{Where } \Pi(\xi) = \alpha \gamma' \quad (4)$$

In (3), Γ and Π are unknown parameter matrices of $n \times n$ size, with an identical, independent, normally distributed error vector with zero mean and constant variance/non-singular covariance matrix (Ω): $\epsilon_t \sim N_{iid}(0, \Omega)$. The summation of coefficients $\Gamma(\ell)$ corresponds to the short-run dynamics, ℓ represents the number of lags; in addition, possible ξ number of long-run relationships [$\Pi(\hat{h})$] between the endogenous variables were incorporated, by means of the vector $\gamma = (1, \gamma_1, \gamma_2, \dots, \gamma_n)'$, and a vector of short-run adjustment speed coefficients $\alpha = (\alpha_1, \alpha_2, \dots, \alpha_n)'$, denoted in expression (4). Finally, D_t corresponds to q -pulse variables, of *dichotomous-Boolean* type in order to correct for anomalous disturbances not explained by the model. In such sense, weak exogeneity tests on the speed of fit coefficients for the five variables incorporated in the model were included, individually ($\alpha_i = 0 \forall i = 1, 2, \dots, 5$), under the null hypothesis that each variable did not respond to the discrepancy of the long-run relationship between the variables (weakly exogenous variable) (Banegas, and Vergara, 2014).

On the other hand, α and γ were determined under hypothesis testing of long-run relationships, if the existence of r cointegrated vectors and imposed restrictions, as stationary linear combinations between the variables is evidenced. In the multivariate cointegration methodology, the proposed approach by Johansen (1988; 1995), is followed to determine the number of independent cointegrating relationships (long run) between the endogenous variables that are part of the vector Z_t , equivalent to the rank Π , and r restrictions or cointegrated vectors (Lütkepohl et al., 2001). The hypotheses were evaluated:

$$H(r_0): rk(\Pi) = r_0 \text{ versus } \bar{H}(r_0): rk(\Pi) > r_0 \quad (5)$$

Λ

$H(r_0):rk(\Pi) = r_0$ versus $H(r_0 + 1):rk(\Pi) > r_0 + 1$

The hypothesis test (5) is performed using The Trace and Maximum eigenvalue:

$$LR_{traza}^0(r_0) = -T \sum_{j=r_0+1}^n \log(1 - \lambda_j) \quad (6)$$

$$LR_{max.aut}^0(r_0) = -T \log(1 - \lambda_{r_0+1}) \quad (7)$$

In this sense, Table 1 shows the four statistical moments¹ in the series used in a stationary sense². In this sense, *credit volatility* reflected the highest level of average variability compared to the other variables analyzed. On the other hand, the greatest dispersion in the data was found in the *percentage variation of investment and savings*; most of the variables presented a negative bias in the data, except for *credit volatility* (with a positive bias). Finally, there were heavy pointed tails with outliers in the variation of *real per capita income and household savings*. When evaluating the condition of normality in the data, it was found that three series present a normal distribution around their mean and standard deviation: the variation of investment, credit volatility and the percentage variation of trade openness. Conversely, the change in *real per capita income and the change in household savings* do not show a normal distribution.

Table 1. Descriptive Statistics

Economic Growth					
Statistics	% Var. Per Capita real income	% Var Inv/Y	Credit volatility	% Var. Dom. Sav./Y	% Var. Trade Openess/ Y
Media	0.95	0.53	6.60	0.51	0.31
Median	2.32	2.17	6.16	3.26	0.88
Maximum	5.57	47.38	17.95	25.59	22.69
Minimum	-17.00	-49.14	0.31	-53.79	-22.72
Stand. Dev.	3.82	18.79	4.46	17.07	9.60
Asymmetry	-2.34	-0.09	0.57	-1.06	-0.17
Kurtosis	10.73	2.92	2.67	4.26	3.24
Jarque-Bera	177.156***	0.08	3.06	13.25007***	0.36
Num. of years	52	52	52	52	52

*** Statistical significance level at 1%.

The *multivariate cointegration* methodology of Johansen (1988) was then used, performing an initial analysis by means of unit root tests, according to Dickey-Fuller-Augmented (DFA), thus showing that all the series were integrated of first order [I(1)] (Annex 1). Similarly, two long-run equations were determined:

$$\log GDPpC_t = \widehat{\gamma}_0 + \widehat{\gamma}_1 VolCredit_t + \widehat{\gamma}_2 \log \left(\frac{Dom.Saving}{Y} \right)_t + \widehat{\gamma}_3 \log \left(\frac{Trade Openn.}{y} \right)_t + u_t \quad (8)$$

$$\log \left(\frac{Inv.}{Y} \right)_t = \widehat{\gamma}_0' + \widehat{\gamma}_1' VolCredit_t + \widehat{\gamma}_2' \log \left(\frac{Dom.Saving}{Y} \right)_t + \widehat{\gamma}_3' \log \left(\frac{Trade Openn.}{y} \right)_t + u_t \quad (9)$$

In (8) and (9), the expression $\log GDPpC_t$ denotes real per capita income—in logarithmic version—as does investment as a ratio of GDP $\left[\log \left(\frac{Inv.}{Y} \right)_t \right]$; similarly, both variables are explained by credit volatility

¹ Time 1, measures of central tendency (mean and median); time 2, measures of dispersion (standard deviation, minimum, maximum); time 3, skewness; time 4, kurtosis).

² The mean, variance and auto-covariance are a constant and are independent of the period of analysis.

$(VolCredit_t)$; domestic savings as a percentage of GDP $\left[\log \left(\frac{Dom.Saving.}{Y} \right)_t \right]$ and Trade openness as a ratio of GDP $\left[\log \left(\frac{Trade Openn.}{y} \right)_t \right]$.

In addition, in (8) and (9), we obtain respectively a semi-elasticity parameter, interpreted as an absolute variation of one standard deviation in credit financing to the private sector, would exert a contraction on the percentage change of economic growth and a reduction on investment:

$$Dom.Saving./y_t, Inv./y_t, Trade Openn./y_t, GDPpC_t$$

$$\partial \log GDPpC / \partial VolCredit = \hat{\gamma}_1 < 0 \quad (10)$$

$$\partial \log \left(\frac{Inv.}{Y} \right) / \partial VolCredit = \hat{\gamma}_1' < 0 \quad (11)$$

The parameter γ_1 measures the relative change in the regressed variable [log (Real per capita income)] given an absolute change in the regressor (financial volatility). By the same time, the parameter γ_1' measures the relative change in the regressed variable [log (Inv./GDP)] given an absolute change in the regressor (credit volatility).

Correspondingly, from (10) and (11), the elasticity of ξ can be demonstrated through basic calculus:

Deriving (8) with respect to YpC_t :

$$\frac{\partial \log YpC_t}{\partial VolCredit_t} = \frac{1}{YpC_t} * \frac{\partial y_t}{\partial VolCredit_t} \quad (12)$$

$$\frac{\partial YpC_t}{\partial VolCredit_t} = \hat{\gamma}_1 YpC_t \quad (13)$$

Given that the elasticity is:

$$\xi_{LP,VolCredit-Growth} = \frac{\partial Y_t}{\partial X_t} * \frac{X}{Y} \quad (14)$$

Then, the Long-Term (LT) elasticity, *Credit Volatility-Economic Growth*, is obtained:

$$\xi_{LP,VolCredit-CGrowth} = \hat{\gamma}_1 GDPpC * \frac{VolCredit}{YpC} = \hat{\gamma}_1 * VolCredit \quad (15)$$

Similarly, we find the Long-Term (LT) elasticity, *Credit Volatility-Aggregate Investment/GDP*:

$$\xi_{LP,VolCredit-Inv./PIB} = \hat{\gamma}_1 \frac{Inv}{PIB} * \frac{VolCredit}{\frac{Inv}{PIB}} = \hat{\gamma}_1' * VolCredit \quad (16)$$

Table 2. Slope, semi-elasticity and elasticity of economic growth and investment to financial volatility, long-run against financial volatility, long term

Model	Equation	Slope { $\partial YpC / \partial CreditVol$ }	Semi-elasticity { $\partial \log YpC / \partial CreditVol$ }	Elasticity ($\xi_{CreditVol-Eco.Grow.}$) { $\partial YpC / \partial CreditVol * (CreditVol / YpC)$ }
Log-lin	$\log YpC_t = \gamma_0 + \gamma_1 VolCredit_t + \gamma_i \log Z_t + u_t$	$\gamma_1 YpC^*$	γ_1	$\gamma_1 VolCredit^*$
Z _t includes other explanatory variables, in this case Domestic Savings and Trade Openness as a proportion of GDP respectively.				
* It indicates the elasticity of economic growth as a function of credit volatility. In practice, when credit volatility values are not specified, it is very common to measure this elasticity with its average observed value.				
Model	Equation	Slope { $\partial Inv./Y / \partial CreditVol$ }	Semi-elasticity { $\partial \log Inv./Y / \partial CreditVol$ }	Elasticity ($\xi_{Credit.Vo.-Inv.}$) { $\partial Inv./Y / \partial CreditVol * (CreditVol / Inv./Y)$ }

Log-lin	$\text{Log}(\text{Inv.}/Y) = \gamma_0' + \gamma_1' \text{VolCredit } t + \gamma_i' \text{Log } Z_t + u_t$	$\gamma_1' \text{Inv}/Y^*$	γ_1'	$\gamma_1' \text{VolCredit}^*$
Z _t includes other explanatory variables, in this case Domestic Savings and Trade Openness as a proportion of GDP respectively.				
* It indicates the elasticity of investment as a function of credit volatility. In practice, when credit volatility values are not specified, it is very common to measure this elasticity with its average observed value.				

4. RESULTS

In this section, by applying a Vector Error Corrector Model (VECM), according to the methodology proposed by Johansen (1988; 1995), the long-run relationships between the variables considered are shown, with the respective calculation of elasticities, impulse-response functions (IRF), short-run causality and variance decomposition.

Long-Term Relationships

Consequently, two long-term relationships were determined (Annexes 3 and 4), where it was shown that credit volatility has a negative and statistically significant relationship with real per capita income (economic growth variable) and aggregate investment (Table 3).

Table 3. Long Run Relationships: Two cointegration equations

			Dependent variables	
			Log (Ingr. Per Cápita real)	Log (Inv. Agre/ PIB)
Constant	Coefficient	g_0	3.03***	-4.19***
	ee		1.01	1.10
	t		3.00	3.80
Credit Volatility	Coefficient	g_1	-0.05***	-0.06***
	ee		0.01	0.01
	t		-4.60	5.25
Log (Dom. Sav./Y)	Coefficient	g_2	-0.67***	-0.14
	ee		0.21	0.23
	t		-3.14	-0.60
Log (Trade Open./Y)	Coefficient	g_3	1.89***	0.76†
	ee		0.36	0.39
	t		5.24	1.62

Statistical significance level: at 1% ***; at 10% † of statistical significance.

Table 4. Long Run Elasticities resulting from Credit Volatility

Explanatory Variable: Credit Volatility	Parameters	Dependent variable	
		Economic Growth	Aggreg. Invest/GDP
Semi-elasticity	γ_1	-0.05***	-0.06***
Elasticity	ξ	-0.31***	-0.40***
Error Corrector (ST)	α	-0.08***	0.63***

ST: Short term. Significance level*** at 1%.

Consequently, according to Table 4, when estimating long-term elasticities for each positive or negative variability of 6.2%. This value corresponds to the historical average for the period 1965-2017, in financing to the private sector, economic growth contracts by 0.31% and aggregate investment is reduced by 0.4%, respectively. Other variables of interest reflect that in the long term, a higher level of

domestic savings would have different impacts on economic growth; for example, in the long term (there would be a decrease) as opposed to the short term (increase according to impulse-response functions); trade openness would have a positive and statistically significant effect on economic growth.

On the long run function side for aggregate investment/GDP, domestic savings would not influence the level of investment, according to Feldstein and Horioka (1980), therefore, international capital flows would play a relevant role; similarly, the level of trade openness presents a weakly significant impact on the level of investment (at 10% statistical significance). Similarly, in terms of the error correction mechanism, an increase in the term ratio with the related factors of economic growth would require an adjustment or reduction speed of 0.08% in the short term. As for aggregate investment, an increase in the long-run ratio would have an increase of 0.68% in the short run, thus diverging from its equilibrium value; both estimates at the 1% level of statistical significance. On the other hand, to evaluate the influence of long-term shocks and their incidence in the short term, the error correction mechanism is evaluated according to Table 5.

Table 5. Error-correcting mechanism in the short term - Weak exogeneity test

<i>Ho: The dependent variable does not respond to Long-Term (LT) discrepancies, therefore, the variable is weakly exogenous.</i>					
	<i>Dependent variable</i>				
	<i>Economic Growth</i>	<i>Var Inv %/Y</i>	<i>Credit Volatility</i>	<i>Var. Do. Sav. %/Y</i>	<i>Var. Trade Open. %/ Y</i>
<i>Ho:</i>	$\alpha_{11} = \alpha_{21} = 0$	$\alpha_{12} = \alpha_{22} = 0$	$\alpha_{13} = \alpha_{23} = 0$	$\alpha_{14} = \alpha_{24} = 0$	$\alpha_{15} = \alpha_{25} = 0$
$c^2(2)$	12.81***	15.02***	7.84**	1.63	0.40

Statistical significance level: *** at 1%; ** at 5%.

In this sense, and according to Table 5, domestic savings and trade openness are weakly exogenous in the short term; then, they do not respond to long-term dynamics and discrepancies. On the other hand, economic growth, aggregate investment and credit volatility show error correction mechanisms in the short term; therefore, long-term dynamics play an adjustment role in the short term. Finally, to provide methodological support for the estimates completed, various econometric specification tests were applied in the econometric modeling (Annexes 8-11). In this way, multivariate normal distribution test on the residuals, hypothesis of no autocorrelation, stability in the parameters and unit circle of inverse roots and hypothesis of no heteroscedasticity

Impulse-Response Functions (IRF)

In this section, the aim is to answer the factors that affect the variability of bank financing, as well as the implications of credit volatility shocks (quantifications) and their propagation mechanisms:

Credit volatility responses: Figure 4 shows that a positive shock of one standard deviation, equivalent to 1.16%, in aggregate investment, reduces credit volatility by up to 1.5%, just as positive innovations in aggregate supply decrease around 1% respectively; on the other hand, while trade openness can reduce variability in credit supply in the short horizon; however, in the medium horizon, volatility increases close to 1% given the possible presence and amplification of external shocks (in five years ahead); likewise, a positive shock of one standard deviation, equivalent to 1.21% in domestic savings can increase credit volatility by up to 0.5% over the medium horizon (dynamic and changing effects).

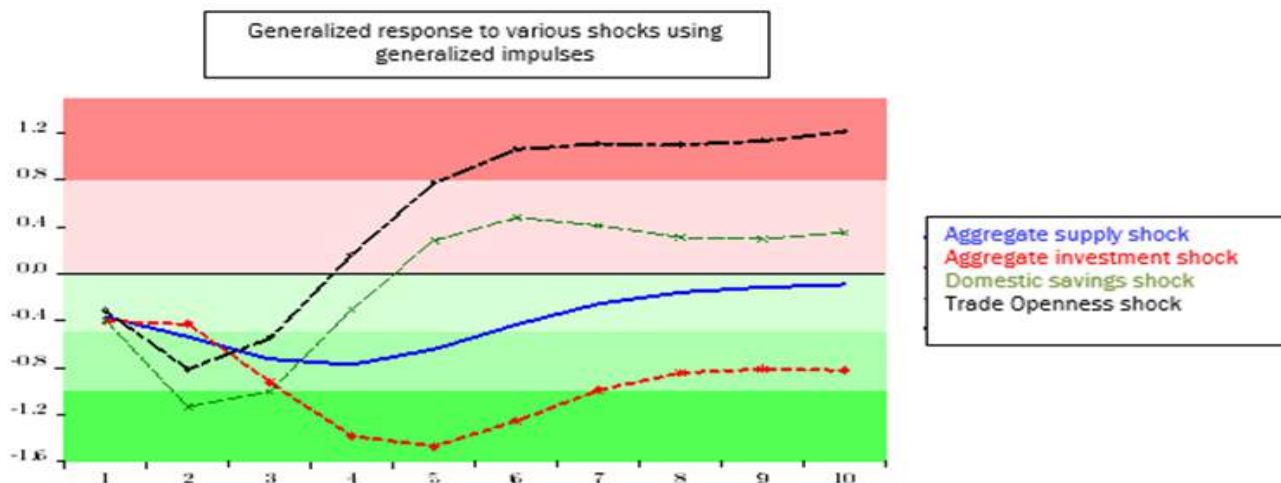


Figure 4. Responses to credit volatility (bank financing) - Impulse-Response Functions, in years forward
Below zero implies a reduction in volatility (green stripes); otherwise, an increase in volatility (pink stripes).
Source: Own estimates.

Propagation mechanisms: In a generalized manner, it is observed in accordance with the stated premise in the document that a *positive shock of one standard deviation, equivalent to 1% in credit volatility*, generates negative fluctuations in the macro-aggregates: -4% on domestic savings in the short term; contraction on aggregate investment between -3 and -5%, and trade openness (-2 and -3% respectively), with permanent effects according to Figure 5. Under the propagation interpretation, the most severe shocks are evidenced from the trade openness shock to domestic savings (positive response); from aggregate supply shocks to aggregate investment (investment accelerator role) and from the domestic savings shock (liquidity shock) to trade openness.

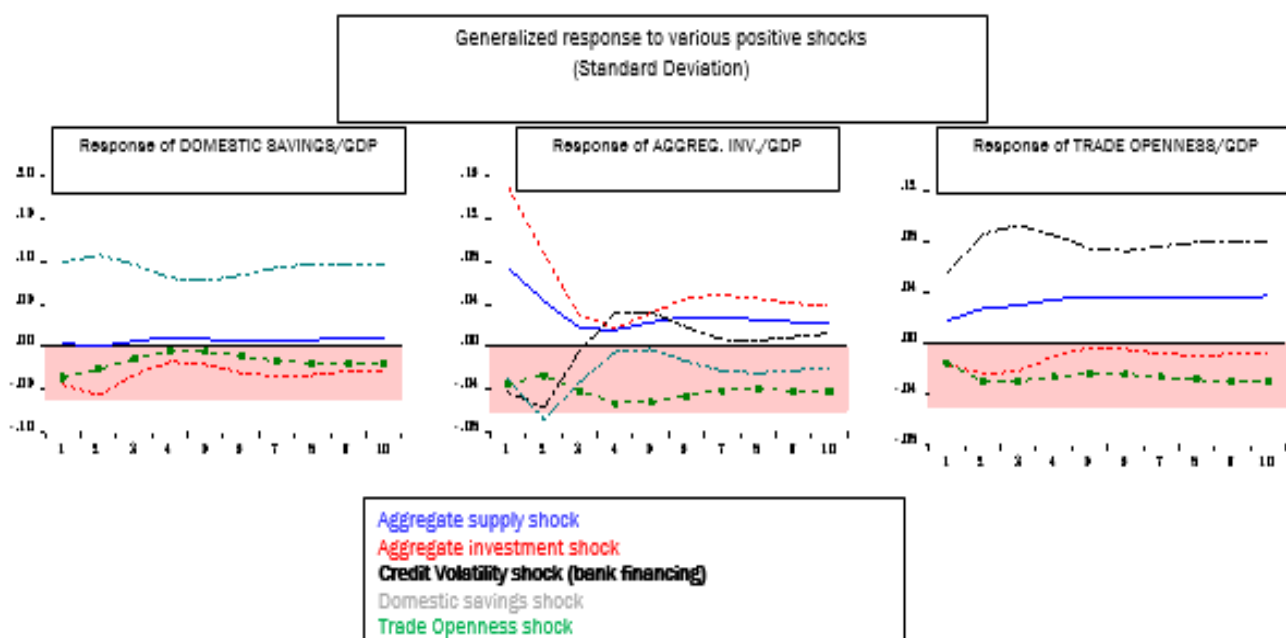


Figure 5. Propagation Mechanisms - Impulse - Response Functions, in years forward
Below zero implies negative responses (pink stripe).
Source: Own estimates

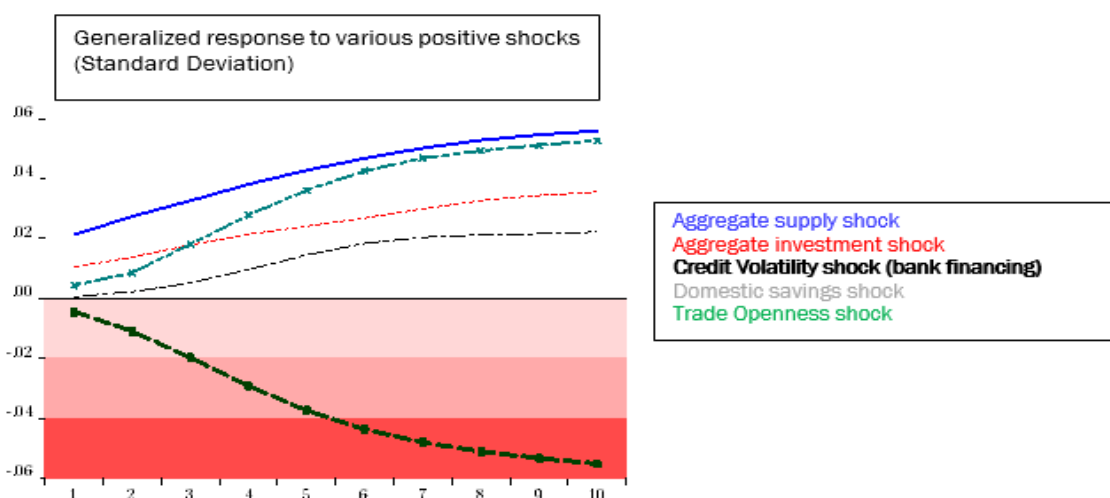


Figure 6. Economic growth responses- Impulse - Response Functions, in years forward

Below zero implies negative responses (pink stripe).

Responses of economic growth: According to Figure 6, economic growth responds positively to aggregate supply shocks, aggregate investment, domestic savings and trade openness, in a unidirectional manner, respectively.

On the other hand, credit volatility on the bank financing side is a decelerating factor of economic growth; therefore, a positive shock of one standard deviation, which is equivalent to 1%, in the volatility of bank financing affects negatively with greater emphasis from the second year onwards, in the order of -1 to -5% in the medium term.

Short-Term Causality and Variance Decomposition: In Granger's sense (Annex 5): there is empirical support that past dynamics of domestic savings and aggregate investment causes present credit volatility (at the 0.05 level of statistical significance); domestic savings cause aggregate investment (at the 0.05 level) and trade openness exerts short-run causality on economic growth (at the 0.01 level).

On the variance decomposition side (Annex 6), shocks to credit volatility, through bank financing, generate about 25% of the variance of economic growth over the medium horizon; in a similar magnitude, innovations in domestic savings generate variability on aggregate investment. Likewise, changes in investment and trade openness explain about 50% of the variance of credit volatility over the medium horizon; consequently, in the short term, from one to five years forward, the variance is explained by the same innovations in the variability of bank financing.

From a historical variance decomposition perspective (Annex 7), since the mid-1980s (reforms and structural adjustment measures), the stochastic component of Bolivia's economic growth was related to the dynamics of credit volatility and the role of aggregate investment; similarly, the historical variance in the random factor of credit volatility has been related to the dynamics of the role of investment. Finally, the trajectory of domestic savings has been synchronized, to a greater extent, with the dynamics of trade openness since the mid-1980s.

5. RESULTS DISCUSSION

As a schematization of the response of credit volatility, Figure 7 systematizes the sources of variation in bank financing due to different sources of fluctuations, in two-time horizons: 1) short, from 1 to 5 years, and 2) medium, greater than 5 years. When considering the approach that moves credit volatility, it is considered that fluctuations in savings and trade flows would be cyclical with effects in the medium horizon, in the interpretation of international contagion and would be transformed into sources of specu-

lative-Ponzi type financing, which would increase financial volatility in the medium horizon. For this type of analysis of the Bolivian economy, the adaptation of Minsky's approach allows to explain the increase in the volatility of bank financing as a complement to the empirical results obtained.

Credit Volatility	Time horizon	
	Short (1 - 5 years)	Medium (> 5 years)
<p style="color: red;">Increased variability (+)</p> <p style="color: red;">Speculative Financing-Ponzi</p>		<p style="color: red;">Trade flows</p> <p style="color: red;">Domestic savings</p>
<p style="color: green;">Decreased variability (-)</p> <p style="color: green;">Security Financing</p>	<p style="color: green;">Trade flows</p> <p style="color: green;">Domestic savings</p>	<p style="color: green;">Aggregate Investment</p> <p style="color: green;">Aggregate Supply</p>

Figure 7. Response of credit volatility in Bolivia to various types of fluctuations

Source: Own elaboration.

As for the sources of fluctuations that reduce the variability of bank financing, it was found that Aggregate Investment and Aggregate Supply, both in the short and medium term and interpreted as fluctuations, generate security financing with a reduction in credit volatility: trade flows and domestic savings reduce volatility in the short term, but amplify it in the medium term.

On the other hand, for the effect of bank financing volatility shocks, there is empirical support for the negative effect of credit volatility on aggregate fluctuations -main emphasis on economic growth- which is consistent with previous studies.

This negative role is interpreted given that the financial system, especially the banking system, presents asymmetries in the knowledge of information and economic expectations, which generates variability in the financing mechanisms, producing misalignments in the real production levels of the economy, in such a way that it has a negative impact on economic growth based on information from 1965 to 2013 for Bolivia.

Bolivia's economic and financial history has been linked to the opening and closing of public and private banks, with credit extension facilities by state banks (Morales and Sachs, 1987), loss absorption, forced bankruptcies in the 90s and credit contraction during the 80s and 90s, which has caused volatility in financing and has spread throughout the productive sector. An example is the Bolivian Agricultural Bank, with loans to the productive sector between 1972 and 1975, which generated irrecoverable losses for the State.

On the other hand, banks act with information asymmetry mechanisms that are not foreseen by investors and economic agents, and therefore, there are agency costs that are passed on to the economy as a whole (Bernanke and Gertler 1989; Carlstrom and Fuerst, 1997; Bernanke et al., 1999) The found results are congruent with previous results, based on the negative effects of the financial sector under conditions of volatility; therefore, the effects of the 2007 international financial crisis have shown that a temporary shock in the supply of credit contracts investment and affects the gradual deterioration of

output (Khan and Thomas, 2013). In short, the greater the credit volatility → ↓ investment → ↓ trade openness → ↓ domestic savings → ↓ economic growth as a virtuous circle.

Public policy implications

By demonstrating that credit volatility has a negative impact, with a propagation mechanism on economic growth, it is pointed out that volatility is a measure of variability around an average, so, high or lower values in relation to a measure of central tendency; in this sense, the credit supply of the financial system should be focused on a sustained smoothing.

First, excess levels above their central tendency measure, may cause over levels of indebtedness and depending on the economic deterioration, systematic risks for the financial sector increase (asset quality risks), which could cause imbalances, financial fragility and generate negative forward fluctuations, with the need for macro-prudential countercyclical policies (Madeira, 2018; Agénor and da Silva, 2017). For Chile, it was found that in situations of economic recessions, the probability of credit default increases by 30%, therefore, the index in bank delinquency in times of crisis is 400 times to the index in times of boom respectively (Madeira, 2018).

Second, lower thresholds below their central tendency measure can cause falls in investment, consumption and production, even generating negative expectations about the future dynamics of the economy. Similarly, the implications for public policies are centered on the debate about the regulation of financial markets versus their liberalization; that is, considering that volatility in the credit supply generates contractionary implications on macroeconomic aggregates, *policy makers* could direct the banking system to comply with specific goals of credit objectives and banking system participation or, alternatively, leave it to the market, under the motto "*laissez faire, laissez passer*" (*laissez faire, laissez passer*).

In conditions of free supply and competition in financial markets or the presence of competitive banking systems, free discretion could be a tentative response (*financial deregulation*); however, the banking system (e.g. Bolivia) is more oriented towards imperfect oligopolistic markets, with characteristics of market power. Consequently, in imperfect markets and in the presence of externalities, regulation is more inclined since it is potential in the presence of the phenomenon of agents and principals, where banks (agents) establish their credit guidelines based on the asymmetry in the information on economic growth expectations, for the granting of credit to borrowers or borrowers of funds (principals). In the end, public policy can focus on reducing variability (positive or negative), since in the short term, the variance of credit volatility is explained by its own innovations, with the perspective of avoiding the channeling of volatility as a measure of uncertainty that dissipates dynamically (forward) in the main variables of the economy: savings, investment, trade openness and growth.

Nevertheless, it should be noted that the cost of inducing a stable and softened credit policy for bank credit could lead to the risk of financial fragility on the financing side, especially speculative or Ponzi schemes, depending on the internal and external economic environment (Minsky, 1996). These schemes could be reduced in function of the composition of reserves for future credit supply, constituted in boom periods to be used in periods of deceleration or fall of the product, under a countercyclical approach (Agénor and da Silva, 2017), in such a way that bank financing is softened in a sustainable way.

Limitations and research agenda

Based on the present results for the case of a small open economy, the *role of credit cycles* is suggested for future research, according to firms or lenders, characteristics of loan contracts, bank risks and their different financing products. The above, in order to measure the level of synchronization with aggregate fluctuations (*procyclical, countercyclical and acyclical*), as well as the role of consumer credit confidence, the bi-directionality hypothesis between the relationship between financial market performance and investors' expectations respectively, and the role of the financial market as a source of credit risk (Greenwood et al., 2019; Azariadis et al., 2015; Liberti, and Sturgess, 2018).

There are other aspects pending evaluation, in accordance with Minsky's (1996) approach, which are considered as an explanatory agenda to explain the volatility of the banking system: profit rate, interest rate, exchange rate, as well as the level of public indebtedness of economic agents in Bolivia.

Finally, the question arises as to the interaction that would exist between the joint hypothesis of *double exchange-rate-credit volatility* and its implications in aggregate fluctuations since in Latin American countries, a strong relationship has been demonstrated between currency crises, costs of banking crises, productivity shocks and currency overvaluation as factors that explain losses in real output (Nakatani, 2019).

CONCLUSIONS

The decade of the 1960s is a period of openness to financial development in Bolivia; in this sense, two research questions were identified based on the period 1965-2017: the first one, related to the elements that determine credit volatility and the second one, related to the role of variability in bank financing and its dynamic effects.

First, it was found that the historical trend in aggregate investment and domestic savings exert causality on the variability in the supply of bank financing in the short term; aggregate investment evidence an explanation of close to 25% in the variance of credit volatility.

From an impulse-response approach, credit volatility is reduced in the face of positive dynamics in *aggregate supply* and *aggregate investment*; conversely, credit volatility increases in the face of positive shocks in trade openness, especially in the medium horizon (amplifications of external shocks). Therefore, changes in trade flows are the main source of credit volatility, followed by domestic savings, generating 1/3 of the increase in the variability of bank financing in the medium horizon.

To answer the second question of the document, the results indicate that a *positive shock* in credit volatility generates negative impacts on economic fluctuations such as domestic savings, up to -4% in the short term; negative and permanent implications on aggregate investment (-3.5%) and trade openness (-2.3%); therefore, the greatest impact is evidenced on economic growth, between -1 and -5%, from the second year onwards and after a credit volatility shock.

When estimating long-term elasticities, for every 6% increase in historical credit volatility, economic growth, it contracts by 0.3% and investment decreases by 0.4%, respectively.

Over the medium horizon, shocks in credit volatility, measured by bank financing, explain about 25% of the variance of economic growth, which is why financial system *shocks* are relevant. As a discussion and suggestion for public policies, it is proposed the smoothing of credit supply around stable paths of bank financing, controlling high and low fluctuations, as *proxy* measurements in the economic-financial uncertainty to avoid the generation of negative expectations by consumers and investors, which is in the debate of financial regulation versus free discretion.

Similarly, the critical point in the softening of bank financing should be oriented towards a context of hedged and sustainable financing, avoiding fragility with speculative or Ponzi-type financing (Minsky's hypothesis).

Finally, the magnitude and severity of bank financing volatility shocks reflect the relevance of the financial sector, especially in a context that generates negative fluctuations in the real economy.

REFERENCES

- Agénor, P., da Silva, L.P. (2017), "Cyclically adjusted provisions and financial stability", *Journal of Financial Stability*, Vol. 28, pp. 143–162.
- Aghion, P., Angeletos, G., Banerjee, A., Manova, K. (2010), "Volatility and growth: Credit constraints and the composition of investment", *Journal of Monetary Economics*, Vol. 57, No. 3, pp. 246–265.
- Aizenman, J., Jinjara, Y., Park, D. (2015), "Financial development and output growth in developing Asia and Latin America: A comparative sectoral analysis", *Working paper*, No. w20917, National Bureau of Economic Research, Cambridge, U.S., January.
- ASFI (2003), *LXXV años de regulación y supervisión financiera en Bolivia, 1928-1982. Ex Superintendencia de Bancos y Entidades Financieras de Bolivia* (In Spanish).

- Azariadis, C., Kaas, L., Wen, Y. (2015), "Self-fulfilling credit cycles", *The Review of Economic Studies*, Vol. 83, No. 4, 1364–1405.
- Banegas, R. A., Vergara, R. (2014), "Influencia y divergencia de choques de precios del petróleo en precios del gas natural: ¿Mecanismo unidireccional o canales de transmisión?, una estimación mediante vectores estructurales con corrector de errores (SVEC), 1992 (I)-2011 (IV)", *EconoQuantum*, Vol. 11, No. 1, 59–87 (In Spanish).
- Bernanke, B.S., Gertler, M., Gilchrist, S. (1999), "The financial accelerator in a quantitative business cycle framework". *Handbook of Macroeconomics*, Vol. 1, 1341–1393.
- Bernanke, B., Gertler, M. (1989), "Agency Costs, Net Worth, and Business Fluctuations", *The American Economic Review*, Vol. 79, No. 1, 14–31.
- Bittencourt, M. (2012), "Financial development and economic growth in Latin America: Is Schumpeter right?", *Journal of Policy Modeling*, Vol. 34, No. 3, 341–355.
- Carlstrom, C.T., Fuerst, T.S. (1997), "Agency Costs, Net Worth, and Business Fluctuations: A Computable General Equilibrium Analysis", *American Economic Review*, Vol. 87, No. 5, pp. 893–910.
- Daly, K. J. (1999), *Financial Volatility and Real Economic Activity*, Ashgate, England, United Kingdom.
- De Gregorio, J., Guidotti, P. E. (1992), "Financial Development and Economic Growth. International Monetary Fund", *Working paper*, No. 92/101, IMF, Washington, U.S.
- Denizer, C., Iyigun, M. F., Owen, A.L. (2000), "Finance and macroeconomic volatility", *Working paper*, No. 2487, World Bank, Washington.
- Eisenhardt, K.M. (1989), "Agency theory: An assessment and review", *Academy of Management Review*, Vol.14, No. 1, pp. 57–74.
- Feldstein, M., Horioka, C. (1980), "Domestic savings and international capital flows", *Economic Journal*, Vol. 90, No. 358, pp. 314–329.
- Fornari, F., Mele, A. (2013), "Financial volatility and economic activity", *Journal of Financial Management, Markets and Institutions*, Vol. 1, No. 2, pp. 155–198.
- Greenwood, R., Hanson, S.G., Jin, L.J. (2019), "Reflexivity in credit markets", *National Bureau of Economic Research*, No. w25747, Cambridge, MA, U.S., April.
- Jahfer, A., Inoue, T. (2014), "Financial development and economic growth: The role of stock market in Japan", *International Review of Business Research Papers*, Vol. 10, No. 2, pp. 46–61.
- Johansen, S. (1988), "Statistical analysis of cointegration vectors", *Journal of Economic Dynamics and Control*, Vol. 12, Issues 2-3, pp. 231–254.
- Johansen, S. (1995), *Likelihood-based inference in cointegrated vector autoregressive models*, Oxford University Press.
- Khan, M. S., Senhadji, A. (2000), "Financial development and economic growth: An overview", *IMF Working Paper*, No.00/209. International Monetary Fund", Washington.
- Khan, A., Thomas, J. (2013), "Credit shocks and aggregate fluctuations in an economy with production heterogeneity", *Journal of Political Economy*, Vol. 121, No. 6, pp. 1055-1107.
- King, R. G., Levine, R. (1993a), "Finance and growth: Schumpeter might be right", *The Quarterly Journal of Economics*, Vol. 108, Issue 3, pp. 717–737.
- King, R. G., Levine, R. (1993b), "Financial intermediation and economic development" in Mayer, C., Vives, X. (Ed.), *Capital Markets and Financial Intermediation*, Cambridge University Press, Cambridge, pp. 156–189.
- Kiyotaki, N., Moore, J. (1997), "Credit cycles", *Journal of Political Economy*, Vol. 105, No. 2, 211–248.
- Knight, F.H. (1921), *Risk, uncertainty and profit*, Houghton Mifflin, Boston.
- Levine, R. (1997), "Financial development and economic growth: views and agenda", *Journal of Economic Literature*, Vol. 35, No. 2, pp. 688–726.
- Levine, R., Zervos, S. (1998), "Stock markets, banks, and economic growth", *American Economic Review*, Vol. 88, No. 3, pp. 537–558.
- Liberti, J. M., Sturgess, J. (2018), "The anatomy of a credit supply shock: evidence from an internal credit market", *Journal of Financial and Quantitative Analysis*, Vol. 53, No. 2, 547–579.
- Loayza, N. V., Ranciere, R. (2006), "Financial development, financial fragility, and growth", *Journal of Money, Credit and Banking*, Vol. 38, No. 4, 1051–1076.
- Lütkepohl, H., Saikkonen, P., Trenkler, C. (2001), "Maximum eigenvalue versus trace tests for the cointegrating rank of a VAR process", *The Econometrics Journal*, Vol. 4, No. 2, 287–310.

- Madeira, C. (2018), "Explaining the cyclical volatility of consumer debt risk using a heterogeneous agents model: The case of Chile", *Journal of Financial Stability*, Vol. 39, pp. 209–220.
- Minsky Ph D, H. P. (1982), "The financial-instability hypothesis: capitalist processes and the behavior of the economy" in Kindleberger, C. P., Laffargue, J. (Ed.), *Financial Crises: Theory, History, and Policy*, Cambridge University Press, Cambridge, England, pp. 13-39.
- Minsky, H.P. (1996), "Uncertainty and the institutional structure of capitalist economies: Remarks upon receiving the Veblen-Commons award", *Journal of Economic Issues*, Vol. 30, No. 2, pp. 357-368.
- Morales, J. A., Sachs, J. (1987), "La crisis económica en Bolivia", *Working paper*, No. 08/87, Universidad Católica Boliviana, Instituto de Investigaciones Socio-Económicas (IISec), La Paz (In Spanish)
- Nakatani, R. (2019), "Output costs of currency crisis and banking crisis: Shocks, policies and cycles", *Comparative Economic Studies*, Vol. 61, No. 1, pp. 83–102.
- Rajan, R.G., Zingales, L. (1998), "Power in a Theory of the Firm", *The Quarterly Journal of Economics*, Vol. 113, Issue 2, 387–432.
- Reinhart, C.M., Reinhart, V. (2015), "Financial Crises, Development, and Growth: A Long-term Perspective", *The World Bank Economic Review*, Vol. 29, pp. S53–S76.
- Schumpeter, J. (1967), *The Theory of Economic Development: An inquiry into profits, capital, credit, interest, and the business cycle*, 4a ed., Fondo de Cultura Económica, México (In Spanish)
- Veblen, T. (2005), "The Theory of Business Enterprise". Cosimo, New York, U.S.
- Venegas, F., Rodríguez, A. (2014), *Is there a relationship between financial development and economic growth in Latin American countries with higher per capita GDP?*, *Aestimatio: The IEB International Journal of Finance*, No. 9, pp. 8–21 (In Spanish).
- Zhang, Y., Yao, D., Zhang, C. (2020), "Bank loan versus financial lease: how do traditional and innovative approaches within the banking sector influence economic growth? A comparative analysis between the US and China", *Applied Economics*, Vol. 52, Issue 40, pp. 4366–4383.

ANNEXES

Annex 1. Unit root test

Variable	Specification	At levels		Specification	First difference		Integration order
		t-statistics	Number of lags		t-statistics	Number of lags	
Log (Y per capita)	With direction	0.622689	1	With no direction	-5.342086***	0	I(1)
Log (Aggreg. Inv./Y)	With direction	-2.856146*	0	With no direction	-8.4411***	0	I(1)
Log (Dom. Sav./Y)	With direction	-2.272173	1	With no direction	-5.794377***	0	I(1)
Credit Volatility	With direction	-2.886246*	0	With no direction	-4.720801***	0	I(1)
Log (Trade Open./Y)	With direction	-1.747794	0	With no direction	-6.898409***	0	I(1)

*** Statistical significance level at 1%.

Annex 2. Selection criteria VECM: ($p - 1$)

Lag	LogL	LR	FPE	AIC	SC	HQ
1	103.13	NA	0.00	-3.19	-2.223889*	-2.822903*
2	132.61	46.92399*	2.43e-08*	-3.371875*	-1.44	-2.64
3	147.60	20.81	0.00	-2.96	-0.07	-1.86

* Indicates the order in which lags are selected

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Annex 3. Summary of cointegration specification, Johansen methodology (1988)

Selection at the 0.05* level, Number of cointegrating relationships per model					
Data tendency	None	None	Lineal	Lineal	Quadratic
Type of test	No intercept	Intercept	Intercept	Intercept	Intercept
	No tendency	No tendency	No tendency	With tendency	With tendency
Trace	2	2	1	1	1
Max. eigenvalue	3	2	1	1	1
*Critical values based on MacKinnon-Haug-Michelis (1999)					
Information criteria by range and model					
Data tendency	None	None	Lineal	Lineal	Quadratic
Range o	No intercept	Intercept	Intercept	Intercept	Intercept
No. of Ces	No tendency	No tendency	No tendency	With tendency	With tendency
Log of verosim. By Range (rows) and model (columns)					
0	140.03	140.03	148.85	148.85	149.94
1	157.54	164.62	172.25	172.83	173.88
2	173.55	180.76	185.61	187.86	188.91
3	183.34	190.75	191.59	196.49	196.65
4	185.63	193.07	193.07	198.24	198.25
5	185.66	193.48	193.48	198.85	198.85
AKAIKE information criterion By Range (rows) and model (columns)					
0	-4.51	-4.51	-4.66	-4.66	-4.51
1	-4.81	-5.04	-5.19	-5.17	-5.05
2	-5.04	-5.25	-5.32	-5.327714*	-5.25
3	-5.03	-5.21	-5.16	-5.23	-5.16
4	-4.73	-4.87	-4.83	-4.87	-4.83
5	-4.34	-4.45	-4.45	-4.46	-4.46
SCHWARZ information criteria by Range (rows) and model (columns)					
0	-3.56	-3.56	-3.52	-3.52	-3.18
1	-3.48	-3.680372*	-3.67	-3.62	-3.35
2	-3.34	-3.47	-3.42	-3.36	-3.17
3	-2.95	-3.01	-2.89	-2.85	-2.70
4	-2.27	-2.25	-2.17	-2.07	-1.99
5	-1.50	-1.42	-1.42	-1.24	-1.24

Annex 4. Cointegration tests: Trace and Maximum Eigenvalue

Adjusted sample: 1967-2017					
Number of observations: 51 years					
Trend assumption: Non-deterministic trend (constrained constant)					
Lagging intervals (in first difference): 1 a 1					
Rank test in irreconstrained cointegration, The Trace					
			5%		
N° of Coint. Ecu.	Eigenvalue	The Trace Stats.	Critical Value	Prob.**	
Ho: Existence of N° of long term relationships					
None *	0.62	106.90	76.97	0.00	
At most 1*	0.47	57.72	54.08	0.02	
At most 2	0.32	25.44	35.19	0.37	
At most 3	0.09	5.47	20.26	0.97	
At most 4	0.02	0.82	9.16	0.97	
The Trace test points out 2 Coint. equations at 5% of Stats Sign.					
*Denotes rejection of the null hypothesis at the 5% level.					
**Prob. according to values of MacKinnon-Haug-Michelis (1999)					
Rank test in irreconstrained cointegration, The Trace					
			5%		
N° of Coint. Ecu.	Eigenvalue	Max. Stats. Eigenvalue	Critical Value	Prob.**	
Ho: Existence of N° of long term relationships					
None *	0.618737	49.17754	34.80587	0.0005	

At most 1*	0.469003	32.28293	28.58808	0.0161	
At most 2	0.324045	19.97304	22.29962	0.1023	
At most 3	0.087054	4.645005	15.8921	0.9169	
At most 4	0.015981	0.821621	9.164546	0.9718	
The Maximum Eigenvalue test points out 2 Coint. Equations at 5% of Stats. Sign.					
*Denotes rejection of the null hypothesis at the 5% level.					
**Prob. according to values of MacKinnon-Haug-Michelis (1999)					

Annex 5. Short-term Causality in the Granger´s sense

Ho: The variable Δx_i does not cause Granger to variable Δy_i

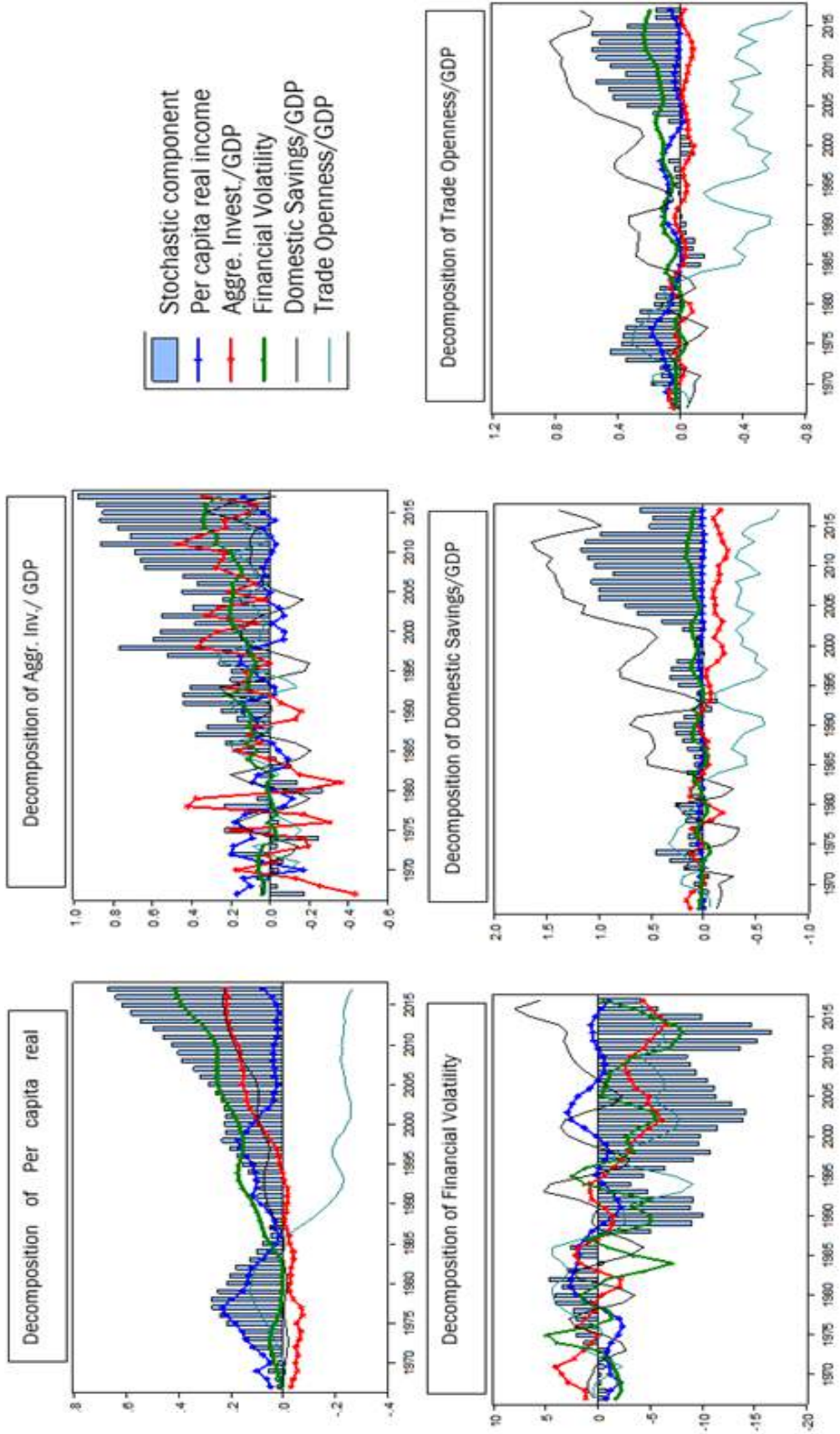
VECM, Granger Causality, Wald block exogeneity test

Sample: 1965-2017		
Included observations: 51 years		
Dependent variable: Economic Growth		
Excluded	c ²	G de L
Var % Inv/Y	1.21	1
Credit Volatility	0.07	1
Var. % Dom. Sav./Y	2.42	1
Var. % Tra. Open./ Y	5.61***	1
Combined	6.78	4
Dependent variable: Var.% Inv/Y		
Excluded	c ²	G de L
Economic Growth	0.67	1
Volatil. Crediticia	0.14	1
Var. % Dom. Sav./Y	4.46**	1
Var. % Tra. Open./ Y	0.11	1
Combined	7.33	4
Dependent variable: Credit Volatility		
Excluded	c ²	G de L
Economic Growth	0.03	1
Var % Inv/Y	4.71**	1
Var. % Dom. Sav./Y	5.24**	1
Var. % Tra. Open./ Y	0.38	1
Combined	12.71**	4
Dependent variable: Var. % of Dom. Sav./Y		
Excluded	c ²	G de L
Economic Growth	0.11	1
Var % Inv/Y	1.70	1
Credit Volatility	0.11	1
Var. % Tra. Open./ Y	0.94	1
Combined	2.57	4
Variable dependiente: Var. % of Tra. Open./Y		
Excluida	c ²	G de L
Economic Growth	2.62	1
Var % Inv/Y	0.30	1
Credit Volatility	0.92	1
Var. % Tra. Open./ Y	3.44†	1
Combined	9.47†	4

Annex 6. Variance Decomposition

<i>Variance decomposition of Economic Growth</i>					
Period	Economic Growth	Var % Inv/Y	Credit Volatil.	Var. % Dom. Sav./Y	Var. % Tra. Open./ Y
1	100	0	0	0	0
5	65	0	19	1	16
10	48	1	27	2	22
<i>Variance decomposition in the Var % of Ad. Inv. /Y</i>					
Period	Economic Growth	Var % Inv/Y	Credit Volatil.	Var. % Dom. Sav./Y	Var. % Tra. Open./ Y
1	25	75	0	0	0
5	18	50	8	6	17
10	16	43	10	5	26
<i>Variance decomposition in Credit Volatility</i>					
Period	Economic Growth	Var % Inv/Y	Credit Volatil.	Var. % Dom. Sav./Y	Var. % Tra. Open./ Y
1	5	2	93	0	0
5	11	17	62	6	4
10	7	23	39	4	26
<i>Variance decomposition in the Var. % of Dom. Savings/Y</i>					
Period	Economic Growth	Var % Inv/Y	Credit Volatil.	Var. % Dom. Sav./Y	Var. % Tra. Open./ Y
1	0	12	8	80	0
5	1	7	4	88	0
10	1	6	5	87	1
<i>Variance decomposition in the Var. % of Trade Openness/Y</i>					
Period	Economic Growth	Var % Inv/Y	Credit Volatil.	Var. % Dom. Sav./Y	Var. % Tra. Open./ Y
1	4	12	4	26	54
5	9	9	9	37	35
10	12	6	12	34	36

Annex 7. Historic Variance decomposition
 VECM model for the Bolivian economy, 1965-2017



Annex 8. Residuals with multivariate normal distribution

Multivariate normality residuals test VECM					
Orthogonalization: Cholesky (Lutkepohl)					
Null hypothesis: Residuals have a multivariate normal distribution.					
Sample: 1965-2017					
Included observations: 51 years					
Component	Asymmetry	c2	G d L	Prob.	
1	-0.289901	0.714362	1	0.398	
2	0.061587	0.03224	1	0.8575	
3	0.00599	0.000305	1	0.9861	
4	-0.559285	2.658799	1	0.103	
5	0.188116	0.300795	1	0.5834	
Combined		3.7065	5	0.5924	
Component	Kurtosis	c2	G d L	Prob.	
1	3.226333	0.108857	1	0.7414	
2	3.593272	0.74794	1	0.3871	
3	3.338382	0.243318	1	0.6218	
4	3.225999	0.108536	1	0.7418	
5	2.575804	0.382378	1	0.5363	
Combined		1.59103	5	0.9023	
Component	Jarque-Bera	G d L	Prob.		
1	0.823219	2	0.6626		
2	0.78018	2	0.677		
3	0.243623	2	0.8853		
4	2.767335	2	0.2507		
5	0.683173	2	0.7106		
Combined	5.29753	10	0.8704		

Annex 9. Stability and roots outside the unit circle

Characteristics of polynomial roots	
N° of endogenous variables: 5	
Maximum N° of allowed roots: 4	
Roots	Module
1.000000	1.000000
1.000000	1.000000
1.000000	1.000000
0.755396	0.755396
0.356627 - 0.561089i	0.664834
0.356627 + 0.561089i	0.664834
0.288973	0.288973
0.062725 - 0.281196i	0.288107
0.062725 + 0.281196i	0.288107
-0.014814	0.014814

The VECM model establishes three roots outside the unit circle, which is less than the maximum number of allowed roots (4). The model meets the stability condition.

Annex 10. VECM, White's Heteroscedasticity Test

(Levels and squares)

Null hypothesis: Residuals are homoscedastic (constant variance).					
Sample: 1965-2017					
Included observations: 51 years					
Combined					
c2	G d L	Prob.			
221.4718	255	0.9364			

Annex 11. VECM, Lm serial non-correlation test

VEC Residual Serial Correlation LM Tests						
Prueba de No correlación serial LM						
Null hypothesis: There is no serial correlation in the residuals h						
Sample: 1965-2017						
Included observations: 51 years						
Null hypothesis: No serial correlation at lag h						
Lag	LRE* stat	G d L	Prob.	Rao F-stat	G d L	Prob.
1	32.07893	25	0.1557	1.326006	(25, 120.4)	0.1588
2	21.94114	25	0.6391	0.871611	(25, 120.4)	0.6426



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Citation:

Streimikiene, D. (2022), "Affordable and Clean Energy for all: Challenges in Balkan Countries", *Montenegrin Journal of Economics*, Vol. 18, No. 3, pp. 57-66.

Affordable and Clean Energy for all: Challenges in Balkan Countries

DALIA STREIMIKIENE¹

¹ Professor, Mykolas Romeris University, Faculty of Public Governance and Business, Vilnius, Lithuania,
e-mail: dalia@mail.lei.lt; <https://orcid.org/0000-0002-3247-9912>

ARTICLE INFO

Received November 25, 2021
Revised from December 28, 2021
Accepted January 28, 2022
Available online July 15, 2022

JEL classification: Q42, Q48; P46

DOI: 10.14254/1800-5845/2022.18-3.4

Keywords:

Energy security,
Energy affordability,
Energy sustainability,
Balkan countries.

ABSTRACT

The paper analyses SDG7 indicators of sustainable development in Balkan Countries. Slovenia, Croatia and Montenegro, Serbia, North Macedonia and Bosnia Herzegovina are selected for case study aiming to define the progress towards SDG7 goal- Affordable and clean energy by applying the main indicators set for analysis of situation in terms of affordable and clean energy for all in selected neighbouring countries of former Yugoslavia. The paper also provides policy recommendations based on analysis performed and allows to share good practices in energy policies among neighbouring countries which as different economic development level and Slovenia is EU Member State since 2004 and Croatia since 2013. Other Balkan states are just planning to join EU in the future.

INTRODUCTION

The Agenda 2030 and its 17 Sustainable Development Goals (SDGs) signifies a all-inclusive agenda which is universal and presents self-enforcing related goals of sustainable development. It is universal as all SDGs should be achieved by developed and developing countries by 2030 (UN-GSDR, 2019). It is indivisible as that all 17 goals are equally significant and they all can be achieved just in combination. Another important issue is monitoring of progress towards the SDGs which is also requires considering achievement of Agenda's 2030 goals in all-inclusive way. Energy plays vital role in implementing all 17 SDGs as energy provides opportunities for economic development and social progress and has huge environmental effect. Therefore, energy use is closely linked with economic, social and environmental dimensions of. Sustainability. By promoting sustainable energy development which means increase of energy efficiency and increase in usage of renewable energy sources it is possible to achieve modern economic growth, poverty reduction, improvement in environmental and human health as well as deliver to other related SDGs goals for industries, transport, cities, communities etc.

There is special goal set for sustainable energy development in SDGs, i. e. SDG 7 which calls for guaranteeing complete access to modern energy services by first of all improving energy efficiency and increasing the share of renewable energy in final energy consumption (Eras-Almeida, Egido-Aguilera, 2020). In order to faster the transition to low carbon, affordable, secure and clean energy system, countries have to promote research and development in sustainable energy field and to rise investment in energy- efficient and clean energy solutions. The low-carbon energy infrastructure plays very important role in achieving clean and affordable energy for all goal. All activities in society are dependent on reliable, secure and affordable energy supply. Energy sector covers such important sectors as power, heating and cooling, transport and other final energy consumption sectors as households, services, agriculture, construction etc. Energy permits the well- functioning of all economic sectors and agents. As many EU member states still use of fossil fuels for energy generation, there a number of challenges to securing affordable, secure, reliable and sustainable energy supply in EU (Pach-Gurgul and Ulbrych, 2019). Therefore, the main aims are to reduce total energy consumption by energy efficiency improvement and energy saving in energy generation and final usage sectors by increasing share of renewables in energy mix. This would help to increase the security of energy supply and growth of competitiveness of EU energy sector by providing affordable energy for all inhabitants. These are the main ways in achieving SDG 7 in EU and other countries. Therefore, the increased energy efficiency and a shift towards renewable energy allows to reduce GHG emissions, reduce energy poverty and energy import dependency (European Commission, 2018).

The current COVID-19 pandemic has a significant negative impact on public health, economic and social stability in all world countries (Banaszyk et al., 2021). COVID-19 pandemics also has impact on implementation of Agenda 2030 as well. All three dimensions of sustainable energy development like economic (competitiveness and energy import dependency), social (energy affordability) and environmental (energy efficiency, renewable energy penetration and GHG emission reduction) are affected by COVID-19 health crisis and threatening the achievement of all SDGs. Different regions of Europe are encountering different challenges in implementing Agenda 2030 and SDGs, including SDG7. Therefore, it is important to analyse and compare situation in terms of progress towards SDG7 goals in specific region to know the main challenges of neighboring countries and to learn from their experience and to share good practices in the region.

The Balkan region requires attention as it consists of several neighboring countries having the similar pasts but now progressing in different ways as intended states towards sustainable development goals. Until 25 June 1991 the Socialist Federal Republic of Yugoslavia consisted from six republics that made up the federation - Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, Serbia (and Slovenia). Since 2004 Slovenia has joined European Union (EU) and in 2013 Croatia joined EU. Bosnia and Herzegovina, North Macedonia, Montenegro and Serbia are independent states also planning EU access in the future. The Balkan countries have many problems linked with high corruption, weak institutions, unemployment and other social problems (Krivokapic, 2020) however there are positive trends of social-economic progress in this region.

There are several studies dealing with results of implementing Sustainable Development Goal (SDG) 7, i. e. to ensure access to affordable, reliable, sustainable and modern energy in various countries and groups of countries (Guler et al., 2018; Marinakis et al., 2017; Nefytou et al., 2020; Papapostolou et al., 2017) however there are no comparative studies for Balkan region countries, former Socialist Federal Republic of Yugoslavia states though it is very important to compare their paths of reaching affordable, reliable, sustainable and modern energy and define the advantages of joining European Union which distinguishes with strict environmental and climate change mitigation policies including policies targeting sustainable development of energy sector.

The paper aims to overcome this gap and analyses development of SDG7 indicators in Balkan countries former Yugoslavia republics. The analysis performed allows to find the best performing countries in selected region and to define the main drivers of success. The policy recommendations to fasten implementation of SDG7 goal were developed based on best practices and achievements. The rest of the paper is structured in the following way: section 1 presents the background of the study based on literature review, section 2 introduces methods and data; section 3 provides case study results; section 4 concludes and provides policy recommendations and future research guidelines.

1. LITERATURE REVIEW AND STUDY BACKGROUND

There are big differences between developing and developed nations in achieving SDGs goals and implementing Agenda 2030. These differences can be clearly see in analysing progress in achievement of SDG 7 between developing and developed countries (Ari, Sari, 2017). For developing countries green house gas (GHG) emission is a big challenge as these countries are in developing path and need to increase energy consumption to ensure economic growth (Cherp et al., 2018; Hnatyshyn, 2018). At the same time these countries do not have enough resources to implement new energy efficient clear technologies based on renewable energy sources. Implementation of renewable energy sources requires high investments in infrastructure, storage options etc. (Gielen et al., 2019; Yan et al., 2020; Batinge et al., 2019) Another important issue is households sector, where energy consumption is based on solid fuels including biomass and waste having negative health impact and high carbon content. In developing countries energy poverty is also key issue (Streimikiene et al., 2021)

European Union has implemented wide range of climate change mitigation policies in energy sector and have set targets to increase energy efficiency, the share of renewable energy (RES) in final energy consumption and reduce GHG emissions by 2020, 2030 and 2050 (Tagliapietra et al., 2019). These policies are linked to promotion of energy efficiency and use of renewable energy sources (Siksnyte et al, 2019). The EU has target to upsurge energy efficiency by 20% in 2020 and by 32.5 % in 2030.

Based on the newest data, provided by EUROSTAT, in 2019 results for achieving SDG7 goal and main targets was negative in EU (European Union, 2021). These negative trends are related to increase of primary and final energy consumption energy consumption per-capita in households since 2014. This does not allow to reach e energy efficiency increase by 32.5% for 2030. The increase in energy consumption had negative impact on increase of energy import dependency in EU during the same period (European Union, 2021). However, there are positive trends in increase of energy productivity. In any case, The COVID-19 pandemic will influence achievement of SDG 7 and it is expected that energy consumption will fall.

The share of renewable energy sources in final energy consumption was continuously rising and EU will reach the share to 32% by 2030. This has positive impact on reduction of greenhouse gas emissions intensity of energy consumption and GDP. The EU has goal to increase the share of RES in final energy consumption to 20% by 2020 and to 32% by 2030. The EU highpoints the importance of RES to achieve EU goal of decarbonising of the EU energy system. Use of renewable energy has been growing continuously in the EU. Its share has doubled since 2004. By 2019, this the share of RES increase from 9.6% (2004) to 19.7%. It is expected that EU will achieve target to have 20% of renewable in final energy consumption by 2020 however the progress seems to slow to meet the 32% of renewables in final energy consumption target by 2030.

The EU has goal to reduce its dependency on energy imports, which consists of natural gas, crude oil and coal imports. Therefore, the EU has goal to become more energy independent through increase of inland domestic energy production mainly relaying on renewable energy sources.

Energy poverty indicators like the share of people who are unable to keep their home adequately warm was declining in EU up to 2019. AS SDG 7 emphasizes the need for affordable energy for reasons of social equality and justice, EU has implemented policies to tackle with energy poverty. These policies are targeting renovation of residential buildings and support to implementing renewable energy micro-generation technologies in residential buildings. These measures allow to reduce energy poverty in long-term as short-term measures consist of social support for low income population (Azam et al., 2016; Shindina et al., 2018; Androniceanu et al., 2020). In EU the lack of access to affordable energy is linked with low income and high energy expenditures which are caused by energy inefficient residential buildings. In 2012, the share of people unable to keep their homes adequately warm was 6.9% and in 2019 it reduced to 3.5% (European Union, 2021).

Therefore, for analysis of progress towards SDG7 - “affordable, reliable, sustainable and modern energy for all” by 2030, it is necessary to monitor indicators showing progress in energy consumption per capita and energy poverty indicators, energy import dependency and indicators addressed also in EU climate and energy package and frameworks, such as the share of renewables in final energy consump-

tion, energy productivity and GHG emissions. In next section of paper indicators framework was developed to assess and compare progress of selected Balkan countries (Slovenia, Croatia and Montenegro, Serbia, North Macedonia and Bosnia Herzegovina) in implementing SDG 7 by 2020.

2. DATA AND METHODOLOGY

The main approach applied in this paper – comparative assessment of dynamics of the main SDG 7 indicators in six neighboring Balkan countries. Based on sustainable development framework, developed by IAEA (2005), the set of indicators to monitor affordable, reliable, sustainable and modern energy for all was selected.

In Table 1 the main SDG7 indicators selected are provided and described.

Table 1. SDG7 indicators to monitor progress of achievement of SDG7

Indicator	Description
Final energy consumption in households per capita, kgoe/inhabitant	This indicator measures how much energy each citizen consumes at home, excluding transport. Data are not temperature-adjusted, so variations from year to year are due in part to weather.
Energy productivity	This indicator measures the amount of economic output produced per unit of gross available energy (GAE). Gross available energy represents the quantity of energy products needed to satisfy all demand of entities in the geographical area under consideration. Economic output is either given as euros in chain-linked volumes to the reference year 2010 at 2010 exchange rates
Share of renewables in final gross energy consumption	This indicator is defined as the share of renewable energy consumption in gross final energy consumption, according to the Renewable Energy Directive (43). The gross final energy consumption is the energy used by end consumers plus grid losses and power plants' own consumption
GHG emissions per capita, tCO2/inhabitant	This indicator is applied to measure SDG. Target 7A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources. Indicator 7.2 Carbon dioxide emissions, total, per capita provides total GHG emissions in CO2 eq divided by total population of the country.
Energy import dependency	This indicator shows the share of a country's total energy needs that are met by imports from other countries. It is calculated as net imports divided by the gross available energy (GAE). Energy import dependency = (imports - exports) / gross available energy.
Population unable to keep their homes adequately warm, %	This indicator monitors access to affordable energy throughout the EU. The data are collected as part of the EU Statistics on Income and Living Conditions (EU-SILC) to monitor the development of poverty and social inclusion in the EU. Data collection is based on a survey, which means that indicator values are self-reported.

Source: created by authors

SDG 7 requires to ensure access to affordable, reliable, sustainable and modern energy. Six selected indicators represent the main issues of SDG: environmental, social and economic.

Environmental issues or sustainable energy aspects are addressed by the three indicators: energy productivity, share of renewables and GHG emissions per capita. These indicators are interrelated as the main way to reduce GHG emissions from energy use are increase in energy productivity and increase in the share of renewables in energy mix.

Energy consumption per capita and indicator of population unable to keep their homes adequately warm provides information on energy affordability or address social issues.

Energy import dependency indicator addresses reliability of energy supply and deals with economic issues.

It is necessary to stress that increasing the EU energy productivity is one of the main pillars for reaching an affordable, reliable, sustainable and modern energy system as envisaged in SDG7. Efficient energy systems reduce energy consumption and costs, decrease energy dependencies and diminish the environmental and climate impacts related to energy supply and use.

Further these indicators will be collected for 6 Balkan countries EU-27 average during 2014-2020 period to define the main trends and the differences in these trends. The reasons for differences will be further discussed and policy implications will be provided for countries lagging in their progress towards affordable and clean energy to all goals set by Agenda 2030.

3. DISCUSSION OF RESULTS

In this section the main SDG7 indicators for Balkan countries former Yugoslavia states were collected from EUROSTAT (2021) and IEA databases for 2005-2020 period. Some indicators were available just from 2014 like in the case of energy productivity GHG emission data was not available in EUROSTAT for North Macedonia, Montenegro, Serbia and Bosnia and Herzegovina therefore to ensure data compatibility all GHG emission data for all Balkan countries including Slovenia and Croatia was collected from International Energy Agency database (IEA, 2021).

In Figure 1 dynamics of final energy consumption in households per capita in six countries is provided..

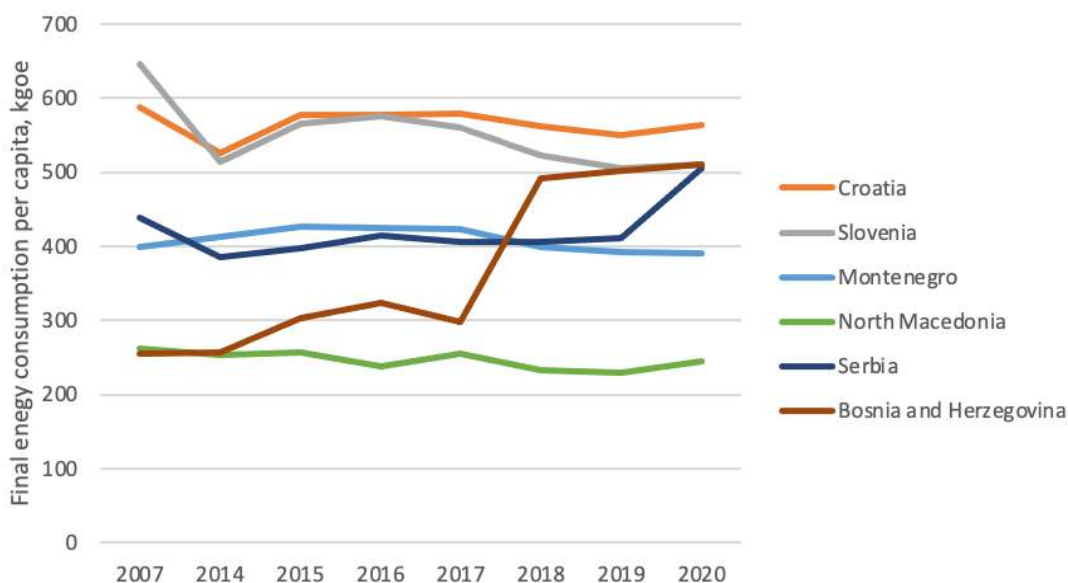


Figure 1. Dynamics of households' energy consumption per capita in Balkan countries

As one can notice from Figure 1 the highest final energy consumption per capita was in Croatia during almost all investigated period. The lowest final energy consumption per capita was in North Macedonia. Montenegro distinguishes from other Balkan countries with stable final energy consumption level per capita. Final energy consumption per capita in Montenegro is in the average between countries having the highest final energy consumption per capita like Croatia, Slovenia and the lowest final energy consumption per capita levels like North Macedonia. The sharp increase in final energy consumption per capita can be noticed in Bosnia and Herzegovina during investigated period. As final energy consumption

per capita is an indication of the aggregate energy consumption of societies and high value of it usually means a high standard of living and urbanization of the society, however it is often being considered as an indicator of an energy-inefficient society. Therefore, high final energy consumption per capita levels of Croatia and Slovenia in comparison with North Macedonia indicates higher economic development and standard of living in Croatia and Slovenia. These countries are already EU Member States and also implementing various EU regulations of energy efficiency improvement. At the same time the increase in final energy consumption per capita in Serbia and Bosnia and Herzegovina can indicate trends of energy-inefficient consumption.

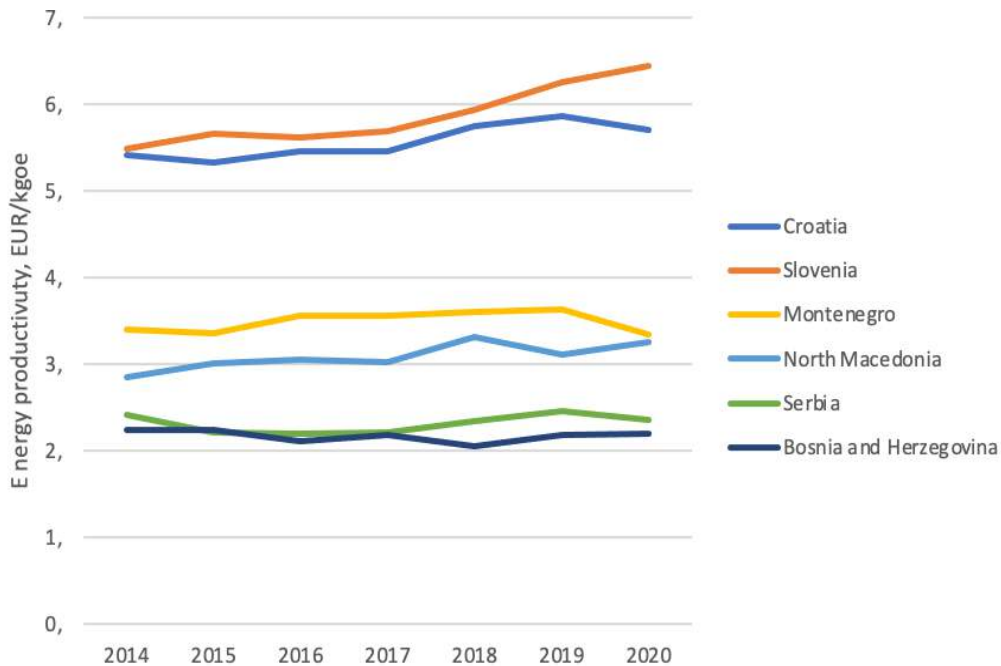


Figure 2. Dynamics of energy productivity in Balkan countries

Source: EUROSTAT, 2021.

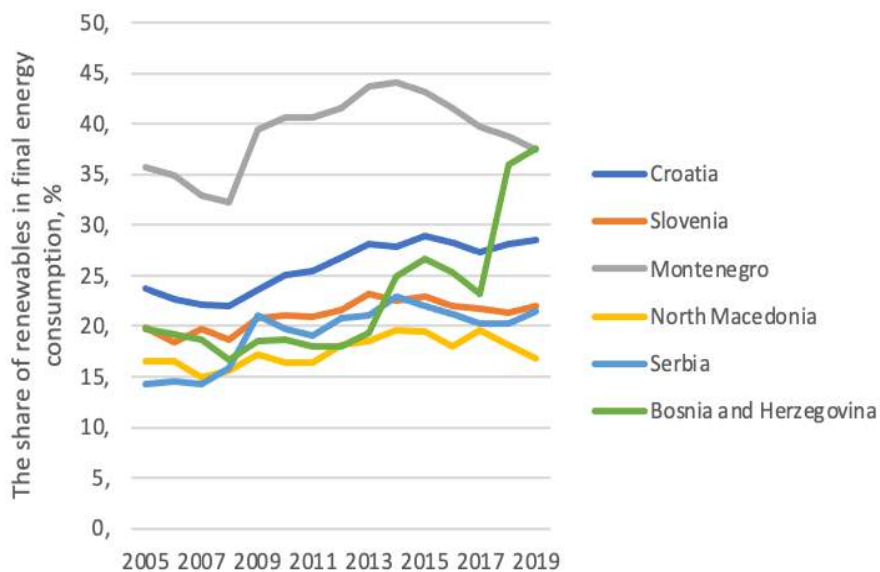


Figure 3. Dynamics of the share of renewables in final energy consumption in Balkan countries

Source: EUROSTAT, 2021.

As one can see from trends presented in Figure 2, Slovenia and Croatia have almost three times higher energy productivity than Serbia and Bosnia and Herzegovina. Montenegro and North Macedonia have almost twice lower energy productivity in comparison with more advanced Balkan countries like Slovenia and Croatia. Also it is necessary to stress that energy productivity was increasing in Slovenia and Croatia during investigated period while in other Balkan countries having low energy productivity it was stagnating. In Montenegro even some decline of energy productivity can be noticed in recent years. Analysis of trends of the share of renewables in final energy consumption in Balkan countries provided in Figure 3, shows that Montenegro distinguishes with the higher share of renewables, though it was declining since 2015. On opposite, the share of renewables in final energy consumption were increasing in Bosnia and Herzegovina and in 2020 it reached the share similar to Montenegro, i.e. above 37%. In Croatia the share of renewables in final energy consumption was continuously increasing during investigated period. The lowest share of renewables was in North Macedonia during all investigated period and even decreased in the recent years to 16%.

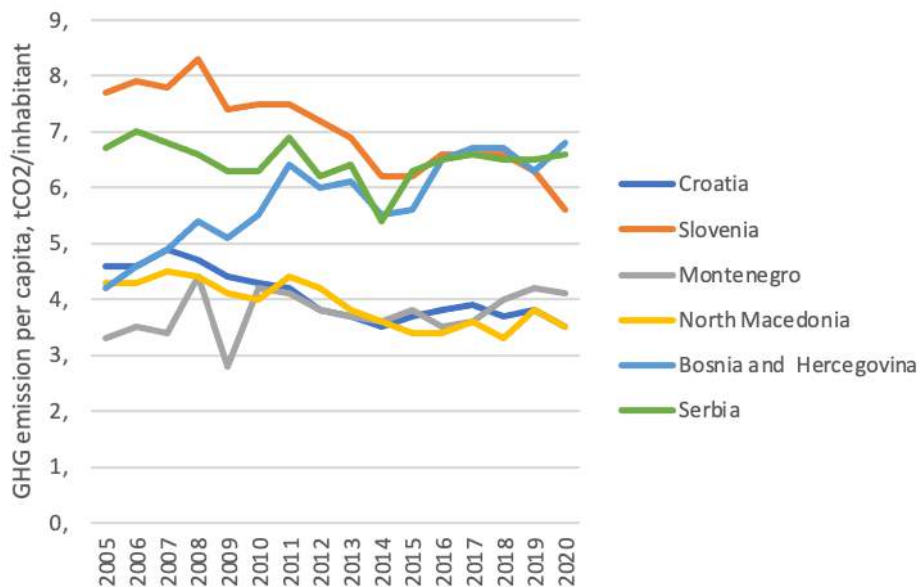


Figure 4. Dynamics of GHG emissions per capita in Balkan countries

Source: IEA, 2021.

As one can see from data given in Figure 4, the highest GHG emissions per capita in 2020 were recorded in Bosnia and Herzegovina followed by Serbia. It is necessary to stress that Slovenia had the highest GHG emission per capita in 2005 however country shows positive trends of GHG emission reduction as they have decreased during investigated period from 7.7 to 5.6 tCO₂/capita. The lowest GHG emissions per capita in 2020 were in North Macedonia and Croatia (3.5 tCO₂/capita) following Montenegro (4.1 tCO₂/capita). In addition, in countries having the lowest GHG emissions per capita the trends of increase of this indicator can be noticed.

As one can notice from Figure 5, North Macedonia has the highest indicator of energy import dependency and it was increasing during investigated period by reaching almost 54% in 2020. Croatia and Slovenia also have quite high energy import dependency however it was declining in recent years. The same trends are characteristic to Montenegro, Serbia and Bosnia and Herzegovina. In 2020 the energy import dependency made about 29% in these countries.

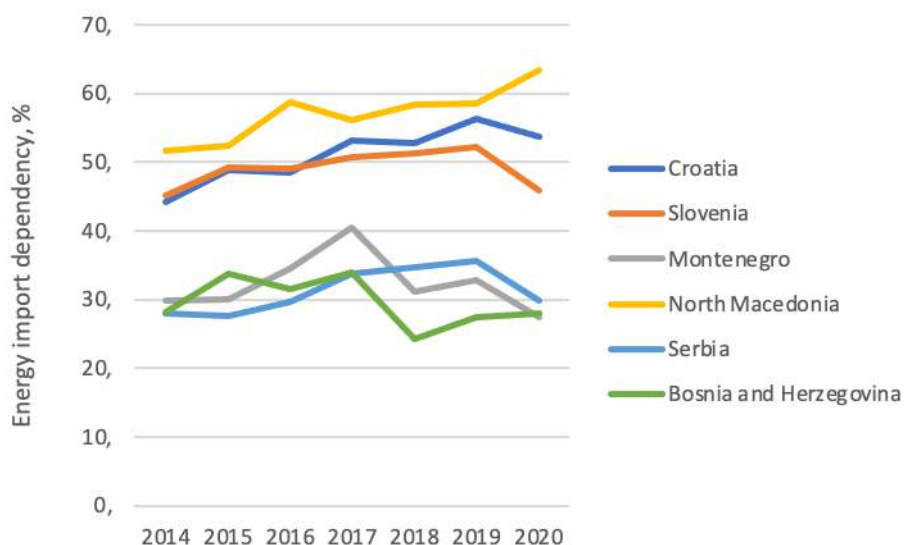


Figure 5. Dynamics of energy import dependency in Balkan countries
Source: EUROSTAT, 2021.

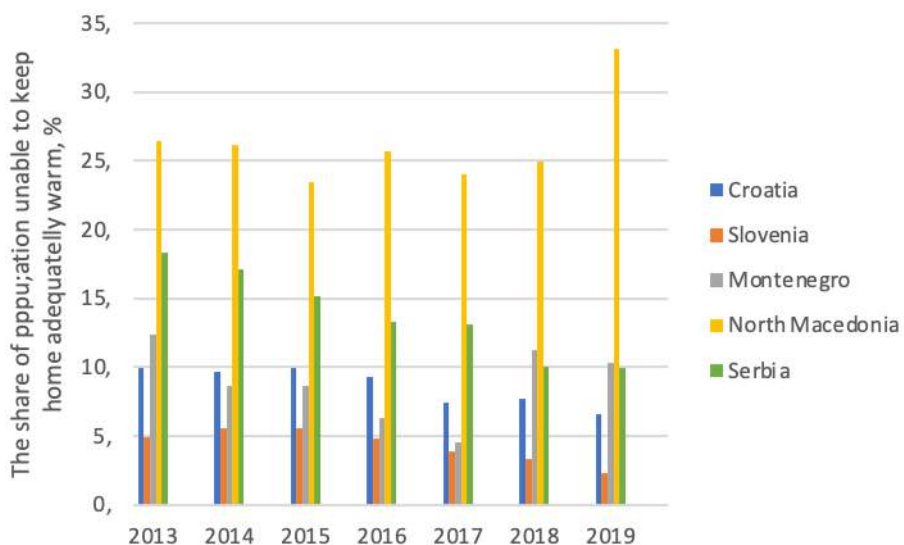


Figure 6. Dynamics of the share of population unable to keep their home adequately warm in Balkan countries
Source: EUROSTAT, 2021.

Information provided in Figure 6 shows that the highest energy poverty indicators expressed by the share of population unable to keep homes adequately warm were in North Macedonia and the negative trends of this indicator development can be observed since 2018. Energy poverty in North Macedonia reached 33% IN 2019. n Serbia though the share of population unable to keep homes adequately warm was second highest among Balkan countries it was continuously declining and decreased from 18% to 10% in 2019. The lowest share of population unable to keep homes adequately warm during investigated period was in Slovenia and it was continuously declining during investigated period by reaching 2.3% in 2019. In Croatia the share of population unable to keep homes adequately warm has decreased from almost 10% in 2013 to 6.6% in 2019. In Montenegro this energy poverty indicator has decreased from 12% to 10% during the same period.

CONCLUSIONS AND POLICY IMPLICATIONS

Conducted analysis of energy poverty indicators development during 2016-2020, indicated positive trends according to SDGs 7 goals in EU Member States (Slovenia and Croatia) linked to ensure access to affordable, reliable, sustainable and modern energy. However, other Balkan Countries like North Macedonia, Montenegro, Bosnia and Herzegovina and Serbia are showing quite different results in approaching SDGs targets for energy. Slovenia is the EU member state since 2004 and has achieved the best results in approaching SDG7 goal based on selected SDG7 indicators. Slovenia and Croatia (the EU Member state since 2013) have the highest energy productivity and lowest share of population unable to keep home adequately warm. According to other SDG7 indicators Slovenia and Croatia have the highest energy consumption per capita and the highest energy import dependency after North Macedonia. In addition, all SDG7 indicators have positive trends in Slovenia and Croatia however other Balkan Countries like North Macedonia, Bosnia and Herzegovina and Serbia are significantly lagging according to energy productivity and energy poverty expressed by the share of population unable to keep their homes warm and what is most important the trends are not positive as energy productivity was declining and energy poverty was increasing during investigated period.

Renewable energy share was increasing in Croatia and Slovenia however Montenegro and Bosnia and Herzegovina had the highest share of renewables in final energy consumption in 2020. One can notice that though in Slovenia and Croatia energy import dependency was decreasing in North Macedonia it was increasing though it was the highest among the Balkan countries. According to GHG emissions per capita Balkan countries can be grouped in two clusters: low GHG emission per capita countries showing the trends of increase of this indicator, i.e. North Macedonia, Montenegro and Bosnia and Herzegovina and countries with high GHG emission per capita indicators showing the trend of decrease Serbia, Croatia and Slovenia. The main policy implications for Balkan countries can be developed for EU Member States countries and countries planning to join EU in the future as these countries have different SDG7 indicators and even different trends of these indicators.

For Slovenia and Croatia the main policy recommendations are to increase use of renewables and reduce of energy import dependency. Though the trends are positive however countries need to pay more attention to energy reliability and sustainability dimensions and strengthen policies in this field. For North Macedonia the main policy recommendations are linked to addressing energy poverty issues and dealing with energy import dependency which might cause major problems for secure and affordable energy supply in the country. For Serbia, Bosnia and Herzegovina and North Macedonia another major issue is very low energy productivity including absence of positive trends, therefore countries need to implement policies' and measures to ensure energy efficiency improvement. The example of EU policies to promote energy efficiency might be useful for these countries.

The study has limitations as just limited period data 2005-2020 or 2014-2020 was used to analyse trends of SDG7 indicators in Balkan countries. Also, limited number of environmental and energy poverty indicators was analysed and compared between Balkan states. This is due to limited availability of indicators for Balkan countries available at EUROSTAT. The future research is necessary to address these issues by using new data on SDG7 indicators and providing comparative assessment of Balkan Countries. The policy analysis and more advanced multi-criteria decision adding models should be applied for ranking of Balkan countries in terms of approaching SDG7 targets.

REFERENCES

- Androniceanu, A.-M., Georgescu, I., Dobrin, C., Dragulanescu, I.V. (2020), "Multifactorial components analysis of the renewable energy sector in the OECD countries and managerial implications", *Polish Journal of Management Studies*, Vol. 22, No. 2, pp. 36-49.
- Ari, I., Sari, R. (2017), "Differentiation of developed and developing countries for the Paris Agreement". *Energy Strategy Reviews*, Vol. 18, pp. 175-182.
- Azam, M., Khan, A.Q., Zafeiriou, E., Arabatzis, G. (2016), "Socio-economic determinants of energy consumption: an empirical survey for Greece", *Renewable and Sustainable Energy Reviews*, vol. 57, pp. 556-567.

- Banaszyk, P., Deszczyński, P., Gorynia, M., Malaga, K. (2021), „The Covid-19 pandemic as a potential change agent for selected economic concepts”, *Entrepreneurial Business and Economics Review*, Vol. 9, No. 4, pp. 35-50. doi: 10.15678/EBER.2021.090403
- Cherp, A., Vinichenko, V., Jewell, J., Brutschin, E., Sovacool, B. (2018), “Integrating techno-economic, socio-technical and political perspectives on national energy transitions: a meta-theoretical framework”, *Energy Research & Social Science*, Vol. 37, pp. 175–190.
- Eras-Almeida, A.A, Egido-Aguilera, M.A. (2020), “What Is Still Necessary for Supporting the SDG7 in the Most Vulnerable Contexts?”, *Sustainability*, Vol. 12, No. 17, 7184, <https://doi.org/10.3390/su12177184>
- EUROSTAT (2021), *Database*, <https://ec.europa.eu/eurostat/data/database>
- European Commission (2018), *A Clean Planet for all. A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy*, COM (2018) 773 final.
- European Union (2021), *Sustainable development in the European Union*, Monitoring report on progress towards the SDGs in an EU context, 2021 Edition.
- Hnatyshyn, M. (2018), “Decomposition analysis of the impact of economic growth on ammonia and nitrogen oxides emissions in the European Union”, *Journal of International Studies*, Vol. 11, No. 1, pp. 201-209. doi:10.14254/2071-8330.2018/11-1/15.
- International Atomic Energy Agency (2005), “Energy indicators for sustainable development. Guidelines and Methodologies”, https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1222_web.pdf
- International Energy Agency (2021), *Data and statistics*, <https://www.iea.org/data-and-statistics>
- Batinge, B., Musango, J.K., Brent, A.C. (2019), “Sustainable energy transition framework for unmet electricity markets”, *Energy Policy*, Vol. 129, pp. 1090–1099.
- Gielen, D., Boshell, F., Saygin, D., Bazilian, M.D., Wagner, N, Gorini, R. (2019), “The role of renewable energy in the global energy transformation”, *Energy Strategy Reviews*, Vol. 24, pp. 38–50.
- Guler, B., Çelebi, E., Nathwani, J.A. (2018), “Regional Energy Hub for achieving a low-carbon energy transition”, *Energy Policy*, Vol. 113, pp. 376–85.
- Krivokapic, R. (2020), “Institutional Efficiency Factors of Adriatic Seaports”, *Transformations in Business & Economics*, Vol. 19, No. 1 (49), pp. 85-94.
- Marinakos, V., Papadopoulou, A.G., Psarras, J. (2017), “Local communities towards a sustainable energy future: needs and priorities”, *International Journal Sustainable Energy*, Vol. 36, No. 3, pp. 296–312.
- Neofytou, H., Nikas, A., Doukas, H. (2020), “Sustainable energy transition readiness: A multicriteria assessment index”, *Renewable and Sustainable Energy Reviews*, Vol. 131, 109988, <https://doi.org/10.1016/j.rser.2020.109988>.
- Pach-Gurgul, A., Ulbrich, M. (2019), „Progress of the V4 Countries towards the EU’s Energy and Climate Targets in the Context of Energy Security Improvement”, *Entrepreneurial Business and Economics Review*, Vol. 7, No. 2. doi: 10.15678/EBER.2019.070210
- Papapostolou, A., Karakosta, C., Nikas, A., Psarras, J. (2017), “Exploring opportunities and risks for RES-E deployment under Cooperation Mechanisms between EU and Western Balkans: a multi-criteria assessment”, *Renewable and Sustainable Energy Review*, Vol. 80, pp. 519–530.
- Shindina, T., Streimikis, J., Sukhareva, Y., Nawrot, Ł. (2018), “Social and Economic Properties of the Energy Markets”, *Economics and Sociology*, Vol. 11, No. 2, pp. 334- 344. doi: 10.14254/2071-789X.2018/11-2/23.
- Siksnyte, I., Zavadskas, E.K., Bausys, R., Streimikiene, D. (2019), “Implementation of EU energy policy priorities in the Baltic Sea Region countries: sustainability assessment based on neutrosophic MULTIMOORA method”, *Energy Policy*, Vol. 125, pp. 90–102.
- Streimikienė, D., Kyriakopoulos, G.I., Lekavicius, V., Siksnyte-Butkienė, I. (2021), „Energy Poverty and Low Carbon Just Energy Transition: Comparative Study in Lithuania and Greece“, *Social Indicators Research*, Vol. 158, pp. 319-371
- Tagliapietra, S., Zachmann, G., Edenhofer, O., Glachant, J.M., Linares, P., Loeschel, A. (2019), “The European Union energy transition: key priorities for the next five years”, *Energy Policy*, Vol. 132, pp. 950–1020.
- UN-GSDR (2019), “Global Sustainable Development Report 2019”, <https://sustainabledevelopment.un.org/globalsdreport/2019>
- Yan, Q., Zhang, W., Yuan, J., Ai, Y., Lu, G. (2020), „The Economy of Power Generation Technologies in China: a Review”, *Transformations in Business & Economics*, Vol. 19, pp. 95-111.



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Citation:

Gouider, A. (2022), "Impact of Economic Freedom on Youth Unemployment in the Gulf Cooperation Council Countries", *Montenegrin Journal of Economics*, Vol. 18, No. 3, pp. 67-75.

Impact of Economic Freedom on Youth Unemployment in the Gulf Cooperation Council Countries

ABDESSALEM GOUIDER^{1,2}

¹ Assistant professor at Imam Mohammad Ibn Saud Islamic University, Riyadh, Saudi Arabia

² Higher Institute of Management of Gabes, University of Gabes, Tunisia, e-mail: abdgouider2011@gmail.com

ORCID ID: <https://orcid.org/0000-0002-1907-5681>

ARTICLE INFO

Received April 25, 2021
Revised from May 27, 2021
Accepted September 26, 2021
Available online July 15, 2022

JEL classification: E24, J68, O43

DOI: 10.14254/1800-5845/2022.18-3.5

Keywords:

Economic freedom,
Labour market,
Youth unemployment,
GCC countries

ABSTRACT

This study aims to examine the impact of economic freedom on youth unemployment in the Gulf Cooperation Council countries of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates during 2005–2019. Theoretically, it is assumed that the improvement of economic freedom reduces the unemployment rate. In this paper, we seek to verify this hypothesis for youth population in the Gulf Cooperation Council countries. Specifically, we will determine which specific component of economic freedom has the strongest effect on youth unemployment. Using the Panel Ordinary Least Square approach with fixed effects, we find that the greater the economic freedom score, the lower the youth unemployment rate. In addition, the results suggest that only six of the ten components of economic freedom have a significant effect on the youth unemployment rate, namely, property rights, government spending, monetary, trade, investment and, financial freedom. These areas should be targeted by policymakers in the Gulf Cooperation Council countries to develop appropriate policies aimed at enhancement of youth employment.

INTRODUCTION

Considered the richest region in the Arab world, the Gulf Cooperation Council (GCC) countries have experienced profound demographic and social changes. According to the World Bank's World Development Indicators (2020), this region has one of the fastest growing populations in the world, with an average annual population growth rate of 4.9% between 2000 and 2019. Furthermore, the GCC remains a youthful region with 31.13% of the total population below 24 years of age. Examining this by country: 37.8% in Saudi Arabia, 34.3% in Oman, 31.8% in Kuwait, 30.1% in Bahrain, 26.4 % in Qatar and 26.4% in United Arab Emirates were in the age range of 0 to 24. In joining the work force, the youth bring their talent, energy and creativity to the fore and add to the productivity of the economy (Gavurova et al. 2019). However, this skew towards a youthful population exerts pressure on the labour market and finding gainful employment for all the entrants is difficult (Snieska et al., 2020). Hence, for GCC countries, boosting youth employability has become a major area of concern.

In terms of unemployment, Qatar achieves the best results among the GCC countries. It has been quite successful in reducing unemployment rate. Over the years 2005 to 2019, the average annual growth rate of the overall unemployment is -15% while the average annual growth rate of the youth unemployment is -17%. In the same period, the score of economic freedom in Qatar grows on average by 0.96 point.

Saudi Arabia and United Arab of Emirates enjoy a comparative situation. The two countries achieve a reduction of unemployment both for the total labour force and for youth people. Over the 2005-2019 period, the average annual growth rates of the overall unemployment are -0.16% and -1.54% for Saudi Arabia and United Arab of Emirates respectively. In addition, the average annual growth rates of the youth unemployment are -0.93% and -0.36% in the two countries respectively. In the same period, the score of economic freedom increases by 1.24 points in United Arab of Emirates but it decreases by 0.27 point in Saudi Arabia.

Kuwait, Oman and Bahrain are suffering from a substantial increase in youth unemployment. Over the period 2005-2019, the average annual growth rate of youth unemployment is 4.25%, 1.94% and 1.2% for the three countries respectively. During the same period, the overall unemployment rate decreases on average by 0.2% in Bahrain and by 3% in Oman but it increases by 2% in Kuwait. In addition, Kuwait, Oman and Bahrain have experienced a reduction of their economic freedom scores. On average, during the period of 2005-2019, the score of economic freedom diminishes by 0.43 point, 0.62 point and 0.5 point respectively for the three countries¹.

The economic expansion experienced by the GCC countries during the past decades, and the structural economic reforms undertaken for income diversification were inadequate for inducing a major reduction in the high and persistent youth unemployment rate. In 2020, Saudi Arabia recorded the highest rate of youth unemployment (28.6%), followed by Kuwait (14.37%) and Oman (13.19%). Qatar has the lowest youth unemployment rate of 0.57%, while Bahrain and United Arab Emirates recorded 4.63% and 7.62% respectively (World Development Indicators, 2020). It is apparent that economic growth alone is not enough to absorb the labour market's new entrants and that youth employment efforts in GCC countries must be given a different impetus. Therefore, we propose that increasing the index of economic freedom (IEF) will contribute to finding a creative solution to this problem. Considering that economic freedom is an important determinant of economic growth in Arab Countries (Gouider, 2022), enhancing economic freedom should play an important role in policies aimed at reducing the youth unemployment rate in GCC countries. In this context, Lasagni et al. (2015) and Pařlová & Vejacka (2018) argue that the improvement of the quality of institutions (proxied by the IEF), is considered a key determinant of employment. For example, a large government sector (Feldmann 2006), strict labour and business regulation, bureaucracy and corruption (Messina, 2005; Feldmann, 2009a; Feldman, 2009b) and, high tax burdens (Daveri and Tabellini 2000) impair market competition and tend to reduce labour force participation and employment rates among female and young workers (Yoon, 2018).

Table 1 reports the IEF ranking and unemployment rates both for the overall labour force and for youth people in GCC countries in 2020.

Table 1. Economic freedom score and unemployment rates in 2020

	<i>IEF score</i>	<i>World ranking</i>	<i>Position</i>	<i>Overall Unemployment rate (%)</i>	<i>Youth unemployment rate (%)</i>
United Arab Emirates	76.2	18	Mostly free	2.35	7.62
Qatar	72.3	31	Mostly free	0.1	0.57
Bahrain	66.3	63	Moderately free	0.71	4.63
Oman	63.6	75	Moderately free	2.67	13.19
Kuwait	63.2	79	Moderately free	2.18	14.37
Saudi Arabia	62.4	83	Moderately free	5.92	28.6

Source: The Heritage Foundation (2020) and World Development Indicators (2020)

¹ Author's calculation using data from World Bank's World Development Indicators (2020)

According to the Heritage Foundation (2020), none of the GCC countries is classified as free economies. Only two countries, United Arab Emirates and Qatar, are classified as mostly free economies, while the rest are considered moderately free economies. Table 1 also indicates that greater economic freedom is associated with a lower unemployment rate mainly for youth population. Therefore, boosting economic freedom may be a key policy tool for the enhancement of employment opportunities in GCC countries, especially for the younger working population.

Numerous empirical studies have investigated how the IEF affects employment. Most of these concluded that a greater economic freedom is associated with lower unemployment rates (Feldmann, 2009a, 2009b; Heller and Stephenson, 2014; Cebula and Alexander, 2015; Cebula, 2016). Many of these studies focused on the relationship between the IEF and employment for the overall labour force. Fewer studies (Feldmann 2007, 2010; Cebula and Alexander 2015) have explored the impact of economic freedom on unemployment rates among particular sub-segments of the population like youths, women and, low-skill workers. Using panel data of 87 countries over 23 years from 1980–2003, Feldmann (2007) concludes that greater economic freedom reduces the unemployment rate for both women and the young population. Feldmann also suggests that the protection of property rights, a smaller size of government and trade freedom, lead to lower unemployment for women and youths. Further, focusing on the relationship between the IEF and unemployment in 100 industrial and developing countries from 1980 to 2008, Feldmann (2010) argues that improving IEF ratings is a key tool for reducing youth unemployment. Similarly, Cebula and Alexander (2015) demonstrated that greater labour market freedom leads to a greater female labour participation rate in the United States.

To our knowledge, apart from the works of Feldmann (2006, 2007, 2009a, 2010), no studies have measured the impact of the various economic freedom components on youth unemployment. Our study is novel in several respects. First, in contrast to most studies in the field that focus on industrialised countries, this study is the first to examine the relationship between youth unemployment and economic freedom components in the Arab world, or particularly for the homogeneous group of GCC countries. Second, most previous studies explore the effect of economic freedom on employment for the total labour force whereas, our study concentrates on the specific demographic group of the youth population. Finally, we have measured not only the whole impact of the IEF but also the effect of each component to determine which component has the strongest effect on youth unemployment in GCC countries. The rest of the paper is organised as follows: section 2 presents and describes the data and the econometric method employed by this study. The results and discussion are presented in section 3, and section 4 summarises our conclusions and recommendations.

1. DATA AND ECONOMETRIC METHOD DESCRIPTION

Our empirical investigation is based on annual data of the GCC countries from 2005 to 2019. All the macroeconomic variables used in this study were obtained online from the World Bank's World Development Indicators, except the IEF data, which were acquired from the Heritage Foundation (2020).

We use the youth unemployment rate as the dependent variable. Domestic investment rate, the percentage of the total population aged between 0 and 14 years, and economic freedom are used as independent variables.

Based on the Feldmann (2007, 2010) studies, the basic model is summarised in the following equation:

$$Yun_{it} = \alpha_0 + \alpha_1 INV_{it} + \alpha_2 Pop(0-14)_{it} + \alpha_3 IEF_{it} + \varepsilon_{it}$$

where:

- Yun is the youth unemployment rate defined as the number of unemployed 15–24 year-olds, expressed as a percentage of the youth labour force.

- i denotes country, t denotes time and ε is the stochastic error term.

- INV denotes the share of investment in total production. It is obtained by calculating the gross capital formation as a percentage of gross domestic production². This variable is used as a proxy of domestic investment. A negative coefficient of INV is expected, because a higher rate of investment enhances economic growth and decreases the unemployment rate.
- Pop (0-14) is the percentage of the total population between 0 and 14 years; a positive coefficient of Pop (0-14) is expected because, when the share of the population between 0 and 14 years grows, the future labour force increases and the youth unemployment subsequently increases (Feldmann 2007).
- IEF represents the overall score of economic freedom. A negative coefficient of the IEF is expected (Heller and Stephenson, 2014; Cebula et al., 2015; Cebula, 2016; Feldmann, 2007).

The IEF is multidimensional. It covers twelve quantitative and qualitative elements. Owing to the non-availability of data on fiscal health and judicial effectiveness, the IEF used in this study is based on ten elements reported in the following table:

Table 2. The ten components of economic freedom

<i>Components</i>	<i>Abbreviations</i>
Government spending	GS
Government integrity	GINTG
Tax burden	TB
Trade freedom	TRFR
Investment freedom	INVFR
Labour freedom	LFR
Monetary freedom	MFR
Financial freedom	FFR
Business freedom	BFR
Property rights	PRIGHTS

All economic freedom components are allocated a score from 0 to 100, with higher scores indicating a higher degree of freedom for that component. These elements are grouped into four areas: Rule of law, Government size, Regulatory efficiency, and Open markets (Heritage Foundation 2020).

Youth are particularly harshly affected by unemployment (Feldmann, 2010). Hence, in order to verify the probably specific aspects that may characterize youth unemployment, we also estimate the effect of the economic freedom on the overall unemployment rate (UR), measured as the number of unemployed persons as a percentage of the total labour force. Table 3 summarizes the descriptive statistics.

Table 3. Descriptive statistics

	<i>UR</i>	<i>YUN</i>	<i>POP 0-14</i>	<i>INV</i>	<i>IEF</i>
Mean	2.59	10.58	21.08	26.09	67.27
Median	2.24	7.95	21.25	24.45	66.60
Maximum	6.25	33.82	33.85	48.31	77.70
Minimum	0.14	0.45	13.08	12.84	59.60
Std. Dev.	1.83	8.99	5.67	7.39	4.79
Skewness	0.52	1.25	0.20	1.06	0.46
Kurtosis	2.06	3.47	2.21	4.07	2.19

As shown in the above table, the average value of the overall unemployment rate is 2.59% while the average value the youth unemployment is 10.58%. In addition, the mean value of the population aged

² <https://tcdata360.worldbank.org/subtopics/h802df10f?country=BRA>

between 0 and 14 years is 21.08% of the total population and domestic investment has a mean value of 26.09%. The average economic freedom score is 67.27 points, which implies that, on average, GCC economies are considered by the Heritage Foundation as moderately free.

The correlation matrix (Table 4) indicates that the independent variables simultaneously used in our basic regression are weakly correlated with each other, revealing that no multicollinearity can be detected. Furthermore, there is a high and negative correlation between the IEF and the unemployment rates which indicates that greater economic freedom leads to lower unemployment both for the total labour force and for youth population.

Table 4. Correlation matrix

	<i>UR</i>	<i>YUN</i>	<i>Pop 0-14</i>	<i>INVT</i>	<i>IEF</i>
UR	1.00	0.88	0.71	-0.42	-0.53
YUN	0.88	1.00	0.71	-0.39	-0.56
Pop 0-14	0.71	0.71	1.00	-0.34	-0.35
INVT	-0.42	-0.39	-0.34	1.00	0.14
IEF	-0.53	-0.56	-0.35	0.14	1.00

Source: author's calculation

We proceed in two stages. First, we estimate the impact of the IEF on the unemployment rate both for the total labour force and for youth population. Second, to avoid problems of multicollinearity, we separately integrate the ten components in the basic equation to determine the aspects of economic freedom that impact overall and youth unemployment rates and which do not. We use a panel approach with fixed effects, which permits better accountability for omitted variables in the regressions (Compton et al. 2011). In addition, the panel approach minimises the non-stationarity of the time series insofar as the panel unit root tests have standard asymptotic distributions (Baltagi 2001).

2. RESULTS AND DISCUSSION

The Panel Ordinary Least Square results of the effect of the IEF on the unemployment rates are summarised in Table 5. The model 1 estimates the effect of the IEF on the overall unemployment rate while the model 2 measures the effect of the IEF on the youth unemployment rate. The choice between fixed or random effects is determined using the Hausman test. For the two population groups, the results of this test show that the fixed effect model is more appropriate both for model 1 and model 2.

Table 5. Relationship between unemployment rates and the IEF

	<i>Model 1</i>	<i>Model 2</i>
Intercept	6.98 (2.89) ***	38.26 (3.45) ***
INV	-0.04 (-2.05) *	-0.17 (-1.9) *
Pop 0-14	0.2 (7.18) ***	1.00 (7.79) ***
IEF	-0.11 (-3.68) **	-0.66 (-4.7) ***
No. of Observations	90	90
F-Statistic	8.13	10.04
Prob.	0.0000	0.0000
R ²	0.65	0.7

Hausman test Prob.	11.85 0.0001	20.65 0.0001
-----------------------	-----------------	-----------------

Notes: The dependent variables are the overall unemployment rate for the model 1 and the youth unemployment rate for the model 2; t statistics are reported in parentheses; ***, ** and * denote statistical significance at the 1%, 5% and 10 % level.

As showed in Table 5, all variables are statistically significant and have the expected sign. When the investment rate increases by 1%, youth unemployment decreases by 0.17% but the overall unemployment rate decreases only by 0.04%. In any event, when the percentage of the population aged between 0 and 14 years increases by 1%, the youth unemployment rate grows by 1% while the overall unemployment rate grows only by 0.2%. Regarding the IEF, this variable is statistically significant and has a negative sign which confirms that greater economic freedom is associated with lower unemployment rate both among the total labour force and among youth people. However, the effect of economic freedom on youth unemployment rate appears more substantial comparatively to its effect on the overall unemployment rate. In other words, greater economic freedom is more appropriate to reduce youth unemployment rate. Indeed, a one-unit increase in the score of economic freedom reduces the youth unemployment rate by 0.66% but the overall unemployment will be reduced only by 11%. This result is supported by Feldman (2010) who find that economic freedom has a more favorable impact on unemployment among youth people.

The results presented in Table 5 are based on the relationship between the aggregate freedom index and unemployment rates. However, since economic freedom is multidimensional and encompasses many factors, it will be useful for policymakers to determine the impact of each component separately to undertake reassuring reforms in terms of employment mainly for youth people. The impact of the ten components of economic freedom on unemployment rates both for the overall labour force and for the youth people in GCC countries are measured using the Panel Ordinary Least Square method. Results are reported in Table 6 and Table 7. For all the regressions, the result of the Hausman test shows that the fixed-effect regression method is better than the random-effect regression method. This confirms that the variability of the score of economic freedom components is due to change over time rather than differences across countries.

Table 6. Relationship between the ten economic freedom components and overall unemployment rate

	GINTG	PRIGHTS	GS	TB	BFR	LFR	MFR	TRFR	INVFR	FFR
Intercept	-3.98 (-2.24) *	3.23 (2.26) *	-1.95 (-1.24)	15.89 (0.9)	0.67 (0.47)	-2.57 (-1.65)	3.8 (1.93) *	3.54 (0.9)	0.86 (1.13)	1.09 (1.3)
INV	-0.05 (-2.42) **	-0.03 (-1.59)	-0.04 (-2.06) *	-0.04 (-1.86) **	-0.04 (-1.95) *	-0.04 (-1.63)	-0.05 (-2.69) **	-0.04 (-2.12) **	-0.03 (-1.94) *	-0.02 (-1.18) *
Pop 0-14	0.29 (7.39) ***	0.19 (6.88) ***	0.25 (7.49) ***	0.23 (8.4) ***	0.24 (8.79) ***	0.24 (8.52) ***	0.2 (8.11) ***	0.23 (7.62) ***	0.28 (13.28) ***	0.26 (11.62) ***
IEF										
Rule of law										
GINTG	0.03 (1.8)									
PRIGHTS		-0.06 (-4.03) ***								
Government size										
GS			0.007 (0.54)							
TB				-0.17 (-0.98)						
Regulatory efficiency										
BFR					-0.03 (-1.82)					
LFR						0.015 (1.06)				
MFR							-0.06 (-2.45)			
Open market										
TRFR								-0.06 (-1.27)		
INVFR									-0.07 (-8.01) ***	
FFR										-0.06

(-6.9)***

N	90	90	90	90	90	90	90	90	90	90
F-Statistic	6.64	8.51	6.21	6.3	6.65	6.33	39.07	6.4	15.45	13.05
R2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hausman test	0.61	0.67	0.59	0.6	0.61	0.6	0.58	0.6	0.78	0.75
Prob.	11.78	16.24	11.22	16.98	11.25	15.3	6.23	11.8	52.8	29.56
	0.008	0.001	0.004	0.002	0.001	0.0014	0.1	0.0000	0.001	0.000

Notes: The dependent variable is the overall unemployment rate; t statistic are reported in parentheses; ***, ** and * denote statistical significance at the 1%, 5% and 10 % level.

Table 7. Relationship between the ten economic freedom components and youth unemployment rate

	GINTG	PRIGHTS	GS	TB	BFR	LFR	MFR	TRFR	INVFR	FFR
Intercept	-1.12 (-0.13)	12.81 (1.88) *	-20.11 (-2.7) ***	-118.2 (-1.40)	-4.77 (-0.68)	-8.15 (-1.18)	17.78 (1.23)	39.4 (2.19) *	2.46 (0.88)	4.32 (1.15)
INV	-0.18 (-1.66)	-0.13 (-1.38)	-0.19 (-1.87) *	-0.23 (-2.13) **	-0.19 (-1.8) *	-0.21 (-1.9) *	-0.24 (-2.32) **	-0.2 (-2.05) **	-0.11 (-1.98) **	-0.07 (-0.93) *
Pop 0-14	1.06 (5.54) ***	0.99 (7.43) ***	-1.37 (8.71) ***	1.24 (9.19) ***	1.24 (9.13) ***	1.23 (9.02) ***	1.13 (8.1) ***	1.09 (7.98) ***	1.47 (19.08) ***	1.31 (12.47) ***
Rule of law										
GINTG	-0.11 (-1.23)									
PRIGHTS		-0.36 (-4.17) ***								
Government size										
GS			0.1 (1.72) *							
TB				1.09 (1.29)						
Regulatory efficiency										
BFR					-0.08 (-1.01)					
LFR						-0.02 (-0.32)				
MFR							-0.32 (-2.03) *			
Open market										
TRFR								-0.58 (-2.83) ***		
INVFR									-0.4 (-12.88) ***	
FFR										-0.29 (-7.09) ***
N	90	90	90	90	90	90	90	90	90	90
F-Statistic	6.92	9.5	7.11	6.94	6.85	6.7	7.31	7.91	31.88	14.33
R2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hausman test	0.62	0.69	0.63	0.62	0.62	0.61	0.63	0.65	0.88	0.77
Prob.	10.22	25.4	17.7	16.35	15.48	14.39	12.44	24.05	145.47	43.22
	0.0167	0.0000	0.0005	0.0010	0.0014	0.0024	0.0006	0.0000	0.0000	0.000

Notes: The dependent variable is the youth unemployment rate; t statistic are reported in parentheses; ***, ** and * denote statistical significance at the 1%, 5% and 10 % level.

As shown in Table 6, among the ten economic freedom components, only three elements are statistically significant and with expected sign. These components are: PRIGHTS, INVFR and FFR. A one-unit increase in the score of these three variables is associated with the decline of the overall unemployment by 0.06%, 0.07% and by 0.06% respectively. However, the improvement of these areas has a lower effect on the overall unemployment rate compared to the effect on the youth unemployment rate. Regarding to the effect of the IEF component's on youth unemployment (Table 7), six elements are statistically significant and with expected sign. Among the six components, four elements are statistically significant coefficients at 1%: property rights, trade, investment and financial freedom. Property rights tend to reduce the youth unemployment rate by 0.36% when its score increases by one point. This result provides evidence that a stronger rule of law, through better protection of property rights is important for the improvement of job opportunities for youth. This finding is in conformity with Feldmann (2007, 2010).

The other three components belong to the area of Open Markets. Enhancement of the trade freedom score by one point, is associated with the reduction of youth unemployment by 0.58%. Also, investment freedom exerts a positive effect on youth unemployment. It is observed that a one-unit increase in the

score of investment freedom would result in a 0.4 % decrease in the youth unemployment rate. The last component in the category of Open Markets, namely financial freedom, reduces the youth unemployment rate by 0.29% when its score is enhanced by one point. It is clear that the strategy of enhancing freedom in trade, investment and financial areas plays a key role in the improvement of youth employment in GCC countries. This result provides evidence that an open market strategy leads to a more efficient allocation of resources which is conducive to a lower unemployment rate (Feldmann 2009a).

Results reported in Table 5 also show that the components, government spending and monetary freedom have a lower statistical significance on youth unemployment. The coefficients of the two components are significant at a 10% level. Government spending is positively associated with the youth unemployment rate which increases by 0.1% when the government spending score rises by one point. This finding, which is in line with previous studies (Alesina et al. 2002; Christopoulos and Tsionas 2002; Feldmann 2007), provides evidence that a larger size of government establishment negatively affects employment through crowding out of the private sector, reducing economic competitiveness and ultimately limiting job opportunities. The coefficient of the monetary freedom component is negative and is less significant. An additional point in the score of monetary freedom leads to a 0.32 % reduction in the youth unemployment rate.

We do not find statistically significant effects of government integrity, tax burden, business and labour freedom.

CONCLUSION

Our research is the first to measure the impact of economic freedom on the youth unemployment rate in GCC countries. This study adds to the literature by determining the sub-components of economic freedom which impact youth unemployment in GCC countries. Based on a Panel Ordinary Least Square approach with fixed effects, we found that increasing economic freedom leads to unemployment reduction both among the total labour force and among youth people in GCC countries. However, the magnitude of the effect of the economic freedom on unemployment is more substantial among young people. Conversely, empirical results show that six of ten economic freedom components – property rights, trade freedom, investment freedom, financial freedom, monetary freedom, and government spending have a significant effect on youth unemployment. The largest statistically significant coefficients concern two categories of economic freedom namely – Rule of law and Open markets. Policymakers who seek to reduce the youth unemployment rate should concentrate their efforts on the improvement of these economic freedom components. It would enable them to enact reforms that promote economic freedom in these areas. Maintaining a stronger rule of law and an open market are key to reducing youth unemployment in GCC countries.

REFERENCES

- Alesina, A., Ardagna, S., Perotti, R., Schiantarelli, F. (2002), “Fiscal policy, profits, and investment”, *American Economic Review*, Vol. 3, No. 3, pp. 571-589.
- Baltagi Badi, H. (2001), “Econometric Analysis of Panel Data”, 2nd ed. New York: John Wiley and Sons.
- Cebula, R. J., Alexander, G. (2015), “An exploratory empirical note on the impact of labour market freedom on the female labour force participation rate in the US”, *Applied Economics Letters*, Vol. 22, No.8, pp. 632-636.
- Cebula, R.J., Foley, M., Capener, D. (2015), “The Impact of Economic Freedom on the Unemployment Rate in OECD Nations: An Exploratory Study Accepting the Validity of Okun’s Law”, *International Economics*, Vol. 68, No. 4, pp. 423-436.
- Cebula, R.J. (2016), “Do Regional Differentials in Economic Freedom Yield Regional Unemployment Rate Differentials in the US? A Brief Exploratory Note Adopting Panel Data Analysis”, *Econometrics Letters*, Vol.3, No.1, pp. 11-25.

- Christopoulos, D.K., Tsionas, E.G. (2002), "Unemployment and government size: Is there any credible causality?", *Applied Economics Letters*, Vol. 9, pp. 797-800.
- Compton, R.A., Giedeman, D.C., Hoover, G. A. (2011), "Panel evidence on economic freedom and growth in the United States", *European Journal of Political Economy*, Vol. 27, No. 3, pp. 423-435.
- Daveri, F., Tabellini, G. (2000), "Unemployment, growth and taxation in industrial countries", *Economic Policy*, Vol. 15, No. 30, pp. 47-104.
- Feldmann, H. (2006), "Government size and unemployment: Evidence from industrial countries", *Public Choice*, Vol. 127 (3-4), pp. 443-459.
- Feldmann H. (2007), "Economic freedom and unemployment around the world", *Southern Economic Journal*, Vol. 74, No. 1, pp. 158-176.
- Feldmann H. (2009a), "The unemployment effects of labor regulation around the world", *Journal of Comparative Economics*, Vol. 37, No. 1, pp. 76-90.
- Feldmann H. (2009b), "Business regulation, labor force participation and employment in industrial countries", *Journal of Economics and Business*, Vol. 61, No. 3, pp. 238-260.
- Feldmann H. (2010), "Government size and unemployment in developing countries", *Applied Economics Letters*, Vol. 17, No. 3, pp. 289-292.
- Gavurova, B., Kubak, M., Huculova, E., Popadakova, D., Bilan, S. (2019), "Financial Literacy and Rationality of Youth in Slovakia", *Transformations in Business & Economics*, Vol. 18, No. 3(48), pp. 43-53.
- Gouider, A. (2022), "The Nexus between Economic Freedom and Economic Growth in Arab Countries", *Montenegrin Journal of Economics*, Vol. 18, No. 1, pp. 121-129.
- Heller L. R., Stephenson E. F. (2014), "Economic freedom and labor market conditions: Evidence from the States", *Contemporary Economic Policy*, Vol. 32, No. 1, pp. 56-66.
- International Labour Office (2013), *Youth labour market analysis: a training package on youth labour market information*, Geneva, Switzerland, ILO.
- Lasagni A., Nifo A., Vecchione G. (2015), "Firm productivity and institutional quality: Evidence from Italian industry", *Journal of Regional Science*, Vol. 55, No. 5, pp. 774-800.
- Messina J. (2005), "Institutions and service employment: A panel study for OECD countries", *Labour*, Vol. 19, No. 2, pp. 343-372.
- Paľová, D., Vejcka, M. (2018). "Analysis of Employment in EU According to Europe 2020 Strategy Targets". *Economics and Sociology*, Vol. 11, No. 3, pp. 96-112. doi:10.14254/2071-789X.2018/11-3/6.
- Snieska, V., Navickas, V. Grencikova, A., Safrankova, J.M, Sikyr, M., (2020), „Fundamental Human Resource Management Practices Aimed at Dealing with New Challenges in the Labour Market”, *Transformations in Business & Economics*, Vol. 19, No. 2 (50), pp. 38-51.
- The Heritage Foundation (2020), *2020 Index of Economic Freedom*, <https://www.heritage.org/index/ranking>
- Yoon, D. (2018). "Rising unemployment among young people and improved employment policy: The case of South Korea", *Economics and Sociology*, Vol. 11, No. 4, pp. 246-264. doi:10.14254/2071-789X.2018/11-4/16



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Citation:

Chowdhury, S.S.H., Irfan, M. (2022), "A Study on the Time-Varying Volatility Connectedness Between the Sectors in the Indian Stock Market", *Montenegrin Journal of Economics*, Vol. 18, No. 3, pp. 77-88.

A Study on the Time-Varying Volatility Connectedness Between the Sectors in the Indian Stock Market

SHAH SAEED HASSAN CHOWDHURY (*Corresponding Author*)¹
and MOHAMMAD IRFAN²

¹ Assistant Professor, Department of Accounting and Finance, Prince Mohammad Bin Fahd University, Al Khobar, Saudi Arabia
e-mail: hchowdh@yahoo.com; schowdhury@pmu.edu.sa

² Associate Professor, CMR Institute of Technology, Bangalore, India, e-mail: Irfan.m@cmrit.ac.in

ARTICLE INFO

Received September 09, 2021
Revised from October 12, 2021
Accepted November 12, 2021
Available online July 15, 2022

JEL classification:

C32, C58, G10, G40, G41

DOI: 10.14254/1800-5845/2022.18-3.6

Keywords:

Emerging Markets,
Volatility Spillover,
Indian Stock Market,
Dynamic Connectedness,
TVP-VAR

ABSTRACT

The main purpose of this study is to examine the connectedness between the sectors in the Indian stock market for the period 01/2011 through 12/2020. It uses TVP-VAR (Time-Varying Parameter Vector Autoregression) based connectedness approach to measure the time-varying connectedness between sectors. For the whole study period, almost 84% of the forecast error variance is explained by cross-sectional shocks within the network of Indian stock market sectors. Thus, own impact only accounts for 16% of the total variability, suggesting a robust overall dependence among the sectors. In general, results suggest that cyclical stocks are usually net transmitters of shocks, whereas non-cyclical stocks are net receivers. Important political events in the past had profound impact on the connectedness between the sectors in the Indian economy. For the portfolio managers, the main implication of the findings is that they should not overly depend on sectors to diversify their portfolios – rather, they should look at the relationship between individual stocks in this regard. And, for the policy-makers, the implication is that they should keep in mind that any policy changes (shocks) to cyclical sectors should be cautiously dealt with.

INTRODUCTION

Many events such as East Asian currency crisis in 1997 and the financial crisis of 2008 have showed that considering a market in isolation is not a good idea as far as portfolio diversification is concerned. This phenomenon is heavily related to the recent trend of globalization of business. Academicians and investors have been looking for new investment opportunities to achieve the benefits of portfolio diversification (Bekaert and Harvey, 1995). A portfolio of investments across multiple markets may seem to be well-diversified although they are inter-connected and vulnerable to human biases such as

panics and excessive exuberance. Hence, information on the connectedness between markets or sectors may tell investors more about the real diversification benefits in extreme situations.

Studies of Eun and Shim (1989) and Hamao et al. (1990) show that the possible scenario of contagion effect – especially in the event of financial panics – has significant implication on portfolio construction across multiple markets. The availability of powerful statistical packages and reliable data of both developed and emerging stock markets have recently contributed to big explosions of studies related to the spillover tendencies between stock markets (Baele, 2005; Diebold and Yilmaz, 2012, 2014). Similarly, spillover effect between sectors is an important issue since it may contribute to the effective diversification efforts of investors. Especially it is true since sector sensitivity to systematic risk factors may not be the only factor for efficient diversification in the presence of behavioral issues.

India has two most traded stock exchanges – Bombay Stock Exchange (BSE) and National Stock Exchange (NSE). As of February 8, 2021, India's stock market was the seventh largest in the world with a market capitalization of US\$ 2.7 trillion. In February, the BSE Sensex reached the 51,000 marks while the Nifty crossed the 15,000 mark for the very first time. The benchmark Nifty gained 6.9% during the first two months in 2021. Interestingly, Economic Times claims that the stock market of India is larger than that of Canada, Germany and Saudi Arabia. It is worth mentioning that India's stock market is the second-best performer among the top 15 stock markets in 2021 and it is expected that it will overtake France to become the sixth largest in the world. Total market capitalization of France now stands at US\$ 2.86 trillion. The MSCI India index has gone up 21% during the December-February period compared to 19% and 12% by MSCI Emerging Market index and MSCI World index, respectively (Iyer, 2021).

Foreign portfolio investors have pumped in nearly US\$ 4.05 billion in Indian stocks since January 2021, which is the second-best inflow performance among all the emerging markets during the same period. IMF projects that India's growth will increase sharply to 11.5% and 6.80% in fiscal years 2022 and 2023, respectively. In this decade, the compound annual growth rate of this market is about 13.22%. According to Fitch ratings in 2020, The previous decade observed the global liquidity infusion of US\$ 6 trillion. Liquidity infusion amounting US\$ 20 trillion has happened again recently due to the Covid-19 pandemic (International Monetary Funds, 2021). Overall, Indian stock market has been an attractive market for global investors. Hence, it deserves a thorough investigation. In this backdrop, this study has chosen to examine sectoral behavior – more specifically, dynamic connectedness between sectors.

In this paper, we examine the time-varying connectedness across 17 sectors of the Indian stock market. This paper is the first in the literature to explore dynamic connectedness/spillover between all the sectors in the Indian market. This study uses the TVP-VAR (Time-Varying Parameter Vector Autoregressive) dynamic connectedness framework of Antonakakis et al. (2020). This framework, in fact, is based on the earlier methodology given by Diebold and Yilmaz (2009, 2012, 2014). This study focuses on the connectedness between the sectors in the Indian stock market for the period 01/2011 through 12/2020. A study by Chatziantoniou et al. (2020) on Indian stock market sectors is close to this paper. However, their study only covers 10 sectors whereas this paper covers the whole Indian market by considering 17 sectors for the period 2011-20. Moreover, this paper uses NSE sectoral index whereas the Chatziantoniou et al. (2020) have used BSE sectoral index. Obviously, our study is more comprehensive in terms of its scope.

This study should have strong implications for the investors, policymakers and academicians. First, this study primarily focuses on the dynamic connectedness of the Indian sectors by considering the volatility spillover of one sector to (and from) other sectors. Thus, this study tells an investor how sectors can behave differently with respect to important economic and political shocks. Second, an investor can achieve efficient diversification by avoiding/accepting investments in a particular sector. Specially, the knowledge of dynamic connectedness between sectors should help investors to take timely actions to safeguard themselves from potential spillover of panic or exuberance. In addition, policymakers and regulators can take the right policy decisions to protect the whole market in such a case. It is understandable that even if some sectors are highly connected, a policy decision for a particular sector cannot be taken by disregarding others. Since this investigation shows the time-varying connectedness between all the sectors of Indian economy, policymakers and investors will also effectively identify the leading and

lagging sectors of the economy. It demonstrates how any shock spreads through the sectoral system, which helps policymakers to achieve efficient policy implementation.

The rest of the paper is organized as follows. Next section provides a brief review of studies related to spillover of volatility shocks (or in another word, connectedness) – especially related to stock market sectors. Section 2 provides information about the data and methodology used to estimate the spillover of volatility of sector returns. Empirical results are discussed in section 3. The last section concludes the paper with some implications for the investors.

1. LITERATURE REVIEW

Early research – such as Arshanapalli and Doukas (1993); Karolyi (1995) – focused on the correlations between the mature markets because investors were not that much interested in emerging markets before mid-1990s. Some studies prefer to use volatility spillovers as a measure of connectedness between two markets. King and Wadhvani (1989) examine volatility transmission between equity markets. When investors of a market collect information from other markets, sensitive information may transmit back and forth, resulting in an increase of overall connectedness. Their findings show that an increase in volatility contributes to further increase in volatility.

A study by Hamao et al. (1990) is probably the first one that applies univariate GARCH models to analyze relationship between cross-border markets. In this study, they use a two-stage approach to analyze volatility transmission among the stocks listed in New York, London and Tokyo stock exchanges. Tsai (2014) find that Germany and the United States were the main markets to transmit information to other important international markets. In a relatively recent study, Berg and Vu (2019) trace the spillover effect of the US stock market volatility on the economic activities of 17 mature markets. Their findings show that the US market influences the performances of these markets more than their own financial markets do.

The increasing importance of emerging markets in the global arena during the 1990s motivated the academicians to perform tests of spillover between these markets. Abbas et al. (2013) report that volatility transmission takes place between different regional markets if they are economically linked. Allen et al. (2013) investigate if volatility spillovers from the Chinese stock market to its neighboring and developed markets. Their results show that volatility spillovers took place among these markets during the pre-global financial crisis era. However, there is slight evidence of spillover from China to other markets during the crisis. For the period 2008-2013, Gomes and Chaibi (2014) report significant transmission of shocks between oil price movements and some of the 21 frontier markets under study.

Yarovaya et al. (2017) test the pair-wise spillover of returns and volatility shocks between nine developed and 11 emerging futures markets and find that there is asymmetry in returns and volatility spillovers between these markets. In a recent study, Arin et al. (2020) examine financial spillovers between four major GCC stock markets. There is evidence of volatility spillovers from Saudi Arabia to Qatar, Abu Dhabi, and Dubai. Moreover, spillovers from the larger markets have increased during the post-2014 oil crisis period. Chowdhury (2020) investigates the presence and direction of stock market sentiment spillover between the GCC stock markets. The findings of this study indicate that Kuwait and Qatar stock market sentiments are not connected to other markets' sentiment and that the stock market sentiments of Saudi Arabia and the UAE are connected as well as bi-directional.

The methodologies to detect connectedness between markets have also evolved over time. Diebold and Yilmaz (2009) propose a simple measure of connectedness of asset returns and/or volatilities. Their framework is able to detect trends and bursts in spillovers. In an analysis of 19 global stock markets for the period 1992-2007, they find that return spillovers display a smooth upward trend, whereas volatility spillovers display bursts without any trend. As an extension of this method, dynamic connectedness introduced by Diebold and Yilmaz (2012, 2014) focuses on the time-varying parameters (TVP) along with vector autoregressive model (VAR). The TVP-VAR framework shows the time-varying variance and covariance structure of given data with more flexibility. Antonakakis et al. (2020) use TVR-VAR along with Mon-

te Carlo simulation to examine currency exchange rates' transmission mechanism. Their results reveal that the euro and the Swiss franc mainly transmit shocks to other currencies during 1975-2019 period.

Gabauer et al. (2020) have also used connectedness mechanism of TVR-VAR to examine the transmission structure of Asia-Pacific sovereign bond returns. They report that during the global financial crisis in 2009, dynamic connectedness increased sharply, which confirms that monetary policies of Asia-Pacific countries are interconnected – especially during periods of financial troubles. Gupta et al. (2020) apply rolling window estimation to examine several episodes of US financial crises during the 1936-2016 period. Their findings state that stock price returns reduce and volatility increases during financial crises. Lee and Lee (2020) investigate international transmission of volatility of Northeast Asian stock market returns. They report that there is a weak relationship between the Northeast Asian markets, and that the US market influences this regional market. They also observe a time-varying behavior of connectedness.

Academicians have published a good number of studies on Indian market's sector connectedness/spillover during the last decade. However, these studies mainly use GARCH based framework to detect volatility spillovers between sectors. Nateson et al. (2013) show that BSE Sensex volatility transmits to affect most of the Indian stock market sectors. However, power and technology sectors appear to be insensitive to shocks to Sensex. A study by Chatziantoniou et al. (2020) on Indian stock market sectors examines the connectedness between 10 selected sectors. Findings show that the Indian market's sectoral connectedness is time-varying.

Connectedness among the sectors reached the highest level during the 2008 financial crisis, the double-digit inflation and stock market crash of 2011, national election of 2014, and the historic and controversial demonetization of 2016. Purankar and Singh (2020) use DCC-GARCH framework to reveal a weak spillover relationship between the commodity and equity sectoral indices. Moreover, they are slightly negatively correlated with each other, indicating opportunities for portfolio diversification. Kumar and Singh (2020) use Granger-causality technique to explore the pattern of Indian sectorial indices and show that financial and banking sectors are the best two performers, whereas pharmaceutical and real estate sectors are the worst performers.

2. DATA AND RESEARCH METHODOLOGY

Seventeen sectoral indices have been considered in this study. The sectors are Automobile, FMCG, Real Estate, Pharmaceuticals, BPM (Business Process Management) & IT, Banking, Media, Financials, Steel, Energy, Healthcare, Services, Construction & Infrastructure, Public Sector Enterprises, Private Banks, MNC, and Consumption. Daily sector returns are calculated as the logged difference of sectoral indexes of two consecutive trading days. Data covers the period January 2011 through December 2020. Data are collected from www.niftyindices.com website.

The methodology followed in this study has been successfully used by Antonakakis et al. (2020), Antonakakis et al. (2018) to trace connectedness between two variables. These studies are based on Diebold and Yilmaz (2009, 2012, 2014), which provide an approach to identify and measure connectedness/spillover between markets. We use it to find the connectedness between sectors in the Indian stock market. In their influential papers, Diebold and Yilmaz basically use a rolling window with the help of a VAR estimation process. This estimation technique suffers from sensitivity to outliers and selection of rolling-window sizes. Thus, this paper uses TVP-VAR based connectedness approach given by Antonakakis et al. (2020), which bypasses above-mentioned two drawbacks. First, we estimate a TVP-VAR(1) model, which can be expressed as follows:

$$z_t = C_t z_{t-1} + u_t \quad u_t \sim N(\mathbf{0}, S_t) \quad (1)$$

$$vec(C_t) = vec(C_{t-1}) + v_t \quad v_t \sim N(\mathbf{0}, R_t) \quad (2)$$

where z_t and u_t represent $k \times 1$ vectors and both C_t and S_t are $k \times k$ matrices. Finally, $vec(C_t)$ and v_t are $k^2 \times 1$ vectors whereas R_t is a $k^2 \times k^2$ matrix.

Next, this study estimates the H -day forward generalized forecast error variance decomposition (GFEVD) by using the approach developed by Koop et al. (1996). Unlike the orthogonalized forecast error variance decomposition of Diebold and Yilmaz (2009), GFEVD is not sensitive to the ordering of variables. Since there are no theory-based models for sectoral shock spillovers, an arbitrary selection of error structure may give invalid results; thus, a GFEVD framework is believed to be a preferred approach. A TVP-VAR can be transformed into a TVP-VMA model as follows,

$$\mathbf{z}_t = \sum_{i=1}^p \mathbf{C}_{it} \mathbf{z}_{t-i} + \mathbf{u}_t = \sum_{i=0}^{\infty} \mathbf{A}_{jt} \mathbf{u}_{t-j}.$$

The scaled GFEVD ($\phi_{ij,t}^g(H)$) normalizes the unscaled version of GFEVD ($\tilde{\phi}_{ij,t}^g(H)$) in such a way so that each row adds up to one. $\tilde{\phi}_{ij,t}^g(H)$ measures sector j 's impact on sector i in terms of its share in forecast error variance. It can be defined as the pairwise directional connectedness or spillover from sector j to sector i . This indicator is computed by,

$$\phi_{ij,t}^g(H) = \frac{S_{ii,t}^{-1} \sum_{t=1}^{H-1} (\mathbf{t}_i' \mathbf{A}_t \mathbf{S}_t \mathbf{t}_j)^2}{\sum_{j=1}^k \sum_{t=1}^{H-1} (\mathbf{t}_i' \mathbf{A}_t \mathbf{S}_t \mathbf{A}_t' \mathbf{t}_i)} \text{ and}$$

$$\tilde{\phi}_{ij,t}^g(H) = \frac{\phi_{ij,t}^g(H)}{\sum_{j=1}^k \phi_{ij,t}^g(H)}$$

where $\sum_{j=1}^k \tilde{\phi}_{ij,t}^g(H)$ equals 1, $\sum_{i,j=1}^k \tilde{\phi}_{ij,t}^g(H) = k$, and \mathbf{t}_j represents to a vector with unity on the j^{th} position and zero otherwise. Based upon the GFEVD framework, Diebold and Yilmaz (2012, 2014) have estimated connectedness between two variables, which can be expressed as follows:

$$TO_{jt} = \sum_{i=1, i \neq j}^k \tilde{\phi}_{ij,t}^g(H) \quad (3)$$

$$FROM_{jt} = \sum_{j=1, i \neq j}^k \tilde{\phi}_{ij,t}^g(H) \quad (4)$$

$$NET_{jt} = TO_{jt} - FROM_{jt} \quad (5)$$

$$TCI_t = \frac{1}{k} \sum_{j=1}^k TO_{jt} \equiv \frac{1}{k} \sum_{j=1}^k FROM_{jt} \quad (6)$$

$\tilde{\phi}_{ij,t}^g(H)$ estimates the impact an innovation in sector j has on sector i . Thus, Equation (3) estimates the total impact a shock in sector j has on all other sectors, which is defined as the *total directional connectedness to others*. Equation (4), on the other hand, estimates the total influence all other sectors have on variable j , which is defined as the *total directional connectedness from others*. Equation (5), the difference between equation (3) and (4), gives the *net total directional connectedness* which tells us whether a sector is a net transmitter or a net receiver of shocks.

Another important feature of equation (6) is to estimate the *total connectedness index* (TCI_t) between all the sectors, which is basically the average impact of all the spillovers between the sectors. A high TCI for the overall market implies a stronger presence of interconnectedness between the sectors.

3. DISCUSSION OF RESULTS

Table 1 gives the descriptive statistics for the returns of 17 individual sectors. All the sectors except PSE, METAL, and REAL have made positive returns during the study period. FMCG and BANK.P have performed the best with 6% return during the past 10 years. REAL's return was the most volatile among all the sectors. BANK, BANK.P, and MEDIA are other volatile sectors after REAL. First two sectors may be volatile because banking sector is usually considered to be pro-cyclical to the economy.

Table 1. Descriptive Statistics of Sector Returns

<i>Indices</i>	<i>Min</i>	<i>Mean</i>	<i>Max</i>	<i>SD</i>
MNC	-12.84	0.05	7.55	1.03
PSE	-10.66	-0.01	8.3	1.28
FMCG	-11.2	0.06	7.99	1.12
IT	-12.49	0.05	8.92	1.34
SERVICE	-14.68	0.04	7.91	1.21
BANK	-18.31	0.04	10	1.57
PHARMA	-9.35	0.04	9.86	1.23
AUTO	-14.91	0.04	9.9	1.39
FINANC	-18.3	0.05	9.03	1.49
METAL	-12.33	-0.01	9.39	1.76
INFRA	-12.84	0.01	7.24	1.35
HEALTH	-8.69	0.04	8.8	1.13
BANK.P	-19.7	0.06	10.49	1.58
MEDIA	-17.88	0.01	8.04	1.58
REAL	-12.33	0	8.09	2.1
CONSUMP	-12.05	0.05	8.38	0.99
ENERGY	-10.22	0.03	8.28	1.33

Table 2 provides the static connectedness between the sectors. The diagonal elements in this table provide the own-sector effects whereas off-diagonal elements provide effects from other sectors to a particular sector. MNC, PSE, SERVICE, BANK, AUTO, FINANC, INFRA, BANK.P, CONSUMP, and ENERGY are the net transmitters of volatility to other sectors. In fact, CONSUMP and SERVICE sectors are the two biggest transmitters of shocks. On the other hand, FMCG, IT, PHARMA, METAL, HEALTH, and MEDIA are the net receivers of shocks from other sectors. The IT sector is a very strong receiver of volatility spillover. MEDIA is the next strong receiver of shocks. TCI (Total Connectedness Index) is 83.67%, indicating that almost 84% of the forecast error variance can be explained by cross-sectional shocks within the sectors of the Indian stock market. This result also implies that own impact only accounts for 16% of the total variability, suggesting a strong overall dependence among the sectors. In such a case, a portfolio manager cannot expect to achieve portfolio diversification by just spreading investments across several sectors in this market. Thus, connectedness between individual firms is also an important consideration for effective portfolio diversification.

Table 2. Average Connectedness between Sectors in the Indian Stock Market

Indices	MN	FM		SER- VICE	BA NK	PHAR MA	AU TO	FI- NAN C				MET AL	IN FRA	HEAL TH	BAN K.P	ME DIA	RE AL	CON SUMP	EN ER GY	FR OM
	C	PSE	CG					IT	AL	FRA	TH									
MNC	12.79	4.90	6.60	2.12	6.69	5.96	2.80	8.20	6.88	4.63	6.35	3.36	6.04	3.36	3.43	10.40	5.16	67.20		
PSE	5.53	14.84	2.69	0.75	5.66	6.03	2.10	6.48	6.67	7.60	9.52	2.48	5.49	3.19	5.27	5.77	9.65	65.15		
FMCG	10.29	3.63	19.66	2.30	6.19	5.16	3.03	5.50	5.96	2.62	4.70	3.48	5.21	2.44	2.46	12.62	4.46	60.33		
IT	6.10	2.20	3.99	29.3	11.31	3.61	4.03	4.32	4.22	2.74	4.46	4.52	3.62	1.94	2.00	6.26	4.78	70.60		
SER- VICE	6.36	4.70	3.75	4.23	11.31	9.90	1.96	5.87	9.97	3.69	6.66	2.36	9.71	2.76	3.92	7.02	5.55	66.66		
BANK	6.07	4.98	3.33	1.54	10.52	12.30	1.54	5.93	10.66	3.99	6.51	1.66	11.96	2.66	4.22	6.36	5.23	67.69		
PHAR MA	5.96	3.50	4.41	2.67	3.80	2.73	22.30	4.80	3.29	2.61	4.26	21.67	2.76	2.60	2.43	6.41	3.09	77.69		
AUTO	6.59	5.65	3.76	1.53	6.47	6.01	2.62	14.00	6.96	5.21	6.92	3.07	6.02	4.27	4.13	9.60	5.11	65.99		
FINANC	6.51	5.31	3.57	1.58	10.20	10.47	1.65	6.26	11.57	4.02	6.66	2.02	10.23	2.90	4.36	6.95	5.60	66.42		
METAL	6.56	6.45	2.15	1.13	5.69	5.60	1.67	7.16	6.03	17.05	6.92	2.23	5.03	3.63	6.17	5.54	6.69	62.94		
INFRA	6.21	6.23	3.15	1.46	7.04	6.55	2.16	6.43	6.94	6.57	13.24	2.63	6.00	3.21	6.06	7.09	6.93	66.75		
HEALTH	6.40	3.72	4.50	2.74	4.17	3.07	19.66	5.10	3.71	3.03	4.63	20.22	3.09	3.04	2.75	6.79	3.31	79.77		
BANK.P	6.32	4.61	3.46	1.61	10.56	12.24	1.60	6.02	10.65	3.64	6.10	1.95	12.65	2.70	3.92	6.56	5.10	67.34		
MEDIA	6.31	5.44	2.61	0.97	5.12	4.90	3.06	7.66	5.46	4.99	6.39	3.59	4.79	21.22	5.02	7.74	4.43	76.76		
REAL	5.10	6.63	2.07	0.60	6.32	6.76	1.61	6.09	7.37	6.65	9.45	2.27	6.11	4.40	16.9	5.43	5.53	63.06		
CON SUMP	9.69	4.66	7.64	2.06	6.96	5.91	2.91	6.39	6.92	3.69	6.76	3.43	5.96	3.60	3.55	12.15	5.25	67.64		
ENER GY	6.23	9.78	3.79	1.53	6.53	6.03	2.15	5.63	6.66	5.66	6.07	2.52	5.62	2.52	4.01	6.92	15.64	64.15		
Contri bution TO oth ers	106.33	66.46	61.75	29.06	113.51	101.24	55.06	100.15	106.91	72.44	106.41	63.74	96.15	49.70	63.62	117.76	65.93	142.245		
Contri bution includ ing own	121.13	101.3	61.42	58.47	124.62	113.54	77.39	114.16	120.49	69.50	119.65	63.96	110.61	70.92	60.75	129.91	101.77	TCI		
Net spillo ver	21.13	1.31	-18.56	-41.5	24.62	13.54	-22.62	14.16	20.49	-10.50	19.65	-16.04	10.61	-29.06	-19.62	29.91	1.77	63.67		

Figure 1 provides the conditional volatility of all the 17 sector daily returns. Since it represents the period 01/2011-12/2020, there are 2,439 daily observations. Thus, the mid-point (slightly more than 1200th observation) of this figure corresponds to the year 2015. Throughout the study period, REAL sector suffers from consistently high level of overall volatility among all the sectors. The reason could be the fact that real estate business by nature is pro-cyclical with the economy. Approximately during the 2019 election period, volatility of all the sectors has gone up significantly. However, volatility of BANK, BANK.P, and FINANC was identical and each of them reaches about 40% in 2019 (this is about half way between the 2000th and the last observation). Banking and financial sectors are also considered to be cyclical industries. Hence, this result is not surprising. Overall, despite some volatility spikes, the conditional volatility for almost all the sector returns was within a healthy limit. That is also the reason for the investors

to have strong faith in this market, which in turn caused the whole market as well as the Indian economy to reach a new peak during the period 2011-20. The nature of change of volatility over time has prompted us to examine the dynamic connectedness between the Indian stock market sectors.

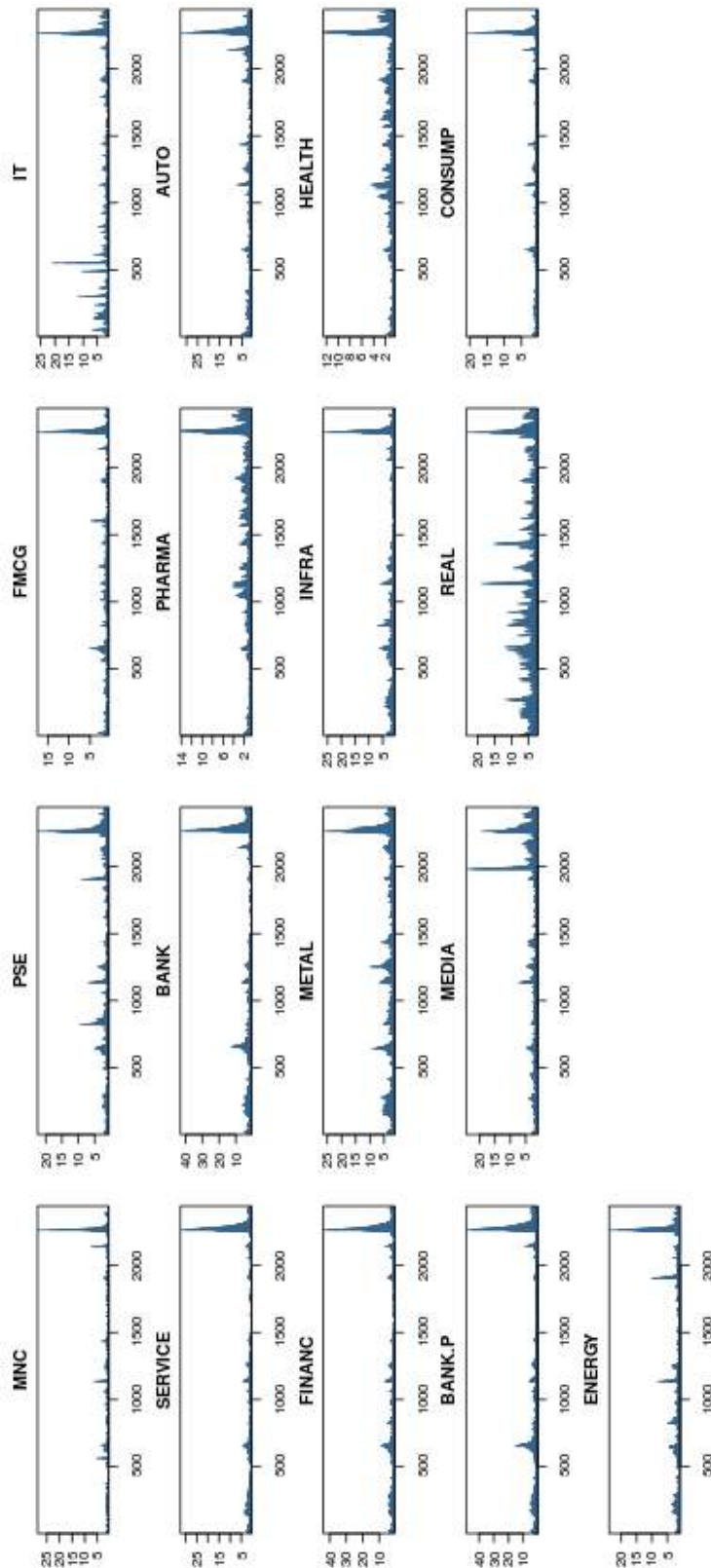


Figure 1. Conditional Volatility of Sector Returns

Figure 2 shows how sectors are interconnected through time. It is a better method to measure connectedness since this method considers a time-varying measure of dependence. The overall connectedness varies approximately between 77% to 91% during the study period. In 2012 (slightly left of start year, 2011), it reaches the maximum level (about 90%). Then it suddenly starts declining to reach approximately 79%. Overall, the total connectedness is high throughout the period, which supports the static findings in table 1. There is a very noticeable drop in connectedness in 11/2016 (close to the 1500th observation in the figure). On November 8, 2016, the Indian government announced the demonetization of all INR 500 and INR 1,000 notes. Government also announced the issuance of new INR 500 and INR 2,000 notes, which could be exchanged for the demonetized ones. This action was mainly taken to curtail the influence of underground economy and reduce the use of illegally earned and counterfeit money to finance unlawful business and terrorism. Initially, the impact is a substantial drop in connectedness around the time of demonetization. Afterwards, the effect runs through all the sectors, which increases the overall sectoral connectedness – thus, a lagged effect of an economic shock is observed.

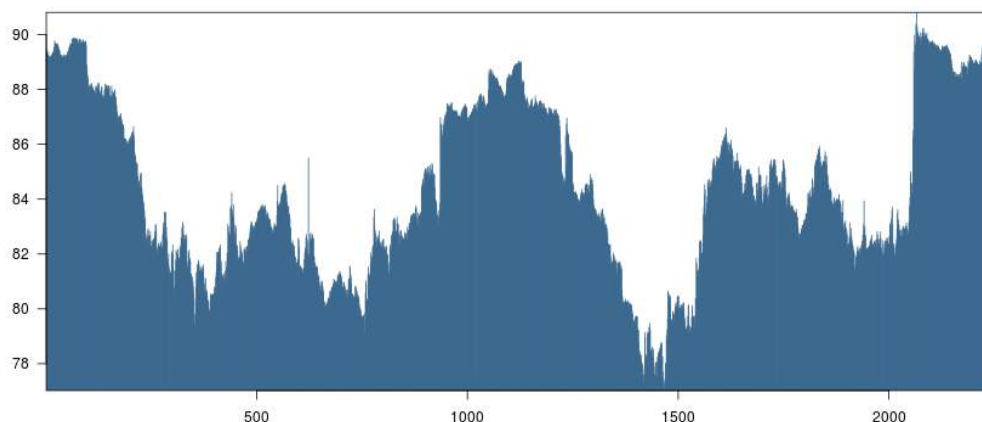


Figure 2. Total Dynamic Connectedness between Sectors in the Indian Stock Market

Effects of two election outcomes – that is, the victory of pro-business Modi government – are clearly observed in this figure. The win in 05/2014 election provides a slow yet positive impact on the connectedness. It corresponds to the time period close to the 1000th observation in this figure. However, the effect of 05/2019 landslide victory of the same government on connectedness is very vividly evident in this figure as the connectedness measure shoots up to 90% from 82% immediately. The effect of 2014 election is gradual whereas the effect of 2019 election is instantaneous. The government declared a corporate tax cut from 30% to 22% in September 2019. Interestingly, its impact on connectedness is not observed in this figure – perhaps, the effect is disguised by the re-election of Modi government or maybe the market has already expected this announcement.

There are three noticeable Indian Rupee depreciation during the study period: (i) between 04/2013 and 08/2013 the price of US dollar appreciates from INR 54.79 to INR 65.24; (ii) between 01/2018 and 09/2018 the price of US dollar appreciates from INR 63.16 to INR 73.86; and (iii) between 01/2020 and 04/2020 the price of US dollar appreciates from INR 71.23 to INR 76.67 (www.tradingeconomics.com). The impact of depreciation of INR is not clearly evident in this figure. The reason probably is that during the study period India was growing very fast and a currency depreciation was considered to be a positive news as it helped export. The double-digit inflation during the 2011-2013 period (www.ycharts.com) and sharp depreciation of INR in 2013 are the possible reasons for the overall connectedness to go down to about 80% in 2013. Overall, results indicate that connectedness increases (decreases) with respect to good (bad) news.

Figure 3 shows the net connectedness between individual sectors in the Indian stock market. That is, it shows if a sector is a net transmitter to or a receiver of shocks from other sectors. MNC, SERVICE, BANK, BANK.P, FINANC, INFRA, and CONSUMP are clearly transmitters of shocks to other sectors. The

strong ability of finance and bank (both private and public) companies to transmit shocks indicates that these three sectors are the obvious channels through which the shocks to the economy are disseminated. Consumption sector is another one which ultimately affects other sectors as consumer confidence is greatly influenced by the fluctuations in the economy. On the other hand, HEALTH, FMCG, PHARMA, MEDIA, REAL are clearly net receivers of shocks. Thus, it can be suggested that these sectors are less efficient to react to major economic shocks and slow to react compared to some quick-response sectors. In general, this figure suggests that cyclical stocks are usually net transmitters of shocks whereas non-cyclical stocks are net receivers. Since cyclical stocks usually have high sensitivity to systematic risk factors, naturally these stocks react to any shocks in the economy quickly as well as sharply in terms of magnitude.

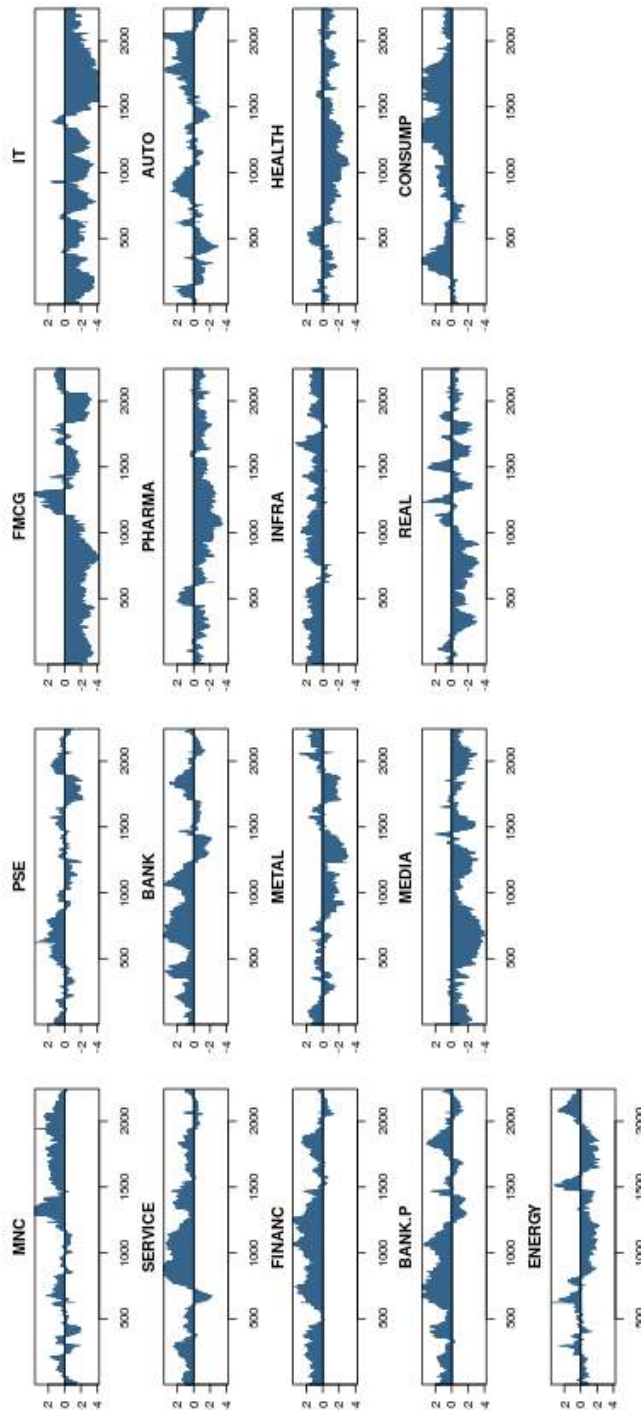


Figure 3. Net Dynamic Directional Connectedness between the Sectors

CONCLUSION AND POLICY IMPLICATIONS

This paper examines the connectedness between the 17 sectors in the Indian stock market for the period 01/2011 through 12/2020. TVP-VAR based connectedness approach is used to trace the connectedness between sectors. Results show that almost 84% of the forecast error variance can be explained by cross-sectional shocks within the sectors of the Indian stock market. It indicates that a sector's own impact, on average, only accounts for 16% of the total variability, suggesting a strong overall dependence among the sectors. In general, cyclical stocks are usually net transmitters of shocks whereas non-cyclical stocks are net receivers. Since cyclical stocks usually have high sensitivity to systematic risk factors, naturally these stocks react to any shocks in the economy quickly as well as sharply in terms of magnitude. Finally, our findings imply that any shock to economy spills from pro-cyclical sectors to non-cyclical sectors. During any crisis period, the connectedness between sectors decreases, implying that sectors react differently in a troubled time. On the other hand, in good times, sectors behave similarly and the overall connectedness increases. Interestingly, this finding contradicts with that of Chatziantoniou et al. (2021), where they report higher connectedness between sectors in crisis situation.

The leading effect of pro-cyclical sectors has an important implication for the policymakers – especially, in the event of key political and economic policy changes. Government should understand that the financial sector is extremely sensitive to relevant shocks and is a net transmitter of shocks to other sectors in the economy. Hence, the government will be more cautious in future to take economic decisions similar to demonetization in 2016. Since financial sector is a net transmitter of shocks, government must be more vigilant to pass information regarding monetary policy changes and exchange rate depreciation.

REFERENCES

- Abbas, Q., Khan, S., Shah, S.Z.A. (2013). "Volatility Transmission in Regional Asian Stock Markets", *Emerging Markets Review*, Vol. 16, No. 3, pp. 66–77.
- Allen, D.E., Amram, R., McAleer, M. (2013). "Volatility Spillovers from the Chinese Stock Market to Economic Neighbors", *Mathematics and Computers in Simulation*, Vol. 94, No. C, pp. 238–257.
- Antonakakis, N., Chatziantoniou, I., Gabauer, D. (2020). "Refined Measures of Dynamic Connectedness Based on Time-Varying Parameter Vector Autoregressions", *Journal of Risk and Financial Management*, Vol. 13, No. 4, pp. 1–23.
- Antonakakis, N., Cuñado, J., Filis, G., Gabauer, D. (2018). "Oil Volatility, Oil and Gas Firms and Portfolio Diversification", *Energy Economics*, Vol. 70, No. C, pp. 499–515.
- Arin, K.P., Caporale, G.M., Kyriacou, K., Spagnolo, N. (2020). "Financial Integration in the GCC Region: Market Size versus National Effects", *Open Economies Review*, Vol. 31, pp. 309–316.
- Arshanapalli, B., Doukas, J. (1993). "International Stock Market Linkages: Evidence from the Pre- and Post-October 1987 Period", *Journal of Banking and Finance*, Vol. 17, No. 1, pp. 193–208.
- Baele, L. (2005). "Volatility Spillover Effects in European Equity Markets", *Journal of Financial and Quantitative Analysis*, Vol. 40, No. 2, pp. 373–401.
- Bekaert, G., Harvey, C.R. (1995). "Time-varying World Market Integration", *Journal of Finance*, Vol. 50, No. 2, pp. 12–23.
- Berg, A.K., Vu, N.T. (2019). "International Spillover of U.S. Financial Volatility", *Journal of International Money and Finance*, Vol. 97, No. C, pp. 19–34.
- BSE India (2021, July 24), Retrieved from Company Overview, <https://www.bseindia.com/about.html>
- Chatziantoniou, I., Gabauer, D., Marfatiax, H. (2020). "Dynamic Connectedness and Spillovers across Sectors: Evidence from the Indian Stock Market", *Working Papers in Economics & Finance 2020-04*, University of Portsmouth.
- Chowdhury, S.S.H. (2020). "Spillover of Sentiments between the GCC Stock Markets", *Global Business Review*, Vol. 11, No. 5, pp. 1122–1140.
- Diebold, F.X., Yilmaz, K. (2009). "Measuring Financial Asset Return and Volatility Spillovers, with Application to Global Equity Markets", *Economic Journal*, Vol. 119, No. 534, pp. 158–171.
- Diebold, F.X., Yilmaz, K. (2012). "Better to Give than to Receive: Predictive Directional Measurement of Volatility Spillovers", *International Journal of Forecasting*, Vol. 28, No. 1, pp. 57–66.

- Diebold, F.X., Yilmaz, K. (2014). "On the Network Topology of Variance Decompositions: Measuring the Connectedness of Financial Firms", *Journal of Econometrics*, Vol. 182, No. 1, pp. 119–134.
- Eun, C.S., Shim, S. (1989). "International Transmission of Stock Market Movement", *Journal of Financial and Quantitative Analysis*, Vol. 24, No. 2, pp. 241–256.
- Gabauer, D., Subramaniam, S., Gupta, R. (2020). "On the Transmission Mechanism of Asia-Pacific Yield Curve Characteristics", *International Journal of Finance & Economics*, pp. 23–46.
- Gomes, M., Chaibi, A. (2014). "Volatility Spillovers between Oil Prices and Stock Returns: A Focus on Frontier Markets", *Journal of Applied Business Research*, Vol. 30, No. 2, pp. 509–525.
- Gupta, R., Marfatia, H. A., Olson, E. (2020). "Effect of Uncertainty on U.S. Stock Returns and Volatility: Evidence from over Eighty Years of High-Frequency Data", *Applied Economics Letters*, Vol. 27, No. 16, pp. 1305–1311.
- Hamao, Y., Masulis, R.W., Ng, V. (1990). "Correlations in Price Changes and Volatility across International Stock Markets", *Review of Financial Studies*, Vol. 3, No. 2, pp. 281–307.
- International Monetary Funds (2021, July 24), Retrieved from *Policy Responses to Covid-19*, <https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19>
- Iyer, V. (2021, Feb 10). *MSCI February review: Analysing the India impact*. Retrieved 08/14, 2021, <https://www.timesnownews.com/business-economy/companies/article/msci-february-review-analysing-the-india-impact/718475>
- Karolyi, G.A. (1995). "A Multivariate GARCH Model of International Transmissions of Stock Returns and Volatility: The Case of the United States and Canada", *Journal of Business Economics and Statistics*, Vol. 13, No. 1, pp. 11–25.
- King, M., Wadhvani, S. (1989). "Transmission of Volatility between Stock Markets", *NBER Working Paper*, No. 2910.
- Koop, G., Pesaran, M.H., Potter, S.M. (1996). "Impulse Response Analysis in Nonlinear Multivariate Models", *Journal of Econometrics*, Vol. 74, No. 1, pp. 119–147.
- Kumar, V., Singh, K. (2020). "Dynamic Linkage between Nifty-Fifty and Sectorial Indices of National Stock Exchange", *American Journal of Economics and Business Management*, Vol. 3, No. 2, pp. 17–27.
- Lee, H.S., Lee, W.S. (2020). "Network Connectedness among Northeast Asian Financial Markets", *Emerging Markets Finance and Trade*, Vol. 56, No. 3, pp. 2945–2962.
- Nateson, C. Palanisamy, R, Renukadevi, P., Suganya, D. (2013). "Spillover Effect of Volatility in BSE Sensex on BSE Sectoral Indices", *International Journal of Management & Business Studies*, Vol. 3, No. 1, pp. 92–95.
- Purankar, S.A., Singh, V.K. (2020). "Dynamic Volatility Spillover Connectedness of Sectoral Indices of Commodity and Equity: Evidence from India", *International Journal of Management Practice*, Vol. 13, No. 2, pp. 151–177.
- Tsai, I. (2014). "Spillover of Fear: Evidence from the Stock Markets of Five Developed Countries", *International Review of Financial Analysis*, Vol. 33, No. C, pp. 281–288.
- Yarovaya, L., Brzeszczyński, J. Lau, C. K. M. (2017). "Asymmetry in Spillover Effects: Evidence for International Stock Index Futures Markets", *International Review of Financial Analysis*, Vol. 53, No. C, pp. 94–111.



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Citation:

Bohusova, H., Svoboda, P., Veverkova, A. (2022), "Impact of New Lease Reporting on Retailing and Wholesale Companies", *Montenegrin Journal of Economics*, Vol. 18, No. 3, pp. 89-98.

Impact of New Lease Reporting on Retailing and Wholesale Companies

HANA BOHUSOVA¹, PATRIK SVOBODA² and ALZBETA VEVERKOVA³

¹ Assistant Professor, Department of Economy and Management, Ambis College, Praha, Czech Republic

e-mail: hana.bohusova@ambis.cz

² Ph.D., Department of Accounting and Taxes, Faculty of Business and Economics, Mendel University in Brno, Czech Republic

³ Ph.D., Department of Accounting and Taxes, Faculty of Business and Economics, Mendel University in Brno, Czech Republic

ARTICLE INFO

Received September 09, 2021
Revised from October 12, 2021
Accepted November 12, 2021
Available online July 15, 2022

JEL classification: M16, M41

DOI: 10.14254/1800-5845/2022.18-3.7

Keywords:

IFRS 16 – Leases,
IAS 17 – Leases,
operating lease,
financial statements,
financial analysis ratios,
lease capitalization

ABSTRACT

Effect of application of IFRS 16 could differ across industries. Retail and wholesale companies are expected to be most significantly affected by the changes in the new lease requirements. Retail space rental is a fundamental part of the business model of these entities. The ratio of operating and finance leases for selected companies in the retail sector is 96% in average. An important factor influencing the magnitude of the changes is not only the percentage of the operating lease to the total lease, but also the volume of unrecognized assets and leasing liabilities. The main aim of the paper is to evaluate the impact of the new lease reporting in the lease intensive industries, especially to keep comparability of financial indicators. Financial statements data of EU retail and wholesale companies are subject of the research. Leases and financial statements and transformed financial statements using IFRS 16 for operating lease reporting are the subject of comparison. The information concerning the operating lease presented in the notes is utilized for financial statements transformation. The financial statements items were selected as significant indicators: Long-term assets, B/S total, Equity, Liability, EBIT, EBITDA, Depreciation, Interest Cost. The changes in affected financial statements items and financial analysis ratios were researched. The average increase in total assets is 37% and debts 55%. The decrease in equity of 4.5% is due to the fact that the carrying amount of the leased asset usually decreases faster than the carrying amount of the lease liability.

INTRODUCTION

The leasing industry has experienced significant growth and has introduced new and innovative ways to finance equipment for companies worldwide. Lease could be considered as an important alternative to a bank loan, while the treatment for its reporting could differ significantly. According to the treatments of International Accounting Standard (IAS) 17, leases should be treated in two different ways as an operating or financial lease. Lease is classified as financial if it transfers substantial risks and rewards incidental to ownership of an asset to the lessee. It is irrelevant for classification of lease as a financial lease whether after the end of the lease there will be transfer of ownership to the lessee. Otherwise, lease is

recorded as an operating lease. The subject of the financial lease is reported as a long-term asset and an appropriate liability while the operating lease is not recognized on the financial position statement - off-balance sheet financing (OBS). OBS financing was very attractive to all companies, but especially to those that had already been highly levered when reported according to IAS 17. For a company that had high debt to equity ratio, increasing its debts was considered problematic for several reasons (their borrowing costs were climbing, the share prices of these companies "mirror" the fluctuations in short-term borrowing costs) and these companies preferred off-balance financing in the form of operating lease. In general, regardless of the form of lease, a lessee obtains an asset or right to use an asset and a liability arises when company enters into a lease contract. The different treatments for financial lease and operating lease reporting were the reason why the IAS 17 lease accounting principles did not provide comparable, and comprehensive information for external and internal users of the financial statements.

The effect of the operating lease reporting on reported leverage was substantial for many lessees. According to Imhoff (1991), firms structured leases as operating leases to avoid increasing the debt-to-equity ratio. Duke, Hsieh and Su (2009) and others stressed that many companies had used operating lease to hide their current liabilities and assets and increase their operating profit to external users in the post-Enron era. They presented the possibility of improvement of financial analysis ratios (Return on Assets (ROA), Debt to Equity (D/E), Debt to Assets (D/A), current ratio) by reporting leases as operating.

On the basis of studies carried out on the off-balance sheet financing, an idea to develop a single high-quality treatment for lease reporting arose. The International Accounting Standards Board (IASB) and Financial Accounting Standards Board (FASB) began to work in 2006 on a joint project with the aim of developing a common standard for lease reporting. The main idea of the lease reporting project was that a lease reporting should be based on principles that fairly report the substance of the lease transaction. The final standard IFRS 16 – Leases was released in 2016, effective date is January 1st, 2019. There are common treatments for reporting of the lease with the term of over one year, regardless of the lease classification in IFRS 16. Due to the effectiveness of this standard since January 2019, it is still the question of the real impact of application of IFRS 16 on financial reporting of the companies.

1. THEORETICAL BACKGROUND

A big problem in comparison of financial statements of business companies using the operating lease as a source of financing of their long-term assets in a high volume with similar business entities was identified by many studies in this area (for example Imhoff, Lipe, Wright, 1991, 1993, 1997, Moody's, 2015, Fito, Moya, Orgaz, 2013, Beattie et al., 1998, Fahnstock and King, 2001). The agency studies such (Standard and Poor's, 2005, Moody's, 2006, Fitch's, 2006), and academic studies used their own models, their own simulation of effects of operating lease capitalization on balance sheet (B/S) items and related items of income statement (I/S).

All models started with the same point - the disclosure of future minimum lease obligations in notes to financial statements according to IAS 17.

The most significant studies in the operating lease area are studies by Imhoff, Lipe and Wright (1991, 1993, 1997) – hereinafter ILW. They indicate that the capitalization of leases leads to a significant decline in the ROA for both intensive and less intensive lease users. Additionally, the impact on the debt-to-earnings ratio is significantly higher for intensive lease users than for less intensive users, 191% compared to 47%. The work of Imhoff, Lipe and Wright is often viewed as the seminal contribution in the area of operating lease capitalization.

Using the capitalization method ILW, the study by Beattie et al. (1998) assessed the impact of operating leases of 232 UK listed companies on their financial statements. They found that unrecorded lease assets make up 6% of the total assets and the unrecorded long-term liabilities are on average 39% of the liabilities reported. Consequentially there is an impact on key financial ratios such as the Asset Turnover, ROA, Debt-to-Equity ratio. The Debt-to-Asset ratio drastically increases and the Current ratio significantly decreases. Durocher (2008) tested the impact of the transformation of operating leases in 100 Canadi-

an listed companies on the financial indicators. The results indicated that the capitalization leads to the recognition of substantially more assets and liabilities on the balance sheet. The study found evidence that some industry segments: merchandising and lodging, oil and gas, and financial services are affected significantly, especially the Return on Assets (hereinafter ROA), Return on Equity (hereinafter ROE) and earnings per share. Fülbier et al. (2008) identified a significant capitalization impact on a number of companies in general and on certain industry groups (fashion and retail) in particular. All studies observed changes in financial ratios for the statement of financial position but minor effects for profitability ratios.

Deloitte (2016) considers the introduction of IFRS 16 as a starting point of an increase in leased assets and financial liabilities on the balance sheet of the lessee and EBITDA. According to their study, companies with material off – balance sheet lease commitments will encounter significant changes in their key financial metrics such as leverage ratio, Return on Invested Capital (ROIC) and valuation multiples. The analysis of expected impact of a new operating lease reporting in retail and hospitality sectors was carried out in 2010 by Singh. He found significant relative and absolute differences across and within the two industries in relation to financial ratios related to leverage, profitability and interest coverage. PricewaterhouseCoopers (PwC) conducted a lease capitalisation study in 2016. They assess the impact of the new leases standard on reported debt, leverage, solvency, and EBITDA in a sample of more than 3,000 listed entities reporting under IFRS across the range of industries and countries (excluding the United States). The research identifies a minimum impact of capitalising existing off – balance sheet operating leases based on commitments disclosures in entities that published financial statements in 2014. The highest impact was identified in retail and wholesale due to the high volume of real estate leases for their stores.

2. RESEARCH OBJECTIVE, METHODOLOGY AND DATA

The aim of the paper is to identify and quantify the impact of the new IFRS 16 Lease in the sector where the operating lease is a material way of financing economic resources for doing business. The conclusions of the paper should serve as an information source about the estimated instant changes in financial analysis indicators due to the change in methodology of lease reporting.

There are large numbers of recent studies carried out on the impact of operating lease reporting, the majority of them concern the publicly traded companies regardless of the industry. On the other hand, there are some studies carried out by European Financial Reporting Advisory Group (EFRAG, 2017; IASB, 2016; Moussaly and Wang, 2014) which have shown that some sectors use operating leases more than others. In these sectors, operating leases represent an alternative to massive capital investment.

The research question is: “Will the new methodology have a significant impact on financial analysis ratios for large companies operating in the lease intensive industry indeed?”

The retail sector according to Nomenclature statistique des activités économiques dans la Communauté européenne (NACE) G. 47 was chosen for this research. Retail is identified as one of the sectors with a very high level of operating lease that is supposed to be most affected by the new lease reporting methodology (EY, 2016; Fito et al., 2011; Durocher, 2008; Fülbier et al., 2008; Mulford & Gram, 2007; Morales-Díaz, Zamora-Ramírez, 2018).

Durocher (2008) proved the importance of leasing in the retail sector and estimates the potential balance sheet impact of including all leases onto lessees' balance sheets. Off-balance sheet operating leases are shown to be a major source of finance, and far more important (3.3 times higher) than on-balance sheet long-term debt; by contrast, finance leases are immaterial. Operating leased assets, the major part of which is 'land and buildings' (98%), represent a significant proportion (28%) of reported total assets. The changes in the retail sector financial analysis indicator are estimated due to the current practices in this business. The majority of retailers and wholesalers use the rented fixed assets such as business area in the form of long-term operating lease contracts. Using the treatments of IAS 17, these assets are neither recognized on financial statements, nor connected liabilities are recognized.

The selection of companies operating in retail, preparing financial statements according to the IFRS and fulfilling the following criteria: annual turnover over EUR 2 billion, use of operating leases as an external source of financing, headquarters of the company in the territory of the EU and the European Free Trade Association – EFTA was carried out. The turnover criterion is based on a 2011 European Commission study that concluded that more than fifty per cent of companies with a turnover of more than 2 billion EUR use lease as an external source of financing. The starting point for company identification was the Amadeus database, which enables to identify the industry on the basis of the defined NACE code, to meet the predetermined turnover. Other assumptions were tested on the basis of an individual assessment - IFRS reporting and the volume of operating leases, the quality of the information in the notes to the financial statements. Failing to meet any of the set of criteria, companies were discarded. The following companies, which met the previously mentioned conditions, were identified Ahold (1), Auchan (2), Carrefour (3), COOP (4), Dixons (5), Douglas (6), Groupe Casino (7), Groupe Fnac Darty (8), HM (9), Inditex (10), J Sainsburys plc. (11), KESKO (12), Kingfisher plc. (13), Marks & Spencer (14), METRO AG (15), Migros Group (16), Morrisons plc. (17), REWE Group (18), SPAR (19), TESCO plc. (20).

The financial statements for the years 2010 – 2016 of these companies were the subject of the research. The share of operating lease (operating lease/ total lease liability) in the researched sample was from 72.5% to 100%, the median was 96.95%. Quantification of the impact of lease reporting according to the new IFRS 16 Leases in the retail sector is the main aim of the paper. The selected financial statements items and financial analysis indicators are utilized for their quantification. The indicators of financial statements prepared according to IAS 17 – Leases and financial statement and transformed financial statements using IFRS 16 for operating lease reporting are the subject of comparison. The information concerning the operating lease presented in the notes is utilized for financial statements transformation. The financial statements items were selected as significant indicators.

- Financial Position Statement (Long-term assets, B/S total, Equity, Liability)
- Income Statement, EBIT, EBITDA, Depreciation, Interest Cost)
- Selected financial analysis ratios (ROE, ROA, D/E, D/A).

Researched companies use leasing services and currently present data on operating leases in accordance with IAS 17. IAS 17 (Paragraph 35) specifies which information is disclosed for operating leases in the notes to financial statements (the summary of future minimum lease payments for non-repayable operating leases separately for a period of one year and a period of up to five and over five years). This information is used for transformation of financial statements prepared according to IAS 17 to IFRS 16. The methods of Fito, Moya and Orgaz (2011) and Fülbier et al. (2008) were used for the interest rate estimation. These methods are based on the median disclosed by researched companies' interest rates (4.2%). The unrecognized value of the leased asset is equal to the value of the discounted future minimum lease payments. This value is added to the assets in the balance sheet and the balance sheet total is increased. Further adjustments are required to determine the change in interest and depreciation costs. Interest expense is determined using the discount rate applied to the average net present value of the minimum lease payments for the current and prior years. These interest costs increase the original interest costs. The unrecognized value of the leased asset is equal to the value of the discounted future minimum lease payments. This value is added to the assets in the balance sheet and the balance sheet total is increased. Further adjustments are required to determine the change in interest and depreciation costs. Interest expense is determined using the discount rate applied to the average net present value of the minimum lease payments for the current and prior years.

$$NPV = \sum_{i=0}^n \left[\frac{Pmt_i}{(1+r)^i} \right] + \frac{Res}{(1+r)^n}$$

Where:

NPV = Net Present value of the minimum lease payments

Pmt_i = Lease payment for period i

r = Interest rate

n = Number of payment periods
Res = Residual amount (if any)

Further assumptions:

- all cash flows occurred at year-end;
- assets are depreciated using the straight-line method;
- operating lease expenses are removed from the income statement, and replaced by depreciation (estimated 20 years of useful life as Imhoff, Lipe, Wright (1991, 1993, 1997) and interest expenses. For the proper estimation of useful life of leased assets, the kind of the assets and accounting policy for depreciation in the business entity should be available. This information is not usually presented in financial statements. In these cases, the useful life was estimated by authors similarly to other studies using the following data: real estate 45 years, mix 20 years, others 10 years.

In order to identify the significance of changes caused by the new leasing reporting methodology, a comparison of the monitored characteristics before and after application was performed. Theoretically, these are two dependent samples, so a two-sample t-test should be used for testing. However, when verifying the assumption of the normality of the differential selection using the Shapiro-Wilk test, the normality was rejected (see Table 3) and therefore a non-parametric alternative to the t-test, namely the Wilcoxon sign rank test, was used.

3. RESULTS AND DISCUSSION

IFRS 16 does not distinguish between reporting financial and operating leases on the side of the lessee any more. All types of leases with a lease term longer than twelve months are required to be reported on the lessee's financial statements, similar to the financial lease under IAS 17. The lease is capitalized on lessee's financial statements. According to the IASB (2016), if the lease is economically close to a loan for purchase of an asset, it is a situation where the lease term corresponds approximately to the life of the leased asset and the value of the reported asset and the liability on the financial statements should be very similar. In an opposite situation where the lease term will be significantly shorter than the economic life of the asset, the value of this asset is significantly higher than the value of the lease liability. IFRS 16 imposes to recognize this asset in a value corresponding to the right of use of this asset.

3.1 Impact on B/S

The volume of non-recognized lease liabilities as a percentage of recognized lease liabilities is shown in Table 1. The volume is in the range from 9.25% to 445.53%. The median is 47.08%. It means that all recognized lease liabilities would increase 1.47 times due to incorporation of operating lease liability to financial statements of retailing companies. The B/S total would increase in the range from 0.65% to 133.98%. The median is 37.88%. The total liabilities would increase in the range from 1.2% to 148.38%, with the median 54.99%. In contrast to the increase in the previous items, the equity would decrease due to a faster decrease in value of the long-term lease assets in comparison to the decrease in the lease liability. The lease instalment is split into interests and an amortization of the lease liability. The decrease in equity is significantly lower in comparison to the increase in long-term assets.

The results of similar studies focusing on the impact of lease capitalization and IFRS 16 in the retail sector differ. The study carried out by Mulford and Gram (2007) which capitalized operating leases concluded that the total assets increased by 14.6% and total liabilities increased by 24.4%. The PwC study (2016) concerned only the increase of the debt; it concluded that the increase was 98%. The study did not mention the change in assets. The IASB (2016) conducted an extensive study on the impact of IFRS 16 on several sectors of the economy. In the case of retail, there were 204 companies researched. After capitalization of long-term operating leases, these companies showed an increase in debt of 214%.

Table 1. Changes on the B/S.

Company	Non-Recognized Lease Liability	Change in Total Assets	Change in Total Liabilities	Change in Equity
1	10.18%	8.53%	11.08%	-2.40%
2	38.28%	36.06%	43.73%	-10.29%
3	47.06%	44.68%	62.12%	-7.37%
4	96.28%	75.66%	109.87%	-8.55%
5	70.87%	42.38%	55.92%	-4.60%
6	62.29%	44.30%	71.48%	-3.82%
7	13.18%	11.08%	15.20%	-2.24%
8	9.29%	6.40%	10.20%	-0.77%
9	124.84%	79.62%	148.38%	-4.35%
10	43.87%	39.70%	51.98%	-2.21%
11	47.10%	34.13%	54.06%	-5.12%
12	16.19%	0.65%	1.20%	-0.06%
13	124.06%	65.21%	141.57%	-6.73%
14	22.41%	16.15%	25.83%	-2.68%
15	117.72%	58.11%	138.06%	-2.78%
16	455.53%	133.98%	419.70%	-10.10%
17	24.61%	21.68%	26.89%	-4.81%
18	102.33%	105.63%	117.45%	-6.70%
19	79.28%	29.70%	93.98%	-2.70%
20	29.25%	22.27%	2.03%	-4.67%
Median	47.08%	37.88%	54.99%	-4.48%

Source: own processing

3.2 Impact on the I/S

The increase in total interest costs (financial costs) is obvious and the increase in depreciation is obvious as well. Table 2 describes changes in the examined items of costs. The increase in depreciation costs is between 0.07% and 113.47% for the researched sample, the median is 27.43%. The rise in interest costs is in the range of 0.23% to 94.96%, the median is 16.36%. The difference between the increase in depreciation costs and interest costs is associated with a decreasing lease liability during the lease, and a straight-line depreciation of leased assets during the lease term. In comparison with the conclusion of the Aslaksen and Baastad study (2017) which shows the expected increase in depreciation costs between 80% and 89%, the conclusions of our research estimate a lower impact. However, Aslaksen and Baastad (2017) did not investigate the change in interest costs separately from other financial costs. The results of this study showed higher increase in financial costs (89%) compared to the conclusions of this work (16.36%). Significantly higher interest costs are mainly due to the assumption that there is a significantly higher increase in liabilities.

As a result of the application of IFRS 16, there is a year-on-year decrease in leasing costs over the lease terms as compared to the previous straight-line lease costs of operating leases. In the context of the new methodology for reporting operating leases of over one year, there is an increase in EBIT, as EBIT is affected only by depreciation costs, interest costs are a part of finance costs. The impact on the researched sample is quantified in Table 2. In the case of EBITDA, the increase is higher as all costs associated with the operating lease are excluded from the EBITDA, in comparison with IAS 17 where all lease costs were reported as operating costs. The median increase is 14.57%. Compared to the results of similar studies, only Aslaksen and Baastad (2017) focused their research on the change in EBIT - EBIT increased by 15%. The increase is higher than that obtained in this study (2.5%). As concerns the change in EBITDA after the application of IFRS 16, the result is a 14.57% increase and it is lower than the conclusions of other studies. Mulford and Gram (2007) reported an increase of 22.5%. A study of Singh (2012) researched 234 restaurants and retail companies during the period from 2006 to 2008. It estimates an increase of 61.3%. Similarly, the IASB study (2016) also estimates a higher increase of 43%.

Table 2. Impact on the I/S.

Company	Change in Amortization and Depreciation Costs	Change in Interest Costs	Changes in EBIT	Changes in EBITDA
1	13.15%	8.74%	2.15%	6.63%
2	41.83%	10.65%	3.82%	20.92%
3	85.41%	16.99%	2.26%	26.61%
4	41.58%	74.39%	13.29%	31.34%
5	79.01%	74.31%	1.57%	8.12%
6	19.35%	12.82%	2.45%	10.04%
7	26.89%	39.15%	2.96%	15.97%
8	8.00%	9.47%	1.64%	4.00%
9	44.92%	15.72%	2.49%	18.80%
10	25.04%	10.29%	3.44%	16.10%
11	27.96%	8.60%	1.54%	12.66%
12	0.07%	0.23%	0.09%	0.08%
13	106.20%	94.96%	7.14%	39.46%
14	18.07%	9.99%	2.30%	11.90%
15	3.06%	84.90%	2.80%	3.11%
16	113.47%	71.04%	2.51%	20.21%
17	14.59%	15.72%	10.03%	13.18%
18	61.69%	37.48%	9.14%	27.28%
19	23.89%	87.58%	1.49%	6.58%
20	37.58%	30.08%	7.03%	20.24%
Median	27.43%	16.36%	2.50%	14.57%

Source: own processing

Using the Normality Test (Shapiro-Wilk test) it was shown that all the variables monitored do not have a normal distribution, so it is necessary to use a non-parametric test (Wilcoxon test) to verify the impact on individual indicators. IFRS 16 has a significant impact on total assets, total liabilities, depreciation and interest expense. Detailed data are in Table 3.

Table 3. Normality test. Source: own processing

Variable	Value
Assets	2,71E-
Liabilities	1,07E-
Equity	1,89E-
Depreciation	4,06E-
Interest cost	3,43E-
EBIT	2,59E-
EBITDA	1,66E-

Table 4. Statistical Significance of IFRS 16 Effects. Source: own processing

Null hypothesis	Value
Σ Assets	2.34**
Σ Liabilities	3.57***
Σ Equity	-0.48
EBIT	0.38
EBITDA	1.15
Depreciation	2.74***
Interest cost	2.11**

*** p-value < 0.01; ** p-value < 0.05; * p-value < 0.1

3.3 Impact on Financial Analysis Ratios

For the analysis of the impact of IFRS 16, only those ratios whose input information is expected to be changed due to the new treatments were selected. The selection is based not only on the studies already carried out, but also on the authors' judgment.

The decrease in the ROA ratio is due to the fact that the change in the denominator (assets) is higher than the changes in the numerator (EBIT). In contrast to ROA, the ROE indicator is increasing in the span of time as the numerator of the formula (EBIT) increases due to the elimination of interest cost from operating income, but the denominator (equity) is lower in the first part of the lease term in comparison with lease reporting under IAS 17. The impact of IFRS 16 on ROE is moderate (less than 7%). In the case of ROA in retail companies there was a decrease of about 20%. As mentioned above, ROA decreased approximately by 23.97%.

Table 5. Impact of IFRS 16 on Selected Financial Analysis Ratios. Source: own processing

<i>Company</i>	<i>ROE</i>	<i>ROA</i>	<i>D/E</i>	<i>D/A</i>
1	4.31%	-6.17%	13.53%	2.25%
2	18.10%	-23.57%	61.31%	5.99%
3	11.07%	-28.29%	77.95%	14.79%
4	23.86%	-35.75%	128.60%	19.54%
5	6.43%	-28.67%	70.40%	10.59%
6	6.17%	-28.83%	78.53%	19.98%
7	5.33%	-7.31%	17.83%	3.68%
8	2.58%	-4.67%	10.98%	3.23%
9	7.20%	-43.02%	159.38%	37.88%
10	6.08%	-22.14%	53.42%	12.61%
11	7.66%	-24.36%	63.76%	15.32%
12	0.05%	-0.40%	1.08%	0.64%
13	14.61%	-35.53%	159.01%	44.20%
14	5.45%	-18.43%	29.21%	7.79%
15	6.20%	-34.86%	131.82%	54.39%
16	14.97%	-56.95%	240.80%	62.58%
17	18.50%	-6.72%	35.96%	5.26%
18	92.58%	-28.41%	67.78%	19.08%
19	4.18%	-21.74%	96.54%	47.45%
20	12.28%	-12.29%	37.82%	7.56%
Median	6.81%	-23.97%	65.77%	13.70%

The increase in the volume of liabilities due to the recognition of the former operating lease liability and the decline in equity, which is less than the increase in debt, lead to an increase of D/E ratio. Table 4 shows that the increase in the D/E indicator is very significant (median of 65.77%). A significant increase in this indicator is due to a higher increase in total liabilities compared with a very low change in equity. Due to the fact that the items entering D/A calculations are growing strongly (total liabilities and total assets), the change in the D/A indicator compared with D/E does not reach such a high value (median of 13.7%).

Comparing the results of our study they are very close to results of similar studies carried out in similar issues. The PwC Global Lease Capitalization study of 2016 identified a 98% increase in debt balances in the retail sector and a 41% increase in EBITDA (measured as a median). Morales-Díaz Zamora-Ramírez (2018) identified the average increase in total liabilities and total assets in retail sector (27% in total assets and 59.2% in total liabilities). According to Baastad, Berg, Aslaksen (2017) the reallocation of costs will have an enormous impact on EBITDA, and to a lesser extent on EBIT and Net Operating Profit After Tax (NOPAT). The capitalization of leases has on average increased Norges Gruppen's non-current assets with approximately 36%. Operational measures derived from the income statement (EBITDA,

EBIT, NOPAT) increase notably. The results of the study by Giner, Pardo (2018) confirm similar conclusions as our study. They identified that there are no-difference results between operating lease liabilities and bank loans. Sari (2016) revealed that lease capitalization has no significant impact on total equity and increases total assets (30.90%, 23.70% respectively) and total liabilities (45.05%, 37.27% respectively).

CONCLUSION

The retail sector is characterized by a high volume of unrecognized lease liabilities due to the high book value of the leased assets for this sector (retail space, plant and equipment). The obligation to disclose the subject of the lease and the lease liability on the lessee's balance sheet was reflected in a one-third increase in the balance sheet total and in almost half of the total liabilities from the newly recognized subject of the lease and the lease liability, the depreciation and interest costs increase to the previously reported depreciation and financial costs. For these reasons, it is clear that the increase in these items must be higher for sectors (companies) showing a greater change in assets and liabilities. In the case of retail companies, there was an increase of about twenty percent. Due to the new structure of the profit, there was not only an increase in EBIT but also a significant increase in EBITDA. The new treatment of IFRS 16 will affect the financial analysis ratios regardless of any changes in business transactions of business entities. Due to the new approach the profitability ratios ROA and ROE usually decrease (ROA without exceptions). This is connected with a true and fair view on the financial situation and performance of a business entity. All business entities employ the assets in their activity regardless of the way of acquisition. Using treatments of IFRS 16, the indebtedness increases due to the recognition of all lease liabilities, it is in an accord with the intended aim of the IFRS 16 development – to protect off-balance financing. According to the results of our research, the significant increase in liabilities, assets, depreciation and interest cost were proved (the median of increase in liabilities is almost 55%, the median increase in balance sheet total is almost 38% and the decrease in equity is 4.5%, depreciation costs increase of 27.4% and the increase in interest cost is 16.4%).

The results of the paper could serve external users of financial information on retail and wholesale listed companies as a source of information about the reasons for a possible significant deterioration in financial analysis indicators. Obtained results show the range of deteriorations in indicators of financial analysis due to the application of the new operating lease reporting methodology (financial analysis ratios deteriorated – ROA by 24%, D/E by 66% and D/A by 14%).

Limitations of the study - the paper presents results of the research using data from 20 largest retail companies in Europe, we used annual reports of these companies, it was not possible to get all exact data of individual lease contracts, we use the estimation.

ACKNOWLEDGMENTS

The paper is the result of GA ČR No. 18-14082S “Fair corporate taxation: Measurement of the corporate profit shifting on the budget of the Czech Republic”.

REFERENCES

- Aslaksen, A. B., Baastad, M. S. (2017), “IFRS 16 Leases and its Effects on Management Compensation Systems in the Norwegian Retail Industry”, *Master Thesis*, BI Norwegian Business School, Oslo.
- Beattie, V., Edwards, K., Goodacre, A. (1998), “The impact of constructive operating lease capitalisation on key accounting ratios”. *Accounting Business research*, Vol. 28, No. 4, pp. 233–254.
- Deloitte (2016), “Leases: Key differences between U.S. GAAP and IFRSs”, <http://www.iasplus.com/en-us/standards/ifrs-usgaap/leases>.
- Duke, J., Hsieh, S., Su, Y. (2009), “Operating and synthetic leases: Exploiting financial benefits in the post-Enron era”, *Advances in Accounting*, Vol. 2, No. 1, pp. 28–37.

- Durocher, S. (2008). "Canadian Evidence on the constructive capitalization of operating lease", *Accounting Perspectives*, Vol. 7, No. 3, pp. 227–256.
- EFRAG (2017). "Ex ante Impact Assessment of IFRS 16. Europe Economics", <https://www.efrag.org/Assets/Download?assetUrl=%2Fsites%2Fwebpublishing%2FsiteAssets%2FIFRS%252016%2520-%2520Europe%2520Economics%2520-%2520Ex%2520ante%2520Impact%2520Assessment%2520%2822%2520February%25202017%29.pdf>.
- European Commission. (2011), "SMEs' Access to Finance Survey 2011. Results by business characteristics", http://ec.europa.eu/enterprise/policies/finance/files/smes_demb.xls
- EY (2016), "Applying IFRS A closer look at the new leases standard", [https://www.ey.com/Publication/vwLUAssets/ey-applying-ifrs-a-closer-look-at-the-new-leases-standard-august-2016/\\$FILE/ey-applying-ifrs-a-closer-look-at-the-new-leases-standard-august-2016.pdf](https://www.ey.com/Publication/vwLUAssets/ey-applying-ifrs-a-closer-look-at-the-new-leases-standard-august-2016/$FILE/ey-applying-ifrs-a-closer-look-at-the-new-leases-standard-august-2016.pdf)
- Fahnestock, R.T., King, C.G. (2001), "An Evaluation of the Impact of Constructive operating Leases on Financial Position and Results of Operations", *Journal of Accounting and Finance Research*, summer, pp. 39–52.
- Fito, M. A., Moya, S., Orgaz, N. (2013), "Considering the effects of operating lease capitalization on key financial ratios", *Revista Española de Financiación y Contabilidad*, Vol. 42, No. 159, pp. 341-369.
- Fülbier, R. S., Silva, J. L., Pferdehirt, M. (2008), "Impact of lease capitalization on Financial ratios of Listed German Companies", *Schmalenbach. Business Review*, Vol. 60, No. 1, pp. 122–144.
- International Accounting Standards Board (2009), IAS 17 – Leases.
- International Accounting Standards Board (2016), IFRS 16 Leases Effect Analysis.
- International Accounting Standards Board (2016), IFRS 16 – Leases.
- Imhoff, E. A., Jr., Lipe, R.C., Wright, D.W. (1991), "Operating Leases: Impact of Constructive Capitalization". *Accounting Horizons*, Vol. 211, pp. 51–63.
- Imhoff, E.A., Lipe, R.C., Wright, D.W. (1993), "The effects of recognition versus disclosure on shareholder risk and executive compensation", *Journal of Accounting, Auditing, and Finance*, Vol. 8, No. 4, pp. 351–368.
- Imhoff, E.A., Lipe, R. C., Wright, D.W. (1997), "Operating Leases: Income Effects of Constructive Capitalization", *Accounting Horizons*, Vol. 28, No., 4, pp. 12–32.
- Moody's (2015), *Moody's updates its global methodology for financial statement adjustments*, https://www.moody.com/research/Moodys-updates-its-global-methodology-for-financial-statement-adjustments-PR_327853.
- Morales-Díaz, J., Zamora-Ramírez, C. (2018), "Effects of IFRS 16 on Key Financial Ratios: A New Methodological Approach", *Accounting in Europe*, Vol. 15, No. 1, pp. 1-33.
- Moussaly, K., Wang, W. (2014), *The Impact of Leased and Rented Assets on Industry Productivity Measurement*, <http://www.statcan.gc.ca/pub/15-206-x/15-206-x2014036-eng.htm>.
- Mulford, Ch.W., Gram, M. (2007), "The Effects of Lease Capitalization on Various Financial Measures: An Analysis of the Retail Industry", *Journal of Applied Research in Accounting and Finance*, Vol. 2, No. 2, pp. 3–13.
- PWC (2016), *A study on the impact of lease capitalisation IFRS 16: The new leases standard*, <https://www.pwc.com/gx/en/audit-services/publications/assets/a-study-on-the-impact-of-lease-capitalisation.pdf>.



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Citation:

Kurbatskii, A. (2022), "Active Strategy and Other Key Factors of Mutual Funds' Performance", *Montenegrin Journal of Economics*, Vol. 18, No. 3, pp. 99-107.

Active Strategy and Other Key Factors of Mutual Funds' Performance

ALEKSEI KURBATSKII¹

¹ Associate Professor, Head of Department of Econometrics and Mathematical Methods in Economics
Lomonosov Moscow State University, Moscow School of Economics, Russia, e-mail: akurbatskiy@gmail.com

ARTICLE INFO

Received December 04, 2021
Revised from January 09, 2022
Accepted February 10, 2022
Available online July 15, 2022

JEL classification:

G11, G12, G14, G15, G17.

DOI: 10.14254/1800-5845/2022.18-3.8

Keywords:

Mutual funds;
bond yields;
active strategy;
managerial skill;
fund's alpha.

ABSTRACT

The demand for mutual funds is determined by their ability to convince investors to achieve their investment goals. Whether mutual fund managers can collect and analyze existing information in such a way as to select assets that entail returns above the market or not, that is a very significant question for both financial industry theorists and practitioners. To compare funds with active strategies and passive ones we use panel data models with the excess return over the benchmark as a dependent variable. Our sample was constructed from US funds over 14 years of observations from 2006 to 2019. We include funds which invest mostly in different US sectors with SP500 as the benchmark. It turns out that active funds don't give significant benefit. Nevertheless, the significance of the spread between long term and short-term US government Treasury bonds yield confirms that the actively managed funds gain more on the expectation of the market's growth than the passive ones.

INTRODUCTION

Mutual funds allow to accumulate funds of private investors who prefer to leave the management of their assets to professional managers. The popularity of mutual funds among US citizens provides urgency to the issue of improving their functioning. The industry has seen steady growth over the past 25 years, driven by stronger demand from households, supported by improved wealth, an aging of the American population, and the evolution of the retirement system.

American mutual funds are truly diverse, they are classified based on strategic orientation: equity, bond, cash and hybrid funds. With the advent of new market instruments, the level of popularity of funds has changed, but most of the assets of mutual funds are held by equity funds (Figure 1).

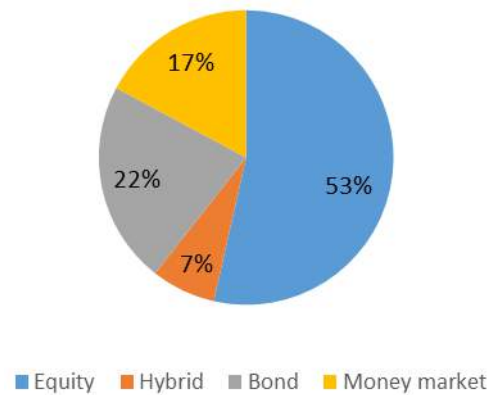


Figure 1. Structure of the US Mutual funds in 2020.

Source: 2020 Investment Company Fact Book (https://www.icifactbook.org/ch3/20_fb_ch3)

With this development of the industry, it is reasonable to assume that some of the funds will beat the market index to a large extent simply due to a happy combination of circumstances.

However, there will also be those whose super-profitability is determined by several factors, both structural and temporal. For the practitioners, the solvency of mutual funds as investment institutions determines the choice between active and passive management of the investment portfolio. From the theoretical point of view, the answer to this question is an argument: for or against the validity of the efficient market theory.

Attempts to improve the performance of mutual funds by varying their individual characteristics may, firstly, be insufficient, and secondly, may have multidirectional consequences, which are undesirable for both individual investors and managers. Moreover, traditionally used methods, such as CAPM model and its subsequent modifications, see (Fama and French, 1993, 2015), do not provide a parametric assessment of the impact of macroeconomic indicators on the mutual fund's yield. The particularity of modifications of the multi-factor benchmark model is that when analyzing excess returns, we use the estimated market index, instead of its real value. While in fact, choosing between investing in the market portfolio and mutual Fund, individual investor rather compares the fund's yield with the yield of the declared benchmark. The recent paper (Artamonov et al., 2020) examines the impact of US government Treasury bonds yield on the return of mutual funds.

In the current study we discuss the problem of identifying the fund's strategy and using panel data model try to estimate impacts of the spread between 10-year and 3-month US Treasuries on funds' alpha and compare funds with active and passive strategies.

1. BACKGROUND

A significant part of researchers agrees that actively managed funds, on average, lose to the benchmark. As a part of this approach, the authors resort, among other things, to various ways to estimate the stability of deviations (both positive and negative) of mutual fund returns from market returns.

There are also a lot of studies on the sustainability of the results of American funds. Even back to 1997 M. Carhart argued that the super-profitability of funds is not associated with the outstanding abilities of mutual Fund managers, but simply with their luck. However, modelling and identifying this luckiness is not an easy task (Carhart, 1997). At the same time, most proponents of the theory of efficient market, and, consequently, passive management, support their position by the existence of Commission fees and management costs, which make an additional contribution to reducing the efficiency of mutual funds relative to the market. In the paper "Active vs. passive, the case of sector equity funds" (Fan and Lin, 2020) wasn't found considerable evidence that actively managed sector mutual funds outperform their passive counterparties. Authors decide that U.S. sector equity market has become more efficient in

the last 10 years. In (Crane and Crotty, 2020) there is an interesting suggestion that no risk-averse investor should choose a random active fund over a random index fund according to stochastic dominance tests.

Another camp of researchers with opposite point of view, for example, (Henrikson, 1984), (Goetzmann and Ibbotson, 1994), postulate that past returns can serve as a predictor for future returns of mutual funds, thus completely rejecting the theory of an efficient market. (Cremers and Petagisto, 2009), argue that higher activity of the management team corresponds to higher future returns. Moreover, higher activity signals new investment concepts and thus is a proxy for investor skills. The existence of managerial skill was discussed in (Berk and van Binsbergen, 2015).

Let us look at the difference in performance between the income of actively managed funds investing in large-cap companies without a focus on any management style (value, growth, etc.) and passive funds (Figure 2).



Figure 2. Active Large Blend versus Passive Funds: Relative Return

Source: Harding Loevner; Data source: Morningstar (<https://www.activemanagers.com/amc/insights/more-balanced-narrative/active-managers-dont-outperform-empirical-argument>)

We see that the results of active funds relative to passive ones have a clear cyclical nature: long periods of outperformance are replaced by long periods of underperformance. These dynamics go against the efficient market theory.

An interesting approach is suggested by (Kosowski et al., 2006). They find that 10% of the best funds in terms of performance relative to the benchmark have such results due not to luck, but to the presence of skill. Their results suggest that only 9 funds out of 2118 would beat the index by more than 10% a year (without expenses and commissions) if managers did not have the ability to use the inefficiency of the stock market to their advantage. In reality, 29 funds were able to beat the index by this amount, which is more than three times higher than the value revealed by luck modeling.

2. IDENTIFYING A STRATEGY

If researchers are supporters of passive or active mutual Fund management, they must first look for ways to assess the nature of the investment organization's strategy. It is easy to define a passive strategy: it consists of buying market assets in the same proportion as the market portfolio. Active management refers to any strategy that deviates from the passive one. However, measuring this "deviation" is

not an easy task. The authors approach this problem from different angles based on what aspect of active management they are trying to highlight. Some even call the active management as a "selectivity".

Two approaches are used to identify the activity of mutual Fund management: first is based on the analysis of returns, and the second one is based on the analysis of the investment portfolio assets. The latter is characterized by determining the activity of the Fund's strategy as the degree of deviation of the Fund's assets from the set of assets of the market portfolio (benchmark).

As for the approach based on the analysis of mutual Fund returns, the most commonly evaluated is the extraordinary volatility of returns. Another traditionally used measure of Fund activity is the tracking error (TE), which shows the variance of the difference between the returns of the Fund's portfolio and the benchmark.

The tracking error depends on different factors:

- the degree of similarity of the asset structure in the Fund's and benchmark's portfolios,
- changes in market capitalization, investment style, macro environment, and other fundamental characteristics of both the Fund and the market index,
- fees charged, management expenses (which the market portfolio does not have),
- market volatility,
- beta of portfolio, and
- inflows and outflows of funds from investors that force managers to review their investment portfolio.

This indicator is convenient because the researcher does not need to know information about the structure of the investment portfolio at any given time and it is understandable for every stock market participant. The approach of tracking the portfolio structure, although it requires a high degree of detail and access to information that is not publicly available, has been widely developed among researchers of indicators of active mutual Fund strategy. (Kacperczyk et al., 2005), for example, use "index of concentration in the industry", and (Cremers and Peajisto, 2009) – use "active share". First consider the performance of funds as an increasing function of the Fund's activity, calculated as the sum of the squares of deviations of the Fund's investment shares in various industries from the corresponding shares in the market portfolio. Second are based on the belief that the active strategy of the Fund consists of two components: a special approach to the selection of assets and/or specific strategies based on the analysis of systemic risk factors. Usually, funds tend to use one of these approaches, so it is difficult to specify a universal way to identify an active strategy. The authors suggest using a combined approach as an indicator of an active strategy. One of the components is the active share, which is calculated as a part of the portfolio different from the market share:

$$\text{Active Share} = \frac{1}{2} \sum_{i=1}^N |w_{fund,i} - w_{index,i}|$$

Where $w_{fund,i}$ – is the weight of the i-th asset in the Fund's portfolio,

$w_{index,i}$ - weight of the i-th asset in the market portfolio,

N – the number of assets in the portfolio.

According to the authors, the combined use of both indicators allows tracking two components of strategic orientation at once: the active share is responsible for displaying activity in terms of selecting assets different from those contained in the market portfolio, and the tracking error as an indicator of the reliability of the investment strategy chosen by the management team. Calculating the active share simultaneously with the tracking error allows researchers to identify not only the binary nature of investment portfolio management (active or passive), but also the type of active management: purely index-based, almost index-based, diversifying, concentrated and factor-oriented. The authors' empirical conclusion is that funds with a high active share have an excess return of 1.51-2.4% per year before commissions and taxes, and a loss of -1.42% to the benchmark for funds with a low active share.

Other measures of the management activity level are: the rate of change of assets within the portfolio; the degree of distinction of the portfolio assets from assets held by similar funds, for example, (Gupta-Mukherjee, 2013); the changes in the risk level of the portfolio (e.g., (Huang et al., 2011)).

The main drawback of this approach is that information about the content of the portfolio at each time is not disclosed by the funds, because otherwise competitors will be able to copy it, which will result in the loss of a significant part of the expected return, as mentioned in the works of (Frank et al., 2014) and (Phillips et al., 2014). In this regard, according to the rules of the US securities and exchange Commission, funds are allowed to disclose quarterly data on the content of the investment portfolio with a lag of 60 days. But even with a two-month lag, only a limited number of statistical databases contain data on the structure of mutual Fund portfolios.

3. EMPIRICAL FINDINGS

In our study we get data from Bloomberg terminal. Our sample was constructed from US funds over 14 years of observations from 2006 to 2019. We include funds which invest mostly in different US sectors. The appropriate sample was created based on the following criteria:

- open-end funds;
- the investment portfolio assets consist of equity securities;
- style (investment goals): Value, Blend, Growth;
- size (market orientation): Large, Mid, Small;
- benchmark - SP500 (we select solely funds whose declared benchmark is the S&P 500);
- country of domicile - USA;
- index funds, highly specialized funds (such as industry funds), and funds that invest a lot in other assets are excluded.

Such dependent variable was chosen for a number of reasons. First, mutual funds are legally required to declare a benchmark, which allows direct use of the officially submitted information. Secondly, both investors and managers compare results with the official benchmark.

Main hypothesis of the study are

- Spread between long-term and short-term rates is a significant factor for the mutual funds “alpha” (the difference between fund and benchmark return).
- Active Funds are better than Passive ones.

Monthly return is the indicator of the fund’s performance which certainly depends on different factors, including micro and macro-variables. Following variables are considered:

- Spread between log return of the tracking error (TOT_RETURN_INDEX_GROSS_DVDS, fund's alpha) and log SP500 return (as the dependent variable);
- Spread between 10-Year Treasury Constant Maturity Rate (rate.10y) and 3-Month Treasury Bill rate (rate.3m);
- is.passive (dummy);
- Style (factor with tree levels Blend, Growth and Value).

Even though we initially select only active funds, some of them are in fact passive. Some of the funds with a high correlation with the benchmark were eliminated. Among the rest, funds with low expense ratio (less than 0.1) and stated fee (less than 0.25) are considered to be passive.

Table 1 contains descriptive statistics for factor Style.

Table 1. Descriptive statistics for factor Style

	<i>N</i>	<i>Blend</i>	<i>Growth</i>	<i>Value</i>
Style	558	267	124	167

We use panel data for fund's alpha, time series data for SP500 and rates and cross-sectional data for other variables. Time range is from December 2005 until December 2019 (monthly data). It is important to note that the fund's micro characteristics are almost constant over time. We consider a panel regression under the form (diff is the first difference in time):

$$\begin{aligned} &diff(\log(\text{TOT_RETURN_INDEX_GROSS_DVDS}) - \log(\text{SP500}))_{it} \\ &= \beta_0 + \beta_1 diff(\text{rate.10y} - \text{rate.3m})_t + \beta_2 diff(\text{rate.10y} - \text{rate.3m})_{t-1} + x'_i \gamma \\ &+ \mu_i + u_{it} \end{aligned}$$

Here $x'_i = (is.\text{passive}, \text{Style})$ is the vector of fund's characteristics. Since regressors in x_i are constant over time, the coefficients γ cannot be estimated for FE-panel regression. Therefore, only pooling and RE regressions are under consideration.

To perform robustness check the models are considered on the following time subperiods:

- Dec2005 - Dec 2008
- Jan 2009 - Dec 2015
- Jan 2016 - Dec 2019
- The whole interval Dec2005 - Dec 2019

Such subperiods were considered roughly in accordance with different periods of US monetary policy.

Diagnostic tests are based on Beta, Sosa-Escudero Yoon robust tests for AR(1) serial correlation and for random effects. The results of tests are presented in Tables 2 and 3.

Table 2. Bera, Sosa-Escudero and Yoon locally robust test: AR(1) errors sub random effects

	<i>chisq.stat</i>	<i>p.value</i>
Dec05-Dec08	367.310	0
Jan09-Dec15	3481.561	0
Jan16-Dec19	2223.721	0
Overall	1329.881	0

Table 3. Bera, Sosa-Escudero and Yoon locally robust test (one-sided): random effects sub AR(1) errors

	<i>z.stat</i>	<i>p.value</i>
Dec05-Dec08	-0.316	0.624
Jan09-Dec15	4.994	0
Jan16-Dec19	4.025	0
Overall	-4.619	1

For all periods we have evidence for serial correlation. For the first two subperiods individual effects are significant. For last period and for overall time range individual effects are insignificant. That's why in Table 4 following estimation results are represented: Random-effect model for periods Jan 2009 - Dec

2015 and Jan 2016 – Dec2019; Pooling model for Dec2005 – Dec 2008 and for the whole range Dec2005 – Dec2019.

Table 4. Estimation results for Panel models (pooling (PL) models, robust s.e. in parenthesis, *diff* stands for time difference, *lag* stands for time lag)

	<i>Dependent variable:</i>			
	diff(log(TOT_RETURN_INDEX_GROSS_DVDS)) - diff(log(SP500))			
	Dec05-Dec08 (PL)	Jan09-Dec15 (RE)	Jan16-Dec19 (RE)	Overall (PL)
diff(rate.10y - rate.3m)	0.0183***	-0.0405***	-0.0073***	-0.0090***
	(0.0014)	(0.0018)	(0.0019)	(0.0006)
lag(diff(rate.10y - rate.3m))	0.0134***	0.0292***	-0.0149***	0.0201***
	(0.0009)	(0.0006)	(0.0017)	(0.0004)
StyleGrowth	-0.0020**	0.0008**	0.0011***	0.0001
	(0.0009)	(0.0004)	(0.0005)	(0.0003)
StyleValue	-0.0001	-0.0011**	-0.0015***	-0.0009***
	(0.0009)	(0.0005)	(0.0004)	(0.0002)
is.passive	-0.0029***	0.0020**	0.0015***	0.0003
	(0.0010)	(0.0003)	(0.0003)	(0.0003)
Constant	-0.1019***	-0.0070	-0.0010	-0.0106***
	(0.0050)	(0.0044)	(0.0007)	(0.0006)
Observations	19175	41436	18663	81268
R ²	0.0221	0.0425	0.0079	0.0118
Adjusted R ²	0.0219	0.0424	0.0076	0.0117
F Statistic	86.7037***	1840.1210***	148.7652***	194.2064** *
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01			

Empirical conclusion:

- Active funds give significant benefit only on the period Dec2005 – Dec 2008.
- The spread between long term and short-term US government Treasury bonds yield is a significant factor on all periods.
- The lag of the spread is a significant and positive for the overall model and much bigger than the spread coefficient.
- The management style Value is significant on periods Jan 2009 – Dec 2015 and Jan16–Dec19.
- The management style Growth is significant on all the subperiods, but it is insignificant on the whole period.

As for the interpretation we may say that active funds didn't significantly overperform passive funds, but surely, results vary by the periods. Luckily for the active managers the spread between long term and short-term US government Treasury bonds yield is significant factor. This confirms that active professional investors are able to get benefit on the expectation of the market's growth and they should gain more in uncertain period than the passive ones (note the negative and significant coefficient on the first sub-period for the variable *is.passive*).

4. DISCUSSION AND CONCLUSION

What else can we explore here? It would be nice to narrow down the sample and leave only funds that deviate greatly from the benchmark (it isn't clear how to do it properly), perhaps it would have produced stronger results. It is also possible to test whether the performance of second-tier stocks relative to the S&P 500 is a significant factor for alpha-managed funds. In theory, second-tier stocks are more likely to outpace the market when the spread between 10-year and 3-month US Treasuries widens. Since even those funds that position themselves as Large Caps still invest a little in small and mid-cap stocks, the negative dynamics of second-tier stocks, *ceteris paribus*, should have a negative effect on their alpha.

Summarizing, we can say that the shape of the US Treasuries curve (in particular, the spread between 10-year and 3-month bonds) can influence the alpha of actively managed funds. This is an interesting fact in itself, since stock portfolio managers do not always take into account the expected movement of interest rates. As a practical implementation, they can take hedging positions in long US Treasuries to protect their alpha. As for mutual fund shareholders the very understanding that the movement of long US Treasuries will have a significant impact on their fund's results, the investment strategy may not suit them. Despite the fact that active funds don't always overperform passive funds, we can see that the actively managed funds can show better results during market's instability than the passive ones. This makes our inferences relevant for long-term investors given the current situation at the beginning of 2022.

ACKNOWLEDGEMENTS

This research is supported by Russian Science Foundation: grant No. 20-68-47030 "Econometric and probabilistic methods for the analysis of financial markets with complex structure". The author is thankful to Emelyanov Nikita (UK ATON Management) for problem statement and for attention to the work.

REFERENCES

- Artamonov, N., Voronina, A., Emelyanov, N., Kurbatskii, A. (2020), "Estimation of interest rates' impact on mutual funds' performance in the USA", *Applied Econometrics*, Vol. 58, pp. 55–75.
- Berk, J.B., van Binsbergen, J.H. (2015), "Measuring skill in the mutual fund industry", *Journal of Financial Economics*, Vol. 118, No. 1, pp. 1–20.
- Berkowitz, J.P., Schorno, P.J., Shapiro, D.A. (2017), "Characteristics of mutual funds with extreme performance", *Review of Financial Economics*, Vol. 34, pp. 50–60.
- Carhart, M. (1997), "On persistence in mutual fund performance", *The Journal of Finance*, Vol. 52, pp. 57–82.
- Crane, A., Crotty, K. (2018), "Passive versus Active Fund Performance: Do Index Funds Have Skill?", *Journal of Financial and Quantitative Analysis*, Vol. 53, No. 1, pp. 33–64.
- Cremers, K.J.M., Peajisto, A. (2009), "How active you fund manager? A measure that predicts performance", *The Review of Financial Studies*, Vol. 22, No. 9, pp. 3329–3365.
- Fama, E.F., French, K.R. (1993), "Common risk factors in the returns on stocks and bonds", *The Journal of Financial Economics*, Vol. 33, pp. 3–56.
- Fama, E.F., French, K.R. (2015), "A five-factor asset pricing model", *The Journal of Financial Economics*, Vol. 116, No. 1, pp. 1–22.
- Fan Y., Lin C.Y. (2020), "Active vs. passive, the case of sector equity funds", *Financial Services Review*, Vol. 28, pp. 159–177.
- Frank, M. M., Poterba, J., Shackelford, D., Shoven, J. (2014), "Copycatfunds: Information disclosure regulation and the returns to active management in the mutual fund industry", *Journal of Law and Economics*, Vol. 47, No. 2, pp. 515–541.
- Goetzmann, W.N., Ibbotson, R.G. (1994), "Do winners repeat?", *The Journal of Portfolio Management*, Vol. 20, No. 2, pp. 9–18.

- Gupta-Mukherjee, S. (2013), "When Active Fund Managers Deviate from their Peers: The Impact on Performance", *Journal of Banking & Finance*, Vol. 37, No. 4, pp. 1286–1305.
- Henriksson, D.R. (1984), "Market timing and mutual fund performance: an empirical investigation", *The Journal of Business*, Vol. 57, No. 1, pp. 73–96.
- Huang, J., Sialm, C., Zhang, H. (2011), "Risk shifting and mutual fund performance", *The Review of Financial Studies*, Vol. 24, No. 8, pp. 2575–2616.
- Kacperczyk, M., Sialm, C., Zheng, L. (2005), "On the industry concentration of actively managed equity mutual funds", *The Journal of Finance*, Vol. 60, No. 4, pp. 1983–2011.
- Kacperczyk, M., Nieuwerburgh, S. V., Veldkamp, L. (2014), "Time-Varying Fund Manager Skill", *The Journal of Finance*, Vol. 69, No. 4, pp. 1455–1484.
- Kosowski, R., Timmermann, A., Wermers, R., White, H. (2006), "Can mutual fund "stars" really pick stocks? New evidence from a Bootstrap analysis", *The Journal of Finance*, Vol. LXI, No. 6, pp. 2551–2595.
- Phillips, B., Pukthuanthong, K., Rau, P. R. (2014), "Detecting superior mutual funds managers: Evidence from copycats", *The Review of Financial Studies*, Vol. 27, No. 4, pp. 286–321.



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Citation:

Suwaidan, M.S. (2022), "Determinants of Corporate Cash Holding: Evidence from an Emerging Market", *Montenegrin Journal of Economics*, Vol. 18, No. 3, pp. 109-119.

Determinants of Corporate Cash Holding: Evidence from an Emerging Market

MISHIEL SAID SUWAIDAN¹

¹ Department of Accounting, Yarmouk University, Jordan, e-mail: msuwaidan@yu.edu.jo

ARTICLE INFO

Received September 10, 2021
Revised from October 11, 2021
Accepted November 11, 2021
Available online July 15, 2022

JEL classification: G32, G34, G35, G39

DOI: 10.14254/1800-5845/2022.18-3.9

Keywords:

Cash holdings,
Emerging markets,
Amman Stock Exchange

ABSTRACT

The objective of this study is to examine the impact of several variables in explaining variations in cash holding for a sample of (62) manufacturing companies listed on the Amman Stock Exchange (ASE) during the period (2012-2017). The results indicate that on average the company holds 6.69% of its net assets (total assets – cash and cash equivalents) as cash and cash equivalents, with a standard deviation of 11.60% suggesting that there is a large variation between the sample companies/years in the cash holdings. Using multiple regression analysis, the results identified, as hypothesized, cash flows and dividends to be positively and significantly associated with variation in cash holdings at the 1% level. Thus, companies with higher amounts of generated cash flows and pay dividends hold more cash than other companies. In addition, size is found (as hypothesized) to be negatively significant, though, at the 10% level. From the coefficients of the variables, the result for the cash flows variable is consistent with the pecking order theory which predicts a positive relationship between cash flow and cash holdings. On the other hand, the negative coefficient of the size variable supports the prediction of the trade-off theory. It also suggests that when a need exists for cash, larger firms have better access to capital markets as compared to smaller firms.

INTRODUCTION

Recent years have witnessed a great deal of research investigating an item that exists in every firm's balance sheet. This item is cash holdings. Firms hold large amounts of their assets in cash. In this study cash holding refers to cash and cash equivalents. Cash equivalents are short term investments that are highly liquid that can be converted into cash easily with minimal risk. The significance of cash holdings increased after the global financial crisis in 2008. A study by Lee and Song (2010) revealed that post the financial crisis, Asian firms have increased their average cash holdings and decreased their leverage.

There are several reasons why firms hold cash. Firms hold cash for transitional, precautionary and speculative reasons (Keynes, 1936; Myers and Majluf, 1984; Opler et al., 1999; Dittmar et al., 2003; Ozkan and Ozkan, 2004), and for agency reasons (Jensen, 1986). Transaction reasons make certain the accessibility of sufficient cash in the company to pay for necessary expenses, while precautionary rea-

sons concern the unanticipated cash requirements. Speculative reasons motivate companies to hold cash to benefit from unexpected profitable opportunities (Ranajee and Pathak, 2019). According to Wasiuzzaman (2014) whatever the reason for holding cash, the eventual objective of the cash management should be to have sufficient cash to cover these reasons. Any excess cash represents cost and may be invested, for example, in marketable securities that can be easily converted into cash when a need exists.

Previous studies indicated that firms vary considerably in the amount of cash and cash equivalents they hold as a percentage of their total assets. This is attributed to a number of factors. Opler *et al.* (1999), in their cash model, identified growth opportunities, size, operating cash flow, cash-flow volatility, leverage, net operating working capital, capital expenditure, the decision to pay out dividends and research and development (R & D) expenditure as factors nominated to explain differences in cash holdings between firms.

The objective of this study is to examine the impact of a number of variables in explaining variations in cash holdings for a sample of manufacturing companies listed on the Amman Stock Exchange (ASE) during the period (2012-2017).

The current study contributes to the literature in a number of ways. First, most studies addressing the determinants of cash holding have been conducted in the context of developed countries; thus, the current study assists us to understand this issue in the context of a developing country, Jordan. As stated by Joshi *et al.*, (2007: 85), "More studies on developing countries are needed to provide a research base...". Second, the study adds to the literature on the determinants of cash holdings by providing empirical results using data from companies listed in an emerging market, the ASE. As will be discussed later on, this is important since the results of previous studies conducted in other countries and settings provide mixed, and sometimes conflicting results. Finally, the study is expected to provide feedback to manufacturing Jordanian companies about the levels of cash they hold, and the variables associated with cash holdings increase or decrease.

This study is organized as follows. Section 2 provide a review of the literature relevant to this study and their related theoretical background. Section 3 sets up the research hypotheses. Section 4 describes the methodology employed by the study. Section 5 reports on the main results of the study. Finally, section 6 summarizes the study and presents its conclusions and implications.

1. PREVIOUS STUDIES

Researchers often cite three theories and arguments to explain the level of cash holdings and its determinants (e.g., Opler *et al.*, 1999; Ozkan and Ozkan, 2004). The first is the trade-off theory, which was developed by Miller and Orr (1966). It posits that firms can reach their optimal level of cash holdings by considering the marginal benefits and marginal costs of holding cash. On the one hand, the benefits of holding cash include reducing the likelihood of financial distress, allowing the undertaking of new investment projects, and minimizing the costs of raising external funds or liquidating existing assets. On the other hand, the traditional marginal cost of holding cash is the opportunity cost of the cash held due to no or low return on liquid assets (Ferreira and Vilela, 2004; Al-Najjar, 2017). The second is the pecking order theory, which was offered by Myers and Majluf (1984). It posits that in the presence of asymmetric information, companies prefer to finance their investments and activities first with retained earnings in form of cash held, then with safe debt and risky debt, and finally with equity. The reason for this order is to reduce asymmetric information costs and other financing costs. Therefore, the level of cash holdings would be the result of financing and investment decisions proposed by this hierarchical pattern of finance (Dittmar *et al.*, 2003). The third is the agency theory proposed by Jensen's (1986). It argues that managers have incentives to hold large amounts of cash to increase the amount of assets under their control and to gain discretionary power over the firm's investment decisions. This tends to give managers more flexibility to pursue their own objectives. By having cash available to invest, the manager does not need to raise external funds and to provide detailed information to the capital markets about the firm's investment projects. Therefore, more established managers hold excess cash to avoid market restraints.

Thus, investing in cash can have harmful effects on a firm's value which may subsequently impair the interests of shareholders (Fama and Jensen 1983).

Based on the above theoretical background, a large number of studies have been undertaken to identify the variable responsible for explaining differences between companies' cash holdings (e.g., Opler et al., 1999; Ozkan and Ozkan, 2004). In their pioneering study, Opler et al., (1999) investigated the determinants of cash holdings for a sample of publicly traded US firms for the period (1971-1994). The results of the study indicated that firms with strong growth opportunities, riskier activities, and small in size hold more cash than other firms. Further, the study found that large firms that have the highest access to the capital market, and those with credit ratings, have a tendency to hold less cash. However, limited support was provided to the proposition that exceeds cash leads to more spending on investments and acquisition.

Following Opler et al. (1999), several studies attempted to use similar methodology to examine the reasons why companies have cash holdings. Ozkan and Ozkan (2004) examined the impact of a number of variables on the cash holdings of a sample of UK companies. The results of the study showed that companies' growth opportunities, cash flows, liquid assets, leverage, and bank debt are important in determining cash holdings. The study indicated that the relation between managerial ownership and cash holdings is a significant non-monotonic relation.

Wasiuzzaman (2014) investigated the factors that influence the cash-holding decision for a sample of Malaysian listed companies for the period (2000-2007). The results of the study indicated that companies with more cash holding are characterized by more growth opportunities, higher cash flows, less liquid substitutes, less capital and R&D expenditures, lower leverage and pay dividends. The study also found that the company's size and its cash-flow vitality had no influence on the cash holding decision.

In a more recent study, Ahmed et. al., (2018) examined the effect of firm-specific characteristics on the level of corporate cash holdings for a sample of 115 large Chinese listed firms for the period 2012 to 2016. The results indicated that leverage, bank debt, and non-cash liquid assets negatively affect the levels of cash holdings. While cash flow volatility, investment opportunity and dividends positively affect the levels of cash holdings. Finally, the study found no association between size, cash flow, board independence and ownership concentration and the levels of cash holdings.

Thu and Khuong (2018) examined the effect of a number of variables on corporate cash holdings for a sample of companies listed on Vietnam's Stock Market for the period (2010-2016). The results found a negative relationship between leverage, return on assets, operating cash flow and corporate cash holdings while a tangible asset has a positive relationship.

In India, Singh and Misra (2019) investigated the determinants of cash holdings for a sample of agricultural companies for the period (1995- 2016). Using multiple regression, the results of the study indicated that companies with higher capital expenditures and distributing dividends hold more cash as compared to other companies. On the other hand, the study found that companies with greater profitable opportunities tend to hold less cash. Finally, the study concluded that transaction motives and precautionary motives are important determinants of cash holding levels for Indian companies.

While previous studies provided mixed results concerning the impact of size on cash holdings, Magerakis et. al., (2020) focused on the impact of large, medium, and small size firms on cash holdings for a sample of non-financial and non-utility listed companies in the United Kingdom for a period (2010 to 2018). The results showed that small-sized firms tend to hold more cash than larger firms due to precautionary motives. The study also revealed that firms with riskier cash flows, more growth opportunities and higher research and development expenditures tend to hold more cash.

2. SETTING UP THE HYPOTHESES

The following section sets up the research hypotheses and provides the rationale for each hypothesis.

Firm Size

Researcher predicts a negative relationship between the firm's size and cash holdings (Ahmed, et al., 2019; Ozkan and Ozkan, 2004). Ozkan and Ozkan (2004), among others, argue that the fixed cost component of borrowings may cause smaller firms to hold higher level of cash. In addition, larger firms have better access to capital markets as compared to smaller firms (eg. Opler et al., 1999; Al-Najjar and Clark, 2017). One more reason is that larger firms are subject to a lower risk of financial distress due to the diversification they have in their products and services (Ferreira & Vilela, 2004; Ozkan & Ozkan, 2004). However, empirical results showed mixed results of the relationship between size and cash holdings. For example, Opler et al., (1999), Ahmad et al. (2018) and Magerakis et al., (2020), among others, reported a negative relation between size and cash holding while Wasiuzzaman (2014) did not find a relationship between the two variables. Based on the above arguments, the following hypothesis is tested:

H1: *There is a negative relationship between firm size and cash holdings.*

Financial Leverage

There are conflicting theoretical views concerning the impact of leverage on cash holdings. While the pecking order theory predict a negative relationship especially when the level of investment exceeds retained earnings, the trade-off theory, on the other hand, predicts a positive relationship. This is because firms with high leverage face greater probability of financial distress and bankruptcy. Thus, highly leverage firms tend to hold more cash (Ferreira & Vilela, 2004; Ozkan & Ozkan, 2004). Beside the two theories, the agency theory predicts a negative relationship between leverage and cash holdings. As leverage increases, the debt holders attempt to restrict management discretion by decreasing the levels of free cash flow available (Ferreira & Vilela, 2004). Thus, we expect a lower levels of cash holdings for highly leveraged firms. Empirically, most of the previous studies reported a negative relationship between leverage and cash holdings (e.g., Opler et al., 1999; Thu and Khuong, 2018; Ahmed et al., 2018). Based on the above argument and the empirical results of most studies, the following hypothesis is tested:

H2: *There is a negative relationship between financial leverage and cash holdings.*

Non-Cash Liquid Asset Substitutes

The existence of non-cash assets that can be converted into cash during reasonable time at low cost can be considered as a substitute for holding higher levels of cash when a company is facing liquidity problems. Thus, we expect a negative relationship between the existence of non-cash liquid assets and cash holdings (Opler et al., 1999; Ferreira and Vilela, 2004; Ozkan and Ozkan, 2004). In other words, if a need for cash appears the company can convert such assets into cash. Empirically, previous studies provided support for the negative relationship between this variable and cash holdings. Based on the above arguments, the following hypothesis is tested:

H3: *There is a negative relationship between liquid asset substitutes and cash holdings.*

Cash Flow

According to the tradeoff theory, a negative relationship is expected between cash flows and cash holdings. This is because companies that are expected to generate higher amount of cash from operations are expected to hold lower levels of cash as a cash reserve (Ferreira and Vilela, 2004; Jibrán et al.,

2019). On the other hand, the pecking order theory predict a positive relationship between cash flow and cash holdings. This is because the cash flows generated from operations are considered an internal source of cash which is less costly as compared with external sources (Ozkan & Ozkan, 2004). Empirical results concerning this variable are, to some extent, mixed. For instance, Opler et. al., (1999) and Wasiuzzaman (2014), among others, reported positive relation between cash flows and cash holdings, while Ahmed et. al., (2018) found a negative relation and no relation, respectively, between the two variables. However, consistent with most previous studies, the following hypothesis is tested:

H4: *There is a positive relationship between cash flows and cash holding.*

Capital Expenditure

According to the pecking order theory, companies with higher capital expenditures tends to use up the liquid assets including cash to spend on the newly purchased assets, thus, such companies would have to keep lower cash in reserve (Opler et al., 1999). This suggests a negative relation between capital expenditures and cash holdings. In contrast, the trade-off theory predicts a positive relationship between capital expenditure and cash holdings. This is because firms with high capital expenditures prefer to hold more cash than to raise external capital (Jani et al., 2004). Consistent with most previous studies, the following hypothesis is tested:

H5: *There is a negative relationship between capital expenditure and cash holdings.*

Payment of Dividends

According to the tradeoff theory, companies that pay dividends are expected to have fewer liquid sources because of dividends payments (e.g., Opler et. al., 1999; Ferreira & Vilela, 2004). Thus, this suggests a negative relation between dividends payment and cash holdings. On the other hand, the pecking order theory suggests that companies pay dividends out of the cash available, thus, they have lower levels of cash holdings. In other words, both theories predict a negative relation between dividends payment and cash holdings. Nevertheless, Ozkan and Ozkan (2004) argue that it is expected that companies that pay dividends to have higher levels of cash as compared to those companies that do not pay dividends. In addition, Hill et al., (2014) state that firms that pay dividends may hold higher amounts of cash to avoid cash shortages, mainly when there is a need to pay dividends. This suggests a positive relationship between dividends payment and cash holdings. However, consistent with most previous studies, the following hypothesis is tested:

H6: *There is a positive relationship between payment of dividends and cash holdings.*

3. RESEARCH METHODOLOGY

3.1 Population and sample

The population of the study includes all manufacturing companies listed on the ASE for the period (2012-2017), while the sample includes companies on which all needed information is available. Of the 72 listed manufacturing companies, annual reports for 62 companies were available and useable, giving 372 company-year observations. This number represents 86.511% of the listed companies on the ASE during the period covered by the study.

3.2 Sources of information and variables measurements

Information on the variables of the study was obtained through two sources. The first was the ASE publications, while the second source was the annual reports of listed companies. Table (1) provides information about the variables included in the study and their measurement.

Table 1. Variables and their Measurements

<i>Variable</i>	<i>Code</i>	<i>Measurement</i>
Cash holdings	CH	Cash and cash equivalents divided by total assets net of cash and cash equivalent
Firm size	SIZE	Natural logarithm of total assets
Leverage	LEV	Total liabilities divided by total assets
Liquid asset substitutes	LIQ	(Current assets - cash and cash equivalent - Current liabilities) / Net assets
Cash flows	CF	(Net profit after tax + Depreciation) / Net assets
Capital expenditure	CEX	(Change in fixed assets + Depreciation) / Net assets
Dividend payment	DIV	Dummy variable, 1 is given if the firm paid dividends and 0 otherwise

3.3 The Regression Model

To investigate the effect of the selected independent variables on cash holdings in Jordan, the study uses panel model analysis for 62 manufacturing companies listed on the ASE over the period 2012-2017. Before estimation, a number of tests were performed which help in the model selection and accuracy of the estimated parameters. The first is concerning descriptive statistics analysis, followed by the test for correlation among the explanatory variables. The following multiple linear regression model is estimated:

$$CH_{it} = \beta_0 + \beta_1 SIZE_{it} + \beta_2 LEV_{it} + \beta_3 CF_{it} + \beta_4 LIQ_{it} + \beta_5 CEP_{it} + \beta_6 DIV_{it} + e_{it}$$

Where:

β_i = the regression coefficient, $i = 0, 1, \dots, 6$.

CH = Cash holding.

SIZE = Firm size.

LEV = Firm's financial leverage.

CF = Cash flow.

LIQ = Liquid assets substitutes

CEX = Capital expenditure.

DIV = Dividends payment.

β_0 = Intercept.

ε = Error term.

The independent variables include one categorical variable: the dividends (DIV). This is represented by a dummy variable in regression. In addition, six variables are continuous variables represented in the regression. These variables are size, leverage growth opportunities, liquid assets substitutes, cash flows, and capital expenditures. Table 2 presents the research hypotheses and the predicted sign of the coefficient (β) for each explanatory variable associated with each hypothesis.

Table 2. Research hypotheses and predicted signs of the coefficients

<i>Research Hypotheses</i>	<i>Predicted Sign of β</i>
H ₁ : Size	-
H ₂ : Leverage	-
H ₃ : Liquid assets substitutes	-
H ₄ : Cash flows	+
H ₅ : Capital expenditures	-
H ₆ : Dividends payment	+

4. RESULTS

4.1 Descriptive Statistical

Table (3) presents the descriptive statistics for the variables used in the study. As seen from the table, on average the firm holds 6.69% of its net assets (total assets – cash and cash equivalents) as cash and cash equivalents, with a standard deviation of 11.60% suggesting that there is a large variations between the sample companies/years in the cash holdings. It can also be noted that the standard deviations, value for the size variable is large, suggesting that there is a considerable variations in the sizes of the manufacturing companies examined. As for the leverage, it can be seen that, on average, the sample company/year finances about 40% of its assets by liabilities or external sources. Also, the standard deviation, the minimum and maximum values suggest that companies have significant differences in their sources of financing. The table also shows that on average the company generates 2.15% cash flows. The negative sign in the minimum value indicate that some companies reported negative cash flows. The information in the table also reveals that, on average, the company spends about 2.57% of net assets on capital expenditures. The other values also indicates that there is a considerable variations on the companies' capital expenditures. Finally, as for the dividends payment which is represented by a dummy variable, the information reveals that about 38% of the company/year have distributed cash dividends during the study period (2012-2017).

Table 3. Descriptive Statistics

	<i>N</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Std. Deviation</i>
Cash holdings (CH)	360	.000001	.714928	.06697810	.116084960
Firm Size (SIZE)	369	283371	1183605000	56349569	161275701
Leverage (LEV)	369	.0040	1.8378	.401127	.2644310
Cash Flows (CF)	369	-1.91-	.55	.0215	.17912
Liquid Assets Substitutes (LIQ)	369	-1.0427-	.7740	.134493	.2731853
Capital Expenditures (CEX)	369	-1.9199-	2.7161	.025695	.1881366
Dividends Payment (DIV)	369	0	1	.38	.486

4.2 Multiple regression analysis

Before conducting the multiple regression analysis, the regression model was checked for the presence of multicollinearity problem between the independent variables. According to Anderson et al. (1993) multicollinearity does not represent a problem if one is interested in predicting the dependent variable from several independent variables, but it does when interpreting the individual influence of each independent variable. However, the latter is one of the major concerns of this investigation. A popular technique for detecting multicollinearity is using a correlation matrix. A high correlation between any pair of independent variables may indicate the presence of multicollinearity. Anderson et al. (1993) consider an absolute correlation coefficient high if it exceeds .7 for any two of the independent variables. To assess the extent of this problem with respect to the current regression model, a complete correlation matrix incorporating all the independent variables was run (see Table 4). As seen from the table, no high level of correlation is found between any two of the independent variables suggesting the absence of multicollinearity problem.

Table 4. Correlation matrix

Variable	SIZE	LEV	CF	LIQ	CEX	DIV
SIZE	1	.069	.382**	-.023-	.060	.226**
		.184	.000	.663	.250	.000
LEV	.069	1	-.250**	-.598**	.011	-.366**
	.184		.000	.000	.828	.000
CF	.382**	-.250**	1	.164**	.097	.404**
	.000	.000		.002	.063	.000
LIQ	-.023-	-.598**	.164**	1	-.011-	.264**
	.663	.000	.002		.829	.000
CEP	.060	.011	.097	-.011-	1	.063
	.250	.828	.063	.829		.228
DIV	.226**	-.366**	.404**	.264**	.063	1
	.000	.000	.000	.000	.228	

** denotes correlation is significant at the 1% level (two tailed)

Another more popular technique for detecting multicollinearity is using variance inflation factors (VIF), which are calculated by $(1 - R^2)^{-1}$, where R^2 is obtained by regressing each independent variable on all other independent variables (Anderson et. Al., 1993). A VIF > 10 constitutes a potentially harmful degree of multicollinearity. The results of VIF reveals that the value for each of independent variable is well below 10 (see the last two columns of Table 5).

The model is also checked for normality. Variables which deviate significantly from normality were transformed using the log function. This can “achieve normality, or linearize a relationship (Anderson et. Al., 1993). The regression model was also checked for the presence of outliers, and these were subsequently removed from the analysis.

Table (5) present a summary of the results of the multiple regression analysis. As seen from the table, the regression model is highly significant was highly significant ($F = 15.299$, $p = .0000$), suggesting that the regression model is important from statistical point of view. It can also be noted from the table that the independent variables incorporated in the model explain 19.3% of the variations in the cash holdings between the companies under investigation.

Table 5. Summary results of the regression model

Model Summary:							
	R^2	.206					
	R^2 (Adj.)	.193					
	F	15.299	Sig. F =	0.000			
Variables	β	Beta	t-value	Sig. t	Tol	VIF	
1 (Constant)	.155		2.258	.025			
Size	-.017-	-.087-	-1.710-	.088	.866	1.155	
Leverage	.016	.037	.582	.561	.565	1.770	
Cash Flows	.268	.381	6.917	.000	.742	1.348	
Liquid Assets Sub.	-.001-	-.003-	-.053-	.958	.632	1.582	
Capital Expenditures	.012	.020	.428	.669	.987	1.014	
Dividends Payment	.044	.185	3.367	.001	.745	1.343	

For the individual independent variables, it can be seen from Table (5) that the size variable is found significant with a negative coefficient, though, at the 10% level. The negative coefficient of the variable supports the prediction of the trade-off theory. It also suggests that when a need exists for cash larger firms have better access to capital markets as compared to smaller firms (eg. Opler et. al., 1999; Al-Najjar and Clark, 2017). The result for this variable is consistent with Opler et. al., (1999), Ahmad et. al. (2018) and Magerakis et. al., (2020), among others, who reported a negative relation between size and cash holdings. However, the results are inconsistent with Wasiuzzaman (2014) who did not find a relationship between the two variables.

The results of the study also reveal (see Table 5) that there is a relationship between the cash flows and cash holdings at the 1% level of significance. As hypothesized, the coefficient for the cash flows variable is positive indicating the higher the cash flows generated by the company's operations, the higher the amount of cash and cash equivalent the company holds. This result agrees with the pecking order theory which predicts a positive relationship between cash flow and cash holdings, because the cash flows generated from operations are considered an internal source of cash which is less costly as compared with external sources (Ozkan & Ozkan, 2004). Compared to other studies, this result is consistent with Opler et. al., (1999) and Wasiuzzaman (2014), among others, who reported positive relation between cash flows and cash holdings, and inconsistent with Ahmed et. al., (2018) who found a negative relation and no relation, respectively, between the two variables.

As for the dividends payment variable, the results indicate that there is a positive relationship between this variable and cash holdings at the 1% level of significance. As argued by Ozkan and Ozkan (2004), this may suggest that Jordanian manufacturing companies that pay dividends hold higher levels of cash as compared to those companies that do not pay dividends, or they may hold higher amounts of cash to avoid cash shortages, mainly when there is a need to pay dividends. Compared with other studies, this result is consistent with Ahmed et. al., (2018) in China and Singh and Misra (2019) in India.

For other independent variables, namely, financial leverage, liquid assets substitutes, and capital expenditures, the results indicated that these variables are insignificant in explaining the Jordanian manufacturing companies' decision concerning cash holdings.

SUMMARY AND CONCLUSIONS

This study reported the results of multiple regression analysis of the effect of a number of independent variables (size, financial leverage, cash flows, liquid assets substitutes, capital expenditures and dividends payment) on explaining variation in cash holdings for a sample of companies listed on the AFM during the period (2012-2017). As hypothesized, the regression model identified cash flows and dividends to be positively and significantly associated with variation in cash holdings at the 1% level. Thus, the null hypotheses that the coefficients associated with these variables are not different from zero can be rejected at the 1% level of significance. Thus, companies with higher amounts of generated cash flows and pay dividends hold more cash than other companies.

Among other variables, size was found to be negatively significant (as hypothesized) though, at the 10% level. The negative coefficient of the size variable supports the prediction of the trade-off theory. It also suggests that when a need exists for cash larger firms have better access to capital markets as compared to smaller firms. For the remaining variables (financial leverage, liquid assets substitutes, capital expenditures), the results provided no support for them in determining the level of cash holdings.

From the coefficients of the variables, the result for the cash flows variable is consistent with the pecking order theory which predicts a positive relationship between cash flow and cash holdings. This may be explained on the ground that the cash flows generated from operations are considered an internal source of cash which is less costly as compared with external sources. On the other hand, the negative coefficient of the size variable supports the prediction of the trade-off theory. It also suggests that when a need exists for cash, larger firms have better access to capital markets as compared to smaller firms.

Overall, the findings of the study offer practical implications for managers of the manufacturing companies listed on the ASE. The findings provide better understanding of the impact of company specific characteristics on the cash holdings decision which, according to the results of the study, is, to some extent, driven by the availability of internal funds and the ability of the company to generate positive cash flows. This may suggest that the pecking order theory is better able to explain the cash holdings decisions made by the Jordanian manufacturing companies than do the trade-off theory. This may also suggest that the company's decision to pay or not to pay dividends is dictated by the availability of internally generated cash. This is evident by the moderate positive Pearson correlation coefficient (.404) between the cash flows and the dividends variables.

The current study has attempted to investigate the determinant of cash holdings in the context of an emerging economy; however, this subject is so broad that one study cannot be expected to cover all its aspects. Thus, further research is needed to incorporate other possible explanatory variables such as ownership structure, the macroeconomic variables and the legal environment, that may improve the predictability power of the cash model employed by the current study.

REFERENCES

- Ahmed, R., Qi, W., Ullah, S., Kimani, D. (2018), "Determinants of corporate cash holdings: An empirical study of Chinese listed firms", *Corporate Ownership & Control*, Vol. 15, No. 3, pp. 57-65.
- Al-Najjar, B., Clark, E. (2017), "Corporate governance and cash holdings in MENA: Evidence from internal and external governance practices", *Research in International Business and Finance*, Vol. 39, issue PA, pp. 1-12.
- Anderson, D., Sweeney, D., Williams, T. (1993), *Statistics for Business and Economics*, 5th ed., West Publishing Company, St. Paul, MN, USA.
- Dittmar, A., Mahrt-Smith, J., Servaes, H. (2003), "International corporate governance and corporate cash holdings", *Journal of Financial and Quantitative Analysis*, Vol. 38, No. 1, pp. 111-133.
- Fama, E.F., Jensen, M.C. (1983), "Separation of ownership and control", *Journal of Law and Economics*, Vol. 26, No. 2, pp. 301-326.
- Ferreira, M.A., Vilela, A.S. (2004), "Why do firms hold cash? Evidence from EMU countries", *European Financial Management*, Vol. 10, pp. 295-319.
- Hill, M., Fuller, K.P., Kelly, W.G. (2014), "Corporate cash holdings and political connections", *Review of Quantitative Finance and Accounting*, Vol. 42, No. 1, pp. 123-142. <https://doi.org/10.1007/s11156-012-0336-6>
- Jani, E., Hoesli, M. and Bender, A. (2004), *Corporate cash holdings and agency conflicts*, Geneva, University of Geneva, http://ssrn.com/abstract_563863.
- Jebran, K., Iqbal, A., Bhat, K., Khan, M., Hayat, M. (2019), "Determinants of corporate cash holdings in tranquil and turbulent period: evidence from an emerging economy", *Financial Innovation*, Vol. 5, No. 3, <https://doi.org/10.1186/s40854-018-0116-y>.
- Jensen, M.C. (1986), "Agency costs of free cash flow, corporate finance and takeovers", *American Economic Review*, Vol. 76, No. 2, pp. 323-331.
- Joshi, P. L., Bremser, W. G., Hemalatha, J., Al-Mudhaki, J. (2007), "Non-Audit Services and Auditor Independence: Empirical Findings from Bahrain", *International Journal of Accounting, Auditing and Performance Evaluation*, Vol. 4, No. 1, pp. 57-89.
- Keynes, J.M. (1936), *The General Theory of Employment, Interest and Money*, Harcourt, Brace and World, New York.
- Lee, Y., Song, K.R. (2010), "Financial crisis and corporate cash holdings: Evidence from East Asian firms", *European Financial Management Association Symposium*, Renmin University, Beijing, China.
- Magerakis, E., Gkillas, K., Tsagkanos, A., Siriopoulos, C. (2020), "Firm Size Does Matter: New Evidence on the Determinants of Cash Holdings", *Journal of Risk and Financial Management*, Vol. 13, No. 8 (Article No. 163), <https://doi.org/10.3390/jrfm13080163>.
- Miller, M.H. and Orr, D. (1966), "A model of the demand for money by firms", *Quarterly Journal of Economics*, Vol. 80, pp. 413-435.

- Myers, S.C., Majluf, N. (1984), "Corporate financing and investment decisions when firms have information that investors do not have", *Journal of Financial Economics*, Vol. 13, pp. 187-221.
- Opler, T., Pinkowitz, L., Stulz, R., Williamson, R. (1999), "The determinants and implications of corporate cash holdings", *Journal of Financial Economics*, Vol. 52, pp. 3-46.
- Ozkan, A., Ozkan, N. (2004), "Corporate cash holdings: An empirical investigation of Uk companies", *Journal of Banking and Finance*, Vol. 28 No. 9, pp. 2103-2134.
- Ranjee, R., Pathak, R. (2019), "Corporate cash holding during crisis and beyond: what matters the most", *International Journal of Managerial Finance*, Vol. 15, No. 4, pp. 492-510.
- Singh, K., Misra, M. (2019), "Financial determinants of cash holding levels: An analysis of Indian agricultural enterprises", *Agricultural Economics*, Vol. 65, pp. 240-248.
- Thu, P.A., Khuong, N. V. (2018), "Factors Effect on Corporate Cash Holdings of the Energy Enterprises Listed on Vietnam's Stock Market", *International Journal of Energy Economics and Policy*, Vol. 8, No. 5, pp. 29-34.
- Wasiuzzaman, S. (2014), "Analysis of corporate cash holdings of firms in Malaysia", *Journal of Asia Business Studies*, Vol. 8, Iss. 2, pp. 118-135.



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Citation:

Paudel, R.C., Kharel, K., Alharthi, M. (2022), "The Role of External Debt, Export Trade, Remittance, and Labour Force in the Economic Growth of Nepal: is Nepal Heading Towards Dutch Disease?", *Montenegrin Journal of Economics*, Vol. 18, No. 3, pp. 121-131.

The Role of External Debt, Export Trade, Remittance, and Labour Force in the Economic Growth of Nepal: is Nepal Heading Towards Dutch Disease?

RAMESH C. PAUDEL¹, KHOM KHAREL²
and MAJED ALHARTHI³ (*Corresponding author*)

¹ Associate Professor, Central Department of Economic, Tribhuvan University Kirtipur, Kathmandu, Nepal
e-mail: ramesh.paudel@alumni.anu.edu.au

² Associate Professor, Tribhuvan University, e-mail: kharelkhom@yahoo.com

³ Finance Department, College of Business, King Abdulaziz University, Rabigh, Saudi Arabia, e-mail: mdalharthi@kau.edu.sa

ARTICLE INFO

Received September 16, 2021
Revised from October 21, 2021
Accepted November 20, 2021
Available online July 15, 2022

JEL classification: C23, O16, O40, O41

DOI: 10.14254/1800-5845/2022.18-3.10

Keywords:

Debt,
Remittance,
Economic growth,
ARDL cointegration with structural break

ABSTRACT

This paper, using the most recent data and updated time series analysis technique in annual data for the period of 1990-2019, examines the role of external debt, remittances, exports, and labour force in the economic growth of Nepal. Despite being a unique country with a high demographic dividend, endowed with natural resources, and fast-growing big economies-China and India- in the neighbour, Nepal has been unable to accelerate its economic growth. The results show that external debt and remittances have contributed negatively to the economic growth of Nepal indicating a symptom of Dutch Disease in the Nepalese economy, especially caused by the remittances inflows in the recent decades. The results also suggest that the debt collected after 2014 has indicated a better performance but still the sign is negative and statistically not significant. The results for exports and labour force indicate that governments of Nepal need to focus more on export performance employing the labour force in the country. There is enough room to improve creating more domestic employment to boost the exports for achieving a better rate of economic growth in the country. The proper utilization of debt and remittances inflows should be an immediate concern of the policymakers in the country. .

INTRODUCTION

The roles of external debt, remittances inflow, export performance, and labour force in economic growth are widely discussed in the literature development economics. Most of the developed countries' examples suggest that these variables have worked unitedly for their economic prosperity. Theoretically, it is said that the properly utilized external debt and remittances inflows contribute to facilitating the required capital of the development tasks smoothing the economy-wide activities. Similarly, exports moti-

vate and incentivize doing entrepreneurship to create employment and to increase the national income. The well-equipped labour forces with production skills also contribute to the national income positively. In these regards, generally, the literature suggests that the role of these variables is positive in economic growth, but the impact is found different in country-to-country cases because of various heterogeneous issues and reasons. Particularly the role of debt and remittance inflows are linked with the Dutch Disease story. Therefore, the nexus of these variables with economic growth has a mixed finding.

For example, about the external debt and economic growth, Fosu (1996) states that debt has deterred the economic growth in African Least Developed Countries (LDCs) between 1970 and 1986. Jayaraman and Lau (2009), using the data for six Pacific island countries from 1988 to 2004, suggest that there is a strong relationship of external debt to GDP growth for the short run. Reinhart and Rogoff (2010), employing the data from 44 countries in the panel structure, find that if the debt to GDP ratio reaches above 60 percent that causes to decline in the annual GDP by two percent. This indicates that the higher debt creates a burden for the economy and slows economic growth. Checherita-Westphal and Rother (2012), from an empirical analysis using the data from 12 European countries for 40 years, find that the debt can contribute to the economy through a channel of private saving, public investment, total factor productivity, and sovereign long-term and interest rates.

Similarly, about remittances' role in economic growth, Javid, Arif et al. (2012) state that there is a positive and significant impact of remittances in the economic growth of Pakistan. Cooray (2012) also suggests a positive relationship of remittances inflows and economic growth in the case of South Asia using a panel data set for the period of 1970-2008. Almost, a similar version of the finding is suggested by Feeny, Iamsiraroj et al. (2014) stating that there is a positive association between remittances inflows and economic growth in small island developing states (SIDS). But this is not always the case as we find many of the studies have suggested the negative association of remittance inflows and economic growth, for example, Sobiech (2019) suggest an ambiguous association between remittance and economic growth stating that remittance can contribute to economic growth only when a country has a low level of financial development. Jawaid and Raza (2012) examine the role of remittances in the economic growth of South Korea and the People's Republic of China and find a positive relationship in the case of South Korea but a negative relationship in the case of the People's Republic of China.

The East Asian Miracle established the role of exports in economic growth replacing the import substitution strategies globally (Paudel 2014). This experience shows that the countries with the priority of exports making the trade-friendly environment in the country adopting suitable policies have performed well in terms of economic growth. Hatemi-j (2002) states that export performance and economic growth has two-way causality in Japan using the data for the period of 1960-1999. Similarly in the Malaysian context, Sulaiman and Saad (2009), using the data for Malaysia for the period of 1960-2005, reveals the export performance has a positive and strong relationship with economic growth for both short-run and long run. Davaakhuu, Sharma et al. (2014), in the context of Mongolia, suggest that export performance has strongly contributed to economic development creating employment opportunities and increasing entrepreneurship in the country. Paudel (2014) states that trade openness with sound governance system helps to accelerate the economic growth in developing countries. Recently, Nguyen (2017) states, analyzing the long run and short-run impact of foreign direct investment and exports on the economic growth of Vietnam using Autoregressive Distributed Lag (ARDL) approach of cointegration in annual data for the period of 1986-2015, that exports have a negative impact in the economic growth of Vietnam.

Labour force is not only one of the factors of production in economics, but also the production function has a compulsory role. Therefore, economic growth is primarily known as the function of labour and capital as discussed in the study of Acemoglu (2012). Sahoo and Dash (2009), using time series data of India for the period of 1970-2006 find that labour force played important role in economic growth. Hicks, Basu et al. (2010) highlight the role of labour forces in the economic growth of China and India in a comparative perspective and suggest that both countries have maintained a reasonable growth which is dominated by the growth in labour productivity. The authors also suggest to India investing in human resources to match with China. But this is not always the case. Some studies report that labour force has a negative contribution to economic growth. For example, Shahid (2014), using time series data from

Pakistan for the period of 1980-2012 concludes that labour force has a negative contribution in the short run.

There are few studies in the context of Nepal discussing the role of different variables in economic growth. Paudel and Shrestha (2006), using annual data from Nepal for the period of 1970-2003, find that external debt has not been utilized properly, and the general assertion of the positive contribution of labour force in economic growth seems untrue in the context of Nepal. However, the study's data seems a bit older and it's to be updated looking for the recent years. Dahal (2014) studies remittances and economic growth of Nepal and suggests a mixed effect of remittances in economic growth. Uprety (2017), using annual data from 1976 to 2013 from Nepal, finds that the increasing trend of the remittances inflows discourages economic growth.

There are two main gaps in the literature review. First, the impact of these variables as an integrated form has not been tested in the context of Nepal. Some studies as stated above have attempted to examine the role of these variables mixing with other variables of their interest but even they are not updated with the latest database. Second, the role of external debt and remittances in economic growth can be with any direction, and these have not been explored in the context of Nepal recently examining the structural shifts that may be in the data.

The major aims of this paper are two folds. First, to document the external debt, remittance, export, and labour force scenario comparing with per capita income growth in the Nepalese context, then to investigate the role of these variables in the economic growth of Nepal so that more credible results can be obtained for the better policy inferences.

Major findings from this paper suggest that external debt and remittances have contributed negatively to the economic growth of Nepal indicating a symptom of Dutch Disease in the Nepalese economy, especially caused by the remittances inflows in the recent decades. The results also suggest that the debt collected after 2014 has indicated a better performance but still the sign is negative and statistically not significant. The results for exports and labour force indicate that governments of Nepal need to focus more on export performance employing the labour force in the country. I recommend that proper utilization of debt and remittances inflows should be an immediate concern of the policymakers in the country.

This article is divided into five sections. The following section highlights the trend of external debt, remittances inflows, exports, and labour force showing their flow with time and direction with per capita gross domestic product (GDP) growth. In section three, I discuss on research methodology. The estimated results have been discussed and interpreted in Section four before concluding in Section five.

External debt, remittances inflow, exports and labour force: trends

If we look at the data for external debt, remittances inflow, export value, and labour force, we feel that they follow a simple increasing trend but at different speeds and slopes. Just comparing the nominal values of these first three variables does not make that impressive sense, therefore, I have analyzed their trend based on their share in GDP expressed in percentage terms.

Figure 1 shows the shares of external debt, remittances inflows, and export values in GDP measured in percentage terms. Also, the same figure includes the data for labour force growth and per capita income growth, both measured in percent. This figure shows some important messages related to the selected economic variables and their association with economic growth. First, while comparing the debt percent of GDP we see that it has a declining trend over the selected period, that is, from about 45 percent in the 1990s, then reaches to above 50 percent until 2000s then declines to record less than 20 percent since 2010. In 2019, it has slightly increased to reach above 21 percent.

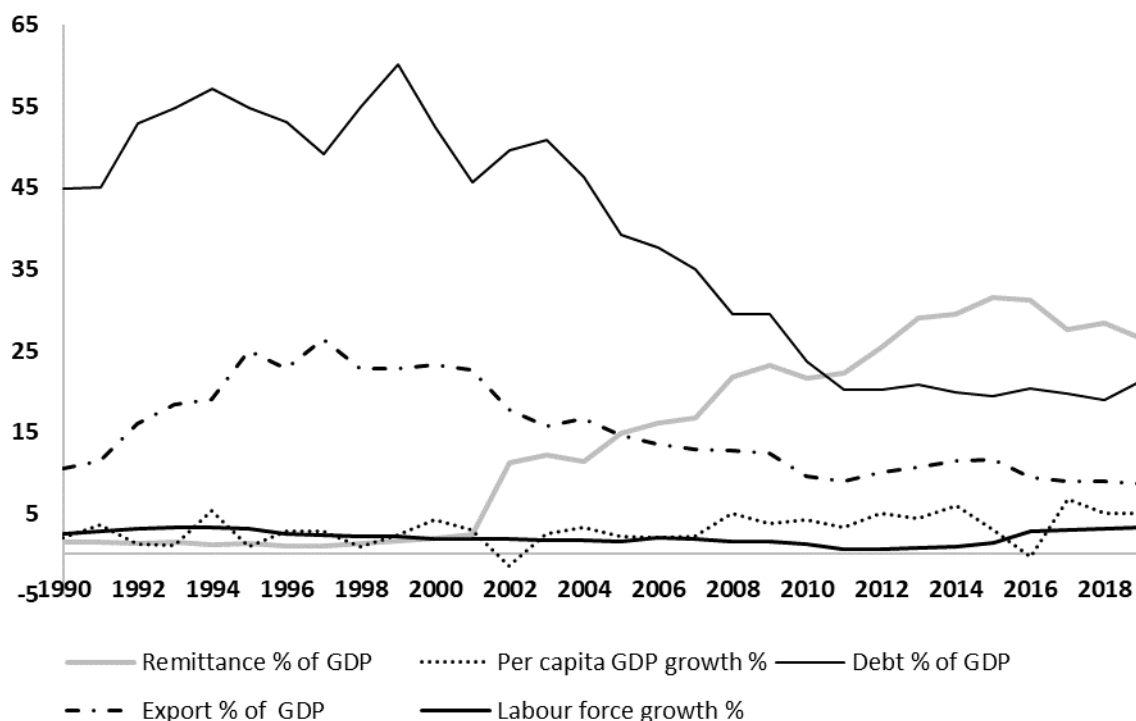


Figure 1. Debt, remittances, exports, labour force, and per capita income scenario, 1990-2019

Source: World Bank (2020)

The same figure shows the trend of remittance inflows percent of GDP. The data shows this share has been nominal until 2001, then starts increasing fastest among all stated variables. Until 2001, it shows less than two percent of GDP, then has a sharp increase in 2002 reaching above 11 percent just in one year. Picking the momentum, it reaches to above 31 percent in 2015, then there is a slight decline to reach about 27 percent in 2019. This means the remittances inflow has started a declining trend, which may be a good symptom for the national economy if the employment opportunities are created for the unskilled and semiskilled labour force in the country. A point to note is that domestic employment rather than remittance would create sustainable growth in the long run as the literature suggests discussed earlier. But it may be too early to hope in that direction until the manufacturing sector progresses, the employment for unskilled and semiskilled labour force becomes a difficult task of the economy.

The exports percent of GDP seems in the faster-declining trend touching the low base and debt percent of GDP also started a sharp decline since the same time when the remittance inflows started increasing. This point is very important when Nepal's economy shifted towards remittance based. The exports percent of GDP reached above 26 in 1997, then it had a gradual decrement until 2001. Then, this number declined to below nine percent in 2019 (Figure 1). Notably, this share was just above 10 percent in 1990, when the democratic system was restored.

The labour force growth remained largely below three percent and the maximum 3.22 percent recorded for the years 1993, 1994, and 2019. For some years, this has been bigger than per capita GDP growth that has been negative in 2002 in the selected period. The per capita GDP growth reached its peak, that is 6.8 percent, in 2017. The per capita GDP growth was below five percent in most of the years earlier than 2008 (Figure 1).

These data indicate that whatever the fluctuation is seen in debt percent of GDP, remittance percent of GDP, and exports percent of GDP; we cannot say how these ups and down in these variables have a direct impact on per capita GDP growth as the trend seems linear but very unpredictable.

1. RESEARCH METHODOLOGY

As the literature suggests that economic growth is a long-term phenomenon and is the combined efforts of the factors of production, which include, but not limited to, capital, labor force, and technology. The issue of economic growth is a complex one as diverse factors may be contributing to it. Therefore, the variables used for modeling the economic growth are not unique, and the growth model as presented in Solow (1956) has been augmented in many ways including the variables of interests.

This paper uses the variables based on growth literature including external debt, remittance inflows, export performance and labour force, and another macroeconomic variable-inflation in the alternative specification. The robustness check of the results is made employing alternative specifications of the model. To know the time-series properties of the data, first, the structural break test is performed before going to the econometrics.

1.1 Model, variables, and data

This paper employs the Solow-Swan growth model that has widely been used in the economic growth literature for a long time but in augmented form following the standard literature of the field.

Per capita GDP growth (GDPPCG), the dependent variable, is employed as the proxy of economic growth. The independent variables are debt percent of GDP (DEBTGDP), remittance percent of GDP (REMGDP), exports percent in GDP (EXPORTGDP), the growth rate of labour force (LABGROWTH), and inflation (INFL). Our benchmark model is as shown in equation (1):

$$GDPPCG_t = \alpha + \beta_1 DEBTGDP_t + \beta_2 REMGDP_t + \beta_3 EXPORTGDP_t + \beta_4 LABGROWTH_t + \epsilon_t \dots \dots \dots (1)$$

Where, α is a constant term, $\beta_1 \dots \beta_4$ are the coefficients of the independent variables, ϵ is the error term, t refers to the time period, i.e., year as we are using the annual data for the period of 1990-2019. Based on the literature, we expect all of these coefficients to be positive.

The data used in this empirical analysis are collected from the world development indicators as given in World Bank (2020) and are compiled to support the objective of this paper.

1.2 Structural break analysis

The testing structural break is kind of mandatory before estimating the empirical work while using time series data. The reason is that if there is a structural breakpoint and is ignored in the time series analysis, the findings may lead to a wrong decision and inferior inference for the policy recommendation. Noting this importance of structural break analysis, in this study, the structural break test is conducted employing Gregory and Hansen (1996) test for cointegration.

Here,

H0: no-cointegration at the breakpoint

H1: there is cointegration at the breakpoint

Table 1 shows the results for a structural break using the Gregory-Hansen method. The results detect the year 2014 has a structural break as indicated by Zt results at 5% level of significance. The year 2014 is selected as the Zt statics are significant with the lowest absolute value of coefficients where the lags are chosen by the Bayesian Information Criterion (BIC). It would be better to have similar results by all statistics but could not ignore even the H0 is rejected in only one model with intercept shift that suggests the cointegration, that is, there exhibit stable properties in the long-only with a structural break. Hence, further econometric estimations are conducted assuming the structural break in 2014 for all estimations.

Table 1. Structural Break Analysis, Gregory-Hansen Cointegration Test

	ADF		Z _t		Z _a	
	Statistics	Break Year	Statistics	Break Year	Statistics	Break Year
Intercept Shift	-6.96**	2002	-6.91**	2014	-37.07	2014
Intercept Shift with trend	-7.13**	1996	-6.85**	2014	-36.81	2014
Intercept shift with slope	-7.68**	1996	-7.00**	2015	-37.19	2015

Note: 1) **indicates the variables are significant at 5 % level of significance.

2) The results detect year 2014 has a structural break as indicated by Z_t results at 5% level of significance. The year 2014 is selected as the Z_t statics are significant with the lowest absolute value of coefficients.

1.3 Econometrics

For the econometric estimation, once the structural break is detected, the standard procedure is to conduct the cointegration test to find out the coefficients so that the relationship between dependent and independent variables can be explained. As we have the time series data with structural break and order of integration is different, the variables included in the equation (1) will be analyzed using a cointegration test based on autoregressive distributed lag (ARDL) approach, which provides both the long-run and short-run relationship of dependent variables with the independent variables irrelevance of the order of their integration (Pesaran, Shin et al. 2001, Paudel and Jayanthakumaran 2009).

Therefore, equation (1) has been modified as in equation (2) to incorporate the structural break year (SBY) and its interaction with independent variables. The SBY is a dummy variable that takes the value 0 until the year 2014 and 1 after then, and it has interacted with the independent variables. The notable point here is that the structural break story is only for the long run. In the short run, the structural break is irrelevant. Therefore, the dummy variable and interaction with independent variables are not to be included in the ARDL model for error correction model (ECM) version.

$$GDPPCG_t = \alpha + \beta_1 DEBTGDP_t + \beta_2 REMGDP_t + \beta_3 EXPORTGDP_t + \beta_4 LABGROWTH_t + \beta_5 SBY_t + \beta_6 SBY_t \times DEBTGDP_t + \beta_7 SBY_t \times REMGDP_t + \beta_8 SBY_t \times EXPORTGDP_t + \beta_9 SBY_t \times ILABGROWTH_t + \epsilon_t \dots \dots \dots (2)$$

The ARDL version of Equation (2) is presented in equation (3):

$$\Delta GDPPCG_t = \alpha + \beta_1 GDPPCG_{t-1} + \beta_2 DEBTGDP_{t-1} + \beta_3 REMGDP_{t-1} + \beta_4 EXPORTGDP_{t-1} + \beta_5 LABGROWTH_{t-1} + \sum_{i=1}^{30} \gamma_i \Delta GDPPCG_{t-i} + \sum_{i=1}^{30} \delta_i \Delta DEBTGDP_{t-i} + \sum_{i=1}^{30} \theta_i \Delta REMGDP_{t-i} + \sum_{i=1}^{30} \varphi_i \Delta EXPORTGDP_{t-i} + \sum_{i=1}^{30} \lambda_i \Delta LABGROWTH_{t-i} + v_t \dots \dots \dots (3)$$

where, β_s refers to the coefficients of each interaction term of dummy variable and independent variable. Equation (3) captures the dynamic impact in the form of the Auto Regressive Distributed Lag Model. In the model, Δ stands for the first-order differential variable. In the equation, α is a intercept, $\beta_1, \beta_2, \beta_3, \beta_4$ and β_5 are

the coefficients of first-order variables. Similarly, $\gamma_i, \delta_i, \theta_i, \varphi_i$ and λ_i are the parameters of the error correction model, and v_t is a vector of random error.

2. RESULTS, DISCUSSIONS, AND INTERPRETATIONS

The estimated results are presented in Table 2. These results provide the base to explain the long-run relationship for the growth model of different specifications in columns (1), (2), (3), (4), and (5). Table 3 presents the results for ECM model in a similar way. These tables show the long-run and short-run coefficients of ARDL with different lags as shown in their headings for the given model. Schwartz-Bayesian Criteria (SBC) is selected due to the relatively small size of the data series. In both tables, the first column presents the results for the benchmark model in the rest of the columns for the alternative specifications of the model. In all the specifications for the long-run relationship, the F-statics (Bound) results show that the values are higher than that of the upper bound of the critical value indicating that the long-run relationships exist in all specifications.

The results in Table 2 column 1 presents the results for our benchmark model. The results show that external debt (DEBTGDP) has a strong long-run relationship indicating over the period that a one percent increase in the DEBTGDP causes to decline the per capita GDP growth on average by about 0.10 percent holding other variables in the model constant at 5 percent level of significance. Against the normal expectation, it can be summarized that the external debt has not been utilized targeting for generating income and there are rooms to improve the proper utilization of available funds in the development tasks. However, the results suggest that the contribution of debt after 2014, as indicated by the coefficient of SBY x DEBTGDP, has improved but still room to improve on the issue.

The same column reveals a more important message about the remittance inflows, that is, a one percent increase in the remittance inflows (REMGDP) causes more than one and a half percent decline in per capita GDP growth employing if the other things remain the same in the model. More importantly, as indicated by SBY x REMGDP, this negative contribution has been increased after 2014. This may indicate a type of Dutch Disease story in the Nepalese economy.

The results for other independent variables, such as exports (EXPORTGDP) and labour force growth (LABGROWTH) are not statistically significant. As can be seen in the same column, the coefficients are positive as expected but not statistically significant, meaning that they have a potential to improve so that a positive contribution for increasing per capita GDP in the future. Yes, there are rooms to improve, even as indicated by our data and Figure 1. Also, the channel of the benefits of labour force growth is linked from the remittance inflows too.

Columns 2, 3, 4 and 5 present the results for alternative specifications of results to check the robustness of the results. Our intention in doing this is to check whether the results are consistent when we add or remove the variables from the model. For this purpose, only EXPORTGDP and its interaction variable SBY x EXPORTGDP have been removed from the model and inflation (INFL) is added, and the results for DEBTGDP remain consistent and REMGDP has lost its statistical significance but still, the sign is negative as consistent with Column 1. Similarly, in Column 3, I removed EXPORTGDP, LABGROWTH, and INFL and their interaction with SBY. In this case, again the results for those main variables of interest remain consistent as of Column 1.

In Column 4, the results are for the regression of DEBTGDP and its interaction with SBY. The results are not meaningfully different, but the coefficient of the interaction term has turned to be negative. Similarly, in Column 5, the results are presented for REMGDP and its interaction with SBY. The results are consistent with the results of Column 1.

Table 3 presents the short-run results based on the error correction model (ECM). In all three specifications of the model, the coefficients for ECM (-1) are statistically significant with an expected negative sign indicating the disequilibrium that occurred in the previous year is corrected in the current year following a short-run shock at a quicker pace if the coefficients are closed to one. I did not find that impressive impact of the variables in the short run, other than REMGDP, which is statistically significant with a

negative sign. This result for REMGDP indicates that, even in the short run, the remittance (REMGDP) has contributed negatively to the per capita GDP growth.

If we check the post estimation statistics, we see that the high value of R-square confirms that the overall goodness of fit of the model is high. The diagnostic test results show that the model passes the tests for serial correlation, functional form, normality, and heteroscedasticity. Further, the stability test results (CUSUM and CUSUMSQ) plotted against the critical bounds of 5 percent level of significance are within the range, indicating that the model is structurally stable (Figures 2 and 3).

Table 2. Long run coefficients of ARDL (1 0 0 1 1 0 0 0 0 0) model for (1) and alternative specifications

<i>Dependent variable: GDPPCG-GDP per capita growth (%)</i>	(1)	(2)	(3)	(4)	(5)
DEBTGDP-Debt's share in GDP (%)	-0.13**	-0.12**	-0.10**	-0.06***	
	(0.051)	(0.055)	(0.026)	(0.022)	
REMGDP-Remittances' share in GDP (%)	-0.04	-0.08	-0.06		0.10***
	(0.063)	(0.076)	(0.071)		(0.033)
EXPORTGDP-Export's share in GDP (%)	0.09				
	(0.080)				
LABGROWTH-Labour force growth (%)	0.04	0.05			
	(0.629)	(0.723)			
INFL-Inflation (%)		0.01			
		(0.073)			
SBY-Structural break (dummy)	-412.92	148.25	46.99**	4.56	23.10**
	(352.562)	(140.653)	(19.842)	(15.134)	(10.950)
SBY x DEBTGDP	1.33	-3.47	-1.067	-0.24	
	(1.770)	(3.919)	(0.700)	(0.760)	
SBY x REMGDP	-1.68**	-2.93	-0.89***		-0.85**
	(0.683)	(2.712)	(0.339)		(0.378)
SBY x EXPORTGDP	32.48				
	(24.664)				
SBY x LABGROWTH	46.09	-1.60			
	(35.922)	(1.339)			
SBY x INFL		1.58			
		(2.540)			
<i>Number of observations</i>	29	29	29	29	29
<i>Root MSE</i>	1.439	1.541	1.447	1.724	1.486
<i>Log likelihood</i>	-43.079	-45.950	-47.180	-53.582	-49.230
<i>R-squared</i>	0.824	0.786	0.767	0.638	0.731

Note: ***, **, and * indicate that the statistics are significant at 1%, 5%, and 10% level of significance. The figures in the parenthesis are the standard error.

Table 3. ECM results, ARDL (1 0 0 1 1 0 0 0 0) model for (1), rest alternative specifications

<i>Dependent variable: GDPPCG (-1)</i>	(1)	(2)	(3)	(4)	(5)
BEBTGDP(-1)			-0.08	-0.09	
			(0.079)	(0.091)	
REMGDP (-1)					-0.33**
					(0.144)
EXPORTGDP (-1)	0.19				
	(0.164)				
LABGROWTH (-1)	0.44	0.286			
	(1.512)	(1.518)			
ECM (-1)	-1.63***	-1.38***	-1.23***	-1.254***	-1.01***
	(0.276)	(0.252)	(0.174)	(0.200)	(0.168)

Note: ***, **, and * indicate that the statistics are significant at 1%, 5%, and 10% level of significance. The figures in the parenthesis are the standard error.

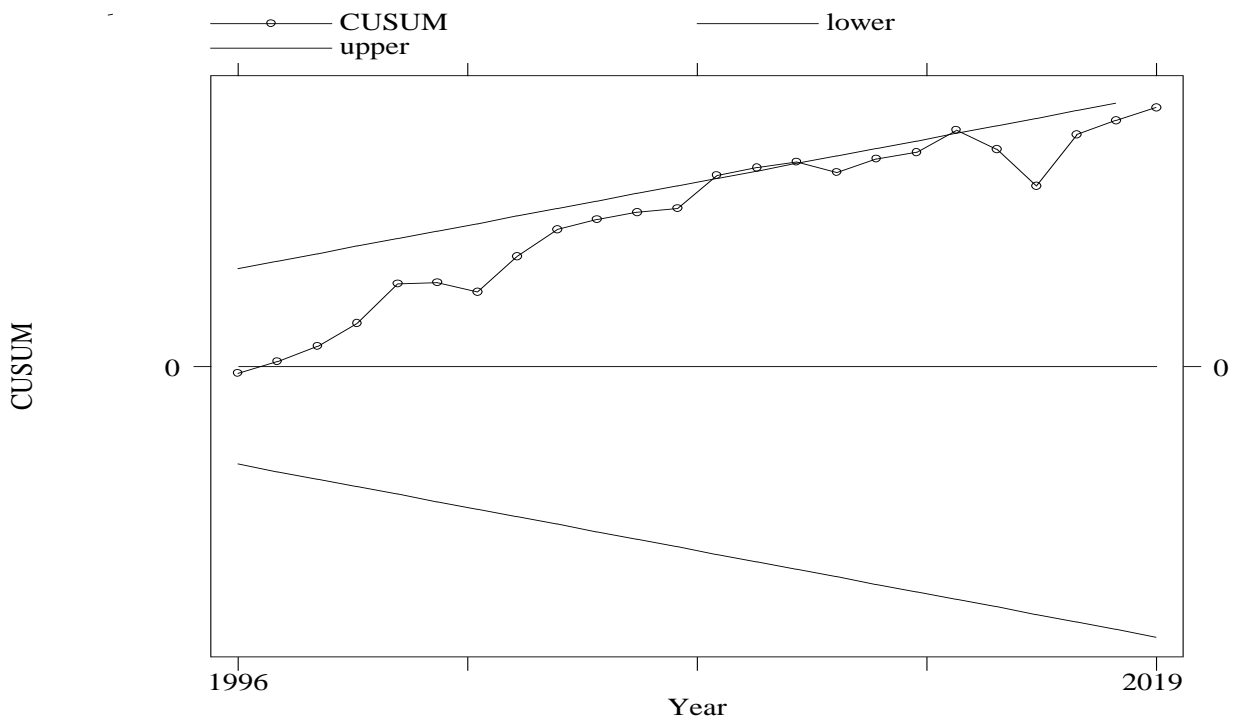


Figure 2. CUSUM upper and lower plot

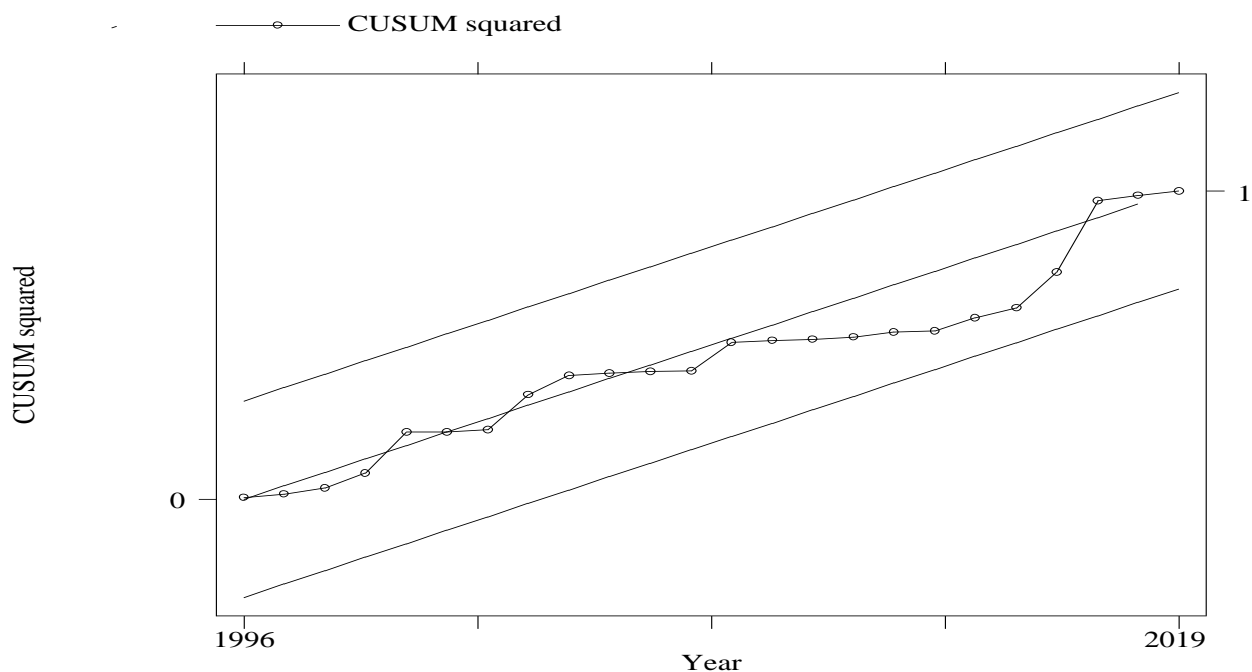


Figure 3. CUSUM squared plot

CONCLUSIONS

This study documents the brief trend of external debt, remittance inflows, exports, labour force growth, and per capita GDP, and then proceed to investigate the role of the first four variables with the last one using the ARDL approach of cointegration with structural break analysis employing a recent dataset for the period of 1990-2019. After conducting the structural break tests, we estimate the model to detect the long-run and short-run relationship among the dependent and independent variables in the model with different alternative specifications.

The external debt has a strong negative impact in the economic growth of Nepal for the period of 1990-2019. However, as suggested by the interaction term, the situation seems to be improved a bit after the period year 2014. The contribution of remittance inflows in economic growth seems strongly negative for the period after 2014. The main policy insight from these results is that Nepal needs a remarkable effort to utilize the available source for development activities so which will contribute to increasing the per capita income. One way of increasing the most effective use of such funds may be to spend in capital expenditure rather than the current expenditure as pointed by many experts and policy discussions in the country in recent years. Also, the other way of advancing the economy may be to focus on domestic employment creation to boost the exports rather than outsourcing the youths for remittance.

REFERENCES

- Acemoglu, D. (2012), "Introduction to economic growth", *Journal of Economic Theory*, Vol. 147, No. 2, pp. 545-550.
- Checherita-Westphal, C., Rother, P. (2012), "The impact of high government debt on economic growth and its channels: An empirical investigation for the euro area", *European Economic Review*, Vol. 56, No. 7, pp. 1392-1405.
- Cooray, A. (2012), "The impact of migrant remittances on economic growth: evidence from South Asia", *Review of International Economics*, Vol. 20, No. 5, pp. 985-998.
- Dahal, P. (2014), "The impact of remittances on economic growth in Nepal: An analysis of a significant basis of development", *Asia Pacific Journal of Public Administration*, Vol. 36, No. 4, pp. 261-282.

- Davaakhuu, O., Sharma, K., Bandara, Y.M. (2014), "Export performance during economic transition in Mongolia", *Economic Analysis and Policy*, Vol. 44, No. 4, pp. 442-450.
- Feeny, S., Iamsiraroj, S., McGillivray, M. (2014), "Remittances and economic growth: larger impacts in smaller countries?", *The Journal of Development Studies*, Vol. 50, No. 8, pp. 1055-1066.
- Fosu, A. K. (1996). "The impact of external debt on economic growth in Sub-Saharan Africa", *Journal of Economic Development*, Vol. 21, No. 1, pp. 93-118.
- Gregory, A.W., Hansen, B.E. (1996), "Residual-based tests for cointegration in models with regime shifts", *Journal of Econometrics*, Vol. 70, pp. 99-126.
- Hatemi-j, A. (2002), "Export performance and economic growth nexus in Japan: a bootstrap approach", *Japan and the World Economy*, Vol. 14, No. 1, pp. 25-33.
- Hicks, J.P.K., Basu, R.B., Sappey (2010), "Ageing, labour force participation and education: comparing the implications for economic growth in China and India", *Economic Papers: A journal of applied economics and policy*, Vol. 29, No. 3, pp. 333-341.
- Javid, M., Arif, U., Qayyum, A. (2012), "Impact of remittances on economic growth and poverty", *Academic Research International*, Vol. 2, No. 1, pp. 433-447.
- Jawaid, S.T., Raza, S.A. (2012), "Workers' remittances and economic growth in China and Korea: an empirical analysis", *Journal of Chinese Economic and Foreign Trade Studies*, Vol. 5, No. 3, pp. 185-193.
- Jayaraman, T.K., Lau, E. (2009), "Does external debt lead to economic growth in Pacific island countries", *Journal of Policy Modeling*, Vol. 31, No. 2, pp. 272-288.
- Nguyen, N.T.K. (2017), "The long run and short run impacts of foreign direct investment and export on economic growth of Vietnam", *Asian Economic and Financial Review*, Vol. 7, No. 5, pp. 519-527.
- Paudel, R.C., Shrestha, M.B. (2006), "The role of external debt, total trade and labour force in economic growth: the case of Nepal", *The Business Review*, Vol. 5, No. 2, pp. 130-136.
- Paudel, R. . (2014), "Economic Growth in Developing Countries: Is Landlockedness Destiny?", *Economic Papers: A Journal of Applied Economics and Policy*, Vol. 33, No. 4, pp. 339-361.
- Paudel, R.C. (2014), *Export performance in developing countries: A comparative perspective*, Australian National University, Canberra, Australia.
- Paudel, R.C., Jayanthakumaran, K. (2009), "Financial Liberalization and Performance in Sri Lanka: The ARDL Approach", *South Asia Economic Journal*, Vol. 10, No. 1, pp. 127-156.
- Pesaran, M.H.Y. Shin, Smith, R.J. (2001), "Bounds testing approaches to the analysis of level relationships", *Journal of Applied Econometrics*, Vol. 16, pp.289-326.
- Reinhart, C.M., Rogoff, K.S. (2010), "Growth in a Time of Debt", *American Economic Review*, Vol. 100, No. 2, pp. 573-578.
- Sahoo, P., Dash, R.K. (2009), "Infrastructure development and economic growth in India", *Journal of the Asia Pacific Economy*, Vol. 14, No. 4, pp. 351-365.
- Shahid, M. (2014), "Impact of labour force participation on economic growth in Pakistan", *Journal of Economics and Sustainable Development*, Vol. 5, No. 11, pp. 89-93.
- Sobiech, I. (2019), "Remittances, finance and growth: Does financial development foster the impact of remittances on economic growth?", *World Development*, 113, pp. 44-59.
- Sulaiman, M., Saad, N.M. (2009), "An analysis of export performance and economic growth of Malaysia using co-integration and error correction models", *The Journal of Developing Areas*, Vol. 43, No.1, pp. 217-231.
- Uprety, D.P. (2017), "The impact of remittances on economic development in Nepal", *Journal of Development Innovations*, Vol. 1, No. 1, pp. 114-134.
- World Bank (2020), *World Development Indicators*, <https://databank.worldbank.org/source/world-development-indicators#>



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Citation:

Kadochnikova, E., Varlamova, Y., Kolesnikova, J. (2022), "Spatial Analysis of Regional Productivity Based on B-Convergence Models", *Montenegrin Journal of Economics*, Vol. 18, No. 3, pp. 133-143.

Spatial Analysis of Regional Productivity Based on B-Convergence Models

EKATERINA KADOCHNIKOVA¹, YULIA VARLAMOVA² and JULIA KOLESNIKOVA³

¹ Assoc. Prof., Kazan Federal University, Kazan, Russia, e-mail: kad-ekaterina@yandex.ru, ORCID 0000-0003-3402-1558

² Assoc. Prof., Kazan Federal University, Kazan, Russia, e-mail: jillmc@yandex.ru, ORCID 0000-0003-3255-9880

³ Prof., Financial University under the Government of the Russian Federation, Moscow, Russia, e-mail: hulia_k@mail.ru, ORCID 0000-0003-3073-100x

ARTICLE INFO

Received August 22, 2021
Revised from September 24, 2021
Accepted October 20, 2021
Available online July 15, 2022

JEL classification: O11, O40, C31, C33

DOI: 10.14254/1800-5845/2022.18-3.11

Keywords:

Innovation,
digitalization,
productivity,
economic growth,
convergence,
spatial correlation.

ABSTRACT

The convergence of productivity in the regions means their sustainable development and the protection of the national economy from external challenges. Accelerating digitalization of society expands the sphere of services and exacerbates the issue of measuring the productivity of the region's economy and the impact on it of internal knowledge factors (including innovations). The spatial heterogeneity of Russian regions, when identifying interrelationships, requires taking into account the spatial aspect. The main aim of the work is to assess the conditional β -convergence of the gross regional product per capita growth rates of the employed population and the impact of technological innovations on productivity in the regional economy on the basis of spatial-econometric models. Research hypotheses suggest that, spatial dependence contributes to the productivity growth rates convergence in the regional economy, technological innovations have a positive impact on productivity growth in the regional economy. The study uses Moran and Geary global spatial correlation indices, Moran local spatial correlation index, econometric model with spatial auto-regression lag, econometric model with spatial interaction in errors, maximum likelihood estimation. We revealed the spatial positive correlation of labor productivity, while the growth rates of real costs for technological innovations have a spatial negative correlation (strong regions "pull" innovations from weak neighbors). Authors didn't confirm the impact of the patents number for inventions and the use of the Internet in organizations on the growth rate of the gross regional product. Based on spatial-econometric models of panel data analysis, no β -convergence of productivity growth rates in the regions was found.

INTRODUCTION

The digital transformation of the economy creates favorable conditions for the service sector development, changes the methods of its measurement and raises new questions for researchers. The service

sector increases its share in the economy and makes the modern economy less tangible and convenient to measure through GDP, which was originally intended to take into account the sphere of material production and production opportunities (Coyle, 2014; Rymarczyk, 2020). The issue of measuring productivity in the regional economy in the context of the economy's digital transformation is becoming the subject of scientific research. In the context of measuring productivity in a regional economy, the mutual influence of regions on each other can become a significant external determinant, increasing the convergence of the growth rates, the mobility of factors and production results (Sobierja and Metelski, 2021). Therefore, the inclusion of a spatial lag in econometric models will allow obtaining unbiased estimates of the explanatory factors.

Convergence of productivity growth rates in the economy means faster growth of regions with low productivity in the future. According to the Solow-Sven theory in the work of P. Barro (1990), the term β -convergence of economic growth is introduced as a negative dependence of growth rates on the initial level of development, that is poor regions have higher economic growth rates than rich ones. In the long term, this should lead to the alignment of regional levels of economic development. According to the theory of endogenous growth, technological progress is the only source of sustainable long-term economic growth. However, the technological inequality of the regions hinders balanced economic development and leads to inequality in the distribution of income and in the welfare of the nation. The interest in forecasting possible inequality in regional development under the assumption of the income fair distribution determined the implementation of the study in the context of β -convergence. The main purpose of the article is to assess the unconditional and conditional β -convergence of the gross regional product growth rates per capita of the working-age population and the impact of technological innovations on productivity in the regional economy on the basis of spatial-econometric models. *Scientific novelty: spatial correlation and lack of convergence of performance in regions based on panel data of Russian regions from 2009 to 2018 were measured for the long term.* The research methodology is largely based on the works of (Barro and Sala-i-Martin, 1992; Rey and Montouri, 1999).

The study assumed that spatial dependence contributes to the productivity growth rates convergence in the regional economy, while technological innovations have a positive impact on productivity growth in the regional economy. As a result of econometric calculations, the need to take into account spatial externalities in econometric models of β -convergence of average productivity growth rates in regions is confirmed, local spatial clustering of regions in Yamalo-Nenets Autonomous district, Khanty-Mansi Autonomous district, Nenets Autonomous district with similar values of variables is revealed: regions with high growth rates of variables are surrounded by neighbors with the same high growth rates. σ -convergence and β -convergence of the average productivity growth rates in the regions in 2009-2018 were not detected. Statistically significant global Moran spatial correlation indices and estimates of the spatial autoregressive coefficient indicated the cooperation of regions in the production of gross regional product per capita of the working population and the competition of regions in the costs of technological innovations. The study revealed the influence of technological innovations costs per capita of the employed population, the volume of investment in fixed assets, the number of university students on the productivity growth rate in the economy. The expected correlation between the gross regional product per capita of the working-age population and the number of issued patents for inventions, the use of the Internet in organizations was not confirmed. *Practical significance: the main conclusions of the article can be used in scientific and practical activities in the policy formulation to stimulate productivity in the regions.*

The article includes the following sections: Literature review, Method and data, Results, and discussion, and Conclusion. The first section presents a review of the literature regarding the results of the β -convergence of the gross regional product growth rates study, taking into account the spatial dependence, it formulates the hypotheses of this study. The second section describes the used econometric models with a spatial component, presents descriptive statistics of variables and justifies the choice of independent variables for the models. The third section contains a discussion of the results of measuring spatial correlation and evaluating models. The conclusion reflects the conclusions of the study.

1. LITERATURE REVIEW

Many researchers have tested the β -convergence hypothesis of economic growth on Russian regional data. In the work of L. Solanko (2003) according to the data for 1992-1998 and from 1999 to 2001, the author confirms a strong σ -divergence of the gross regional product per capita simultaneously with β -convergence. Y. Andrienko, and S. Guriev (2003) concluded that regions with common borders are characterized by a higher degree of convergence in terms of GDP per capita due to increased mobility, knowledge dissemination and trade relations. The conclusion that there is no conditional convergence of the gross regional product per capita according to the data from 1993 to 2000 is made in the work of D. Berkowitz and d. DeJong D. (2005). In the work of T. Buccellato (2007), according to data for the periods from 1992-1998 and 1999-2004, a conditional convergence of the growth rates per capita was found, the author made the conclusion on the role of hydrocarbon production in increasing divergence, about the insignificance of spatial effects from research and development expenditures. In the work of K. Kolomak (2010) according to the data for the period from 1996 to 2008, the author discovers a convergence of the gross regional product growth rates and comes to the conclusion that the effects of interregional cooperation dominate over the effects of interregional competition, and if positive externalities of economic growth prevail in the European part of the country, then negative externalities dominate in its eastern part of it.

In the study of Ivanova V. (2014) according to data from 1996 to 2012 the convergence of the regional average per capita income of the population was confirmed, a significant influence of the spatial features of the regions on the characteristics of convergence was also established. In the work of O. Lugovoy et al. (2007), according to data for the period 1996-2004, it is shown that spatial cooperation of regions prevails over competition and the formation of relatively rich and dynamically developing macroregions and relatively underdeveloped periphery is predicted in the long term, the hypothesis of the presence of conditional convergence is not rejected. Also, in the work of K. Kholodilin et al. (2012) the authors find a positive spatial correlation of regions and a strong regional convergence between high-income regions, conclude that the rate of regional convergence in Russia decreases after taking into account spatial effects. The same conclusion about the positive spatial impact on neighboring regions in economic growth according to data from 1996 to 2013 was obtained in the work of V. Ivanova (2018). The work of O. Demidova and D. Prokopov (2019) is closed to the study in terms of the methodology, which tests the hypothesis of conditional convergence in four types of economic activity (industrial production, construction, agriculture, retail trade), the authors found convergence only in retail trade in 2000-2017 and in industrial production in 2009-2017.

Economic development based on low cost and natural resources cannot last for a long period. Independent innovations play an irreplaceable role in the modern technologically intensive development. Theoretical and empirical studies have revealed a spatial dependence in regional innovation activity: (Fischer and Varga, 2003, Qiu et al., 2020).

Based on the study of R. Barro (2004) and the aims of the work, two main hypotheses can be developed:

- spatial dependence contributes to the productivity growth rates convergence in the regional economy;
- technological innovations have a positive impact on productivity growth in the regional economy.

To test the first hypothesis, it is proposed to use the spatial autoregressive coefficients ρ . To test the second hypothesis, it was proposed to check the statistical significance of the corresponding regression coefficient in the models of conditional β -convergence.

2. METHOD AND DATA

The data sample was obtained from the statistical edition: "Regions of Russia. Socio-economic indicators" for 83 regions of the Russian Federation for the period from 2009 to 2018. The Republic of Cri-

mea and the city of Sevastopol were not included in the sample due to changes in the administrative borders of Russia. Descriptive statistics of variables is presented in Table 1.

Table 1. Descriptive statistics of variables

<i>Variables</i>	<i>Mean</i>	<i>St. D.</i>	<i>Min</i>	<i>Median</i>	<i>Max</i>
The average growth rate of the real gross regional product per capita of the working-age population in 2009 prices	1,01	0,03	0,91	1,00	1,08
Expenditures on technological innovations per capita of the working-age population, thousand rubles	1,11	0,14	0,71	1,12	1,52
Investments volume in fixed assets per capita of the working-age population	83,41	50,15	26,35	73,86	305,07
Number of issued patents for inventions, pcs.	261,80	314,58	0,00	159,50	1994,00
Number of university students, thousand people	246,32	83,94	44,11	247,99	549,01
The use of the Internet in organizations,%	88,60	6,34	68,40	89,85	98,10

Source: obtained by the authors according to the data of the "Regions of Russia. Socio-economic indicators. 2018" edition.

Spatial-econometric models based on panel data allow taking into account possible variations of the gross regional product per capita of the working-age population to measure the β -convergence of productivity in the regions in the long-term time period. The research is largely based on the works of (Barro and Sala-i-Martin, 1992; Rey and Montouri, 1999). Dependent variables are the logarithm of the average growth rate of the real gross regional product per capita of the working-age population in 2009 prices as measure the conditional β -convergence of productivity in the regional economy (Barro and Sala-i-Martin, 1992; Tsionas, 2010; Cuaresma et al. 2014). The variable of interest are the expenditures on technological innovations per capita of the working-age population (Romer, 1994). To control the heterogeneity of convergence, control explanatory variables of the matrix X are: investments volume in fixed assets per capita of the working-age population, thousand rubles, Number of issued patents for inventions, pcs. Number of university students, thousand people, the use of the Internet in organizations, %. Below the authors explain such a sample.

This article uses models in which productivity is studied from the perspective of knowledge determinants of economic growth, which are a kind of public good, their effects go beyond the administrative boundaries of territories (Krugman, 1991, Romer, 1994; Aghion and Howitt, 1992).

Theories of economic growth have shown the key role of investment and knowledge capital in achieving economic growth (Krugman P. 1991). The spatial effects of investments were measured in the works of H. Huang and Y. Wei (2016), O. Demidova and D. Prokopov (2019). Therefore, the model includes the volume of investments in fixed assets per capita, thousand rubles, as a characteristic of the economic development of the region.

A positive relationship between economic growth and human capital has been found in a number of studies (Lugovoy et al., 2007; Cuaresma et al. 2014; Yunfu and Aiya, 2019). A positive relationship between the number of corporate patent applications as a direct result of the R&D process has also been noted in studies (Scherngell et al., 2014; Qiu et al., 2020). In this study, the number of issued patents for inventions, pcs, and the number of university students, thousand people, were used to measure the knowledge capital and the human capital stock.

The link between access to websites and telecommunications and economic growth has been identified for many regions of Europe (Scherngell et al. 2014, Cuaresma et al. 2014). Therefore, we include

the indicator of Internet usage in organizations, %, in the model. To identify spatial dependence, global Moran's indices are defined (Anselin, 1988):

$$I(X) = \frac{N}{\sum_{i,j} w_{ij}} \cdot \frac{\sum_{i,j} w_{ij} (X_i - \bar{X})(X_j - \bar{X})}{\sum_i (X_i - \bar{X})^2},$$

where N – the number of regions, \bar{X} – average value of an indicator X, w_{ij} – elements of the boundary matrix of weights, W indicates the amount for all w_{ij} .

The Moran index takes values in the range of [-1; 1]. A positive spatial correlation coefficient means that a growing region contributes to the growth of its neighbors; a negative value means that a growing region "pulls" the resources of its neighbors. The insignificance of the coefficient indicates the absence of processes interrelation in different regions.

To identify local spatial dependence, local Moran's indices are defined (Anselin, 1995):

$$I_{Li} = N \cdot \frac{(X_i - \bar{X}) \sum_j w_{ij} (X_j - \bar{X})}{\sum_i (X_i - \bar{X})^2}$$

If a given region differs significantly from its neighbors (outlier), then the negative value of the local Moran's index belongs to it. A positive correlation indicates that the region is similar to neighboring territories (cluster). The larger the LISA value in modulus, the stronger the similarity / difference between the region and its neighbors. According to the concept of σ -convergence (reduction of variance), measuring the heterogeneity of economic growth and the costs of technological innovations in regions involves the analysis of spatial variance over time based on the coefficient of variation or standard deviation (Rey and Montouri, 1999; Barro and Sala-Martin, 2004; Ivanova, 2014). β -convergence usually leads to σ -convergence, but this process can be hindered by other processes and external shocks that cause an increase in variance (Barro and Sala-Martin, 2004).

In the case of unconditional β -convergence based on the neoclassical growth theory, all regions are identical in structure and possess the same technologies, have the same steady-state equilibrium (steady-state level) for all regions, but differ only in initial conditions. In this case, poor regions grow faster than rich ones and catch up with them in the long run, and in a stable state, regions have the same growth rate. Conditional β -convergence models test the hypothesis that there is a negative link between the average growth rates and the starting level of productivity in 2009, assuming that the regions have their own stable state. To control the heterogeneity of convergence, the conditional β -convergence model includes characteristics of regional differences in the levels of equilibrium stable states-explaining the variables of the X matrix.

To empirically verify the relationship in the R software environment, the maximum likelihood method is used to evaluate β -convergence models with a spatial component (splm package) of the SAR and SEM type on panel data (Anselin, 1988; Barro and Sala-i-Martin, 1992; Vakulenko, 2016).

SAR-model with spatial autoregressive lag:

$$\frac{1}{T} \ln \frac{y_{i,t_0+T}}{y_{i,t_0}} = \alpha_i + \delta_{t_0+T} + \beta \ln y_{i,t_0} + \sum_{k=1}^K \gamma_k X_{kit} + \rho W_{ij} \ln \frac{y_{i,t_0+T}}{y_{i,t_0}} + \varepsilon_{i,t_0+T} \quad (1)$$

where $i=1,\dots,83$ – region number, $[t_0+T]$ – convergence period from 2009 to 2018, y_{i,t_0} – GRP per capita of the working-age population in region i at the initial moment of time (2009), k – explanatory variable number, K – number of explanatory variables, α_i – vector of regional fixed effects, which allow to control for unobserved spatial heterogeneity, δ_{t_0+T} – time fixed effects, set by a number of dummy variables for years, is a time effect in order to control for common country factors affecting dynamics of considering factors, β – parameter to be estimated for the GRP per capita of the working-age population at the initial moment of time (2009), γ_k – parameters to be estimated for explanatory variables; W_{ij} – boundary

weighting matrix for dimensions ($N=83 \times N=83$), ρ – spatial autoregressive coefficient, ε_{i,t_0+T} – random error, which are normally distributed. β represents the convergence. If $\beta < 0$, then there is conditional beta convergence. This means that poorer regions have higher growth rates than richer regions – which is why they are able to ‘catch up’. SEM-model with spatial interaction in errors with fixed effects:

$$\frac{1}{T} \ln \frac{y_{i_{t_0+T}}}{y_{i_{t_0}}} = \alpha_i + \delta_{t_0+T} + \beta \ln(y_{i_{t_0}}) + \sum_{k=1}^K \gamma_k X_{kit} + \lambda W \varepsilon_{i,t_0+T} + u_{i,t_0+T} \quad (2)$$

SEM-model with spatial interaction in errors with random effects:

$$\frac{1}{T} \ln \frac{y_{i_{t_0+T}}}{y_{i_{t_0}}} = \alpha_i + \delta_{t_0+T} + \beta \ln(y_{i_{t_0}}) + \sum_{k=1}^K \gamma_k X_{kit} + \lambda W \varepsilon_{i,t_0+T} + v_{i,t_0+T} \quad (3)$$

where λ – spatial autocorrelation coefficient for shock, $v_{i,t_0+T} = \mu + u_{i,t_0+T}$ (Kapoor et al. 2007)

The dependent variable autoregression coefficient ρ for the spatial lag allows one to identify the influence of the gross regional product per capita of the working-age population in other regions on the studied region. The statistical insignificance of the spatial autoregression coefficient means that the processes of increasing gross regional product per capita of the working-age population in different regions are not related to each other, a positive value indicates regional cooperation, and a negative value indicates regional competition. The spatial autocorrelation coefficient for shock λ reveals the influence of the spatial structure of errors. The statistical insignificance of λ means that the shocks of neighboring regions that affect the productivity growth rates in a given region are not related to each other.

3. RESULTS AND DISCUSSION

Local Moran indices confirmed the regional local spatial clusters with a higher level of the gross regional product per capita of the working-age population: Yamalo-Nenets Autonomous district, Khanty-Mansi Autonomous district, Nenets Autonomous district. Local spatial clusters of regions similar to neighboring territories were found in the Ural Federal District, the Siberian Federal District, Northwestern Federal District in terms of the expenditures on technological innovations per capita of the working-age population (Figure 1).

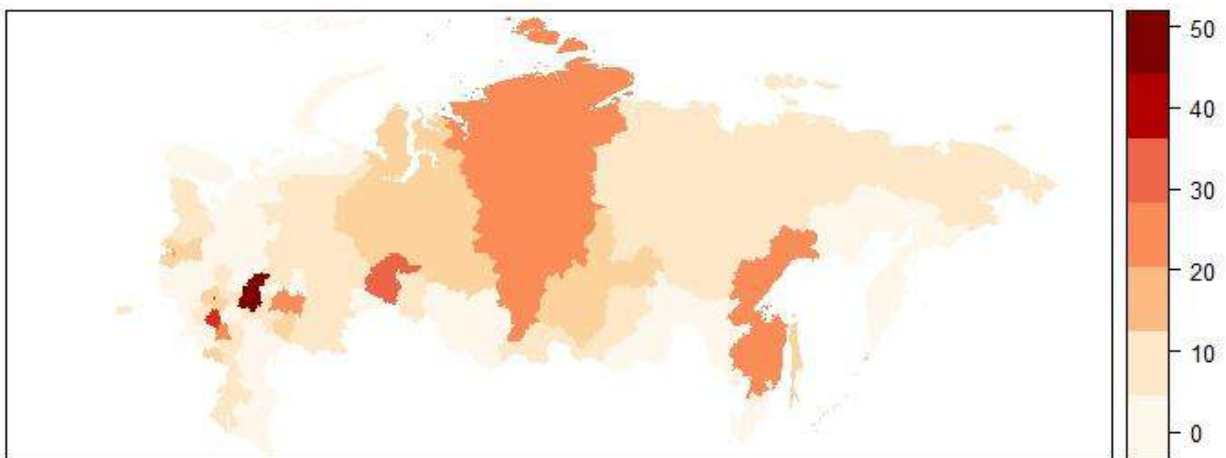


Figure 1. Cartogram of technological innovations costs per capita of the employed population, in 2019, thousand rub.

Source: obtained by the authors according to the data of "Regions of Russia. Socio-economic indicators. 2019" edition.

Most of these clusters are characterized by the orientation of the economy to the raw materials extraction. The predominance of costs for technological innovations is observed in the regional clusters of the Urals and Siberia, which have a raw material orientation of the economy, as well as in Moscow. The Moran diagram (Figure 2) shows that most regions are concentrated in the LL quadrant (weak regions surrounded by weak ones) and in the LH quadrant (weak regions surrounded by strong ones). Most of the industrial regions of central Russia with a high population density belong to clusters with low costs for technological innovations per capita of the working-age population.

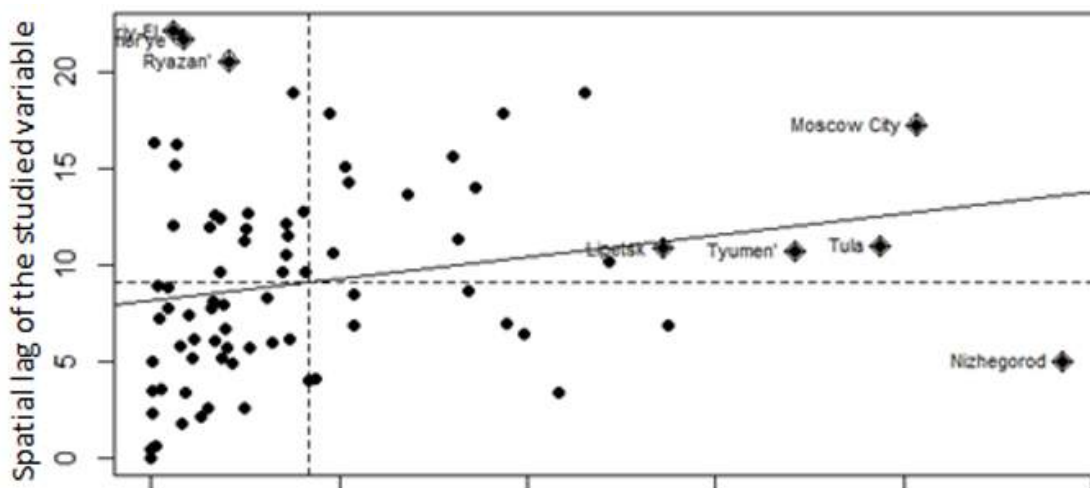


Figure 2. Spatial diagram of the technological innovations costs per capita of the employed population, thousand rubles, in 2019

Source: obtained by the authors according to the data of "Regions of Russia. Socio-economic indicators. 2019" edition.

Global spatial correlation indices demonstrated the presence of a positive spatial correlation of the gross regional product per capita of the working-age population, which means that strong regions contribute to the growth of their neighbors (Table 2).

Table 2. Global Moran spatial Correlation Indices for GRP per capita of the working-age population

Index	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
<i>The gross regional product per capita of the working-age population</i>										
Moran Index	0,345***	0,344***	0,332***	0,314***	0,301***	0,356***	0,347***	0,362***	0,367***	0,349***
Geary Index	0,704***	0,715***	0,724***	0,759***	0,787**	0,755***	0,753***	0,733***	0,793**	0,767**
<i>The expenditures on technological innovations per capita of the working-age population</i>										
Moran Index	0,013	- 0,271*	- 0,291*	- 0,264*	- 0,232*	- 0,118*	0,034	0,043	- 0,115*	0,031
Geary Index	0,999	1,273	1,233	1,226	1,251	1,148	0,950	0,959	1,221	1,024

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: obtained by the authors according to the data of "Regions of Russia. Socio-economic indicators. 2019" edition.

As demonstrated on the graphs (Figure 3), there is no tendency to decrease the coefficients of variation, which means that there is no convergence of regions in terms of the average growth rate of the real gross regional product per capita and the average growth rate of the costs of technological innovations per capita.

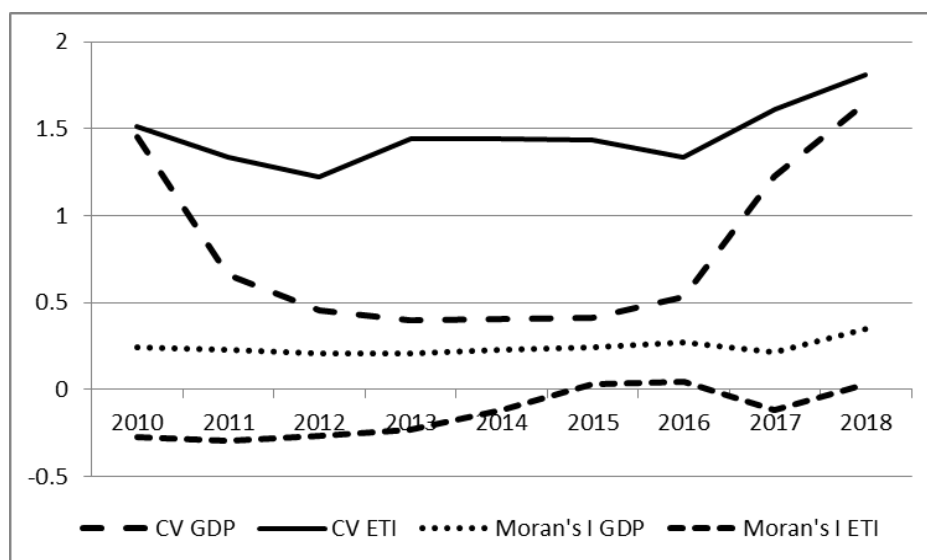


Figure 3. Dynamics of changes in the coefficient of variation and the global Moran index for dependent variables

Source: obtained by the authors according to the data of "Regions of Russia. Socio-economic indicators. 2019" edition.

Both specifications of the β -convergence models of the average real gross regional product per capita growth rate of the working-age population with a spatial component (Table 3) showed the absence of a β -convergence process in 2009-2018. The convergence of the levels of development of regions, taking into account spatial externalities, has not been confirmed. The expected correlation between the gross regional product per capita of the working-age population and the investments volume in fixed assets per capita, the expenditures on technological innovations, the number of university students, was confirmed.

Table 3. Evaluation results of the β -convergence models of the average productivity growth rate in the Russian regions

Regressors	Without a spatial component			With a spatial component	
	OLS	FE	RE	SAR_RE	SEM_RE
The logarithm of the average growth rate of the gross regional product per capita of the working-age population in 2009 prices	-2.345e-02*		-2.658e-02	-2.749e-02	-2.789e-02
Expenditures on technological innovations per capita of the working-age population, thousand rubles	2,679 e-04**	3,674 e-04**	3,267e-04**	3,689e-04	3,563e-04**
Investments volume in fixed assets per capita of the working-age population	2.453e-04***	4.578e-04***	3.342e-04***	3.563e-04	3.478e-04***
Number of university students, thousand people	2.673e-04***	3.894e-04***	3.567e-04***	2.458e-04	2.589e-04***
Number of issued patents for	9.563e-06	-1.237e-05	-2.452e-07	-1.348e-07	3.367e-06

inventions, pcs.					
The use of the Internet in organizations,%	3.783e-04	2.454e-04	1.784e-04	6.457e-05	-3.784e-04
Intercept	5.583e-02		4.569e-02	6.569e-02	1.378e-01
Time lag				3.673e-02***	2.569e-02***
Spatial lag (lambda)					0.267***
Spatial lag (rho)				0.679***	
p-value(F)	< 2.22e-16	2.22e-16			
Adj. R ²	0.167	0.160	0.245		
AIC	-584	-476	-763	-1706	-1895
Hausman test (p-value)			2.22e-16	0.051	< 2.4e-16
n	747	747	747	747	747

Notes: *** p<0.01, ** p<0.05, * p<0.1.

Source: obtained by the authors according to the data of "Regions of Russia. Socio-economic indicators" edition.

The expected correlation between the gross regional product per capita of the working-age population and the number of issued patents for inventions, the use of the Internet in organizations was not confirmed. This can be explained by the high proportion of widespread use of telecommunications technologies, and, at the same time, low results of inventions in the regions. The models showed a statistically significant positive spatial autoregressive ρ coefficient for the average growth rate of the gross regional product per capita. This confirms the hypothesis about the spatial influence of neighboring regions on this one and indicates the cooperation of regions: if the average growth rate of the gross regional product in one region increases, then similar changes will occur in the neighboring ones, that is, strong regions "pull" the weak ones after them. Also, the models (with the exception of SAC_RE) demonstrated a statistically significant positive spatial autocorrelation coefficient for shock. This once again confirms the cooperation of the regions.

CONCLUSIONS

The authors confirmed the need to take spatial effects into account in econometric studies of the modern digital economy growth rates. Regions clustering according to the growth rates of the real gross regional product per capita is characterized by a spatial positive correlation (strong regions contribute to the growth of their neighbors), while the growth rates of real costs for technological innovations have a spatial negative correlation (strong regions "pull" innovations from weak neighbors). Using spatial econometrics models, the study reveals the absence of β -convergence of average productivity growth rates in the regions. This means that this process is hindered by internal and external economic shocks that cause an increase in variance, which correlate with the explanatory variables and have an impact on groups of regions. A conditional β -divergence in the growth rate of expenditures on technological innovations in the short term is revealed. This predicts higher short-term growth in regions with higher initial levels of technological innovation, assuming that the regions have their own sustainable state. At the same time, spatial cooperation of regions has emerged in recent years. A statistically significant positive spatial autoregression ρ coefficient for the short term forecasted the cooperation of regions in terms of the technological innovations' growth: clusters of technologically growing regions "pull" their neighbors (Bagautdinova and Kadochnikova, 2020). In the absence of new shocks, the variance will gradually return to the value that characterizes the stability. The models showed a statistically significant impact of technological innovations costs per capita of the employed population, the volume of investment in fixed assets, the number of university students on the productivity growth rate in the economy. The positive spatial impact of productivity in neighboring regions on this region was found. Therefore, in order to manage problematic regions through the mechanism of cooperation, it is advisable to influence the growth of labor productivity in neighboring leading regions.

ACKNOWLEDGEMENTS

The study was performed with the financial support of the Russian Foundation for Basic Research within the framework of scientific project No. 20-010-00663. The authors express their gratitude for the valuable feedback to the participants of the 60th Annual ERSA Congress, 24-27 August 2021, Italy.

BIBLIOGRAPHY

- Aghion, P., Howitt, P. (1992), "A model of growth through creative destruction", *Econometrica*, Vol. 60, No. 2, pp. 323–351.
- Andrienko, Y., Guriev, S. (2003), "Determinants of Interregional Mobility in Russia: Evidence from Panel Data", *CEFIR publications*.
- Anselin, L. (1988), *Spatial econometrics: Methods and models*, Kluwer, Dordrecht.
- Anselin, L. (1995), "Local Indicators of Spatial Association—LISA", *Geographical Analysis*, Vol. 27, No.2, pp. 93–115.
- Bagautdinova, N., Kadochnikova, E. (2020), "Technological Innovations: Analysis of Short-Term Spatial Effects in Regions by Development of Econometric Model", *Industrial Engineering & Management Systems*, Vol.19, No.4, pp. 888-895.
- Barro, R. (2004), *Economic growth*, Massachusetts Institute of Technology.
- Barro, R. (1990), "Economic Growth and Convergence across the United States", *Working Paper 3419*, Cambridge; Mass.: NBER.
- Barro, R., Sala-i-Martin, X. (1992), "Convergence", *The Journal of Political Economy*, Vol.100, No. 2, pp. 223–251.
- Berkowitz, D., DeJong, D. N. (2005), "Entrepreneurship and Post-socialist Growth", *Oxford Bulletin of Economics and Statistics*, Vol. 67, pp. 25–46.
- Buccellato, T. (2007), "Convergence Across Russian Regions: A Spatial Econometrics Approach", Centre for the Study of Economic and Social Change in Europe, SSEES, UCL. *Economics Working Papers*, No. 72. London.
- Coyle, D. (2014), *GDP: A Brief but Affectionate History*, Princeton University Press.
- Cuaresma, J. C., Doppelhofer, G., Feldkircher, M. (2014), "The Determinants of Economic Growth in European Regions", *Regional Studies*, Vol. 34, pp. 44-67.
- Demidova, O., Prokopov, D. (2019), Beta-Convergence of Russian Regions: Sectoral and Spatial Aspects. Special IARIW-HSE Conference "Experiences and Future Challenges in Measuring Income and Wealth in CIS Countries and Eastern Europe", Moscow, Russia, September 17-18.
- Fischer, M., Varga, A. (2003), "Spatial knowledge spillovers and university research: Evidence from Austria", *The Annals of Regional Science*, Vol. 37, No.2, pp. 303–322.
- Huang, H., Wei, Y. D. (2016), "Spatial inequality of foreign direct investment in China: Institutional change, agglomeration economies, and market access", *Applied Geography*, Vol. 69, pp. 99-111.
- Ivanova, V. (2014), "Regional Convergence of Incomes of the Population: Spatial Analysis", *Spatial Economics*, Vol. 4, pp. 100-119 (in Russian).
- Ivanova, V. (2018), "Spatial Convergence of Real Wages in Russian Cities", *The Annals of Regional Science*, Vol. 61, No. 1, pp. 1-30 (in Russian).
- Kapoor, M., Kelejian, H., Prucha, I. (2007), "Panel Data Models with Spatially Correlated Error Components", *Journal of Econometrics*, Vol. 140, pp. 97–130.
- Kholodilin, K., Oshchepkov, A., Siliverstovs, B. (2012), "The Russian regional convergence process: Where is it leading?", *Eastern European Economics*, Vol. 50, No. 3, pp. 5-26.
- Kolomak E. A. (2010), "Interregional Disparities in Russia: Economic and Social Aspects", *Spatial Economics*, Vol.1, pp. 26–35 (in Russian).
- Krugman, P. (1991), "Increasing returns and economic geography", *Journal of Political Economy*, Vol. 99, pp. 483–499.
- Lugovoy, O., Dashkeyev, V., Fomchenko, D., Mazayev, I., Polyakov, E. (2007), *Analysis of Economic Growth in Regions: Geographical and Institutional Aspect*. Consortium for Economic Policy Research and Advice, IET, Moscow (in Russian).

- Qiu, J., Liu, W., Ning, N. (2020), "Evolution of Regional Innovation with Spatial Knowledge Spillovers: Convergence or Divergence?", *Networks and Spatial Economics*. Vol. 20, No. 1, pp. 179-208,
- Rey, S., Montouri, B. (1999), "US Regional Income Convergence: A Spatial Econometric Perspective", *Regional Studies*, Vol. 33, No. 2, pp. 143–156.
- Romer, P. (1994), "The Origins of Endogenous Growth", *The Journal of Economic Perspectives*, Vol. 8. No. 1, pp. 3–22.
- Rymarczyk, J. (2020), "Technologies, Opportunities and Challenges of the Industrial Revolution 4.0: Theoretical Considerations", *Entrepreneurial Business and Economics Review*, Vol. 8, No. 1, pp. 185-198. doi:10.15678/EBER.2020.080110
- Scherngell, T., Borowiecki, M., Hu, Y. (2014), "Effects of knowledge capital on total factor productivity in China: A spatial econometric perspective", *China Economic Review*, Vol. 29, No. C, pp. 82-94.
- Sobieraj, J., Metelski, D. (2021), "Economic determinants of total factor productivity growth: The Bayesian modelling averaging approach", *Entrepreneurial Business and Economics Review*, Vol. 9, No. 4, pp. 147-171. doi:10.15678/EBER.2021.090410
- Solanko, L. (2003), "An Empirical Note on Growth and Convergence Across Russian Regions", BOFIT, *Discussion Papers*, Vol. 9.
- Tsionas, E. (2000), "Regional Growth and Convergence: Evidence from the United States", *Regional Studies*, Vol. 34, pp. 231-238.
- Vakulenko, E. (2016), "Does migration lead to regional convergence in Russia?", *International Journal of Economic Policy in Emerging Economies*, Vol. 9, No. 1, pp. 1-25
- Yunfu Xu, Aiya Li. (2019), "The relationship between innovative human capital and interprovincial economic growth based on panel data model and spatial econometrics", *Journal of Computational and Applied Mathematics*, Vol. 365, Article 112381.



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Citation:

Govdeli, T. (2022), "Economic Growth, Domestic Savings and Fixed Capital Investments: Analysis for Caucasus and Central Asian Countries", *Montenegrin Journal of Economics*, Vol. 18, No. 3, pp. 145-153.

Economic Growth, Domestic Savings and Fixed Capital Investments: Analysis for Caucasus and Central Asian Countries

TUNCER GOVDELI¹

¹ Associate Professor, Ataturk University, Oltu Faculty Of Humanities and Social Sciences, Oltu Yerleşkesi, Yusuf Ziyabey Mahallesi, Sanayi Caddesi, Erzurum, Turkey, e-mail: tgovdeli@gmail.com

ARTICLE INFO

Received September 26, 2021
Revised from October 24, 2021
Accepted November 20, 2021
Available online July 15, 2022

JEL classification: E2, F43

DOI: 10.14254/1800-5845/2022.18-3.12

Keywords:

Economic growth,
Gross domestic savings,
Fixed capital investments,
VECM Granger causality.

ABSTRACT

This study examines whether there is a long-term relationship between gross domestic savings, fixed capital investments and economic growth in 7 Caucasian and Central Asian countries, and the causality relationship between the variables. The empirical evidence covering the period between 1993 and 2017 suggests that there is a cointegration relationship in the model where economic growth is the dependent variable. According to the panel VECM Granger causality analysis, domestic savings are the causality of economic growth. Furthermore, economic growth was found to be the causality of fixed capital investments and domestic savings was also found to be the causality of fixed capital investments. According to the findings, policy recommendations that will allow domestic savings to reach a sufficient level for investments are needed to be developed for the economies of countries to be able to attain the goal of sustainable growth. Thus, the decisions to be taken by policymakers in collaboration with economists will enable domestic savings to be used in investments.

INTRODUCTION

Savings promote capital formation. Furthermore, savings lead to new and improved techniques that help economies with large scale of production, enhance labor productivity, and increase know-how. Savings would thus lead to the efficient use of existing scarce resources; an increase in national production, income and employment; and help solve the problems of inflation, unemployment, balance of payments, poverty and inequality. In addition, savings save the economy from the burden of external debt and take society to a higher level of prosperity. Adequate savings in developing countries reduce poverty and are also the key to economic development. Moreover, it is noteworthy that the slow rate of development in third-world countries is often due to the low levels of national savings, which limit their capacity to invest in capital formation. This leads to a lower level of economic growth and development compared to other countries that are able to provide sufficient savings. Savings are, therefore, generally considered the main source of economic growth (Jagadeesh, 2015).

In the classic model of Lewis (1955), the key to growth is an increase in investments and savings. An economy is divided into two sectors which are agriculture and industry. Due to low productivity in the agricultural sector, people turn to the industrial sector where they can generate more income. This outcome would increase savings, providing more funds to increase economic growth. Harrod (1939) and Domar (1946) also emphasized the importance of savings and investments as the drivers of growth. Essentially, this model should be able to increase growth by increasing the national savings levels of a country. It should be noted that since some of the savings are used in lieu of old capital, not all savings would lead to growth. Solow (1956) stated that the rate of savings only leads to short-term growth and that long-term growth depends on technological progress. A permanent increase in the rate of savings would initially increase capital stock and thus lead to an increase in production per worker in the short term. However, in subsequent periods, increased savings would only suffice to cover capital depreciation per worker due to the reduced returns. Therefore, although the economy would reach a higher level of stability in the long run, the growth rate would be zero (Nguyen and Nguyen, 2017).

For the national economy, it is important to look at the factors that affect the level of the gross domestic savings and to improve the economic growth of the country. Gross domestic savings offer a significant relationship between past, present and future economic growth. Economic growth is the main objective of every country. Citizens of developed countries live a more comfortable life and enjoy greater prosperity than citizens of developing countries. Reducing poverty, unemployment and inflation, and raising the level of per capita income is the main objective of every country (Kazmi, 1993; Khan et al., 2018).

Pagano (1993) concluded that stable growth depends on the percentage of savings directed to investment. In other words, growth is expected to benefit from higher gross domestic savings and, hence, a higher volume of investment (Hassan et al., 2011). By creating appropriate economic policies against the crisis, which is one of the biggest obstacles to stable growth, it ensures that the problems and the crisis process are defined accurately and in a timely manner.

According to the World Bank database, in 1993 Tajikistan had the highest rate of gross domestic savings with a rate of 65.03% among all Caucasian and Central Asian countries. This was followed by Turkey and Kazakhstan with rates of 18.01% and 15.22%, respectively. In 2017, on the other hand, Kazakhstan had the highest rate of gross domestic savings with a rate of 37.23%. This was followed by Azerbaijan and Turkey with rates of 30.86% and 26.45%, respectively.

Examining the causality between domestic savings and economic growth is quite important. It provides useful information about which economic variables should be controlled by policymakers and the relevant authorities to reach the desired level of targeted variable(s) (Sajid and Sarfraz, 2008). For example, if the results of the causality test indicate that domestic savings drive economic growth and lead to economic growth, the government and policymakers can design or use policies that will encourage the mobilization of savings to achieve higher economic growth. On the other hand, if the econometric analysis reveals the opposite, policymakers will endeavor to remove barriers and accelerate economic growth in order to raise the level of savings (Abu, 2010).

The motivation of this study is to examine the cointegration and causality relationship between gross domestic savings, fixed capital investments and economic growth in seven Caucasian and Central Asian countries. This is particularly important as it has critical policy implications for developing economies with relatively low levels of gross domestic savings. The study is comprised of four sections. In the second section, the findings of current studies in the literature are discussed. In the third section, the data set is defined and the methods used in the empirical study are introduced. In addition, the results of the empirical findings are discussed. The final section provides the conclusion and political recommendations.

1. LITERATURE REVIEW

Katircioglu and Naraliyeva (2006) investigated the cointegration and causality relationships between economic growth, domestic savings and foreign direct investments in Kazakhstan using quarterly data for the period between 1993 and 2002. In the findings, a cointegration relationship was found in the

model where economic growth was dependent. A 1% increase in foreign direct investments would increase economic growth by 0.62%, while a 1% increase in domestic savings would increase economic growth by 0.28%. According to the causality analysis, there is a two-way causality between foreign direct investments and domestic savings. In addition, domestic savings are the causality of economic growth and foreign direct investments are again the causality of economic growth. Tang and Tan (2014) empirically analyzed the relationship between savings and economic growth in Pakistan for the period between 1971 and 2011. According to the findings, a cointegration relationship was identified, and the elasticity coefficient of the savings was found to be positive and significant. A two-way causality between savings and economic growth was identified based on the causality analysis.

Sekantsi and Kalebe (2015) investigated the relationship between savings, investments and economic growth in Lesotho for the period between 1970 and 2012. The results revealed that there was a cointegration relationship between the variables. In addition, a causality relationship from economic growth towards savings in the short term, and a causality relationship from savings towards economic growth in the long term were identified. Moreover, there is a causality relationship from investments towards economic growth both in the short and long term. In their study on East Africa for the period between 1981 and 2014, Elias and Worku (2015) investigated the relationship between gross domestic savings and economic growth. Through empirical findings, they concluded that economic growth in Ethiopia and Uganda was the causality of gross domestic savings.

Siaw et al. (2017) examined the economy of Ghana for the period between 1970 and 2013. In the study which investigated the relationship between domestic savings and economic growth, they found a cointegration relationship in the model where economic growth was dependent. The other findings indicated that domestic savings increased economic growth in the long term, but had a negative, yet insignificant impact on economic growth in the short term. Bolarinwa and Obembe (2017) analyzed the relationship between gross domestic savings and economic growth in six Sub-Saharan African countries for the period between 1981 and 2014. According to the findings, economic growth is the causality of gross domestic savings in Ghana and Burkina Faso. In Liberia, Niger and Sierra Leone, gross domestic savings are the causality of economic growth. In Nigeria, no causality relationship was identified between economic growth and gross domestic savings.

Rosado and Sánchez (2017) investigated Ecuador for the period between 1975 and 2015. According to the results of the econometric analysis, they found a causality from the rate of savings towards economic growth. Patra et al. (2017) analyzed the relationship between savings and economic growth in India for the period between 1951 and 2012. Based on the empirical findings, it was concluded that economic growth is the causality of savings in the short term. Tang and Tan (2017) investigated the causality relationship between savings and economic growth in East Asian countries for the period between 1970 and 2011. Based on the results of the empirical analysis, they concluded that savings in East Asian countries are the causality of economic growth. Keho (2018) examined the relationship between domestic savings and economic growth in West African countries for the period between 1981 and 2014. The findings revealed that economic growth is the causality of domestic savings in Guinea-Bissau and Nigeria. In addition, domestic savings in Benin, Gambia, Mali, Niger and Senegal are the causality of economic growth. A two-way causality between domestic savings and economic growth was identified in Ghana. Hussain and Saaed (2018) investigated the relationship between economic growth and gross domestic savings in the United Arab Emirates for the period between 1980 and 2013. In the study a cointegration relationship was found and it was concluded that gross domestic savings have a positive and significant effect on economic growth.

2. DATA SET, METHODOLOGY AND IMPLEMENTATION

The gross domestic savings (GDS), fixed capital investments (GFI) and economic growth (GDP) data of seven Caucasian and Central Asian countries (Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan and Turkey) were used in the study. In the empirical study conducted for the period of 1993-2017, the data was obtained from the World Bank database.

2.1 Methodology and Implementation

The purpose of an empirical study is to estimate the cointegration and causality relationships between variables. The stationarity of the variables must be analyzed to be able to identify the methods that would allow the estimation of the cointegration and causality relationship. For this purpose, the Levin et al. (2002) (LLC), ADF (Augmented Dickey-Fuller) Fisher and Im et al. (2003) (IPS) tests were used to be able to test the stationarity of the variables used. The null hypothesis of the tests is “there is a unit root in the variable”, while the alternative hypothesis is “the variable is stationary”.

Table 1. Results of the Panel Unit Root Test

	LLC		ADF-Fisher		IPS	
	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.
LEVEL						
GDP	0,430	0,667	7,868	0,896	0,553	0,710
GDS	-0,626	0,266	15,777	0,327	0,208	0,582
GFI	-0,232	0,408	13,787	0,466	-0,275	0,392
1. DIFFERENCE						
ΔGDP	-4,786	0,000	38,586	0,000	-3,412	0,000
ΔGDS	-13,542	0,000	127,961	0,000	-13,092	0,000
ΔGFI	-5,748	0,000	52,960	0,000	-5,262	0,000

*, and ** refer to significance levels of 1% and 5%, respectively.

The results of the panel unit root test are presented in Table 1. According to the LLC unit root test, the test statistics of the GDP, GDS and GFI variables at level are 0.430, -0.626 and -0.232, respectively. Since the H_0 hypothesis cannot be rejected in any of the three test statistics, the variables are unit rooted at level. Taking the first difference in the variables revealed that the test statistics of the GDP, GDS and GFI variables were 4.786, -13.542 and -5.748, respectively. The null hypothesis was rejected, and the alternative hypothesis was accepted at a significance level of 1%. For this reason, based on the LLC unit root test, the GDP, GDS and GFI test statistics were found to be stationary at the first difference. According to the ADF-Fisher unit root test, the test statistics of the GDP, GDS and GFI variables were 7.868, 15.777 and 13.787, respectively. Based on the test statistics, it was concluded that all three variables were unit rooted at level. Taking the first difference of the variables revealed that the test statistics of the GDP, GDS and GFI variables were 35.568, 127.961 and 52.960, respectively. According to the test statistics, the null hypothesis was rejected for all three variables and the alternative hypothesis was accepted at a significance level of 1%. Therefore, according to the ADF-Fisher unit root test, the variables are stationary at their first difference. According to the IPS unit root test, the test statistics of the GDP, GDS and GFI variables at level are 0.553, -0.208 and -0.275, respectively. The null hypothesis could not be rejected for any of the three variables and the variables were considered to be unit rooted. Taking the first difference of the variables revealed that the test statistics of the GDP, GDS and GFI variables were -3.412, -13.092 and -5.262, respectively. Therefore, taking the first difference of the variables resulted in the rejection of the H_0 hypothesis and the acceptance of the alternative hypothesis at a significance level of 1%. According to the LLC, ADF-Fisher and IPS unit root tests, the GDP, GDS and GFI variables were found to be stationary at level I(1).

After confirming that the variables are stationary at level I(1), panel cointegration tests were used to test whether there was a long-term relationship between the internally identified variables. Seven different test statistics were used in the Pedroni (1999, 2004) panel cointegration test. The critical values in this test were determined by the Monte Carlo simulation. The Kao (1999) test was also used in the study to enable testing of the cointegration relationship. Kao (1999) developed a panel test for cointegration,

which can be considered as a generalization of the DF and ADF tests. For both tests, the null hypothesis is “there is no cointegration relationship”, and the alternative hypothesis is “variables are cointegrated”.

Table 2: Panel Cointegration Tests Results

Pedroni Cointegration Test (GDP Bağımlı Değişken)	
<i>Within dimensions</i>	<i>t- statistics</i>
Panel v-statistics	0.310
Panel ρ - statistics	-0.924
Panel PP- statistics	-2.079**
Panel ADF- statistics	-2.962*
<i>Between dimensions</i>	
Group ρ - statistics	1.108
Group PP- statistics	-2.433*
Group ADF- statistics	-2.458*
Kao Cointegration Test (GDP Bağımlı Değişken)	
ADF	-4.797*

Note: *, and ** refer to the existence of a cointegration relationship at significance levels of 1% and 5%, respectively.

The results of the panel cointegration tests are presented in Table 2. The Pedroni (1999, 2004) panel cointegration analysis is tested by applying seven different test statistics. In three of the seven test statistics (Panel v-statistics, Panel ρ - statistics and Group ρ - statistics), the H_0 hypothesis could not be rejected, while the H_0 hypothesis was rejected and the alternative hypothesis was accepted in the remaining four test statistics (Panel PP-statistics, Panel ADF- statistics, Group PP- statistics, Group ADF- statistics). The findings showed that, according to the Pedroni (1999, 2004) panel cointegration test, it was concluded that the variables would act together in the long term. The results of the Kao (1999) panel cointegration test are also presented in Table 2. The Kao test statistic was found to be -4.797. Since the null hypothesis was rejected and the alternative hypothesis was accepted at a significance level of 1% based on this test, it was identified that the variables would act together in the long term.

The Pooled Mean Group Estimator (PMGE) limit test model developed by Pesaran et al. (1999) was used in the study.

$$\Delta GDP_{it} = \varphi_i + \sum_{k=1}^p \delta_{ij} \Delta GDP_{i,t-j} + \sum_{k=1}^p \gamma_{ij} \Delta GDS_{i,t-j} + \sum_{k=1}^p \omega_{ij} \Delta GFI_{i,t-j} + \beta_{1ij} GDP_{i,t-1} + \beta_{2ij} GDS_{i,t-1} + \beta_{3ij} GFI_{i,t-1} + \varepsilon_{it} \quad (1)$$

where, φ_i is the error correction parameter, $i=1,2,\dots,N$ is the cross section units, and $T=1,2,\dots,N$ is the time period. The null hypothesis of the test is “there is no cointegration relationship”, and the alternative hypothesis is “variables are cointegrated”. In the ARDL model, the Schwarz information criterion was used and a maximum lag length of 4 was chosen. The optimal lag length chart is provided below.

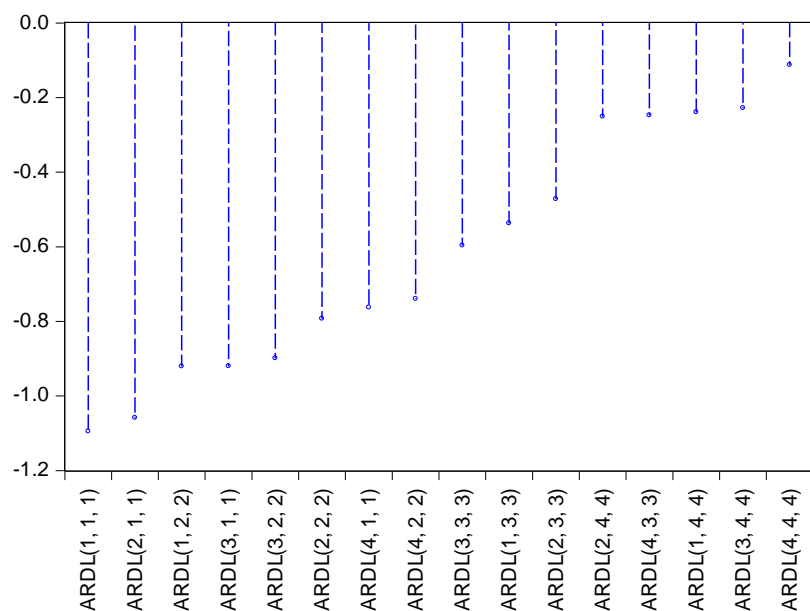


Figure 1. The optimal ARDL model choice based on the Schwarz information criterion.

Given the fact that the components of economic growth have different effects on economic growth in the short and long term, these effects need to be estimated. The first step of the panel ARDL test is to find the optimal lag and test the model based on this lag. As shown in Figure 1, the lowest criterion of Schwarz is ARDL (1,1,1). Therefore, the ARDL (1,1,1) was found to be the optimal model.

Table 3. Results of the Panel ARDL Test

	Stat.	Prob.
LONG RUN COEFFICIENTS		
GDS	0,021*	0,000
GFI	0,828*	0,000
SHORT RUN COEFFICIENTS		
C	0,920**	0,012
GDS	-0,001	0,562
GFI	0,265*	0,000
ECM (-1)	-0,183**	0,012
Hausman specification test: Chi-square = 5.312	Prob = 0.070	

*, and ** refer to significance levels of 1% and 5%, respectively.

Table 3 shows the estimation results of the general form of research within the framework of the ARDL (1,1,1) model. According to the long-term coefficients, the coefficients of the GDS and GFI variables are positive and statistically significant at a level of 1%. The GDS coefficient suggests that its impact on economic growth will be very weak. Any change in the GDS and GDI variables will affect economic growth in the same direction in the long term. According to the short-term coefficient estimation, the GDS coefficient was found to be negative and statistically insignificant. The GFI coefficient, on the other hand, was estimated to be 0.265 in the short term and was statistically significant. Based on theoretical expectations, the error correction coefficient (ECM) was between -1 and 0 and was statistically significant. 18.3% of the deviations are anticipated to recover in the next period and approach balance in the long term.

If there is evidence of cointegration between the variables, the short- and long-term causality relationship is determined using the vector error correction model (VECM) Granger causality test (Granger, 1969). The VECM can be written as:

$$(1 - L) \begin{bmatrix} GDP \\ GDS \\ GFI \end{bmatrix} = \begin{bmatrix} a_1 \\ a_2 \\ a_3 \end{bmatrix} + \sum_{i=1}^p (1 - L) \begin{bmatrix} b_{11i} & b_{12i} & b_{13i} \\ b_{21i} & b_{22i} & b_{23i} \\ b_{31i} & b_{32i} & b_{33i} \end{bmatrix} X \begin{bmatrix} GDP_{t-1} \\ GDS_{t-1} \\ GFI_{t-1} \end{bmatrix} + \begin{bmatrix} \beta_1 \\ \beta_2 \\ \beta_3 \end{bmatrix} + ECT_{t-1} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix} \quad (2)$$

above, $1 - L$ is the lag operator, ECT_{t-1} is the lagged error correction term, β_j ($j=1,2,3$) refers to correction coefficients and ε_{jt} ($j=1,2,3$) refers to error correction terms. In order to interpret long-term causality, the ECM_{t-1} coefficient must be significant and between -1 and 0. The fact that the ECM_{t-1} coefficient is negative and statistically significant indicates that the effect of a shock that may occur in the variables will continue to have a diminishing impact and so will balance itself out again in the long term.

Table 4.VECM Granger causality test results

Dependent Variable	ΔGDP	ΔGDS	ΔGFI	Long-run (p-value) ECT_{t-1}	Direction of causality
ΔGDP	-	3,004 (0,083)	0,240 (0,623)	-0,121 [-2,834]	GDS→GDP
ΔGDS	0,108 (0,741)	-	0,956 (0,328)	-7,277 [-2,383]	-
ΔGFI	3,580 (0,058)	8,777 (0,003)	-	0,510 [4,549]	GDP→GFI, GDS→GFI

Notes: p-values are presented in parentheses, while t-statistics are shown in bracket.

Table 4 presents the results of the VECM Granger causality test. According to the short-term causality findings, the null hypothesis that gross domestic savings are not the causality of economic growth was rejected, and gross domestic savings were found to be the causality of economic growth. The null hypothesis that economic growth is the causality of fixed capital investments was also rejected and the alternative hypothesis was accepted. Thus, economic growth is the causality of fixed capital investments. In addition, gross domestic savings were identified to be the causality of fixed capital investments in the short term. According to the results of the long-term VECM Granger causality test, the GDP coefficient was found to be -0.121 and statistically significant. Therefore, a long-term causality relationship from gross domestic savings and fixed capital investments to economic growth was identified. Since the test statistics of the GDS and GFI variables are not between -1 and 0, the test statistic was considered to be invalid.

CONCLUSION

In this study, the existence of a cointegration and causality relationship between domestic savings, fixed capital investments and economic growth was investigated in 7 Caucasian and Central Asian countries. Much of the empirical literature includes findings indicating that domestic savings and fixed capital investments will have a positive impact on the economy in the long term. If these variables really affect economic growth in the long term, then there should be a cointegration relationship where economic growth is a dependent variable. In this study which includes a cointegration relationship between the variables, the cointegration coefficients of the variables of domestic savings, fixed capital investments and economic growth were estimated using the panel ARDL method. Findings show that the elasticity coefficients of domestic savings and fixed capital investments are positive and significant in the long term.

The causality relationship between the variables was analyzed by the panel VECM Granger causality test. Findings showed evidence that the short-term and long-term domestic savings are the causality of economic growth. As domestic savings are the causality of economic growth, the rise in savings in the Caucasian and Central Asian countries will have a positive impact on economic growth. According to this result which is in line with the literature, savings were identified to be a necessary element for growth, particularly in developing countries.

Another result in the causality analysis is the empirical evidence that domestic savings are the causality of fixed capital investments. Policymakers need to raise domestic savings, and take the necessary steps for such savings to be converted into investments. The policies, which will be put into effect by policymakers who should act together with economists, would increase their country's level of development and reduce external dependence for capital requirements.

As economic growth increases, investors' confidence in the economy will also increase, raising fixed capital investments. For this reason, the responsibility of policymakers at this point is to identify and implement balanced and positive policies for sustainable economic growth. It should be ensured that both domestic and foreign investors invest in the country, particularly through policies that would encourage investors. It should be noted here that domestic investors need to be protected while developing policies that will attract foreign investors. If domestic investors are not protected in our globalized world, the economies will grow based only on foreign resources in the long term, which could lead to a number of economic and political risks.

REFERENCES

- Abu, N. (2010), "Saving-economic growth nexus in Nigeria, 1970-2007: Granger causality and co-integration analyses", *Review of Economic and Business Studies*, No. 5, pp. 93-104.
- Bolarinwa, S.T., Obembe, O.B. (2017), "Empirical Analysis of the Nexus between Saving and Economic Growth in Selected African Countries (1981-2014)", *Journal of Development Policy and Practice*, Vol. 2, No. 1, pp. 110-129.
- Domar, E.D. (1946), "Capital expansion, rate of growth, and employment", *Econometrica, Journal of the Econometric Society*, Vol. 14, No. 2, pp. 137-147.
- Elias, S., Worku, A. (2015), "Casual relationship between gross domestic saving and economic growth in east Africa: evidence from Ethiopia, Uganda and Kenya", *Journal of Agriculture and Social Research*, 15, No. 2, pp. 31-39.
- Harrod, R. F. (1939), "An essay in dynamic theory", *The Economic Journal*, Vol. 49, No. 193, pp. 14-33.
- Hassan, M.K., Sanchez, B., Yu, J.S. (2011), "Financial development and economic growth: New evidence from panel data", *The Quarterly Review of Economics and Finance*, Vol. 51, No. 1, pp. 88-104.
- Hussain, M.A., Saaed, A.A.J. (2018), "Relationship Between GDP And GDS In The UAE: ARDL Bound Testing Approach", *Archives of Business Research*, Vol. 6, No. 7, pp. 192-203.
- Im, K.S., Pesaran, M.H., Shin, Y. (2003), "Testing for unit roots in heterogeneous panels", *Journal of Econometrics*, Vol. 115, No. 1, pp. 53-74.
- Jagadeesh, D. (2015). "The impact of savings in economic growth: an empirical study based on Botswana", *International Journal of Research*, No. 2, pp. 10-21.
- Kao, C. (1999). "Spurious regression and residual-based tests for cointegration in panel data", *Journal of Econometrics*, Vol. 90, No. 1, pp. 1-44.
- Katircioglu, S.T., Naraliyeva, A. (2006), "Foreign direct investment, domestic savings and economic growth in Kazakhstan: Evidence from co-integration and causality tests", *Investment Management and Financial Innovations*, Vol. 3, No. 2, pp. 34-45.
- Keho, Y. (2018). Which comes first-savings or growth? Time series evidence from ECOWAS countries. *Theoretical and Applied Economics*, Vol. 25, No. 2(615), pp. 247-254.
- Khan, M.I., Khan, M.K., Rehan, M., Abasimi, I. (2018), "Determinants of Gross Domestic Saving: An Evidence from Asian Countries", *Economic Research*, Vol. 2, No. 10, pp. 1-14.
- Levin, A., Lin, C.F., Chu, C.S.J. (2002), "Unit root tests in panel data: asymptotic and finite-sample properties", *Journal of Econometrics*, Vol. 108, No. 1, pp. 1-24.

- Lewis, W.A. (1955), *Theory of economic growth*, R. D. Irwin Homewood, Ill.
- Nguyen, N.T.K., Nguyen, H.H. (2017), "Impacts of domestic savings on economic growth of Vietnam", *Asian Journal of Economic Modelling*, Vol. 5, No. 3, pp. 245-252.
- Patra, S.K., Murthy, D.S., Kuruva, M.B., Mohanty, A. (2017), "Revisiting the causal nexus between savings and economic growth in India: An empirical analysis", *Economía*, Vol. 18, No. 3, pp. 380-391.
- Pedroni, P. (1999), "Critical values for cointegration tests in heterogeneous panels with multiple regressors", *Oxford Bulletin of Economics and Statistics*, Vol. 61, No. S1, pp. 653-670.
- Pedroni, P. (2004), "Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis", *Econometric Theory*, Vol. 20, No. 3, pp. 597-625.
- Pesaran, M.H., Shin, Y., Smith, R.P. (1999), "Pooled mean group estimation of dynamic heterogeneous panels", *Journal of the American Statistical Association*, Vol. 94, No. 446, pp. 621-634.
- Rosado, J.A., Sánchez, M.I.A. (2017), "From population age structure and savings rate to economic growth: Evidence from Ecuador", *International Journal of Economics and Financial Issues*, Vol. 7, No. 3), pp. 352-361.
- Sajid, G.M., Sarfraz, M. (2008), "Savings and Economic Growth in Pakistan: An issue of causality", *Pakistan Economic and Social Review*, Vol. 46, No. 1, pp. 17-36.
- Sekantsi, L. P., Kalebe, K. M. (2015), "Savings, investment and economic growth in Lesotho: An empirical analysis", *Journal of Economics and International Finance*, Vol. 7, No. 10, pp. 213-221.
- Siaw, A., Enning, K., Pickson, R. (2017), "Revisiting domestic savings and economic growth analysis in Ghana", *Theoretical Economics Letters*, No. 7, pp. 1382-1397.
- Solow, R.M. (1956), "A Contribution to the Theory of Economic Growth", *The Quarterly Journal of Economics*, Vol. 70, No. 1, pp. 65-94.
- Tang, C.F., Tan, B.W. (2014), "A revalidation of the savings-growth nexus in Pakistan", *Economic Modelling*, Vol. 36, pp. 370-377.
- Tang, C.F., Tan, E.C. (2017), "Re-visiting the Savings-Led Growth Hypothesis and Its Stability in East Asian Economies", *International Economic Journal*, Vol. 31, No. 3, pp. 436-447.



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Citation:

Bilas, V., Franc, S., Jurakic, M. (2022), "Foreign Direct Investment and Export Incentive Policies: Do They Enhance Growth?", *Montenegrin Journal of Economics*, Vol. 18, No. 3, pp. 155-168.

Foreign Direct Investment and Export Incentive Policies: Do They Enhance Growth?

VLATKA BILAS¹, SANJA FRANCO² and MARKO JURAKIC³

¹ Professor, Faculty of Economics and Business University of Zagreb, Croatia, e-mail: vbilas@efzg.hr

² Associate Professor, Faculty of Economics and Business University of Zagreb, Croatia, e-mail: sfranc@efzg.hr

³ Assistant Professor, Vimal akademija, Moslavacka Slatina, Croatia, e-mail: markovimal@gmail.com

ARTICLE INFO

Received September 26, 2021
Revised from October 24, 2021
Accepted November 20, 2021
Available online July 15, 2022

JEL classification: F22, E61

DOI: 10.14254/1800-5845/2022.18-3.13

Keywords:

Foreign direct investment,
economic growth,
causal relationship,
Croatia,
incentive policy.

ABSTRACT

The main idea of the paper is to determine whether incentive policies contribute to economic growth. The goal of the research is to examine whether foreign direct investments and export promote economic growth with the purpose of determining a causal relationship between the variables and then identifying implications for policy measures. Policy makers design and implement various incentive policies but those often do not bring expected benefits. A careful consideration of budget costs and benefits is therefore required. Various econometric methods on different series definitions are used to ensure the robustness of the findings, including unit-root tests with structural break, Engle-Granger cointegration tests, Johansen cointegration test, and Granger causality test. Empirical testing was conducted to test the hypothesis that incentive policies do not fulfill their purpose in ensuring growth. Findings reveal that foreign direct investment and export of goods and services do not have an unequivocally statistically significant impact on the economic growth in the Republic of Croatia which leads to the conclusion that incentive measures did not fulfill their potential.

INTRODUCTION

Global economy is going through major changes, from the aspect of digitalization, migration, economic volatility, health sector and etc. Countries of all sizes and levels of development need to adapt to this new environment and stay healthy and competitive. Economic growth is therefore one of the main economic goals of policy makers around the world. However, factors that contribute to economic growth change over time (Chlebisz and Mierzejewski, 2020). Classic growth models indicate that an increase in production factors is one of the most important sources of growth. Enhancing productive capacity along with investments and saving leads to economic growth. Foreign direct investments (FDI) and exports are also often mentioned contributors to growth. In fact, FDI represents one of the most stable long term

form of capital and often, as a synthesis of capital stock, knowledge and technology, FDI pushes the technological progress through technological spillover, especially in developing countries (Borenztein et al., 1998). That is why many countries had opened their economies and started to attract FDI. Based on vast empirical and theoretical evidence on the positive relationship between FDI, export and growth (Borenztein, 1998; Hong, 2014; Nguyen et al., 2021), policy makers design policies to promote openness and foreign investments (Dorozynski et al., 2021). However, it is not automatically guaranteed that those will in fact promote growth. There are some studies that indicate modest contribution or even ineffectiveness of FDI (Hobbs, 2021) and export (Bajo-Rubio, 2020; UNCTAD, 2013) in promoting growth, which raises questions on the effectiveness and appropriateness of incentive policies and measures. There are other factors that need to be considered, especially in the age of digitalization. Those include available skills, level of technological development, regional integration and cooperation, level of financial market development and other (Sobieraj and Metelski, 2021).

Simionescu (2016) analyzed FDI and growth nexus on the sample of European Union and found a reciprocal relationship between the two variables. She concluded that the EU policies should include the extension of the single European market, increasing the degree of openness and competitiveness outside and inside the EU, an attractive tax system and a modern infrastructure in all of the EU countries. OECD (2003) defined several criteria for determining the usefulness or harmfulness of FDI incentives. Firstly, a country should measure whether the use of incentives results in greater benefits for the host country than budget costs. Otherwise, incentives are ineffective. Secondly, a country should measure whether the government has succeeded or failed to maximize those benefits and minimize costs. In other words, if the same benefits could have been realized at lower costs, then incentives are inefficient. There could also be some opportunity costs. Incentives can be effective and efficient, but still wasteful if these funds could be used in another, more profitable way. Finally, if the incentive measures cause other competing countries to increase their incentives it can lead to excessive spending, and ultimately, it can have a detrimental effect on the domestic economy (OECD, 2003). Costs from incentive policy are also measured by the redundancy rate, that is, the number of companies that would invest regardless of incentives. Chai and Goyal (2008) found that incentives have a negligible effect on FDI and that estimated loss of tax revenues is 9.5% to 16.5% of GDP. Incentives are also often discriminatory towards small and local firms and may cause administrative problems for tax authorities. It can be concluded that designing effective incentive policy is a complex task and often results in the transfer of profits and welfare to foreign investors instead of the host country. Loewendahl (2018) states that clear institutional framework together with government coordination are crucial for attracting FDI and promoting export.

The main aim of the paper is to examine whether foreign direct investments and export promote economic growth. Based on the research results conclusions are made regarding the usefulness of incentive policies.

1. LITERATURE REVIEW

The impact of FDI and trade on economic growth has been researched for decades. However, there are mixed results and diverse conclusions. Hobbs et al. (2021) researched the relationship between FDI, exports and economic growth. They found that FDI does not contribute to economic growth in the long run. On the other hand, exports showed to be more efficient in promoting growth. Shabbir and Naveed (2010) also examined the cointegration relationship between foreign direct investment, exports, and gross domestic product (GDP) in Pakistan. The result showed that there is a long-term link between growth and exports, but not foreign direct investment. Besides FDI, authors note that there are other complementing factors that contribute to growth. Dinh et al. (2019) empirically researched the effect of FDI on economic growth using various econometric tests. They concluded that in the long run FDI has a positive effect on growth, while in the short run it has a negative effect. They also found that other macroeconomic factors contributed to growth such as human capital, domestic investments, domestic credit etc. Abbes et al. (2015) analyzed the relationship between foreign direct investment and economic growth using cointegration and panel Granger causality tests. The results showed a disparity in the relationship between the cointegration of the panel study. The results also indicated a one-way causality

from foreign direct investment to GDP, which could be a good tool for prioritizing the allocation of resources by sector to promote foreign direct investment.

On the other hand, there are studies which indicate to different conclusions from the ones above. Harris and Danila (2018) examined the effect of FDI on growth. They came to the conclusion that FDI does not have any impact on GDP, while some other variables influence the growth of the economy. In their study authors imply that the package of economic policies and taxation are not enough for FDI to have an impact on GDP, but other factors, such as wage rate, labor skills, transport and infrastructure, and property rights, must be developed. Similarly, Hong (2014) researched the relationship between FDI and growth in China. He found that FDI positively affects growth but also that economy of scale, human capital, infrastructure, wage levels, and regional disparities interact actively with FDI and promote economic growth, while openness of trade does not induce FDI significantly. Yue et al. (2016) found that FDI positively affects green growth in China, but they also note that the effect is different in different sectors. Cakrovic and Levine (2005) and Hudakova et al., (2020) also tested the impact of FDI on economic growth. Their results revealed that there is no significant impact of FDI on growth. They claim that although sound policies may spur FDI and growth, their results indicate that FDI does not have positive impact on growth without other related determinants. (2012). On the other hand, Stojčić and Orlić (2016) found beneficial effect of FDI on export sophistication and consequently, on growth.

2. METHODOLOGY AND DATA

Empirical analysis conducted in this paper is based on examining the relationship between economic growth, FDI and exports in the Republic of Croatia with the purpose of discussing and reaching a conclusion about the effectiveness of incentive policies. If incentives do not contribute to growth the question about their usefulness arises. Annual data on gross domestic product (GDP), foreign direct investment (FDI) and exports of goods and services (EXP) from 1995 to 2020 are used in the analysis. Following empirical tests are conducted in the paper: (i) unit root tests with structural breakdown, (ii) cointegration tests and (iii) Granger causality test. In order to test the robustness of results, two alternative definitions of series are employed:

Definition 1: $rtGDP_WDI_CON$, $Log(FDI_GDP_WDI_DEF)$, $Log(EXP_GDP_WDI_DEF)$.

Definition 2: $rtGDP_WDI$, $Log(FDI_GDP_WDI)$, $Log(EXP_GDP_WDI)$.

Series of data are in current prices, after converting FDI_GDP_WDI and EXP_GDP_WDI series by GDP deflator. In both definitions series FDI and EXP are shown as percentage shares. This is in accordance with the prevalent approach in the recent literature. Table 1 contains definitions of variables used in the analysis along with data sources.

Table 1. Variables and sources of data

<i>Series</i>	<i>Description and data source</i>
GDP_WDI_CON	GDP (constant 2010 US\$) Data are in constant 2010 U.S. dollars. Dollar figures for GDP are converted from domestic currencies using 2010 official exchange rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, an alternative conversion factor is used. Source: World Bank national accounts data, and OECD National Accounts data files. Economic Policy & Debt: National accounts: US\$ at constant 2010 prices: Aggregate indicators Series Code: NY.GDP.MKTP.KD
rGDP_WDI_CON	Growth rate GDP_WDI_CON (u %)
rtGDP_WDI_CON	LOG transformation of growth rate rGDP_WDI_CON due to negative growth rates (in %)
GDP_WDI	GDP (current US\$) Data are in current U.S. dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange

Series	Description and data source
	rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, an alternative conversion factor is used. Source: World Bank national accounts data, and OECD National Accounts data files. Economic Policy & Debt: National accounts: US\$ at current prices: Aggregate indicators. Series code: NY.GDP.MKTP.CD
rGDP_WDI	Growth rates GDP_WDI (u %)
rtGDP_WDI	LOG transformation of growth rate rGDP_WDI due to negative growth rates (in %)
FDI_WDI	Foreign direct investment, net inflows (BoP, current US\$) Foreign direct investment refers to direct investment equity flows in the reporting economy. Source: International Monetary Fund, Balance of Payments database, supplemented by data from the United Nations Conference on Trade and Development and official national sources. Economic Policy & Debt: Balance of payments: Capital & financial account. Source code: BX.KLT.DINV.CD.WD
FDI_GDP_WDI	Foreign direct investment, net inflows (% of GDP) This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors, and is divided by GDP. Source: International Monetary Fund, International Financial Statistics and Balance of Payments databases, World Bank, International Debt Statistics, and World Bank and OECD GDP estimates. Economic Policy & Debt: Balance of payments: Capital & financial account. Source code: BX.KLT.DINV.WD.GD.ZS
EXP_WDI	Exports of goods and services (BoP, current US\$) Source: International Monetary Fund, Balance of Payments Statistics Yearbook and data files. Economic Policy & Debt: Balance of payments: Current account: Goods, services & income. Source code: BX.GSR.GNFS.CD
EXP_GDP_WDI	Exports of goods and services (% of GDP). Source: World Bank national accounts data, and OECD National Accounts data files. Economic Policy & Debt: National accounts: Shares of GDP & other. Source code: NE.EXP.GNFS.ZS
GDP_DEF	GDP deflator (in %). Source: WDI.
GDP_WDI_DEF	Series GDP_WDI / GDP_DEF *100
rGDP_WDI_DEF	GDP growth rate GDP_WDI_DEF (in %)
rtGDP_WDI_DEF	LOG transformation of growth rate rGDP_WDI_DEF due to negative growth rate (in %)
FDI_WDI_DEF	Series FDI_WDI / GDP_DEF *100
FDI_GDP_WDI_DEF	Share of FDI_WDI_DEF in GDP_WDI_CON (in %)
EXP_WDI_DEF	Series EXP_WDI / GDP_DEF *100
EXP_GDP_WDI_DEF	Share of EXP_WDI_DEF in GDP_WDI_CON (in %)

Source: authors.

2.1 Unit-root tests

The first test used in the research was Perron and Vogelsang test. There are two forms of this unit-root test: the additive outlier (AO) model and the innovative outlier (IO) model. Our results suggest consideration of models with a possible additive deviation due to a sudden change in the mean value of the series.

Secondly, Zivot & Andrews test () was used as it allows one structural break in the level and trend of the series. In order to test the hypothesis of the existence of a unit-root in a series in which there is a single structural break, the following three models were evaluated:

Model A:

$$\Delta y = \mu + \beta t + \alpha y_{t-1} + \theta DU_t + \sum_{i=1}^k c_i \Delta y_{t-i} + \varepsilon_t$$

Model B:

$$\Delta y = \mu + \beta t + \alpha y_{t-1} + \gamma DT_t + \sum_{i=1}^k c_i \Delta y_{t-i} + \varepsilon_t$$

Model C:

$$\Delta y = \mu + \beta t + \alpha y_{t-1} + \theta DU_t + \gamma DT_t + \sum_{i=1}^k c_i \Delta y_{t-i} + \varepsilon_t$$

where DU_t i DT_t are dummy variables for changes in the level and trend of the series. The change can occur at any time T_B ($1 < T_B < T$). These variables are defined as follows:

$$DU_t = \begin{cases} 1, & \text{if, } t > T_B \\ 0, & \text{otherwise} \end{cases}$$

$$DT_t = \begin{cases} t - T_B, & \text{if, } t > T_B \\ 0, & \text{otherwise} \end{cases}$$

where k is the number used for each time point in which the break occurred, using one of the information criteria (e.g., AIC or Schwarz SIC criterion).

Clemente et al. (1998) defined a test that can be used if a series has one or two breaks. The null hypothesis is:

$$H_0: y_t = y_{t-1} + \delta_1 DTB_{1t} + \delta_2 DTB_{2t} + u_t.$$

Alternative hypothesis is:

$$H_1: y_t = u + d_1 DU_{1t} + d_2 DTB_{2t} + e_t,$$

where $DU_{it} = 1$, when $t > TB_i$ ($i = 1,2$), DTB_{it} is an impulse variable which taken on the value 1 when $t = TB_1 + 1$ ($i = 1,2$) and 0 otherwise. TB_1 i TB_2 are the dates of the break when the middle of the series changed. If two breaks were caused by an innovative outlier, then the unit-root hypothesis can be tested by first evaluating the following model:

$$y_t = \mu + \rho y_{t-1} + \delta_1 DTB_{1t} + \delta_2 DTB_{2t} + d_1 DU_{1t} + d_2 DU_{2t} + \sum_{i=1}^N c_i \Delta y_{t-i} + e_t.$$

If the middle of the series has changed due to the additive outlier, then the null unit root hypothesis can be tested using the following two-step procedure. In the first step, the deterministic part of the series is removed by evaluating the next model:

$$y_t = \mu + d_1 DU_{1t} + d_2 DU_{2t} + \tilde{y}_t.$$

Unit-root test was also applied with the search of minimal value of the t -statistics when $\rho = 1$ in the model:

$$\tilde{y}_t = \sum_{i=1}^N \omega_{1i} DTB_{1t-1} + \sum_{i=1}^N \omega_{2i} DTB_{2t-1} + \rho \tilde{y}_{t-1} + \sum_{i=1}^N c_i \Delta \tilde{y}_{t-i} + e_t.$$

2.2 Cointegration tests

The existence of cointegration between series can be tested with several tests. Two versions of the Engle Granger test are used in this analysis: the standard and the extended Engle-Granger test. The extended Engle-Granger test is used in the case when the conditions of the standard test for errors to be serially independent are not met. Then, in the regression equation of the test, the residues of the first residual difference can be included so that the residual parts in that regression appear to be serially uncorrelated. As it will be shown in the results, unit-root tests suggested that the real GDP growth rate and the series of shares of foreign direct investment and exports of goods and services in real GDP are of the same order of integration (I (1)), so it is possible to apply the Johansen cointegration test.

In the final step of the analysis, Granger's causality test is performed. Series X is said to cause series Y in terms of Granger if Y can be better predicted using past values of series X and Y than just using past values of series Y.

3. RESULTS AND DISCUSSION

3.1 Results of the unit-root tests

Testing the hypothesis of the existence of a unit-root in a series with a fracture was performed using Perron and Vogelsang (PV), Zivot and Andrews (ZA), and Clemente, Montanes, and Reyes (CMR) tests. In the case of the CMR test, models with additive (AO) and innovative outlier (IO) were used. The results are presented in Table 2.

Table 2. Unit-root tests with single structural break

Series	PV (AO)			ZA (AO)			CMR (AO)			CMR(IO)		
	stat	TB	O	stat	TB	O	stat	TB	O	stat	TB	O
<i>Level of series</i>												
GDP1	-3.03 (.67)	2008	I(1)	-3.43 (>.10)	2009	I(1)	- 2.79	2010	I(1)	- 3.00	2006	I(1)
GDP2	-4.02 (.15)	2008	I(1)	-4.77 (>.05)	2009	I(1)	- 3.64	2010	I(0)	- 37.8	2007	I(0)
FDI1	-5.78 (<.01)	2014	I(0)	-6.03 (<.01)	2015	I(0)	- 4.20	2012	I(0)	- 11.3	2013	I(0)
FDI2	-5.82 (<.01)	2015	I(0)	-5.80 (<.01)	2015	I(0)	- 4.44	2012	I(0)	- 5.65	2013	I(0)
EXP1	-3.79 (.24)	2005	I(1)	-3.83 (>.10)	2004	I(1)	- 3.74	2005	I(0)	- 3.32	2001	I(1)
EXP2	-3.21 (.56)	2009	I(1)	-2.98 (>.10)	2008	I(1)	- 0.70	2012	I(1)	- 3.21	2008	I(1)
<i>First differences</i>												
GDP1	-5.34 (<.01)	2009	I(0)	-4.60 (>.05)	2011	I(1)	- 3.79	2017	I(0)	- 60.4	2008	I(0)
GDP2	-6.45 (<.01)	2001	I(0)	-4.73 (>.05)	2009	I(1)	- 2.65	2016	I(1)	- 5.24	2008	I(0)
FDI1	-13.8 (<.01)	2015	I(0)	-8.23 (<.01)	2009	I(0)	- 6.10	2013	I(0)	- 13.8	2014	I(0)
FDI2	-13.5 (<.01)	2015	I(0)	-8.34 (<.01)	2000	I(0)	- 6.06	2013	I(0)	- 13.5	2014	I(0)
EXP1	-4.28 (.08)	2000	I(1)	-4.89 (<.05)	2001	I(0)	- 4.40	2001	I(0)	- 4.28	1999	I(0)
EXP2	-4.12 (.11)	2019	I(1)	-4.03 (>.10)	2010	I(1)	- 2.44	2017	I(1)	- 3.64	2008	I(1)

Note: TB is the break. "0" means a decision made on the basis of a materiality level of 5%. The P-value is given in parentheses below the test statistic. The null hypothesis for these tests is that the series has a unit-root with a single break. The Schwarz information criterion was used to select the degree of magnification for the Perron & Vogelsang test. Minimized Dickey-Fuller t-statistics were used to select breaks in these tests. Critical values for the Clemente-Montañés-Reyes single root single-break test are for AO and IO -3.56 and -4.27 at a significance level of 5%.

Source: authors.

Testing of the hypothesis of the existence of a unit-root in a series with two structural breaks was performed using the CMR test in which the models with additive (AO) and innovative outlier (IO). The results are presented in Table 3.

Table 3. Clemente-Montañés-Reyes unit root tests with two endogenous breaks

Series	IO				AO			
	t-stat	TB ₁	TB ₂	Decision	t-stat	TB ₁	TB ₂	Decision
	<i>Level</i>							
GDP1	-4.19	2007	2013	I(1)	-3.41	2006	2014	I(1)
GDP2	-37.78	2001	2007	I(0)	-5.26	2001	2006	I(1)
FDI1	-6.88	2013	2017	I(0)	-3.10	2012	2017	I(1)
FDI2	-6.09	2009	2013	I(0)	-3.35	2012	2017	I(1)
EXP1	-2.31	2002	2009	I(1)	-1.74	1998	2004	I(1)
EXP2	-6.02	1998	2012	I(0)	-3.82	2001	2013	I(1)
	<i>First differences</i>							
GDP1	-60.43	1998	2008	I(0)	-4.27	2007	2013	I(1)
GDP2	-5.24	1999	2008	I(1)	-3.47	2007	2011	I(1)
FDI1	-15.25	2012	2014	I(0)	-2.54	2012	2015	I(1)
FDI2	-14.85	2012	2014	I(0)	-2.34	2012	2015	I(1)
EXP1	-5.54	2001	2008	I(0)	-4.04	2000	2007	I(1)
EXP2	-3.52	2002	2008	I(0)	-0.91	2001	2007	I(1)

Note: TB1 and TB2 are breaks The decision on the nature of nonstationarity was made based on a materiality level of 5%. The null hypothesis for these tests is that the series has a unit root with two breaks. The critical value for the Clemente-Montañés-Reyes unit-root test with two structural breaks for IO and AO is -5.49 at a significance level of 5%.

Source: authors.

3.2 Engle-Granger cointegration test results

As explained, two versions of the test were used. The null hypothesis in both versions of the Engle-Granger cointegration test is that the series are not cointegrated. The test results are presented in Tables 4 and 5.

Table 4. Engle-Granger test for series definition 1

Dependent	<i>tau</i> -statistics	<i>P</i> -value*	<i>z</i> -statistics	<i>P</i> -value*
	series: Log(rGDP), Log(FDI/GDP) & Log(EXP/GDP)			
<i>With constant as additional regressor</i>				
Log(rGDP)	-2.54	0.49	-10.20	0.49
Log(FDI/GDP)	-2.04	0.72	-9.14	0.57
Log(EXP/GDP)	-1.48	0.90	-4.80	0.89
<i>With trend as additional regressor</i>				
Log(rGDP)	-2.54	0.54	-10.20	0.55
Log(FDI/GDP)	-2.04	0.78	-9.14	0.63
Log(EXP/GDP)	-1.48	0.94	-4.80	0.94

Note: * MacKinnon (1996) *P*-values. A modified Schwarz information criterion was used to select the degree of increase in the test equation.

Source: authors.

Table 5. Engle-Granger test for series definition 2

Dependent	<i>tau</i> -statistics	<i>P</i> -value*	<i>z</i> -statistics	<i>P</i> -value*
	Series: Log(rGDP), Log(FDI/GDP) & Log(EXP/GDP)			
<i>With constant as additional regressor</i>				
Log(rGDP)	-3.94	0.07	-19.14	0.05
Log(FDI/GDP)	-2.79	0.38	-15.83	0.14
Log(EXP/GDP)	-1.20	0.95	-4.17	0.92
<i>With trend as additional regressor</i>				
Log(rGDP)	-3.94	0.08	-19.14	0.07
Log(FDI/GDP)	-2.79	0.42	-15.83	0.16
Log(EXP/GDP)	-1.20	0.97	-4.17	0.96

Note: * MacKinnon (1996) *P*-values. A modified Schwarz information criterion was used to select the degree of increase in the test equation.

Source: authors.

Summarizing the results of Engle-Granger tests, it can be concluded that there is no long-term balance between the growth rate of real GDP, the share of foreign direct investment and exports of goods and services in real GDP in Croatia.

3.3 Johansen cointegration test results

The application of Johansen cointegration test is appropriate as the unit-root tests suggested that the real GDP growth rate and the series of shares of foreign direct investment and exports of goods and services in real GDP are of the same order of integration (I (1)). Before applying the Johansen cointegration test, the lag order of the VAR model containing three series, Log (rGDP), Log (FDI/GDP) and Log (EXP/GDP), should be selected. The results of the lag size selection using different selection criteria for lags from 0 to 4 are presented in Tables 6 and 7.

Due to the small sample size, the smallest possible lag length suggestions are preferred. In the case of definition 2, all criteria suggest a VAR (1) model. As the value of the adjusted Q (4) test statistic is 20.53 and the P-value is 0.81, this null hypothesis about the absence of autocorrelation in the estimated VAR (1) model cannot be rejected. Therefore, this VAR model specification will be used in the Johansen test.

Table 6. Optimal lag order of VAR models for series definition 1

lags	LogL	LR	FPE	AIC	SC	HQ
0	-36.561	-	0.010491	3.956	4.105	3.985
1	-5.579	49.572*	0.001183*	1.758*	2.355*	1.874*
2	-0.978	5.980	0.001983	2.198	3.243	2.402
3	3.947	4.925	0.003652	2.605	4.099	2.897
4	9.789	4.089	0.007902	2.921	4.863	3.300

Note: * indicates the lag order of the selected criteria. LR: sequentially modified LR test statistics (each at the 5% level). FPE: Final prediction error. AIC: Akaike information criterion. SC: Schwarz information criterion. HQ: Hannan-Quinn information criterion.

Source: authors.

In definition 2, the Schwarz information criterion suggests a VAR (1) model. Other criteria suggest 3rd and 4th order VAR models. The autocorrelation properties of the residual VAR (1) of the model will be checked. As for this model the value of the adjusted statistic Q (4) of the test is 27.77 and the P-value is 0.42, this null hypothesis about the absence of autocorrelation in the estimated VAR (1) model cannot be rejected. Therefore, this VAR model specification will be used in the Johansen test.

Table 7. Optimal lag order of VAR models for series definition 2

lags	LogL	LR	FPE	AIC	SC	HQ
0	-35.818	-	0.00974	3.882	4.031	3.911
1	-7.871	44.716	0.00149	1.987	2.585*	2.104
2	-2.222	7.343	0.00225	2.322	3.368	2.526
3	15.829	18.051*	0.00111*	1.417	2.911	1.709
4	26.654	7.578	0.00146	1.235*	3.176	1.6136*

Note: * indicates the lag order of the selected criteria. LR: sequentially modified LR test statistics (each at the 5% level). FPE: Final prediction error. AIC: Akaike information criterion. SC: Schwarz information criterion. HQ: Hannan-Quinn information criterion.

Source: authors.

The results of the Johansen test, i.e. the statistics of the trace test and the maximum Eigen value, are presented in Table 8. Based on the statistics of the maximum Eigen value, we cannot reject the null hypothesis of the absence of cointegration between the three series.

Table 8. Johansen cointegration test for series definition 1

<i>Null hypothesis</i>	<i>Alternative hypothesis</i>	<i>Test statistics</i>	<i>5% critical value</i>	<i>P-value</i>
<i>Trace statistics</i>				
$r = 0$	$r \geq 1$	18.28	29.80	0.55
$r \leq 1$	$r \geq 2$	8.76	15.49	0.39
$r \leq 2$	$r \geq 3$	0.92	3.84	0.34
<i>Maximum Eigen value statistics</i>				
$r = 0$	$r \geq 1$	9.52	21.13	0.79
$r \leq 1$	$r \geq 2$	7.84	14.26	0.40
$r \leq 2$	$r \geq 3$	0.92	3.84	0.34

Note: P-value: MacKinnon, Haug & Michelis (1999).

Source: authors.

Table 9. Johansen cointegration test for series definition 2

<i>Null hypothesis</i>	<i>Alternative hypothesis</i>	<i>Test statistics</i>	<i>5% critical value</i>	<i>P-value</i>
<i>Trace statistics</i>				
$r = 0$	$r \geq 1$	20.22	29.80	0.41
$r \leq 1$	$r \geq 2$	8.31	15.49	0.43
$r \leq 2$	$r \geq 3$	0.01	3.84	0.96
<i>Maximum Eigen value statistics</i>				
$r = 0$	$r \geq 1$	11.90	21.13	0.56
$r \leq 1$	$r \geq 2$	8.31	14.26	0.35
$r \leq 2$	$r \geq 3$	0.01	3.84	0.96

Note: P-value: MacKinnon, Haug & Michelis (1999).

Source: authors.

In all Johansen test options (both versions of the test statistic) it is suggested that it is not possible to reject the null hypothesis of the absence of cointegration connectivity of the observed three series. ie growth rates of real GDP, the share of foreign direct investment and exports of goods and services in GDP in the Republic of Croatia for the period under study. Although there is no cointegration relationship between the three series, it is possible to examine the existence of a cause-and-effect relationship between them. But before testing the causality of Granger, the robustness of the results obtained by the Johansen cointegration test this time using boundary cointegration tests based on the ARDL model will be checked.

3.4 Granger's causality test

The existence of cointegration indicates only the presence or absence of causality, but not the direction of causality. Once the existence of cointegration is established, then long-term and short-term causality in Granger's terms can be tested within the VECM model. However, as the results showed, there is no cointegration relationship between the series. Therefore, the VECM form of the Granger causality test cannot be used. In this case, Toda and Yamamoto Granger causality test procedure can be used, since this procedure, unlike the test based on the VECM approach, does not require series cointegration. The results of the Toda-Yamamoto procedure are shown in Table 10.

Table 10. Granger causality test for series definition 1

<i>Dependent</i>	<i>Excluded series</i>			<i>All series</i>	<i>Causal relationship</i>
	<i>Log(rGDP)</i>	<i>Log(FDI/GDP)</i>	<i>Log(EXP/GDP)</i>		
Log(rGDP)	-	0.35 (0.56)	0.39 (0.53)	1.15 (0.56)	No No No
Log(FDI/GDP)	0.15 (0.70)	-	0.30 (0.59)	0.74 (0.69)	No No No
Log(EXP/GDP)	0.05 (0.82)	0.71 (0.40)	-	1.25 (0.53)	No No No

Note: Chi-square statistics values with P-values in parentheses are given. The VAR (1) model was used.

Source: authors.

A causality test according to definition 1 showed that there is no cause-and-effect relationship between any pair of series.

Table 11. Granger causality test for series definition 2

<i>Dependent</i>	<i>Excluded series</i>			<i>All series</i>	<i>Causal relationship</i>
	<i>Log(rGDP)</i>	<i>Log(FDI/GDP)</i>	<i>Log(EXP/GDP)</i>		
Log(rGDP)	-	1.16 (0.28)	2.07 (0.15)	3.32 (0.19)	No No No
Log(FDI/GDP)	7.68 (0.01)	-	1.26 (0.26)	10.18 (0.01)	Yes No Yes
Log(EXP/GDP)	8.01 (0.01)	0.65 (0.42)	-	8.12 (0.02)	Yes No Yes

Note: Chi-square statistics values with P-values in parentheses are given. The VAR (1) model was used.

Source: authors.

The causality test under definition 2 showed that there is a one-way causal link from the real GDP growth rate to the share of foreign direct investment and the share of exports of goods and services in real GDP.

According to these results, it can be concluded that the question of the existence of a causal link between real GDP growth and the share of foreign direct investment remains open, as the results largely depend on both the definition of these series and the small sample size.

3.5 Discussion

Export and FDI incentive policies have the main purpose of intensifying exports and attracting FDI. Most often those incentive measures include financial, fiscal and other incentives. Financial incentives are most often granted in the form of state subsidies, subsidized state loans, state guarantees and guaranteed export credits, insurance against currency and non-commercial risks, etc. Fiscal incentives are used to attract FDI by reducing the tax burden on foreign investors. Such incentives also include exemptions from import duties or reduction of income tax on foreign investment. There are also other incentives with the aim of increasing profitability, i.e. reducing investment costs through non-financial measures and funds.

Studies such as Gherghina et al. (2019), Iamsiraroj (2015), and Gürsoy et al. (2013) indicate a positive causal relationship between FDI and growth. Accordingly, authors conclude that governments should create more incentives for foreign investment, especially in higher value added activities as they stimulate growth. Burger et al. (2012) analyzed the effectiveness of FDI incentives in Slovenia. They concluded

that subsidized foreign companies outperform local firms and have better qualitative characteristics. In cases when it can be proved that export and FDI are positively linked to growth incentive policies have accomplished their purpose and can be considered as relevant for growth promotion. However, there are cases when such positive relationship is not proven.

Studies such as Khobai et al. (2017) found that FDI has negative or insignificant influence on welfare and growth, depending on the quantile. Carković and Levine (2005) found that FDI does not significantly nor positively impact economic growth indicating that sound incentive policies may contribute to attracting FDI but do not necessarily result in economic growth. Delevic (2020) studied the effectiveness of FDI incentives, but he found no positive effect in terms of employment and crowding-in effect. He concluded that subsidy-driven FDI policy, based on financial subsidies per job created, does not lead to a sustained employment growth pattern. On the other side, most studies on effectiveness of export promotion reveal positive effect of incentives on exports, but the effects do not seem to last in the long run (e.g. Cadot, 2015). Such mixed results do not provide firm and unanimous conclusion about the effectiveness of incentive policies.

CONCLUSION

The purpose of this paper was to examine the relationship between FDI, exports and economic growth and based on the results to determine whether it is opportune to enforce policy incentives. Although FDI and export are most commonly considered as positive contributors to growth, this research does not find evidence to support this conclusion. The results of cointegration tests showed that there is no long-term balance relationship between the annual growth rate of real GDP, the series of shares of foreign direct investment and the share of exports of goods and services in real GDP. The results of the Granger causality test did not indicate unequivocally that there was a cause-and-effect relationship between the real GDP growth rate, the share of foreign direct investment series, and the share of exports of goods and services in real GDP. In other words, foreign direct investment and exports of goods and services do not have an unequivocally statistically significant impact on the GDP growth rate in the Republic of Croatia. This result raises questions about the effectiveness and the appropriateness of incentive policies. Policy makers should carefully reexamine the existing policies and measures and compare budget costs with benefits from FDI and export. It is not uncommon that costs of incentives often offset the benefits and domestic firms and taxpayers carry the burden of such stimulus. This conclusion is made having in mind the limitation of the empirical analysis which is the small sample size, i.e. the shortness of the time series.

REFERENCES

- Abbes, S. M., Belmokaddem, M., Guellil, M.S., Ghouali Y.Z. (2015), „Causal Interactions between FDI, and Economic Growth: Evidence from Dynamic Panel Co-Integration“, *Procedia. Economics and Finance, a significant contributor to economic growth*, Vol. 23, pp. 276 – 290.
- Bajo-Rubio, O. (2020), „Exports and long-run growth: The case of Spain, 1850-2017“, *GLO Discussion Paper*, No. 461, Global Labor Organization (GLO), Essen.
- Borenztein, E., De Gregorio, J., Lee, J.W.O. (1998), “How does Foreign Investment Affect Economic Growth?“, *Journal of International Economics*, Vol. 45, pp. 115 -135.
- Burger, A., Jaklic, A., Rojec, M. (2012), „The effectiveness of investment incentives: the Slovenian FDI Co-financing Grant Scheme“, *Post Communist Economies*, Vol. 24, No. 3, pp. 383-401.
- Cadot, O., Fernandes, A., Gourdon, J., Mattoo, A. (2015), „Are the benefits of export support durable? Evidence from Tunisia“, *Journal of International Economics*, Vol. 97, No. 2, pp. 310-324.
- Carkovic, M., Levine, R. (2005,) „Does Foreign Direct Investment Accelerate Economic Growth“, *Working Paper*, Institute for International Economics, University of Minnesota Department of Finance, USA.
- Chlebisz, A., Mierzejewski, M. (2020), “Determinants of GDP growth in Scandinavian countries with special reference to scientific progress“, *International Entrepreneurship Review*, Vol. 6, No. 3, pp. 21-35. doi: 10.15678/IER.2020.0603.02

- Clemente, J., Montañés, A., Reyes, M. (1998), "Testing for a unit root in variables with a double change in the mean", *Economics Letters*, Vol. 59, pp. 175-182.
- Delevic, U. (2020), *Employment and state incentives in transition economies: are subsidies for FDI ineffective? The case of Serbia*, https://unctad.org/system/files/official-document/diaeia2020d2a2_en.pdf (scceded September 29, 2021).
- Dinh, T., Hong Vo, D., The Vo, A., Nguyen, T.C. (2019), "Foreign Direct Investment and Economic Growth in the Short Run and Long Run: Empirical Evidence from Developing Countries", *Journal of Risk and Financial Management*, Vol. 12, No. 14, pp. 1-11.
- Dorozynski, T., Swierkocki, J., Dobrowolska, B. (2021), "Governance of special economic zones and their performance: Evidence from Poland", *Entrepreneurial Business and Economics Review*, Vol. 9, No. 3, pp. 149-167. doi: 10.15678/EBER.2021.090310
- Dritsaki, C., Stiakakis, E. (2014), "Foreign direct investments, exports, and economic growth in Croatia: A time series analysis", *Procedia Economics and Finance*, Vol. 14, pp. 181-190.
- Gherghina, O.S., Simionescu, L. N., Hudea, O.S. (2019), "Exploring Foreign Direct Investment–Economic Growth Nexus—Empirical Evidence from Central and Eastern European Countries", *Sustainability*, Vol. 11, No. 19, 5421; <https://doi.org/10.3390/su11195421>
- Gürsoy, F., Sekreter, A., Kalyoncu, H. (2013), "FDI and Economic Growth Relationship Based on Cross-Country Comparison", *International Journal of Economics and Financial Issues*, Vol. 3, No. 2, pp. 519-52.
- Hobbs, S., Paparas, D., AboElsoud, M.E. (2021), "Does Foreign Direct Investment and Trade Promote Economic Growth? Evidence from Albania", *Economies*, Vol. 9, No. 1, pp. 1-19.
- Hong, L. (2014), "Does and How does FDI Promote the Economic Growth? Evidence from Dynamic Panel Data of Prefecture City in China", *IERI Procedia*, Vol. 6, pp. 57-62.
- Hudakova, J., Papcunova, V., Stubnova, M., Urbanikova, M. (2020), "Relationship of labour costs and labour productivity with foreign direct investment in the V4 countries", *Polish Journal of Management Studies*, Vol. 22, No. 2, pp. 173-186.
- Iamsiraoj, S. (2015), "The foreign direct investment-economic growth nexus", *International Review of Economics & Finance*, Vol. 42, pp. 116-133.
- Khobai, H., Hamman, N., Mkhombo, T., Mhaka, S., Nomahlubi, M., Phiri, A. (2017), "The FDI-growth nexus in South Africa: A re-examination using quantile regression approach", *MPRA paper*, Munich Personal RePEc Archive, https://mpra.ub.uni-muenchen.de/80152/1/MPRA_paper_80152.pdf (accessed September 29 2021).
- Loewendahl, H. (2018), "Innovations in Foreign Direct Investment Attraction", *Technical Note*, N° Idb-Tn-1 572, Inter-American Development Bank.
- Nguyen, M.-L.T., Doan, T.-T.T., Bui, T.N. (2021), "The impact of macroeconomic and control of corruption on foreign direct investment inflows", *Polish Journal of Management Studies*, Vol. 24, No. 1, pp. 236-249.
- OECD (2003), "Checklist for foreign direct investment incentive policy", <http://www.oecd.org/dataoecd/45/21/2506900.pdf> (accessed 1.8.2010).
- Simionescu, M. (2016), "The relation between economic growth and foreign direct investment during the economic crisis in the European Union", *Proceedings of Rijeka Faculty of Economics: Journal of Economics and Business*, Vol. 34, No. 1, pp. 187-213.
- Sobieraj, J., Metelski, D. (2021), "Economic determinants of total factor productivity growth: The Bayesian modelling averaging approach", *Entrepreneurial Business and Economics Review*, Vol. 9, No. 4, pp. 147-171. doi: 10.15678/EBER.2021.090410
- Sothan, S. (2016), "Foreign direct investment, exports, and economic growth in Asia: Panel cointegration and causality analysis", *International Journal of Economics and Finance*, Vol. 8, No. 1, pp. 26-37.
- Stojcic, N, Orlic, E. (2016), "Foreign direct investment and structural transformation of exports", *Economic Thought and Practice*, Vol. 25, No. 29, pp. 355-378.
- Sunde, T. (2017), "Foreign direct investment, exports, and economic growth: ADRL and causality analysis for South Africa", *Research in International Business and Finance*, Vol. 41, pp. 434-444.
- UNCTAD (2013), *Trade and development report*, UN, New York, Geneva.
- Yue, S., Yang, Y., Hu, Y. (2016), "Does Foreign Direct Investment Affect Green Growth? Evidence from China's Experience", *Sustainability*, Vol. 8, No. 2, pp. 1-14.

Zivot, E., Andrews, K. (1992), "Further evidence on the great crash, the oil price shock, and the unit root hypothesis", *Journal of Business and Economic Statistics*, Vol. 10, No. 3, pp. 251–270.



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Citation:

Dude, U., Zitkiene, R., Kazlauskiene, E. (2022), "An Assessment of the Impact of the Drivers of Outsourcing on Service Delivery in Organisational Networks", *Montenegrin Journal of Economics*, Vol. 18, No. 3, pp. 169-182.

An Assessment of the Impact of the Drivers of Outsourcing on Service Delivery in Organisational Networks

UGNE DUDE¹, RIMA ZITKIENE² and EGLE KAZLAUSKIENE³

¹ Dr., Faculty of Public Governance and Business, Mykolas Romeris University, Vilnius, Lithuania;
e-mail: ugne@mruni.eu

² Professor, Faculty of Public Governance and Business, Mykolas Romeris University, Vilnius, Lithuania,
e-mail: rizit3@mruni.eu

³ Professor, Faculty of Public Governance and Business, Mykolas Romeris University, Vilnius, Lithuania,
e-mail: egle.kazlauskiene@mruni.eu

ARTICLE INFO

Received October 11, 2021
Revised from November 11, 2021
Accepted December 11, 2021
Available online July 15, 2022

JEL classification: L24, L80, M10, L16

DOI: 10.14254/1800-5845/2022.18-3.14

Keywords:

Outsourcing drivers,
networking,
service delivery,
impact,
organisational changes.

ABSTRACT

The COVID-19 pandemic has forced many areas of business to make changes, including: rethinking business strategies; using new ways of organising activities; optimising processes; and using outsourcing. These changes have in turn led to changes in organisational structure and modes of operation in corporate networks. Based on process models and the drivers that give rise to outsourcing, a theoretical model of the impact of drivers of outsourcing on the formation of networks of service organisations was developed. The interfaces between outsourcing and the networking of service organisations were then revealed in order to highlight the components and results of this interaction. The case study method was used to test the theoretical assumptions and the practical application of this model, which revealed the peculiarities of service organisations operating in international and local markets. Along with an analysis of the scientific literature, these case studies justified organisational changes in the delivery of services through differences in the implementation of outsourcing, and highlighted direct links with the drivers of outsourcing. The impact of technological and strategic drivers on the implementation of outsourcing has been identified, where a merger or the creation of a legally-linked entity leads to both vertical and horizontal networking.

INTRODUCTION

Sharma et al. (2020) argued that most of the models and theories presented in the literature cannot cover the changes taking place during the COVID-19 pandemic, which has put many organisations in difficulty. Studies show that an increasing number of organisations are looking for partners to provide services for a variety of reasons, and Ikediashi and Aigbavboa (2018) noted that organisations are seeking to improve organisational efficiency. Organisations are increasingly focusing on core activities, while

other services are looking for specialised service providers (Munjal et al., 2019). The 2020 World Development Report stated that organisations sought cooperation in various forms, for example: Samsung produces telephones for which 2600 partners from around the world provide consumables and services (World Bank, 2020). The active institutional and informational transformation of society in the 21st century has radically changed the traditional systems of production and exchange of goods, the relationship (interaction) between hierarchical structures, network systems in public administration and the management of corporations, employment and consumption, and economic and social organization (Malyi et al., 2021). The COVID-19 pandemic has affected the global economy and the service sector (Xiang et al., 2021) by compelling organisations to review their operational strategies, to use new ways of organising activities, and to optimise processes through external services. Service organisations need to prepare for and anticipate how new habits that were developed during the pandemic will affect both themselves and the behaviour of their consumers after the end of the pandemic, in order to be able to adapt to changed conditions. Networks of organisations are emerging in the market, but the link between the causes of outsourcing and the nature of these networks has not yet been highlighted. The purpose of this article is, therefore, to analyse the models of the outsourcing process and the theoretical links between the networking of organisations, as well as to highlight the impact and importance of the drivers of outsourcing on cooperation between different service organisations for development.

1. LITERATURE REVIEW

1.1 Links between outsourcing and networking

The reasons for using outsourcing and the evolution of these reasons have been studied by many scientists. Assaf et al. (2011) identified 38 drivers that were divided into 6 groups: economic, strategic, technological, quality, managerial, and functional. Ikediashi and Okwuashi (2015) compiled a list of 65 drivers and split them into 8 groups: cost/economic, strategic, innovation, revenue, quality, time, social, and other. Espino-Rodriguez and Ramirez-Fierro (2017), in the context of hotel research, divided a total of 12 drivers into two groups: tactical and strategic.

It should be noted that the links between outsourcing, its drivers, and networks of organisations are assessed differently. Some authors understand outsourcing as a component of the network. For example, Podolny and Page (1998) highlighted the idea that the network covers a broad set of joint ventures, strategic alliances, business groups, franchises, research consortia, relative contracts, and outsourcing, but does not include agreements between market participants – such as short-term contracts, immediate agreements, or labour relations. Conversely, other researchers see the network as a result of the outsourcing relationship. Franceshini et al. (2003) demonstrated that four types of relationship can be established between the external provider and the organisation conducting outsourcing activities: the traditional buyer-seller relationship; a temporary relationship; a strategic union; or a network organisation.

Kedia and Lahiri (2007), and Staniulienė (2009) observed that outsourcing changes the structure of organisations by making them flatter. According to Staniulienė (2009), outsourcing is part of the reorganisation process, and there are two possible options for an organisation to become networked: the enterprise is reborn as a newly organised network structure (i.e., merging); or the organisation undergoes restructuring and becomes a network. Tratyak and Popov (2009) pointed out that networks can be formed both by splitting large corporations and by connecting independent entities. It is claimed, that Cross-border mergers and acquisitions are considered to be a major global phenomenon that enables companies to create synergies for business, acquire assets, generate tax savings, gain access to new technologies, diversify business activities, increase the company's competitiveness and market value. According to Ribaconka and Kasnauske (2014), businesses are increasingly losing vertical structures: they are gaining a network structure that is dispersed globally, and more and more networks are dominated by the practice of outsourcing their functions to optimise access to the knowledge and resources needed to generate innovation.

According to the hierarchy of relations, the network distinguishes between two main network structures: vertical (Liu, 2016), where entities have different hierarchical levels or combinations; and horizontal (Juntunen, 2010), for entities at the same hierarchical level (Kedia and Mukherjee; 2009). According to Achrol (1997), vertical networks are formed as a supply-distribution relationship which is concentrated around parent organisations. Subsequent studies by Moller and Rajala (2006) suggest that, in the case of horizontal networks, organisations are acting in the same area (or even competing) in order to strengthen their influence and draw on the resources of the network participants. Although horizontal and vertical networking are distinguished as separate structures, Moller and Rajala (2006) consider that in the formation of complex networks of organisations, vertical and horizontal networking is closely linked and intertwined.

Broekhuis and Scholten (2018), Vynstra et al. (2015), and a host of other researchers have observed that networks emerging from the interactions of service organisations are particularly complex and uncertain. According Vynstra et al. (2015), the growth of specialisation and outsourcing between organisations has stimulated growth in operations and supply environments based on networks rather than on vertical integration. Organisations focus on what they do best, and outsource the remaining activities to external service providers.

Networks of service organisations are also affected by the choice of which services are outsourced. As a general rule, the services provided by a service organisation are divided into two types: core services and non-core (complementary) services (Lovelock, 1983). Espino-Rodriguez and Ramirez-Fierro (2017), and many others have stressed that service organisations must avoid the outsourcing of core services, and recommend that only non-core services be outsourced.

Research has shown that, depending on the drivers that lead to it and the services (core or non-core) for which it is used, outsourcing is carried out in different ways:

- When an organisation divides its activities, part of the non-core activities performed in the organisation are separated and outsourced. The supply of services on the basis of a contract is transferred to one or more of a number of suppliers operating in the market which are most suited to the needs of the organisation, and which are awarded long-term contracts for the delivery of services. Some authors refer to this method as “offshore outsourcing” (Hutzschenreuter et al., 2011), “external outsourcing” (Gerbl et al., 2009), “market relation” (Pekkola et al., 2005), or a “contract relationship” (Mirani, 2006).
- Organisations operating in the network are hierarchically equal and legally independent, but interact and share their core services and resources to achieve common goals. The network is formed by the connection between organisations that are not legally connected, as decisions are taken in relation to the organisation’s core activities. The authors refer to this method as a “hybrid model, joint venture” (Caniato et al., 2015).
- The most challenging way of developing a network is to cover both segmentation and networking. On the one hand, a network may be formed by the division of an organisation – i.e., by separating part of its activities – transferring it not via the use of contracts, but instead by establishing a legal entity (subsidiary, branch, etc.), which provides services to the founding organisation as well providing services in the market (the wider network). On the other hand, when an organisation uses merger principles to form a network, it may acquire an existing business or a part thereof, thus retaining full ownership and control. Both are used in cases where there is a need to outsource core services (or activities on which core services that carry a competitive advantage depend to a large extent), where their loss or the failure to control them would have a significant negative impact on the organisation’s performance. Scientists refer to this approach as “captive offshoring” (Caniato et al., 2015, Hutzschenreuter et al., 2011) or “internal outsourcing” (Gerbl et al., 2009).

Based on the previously discussed outsourcing of service organisations and the formation of collaborative networks, it is possible to illustrate the process of outsourcing in service organisations (Figure 1).

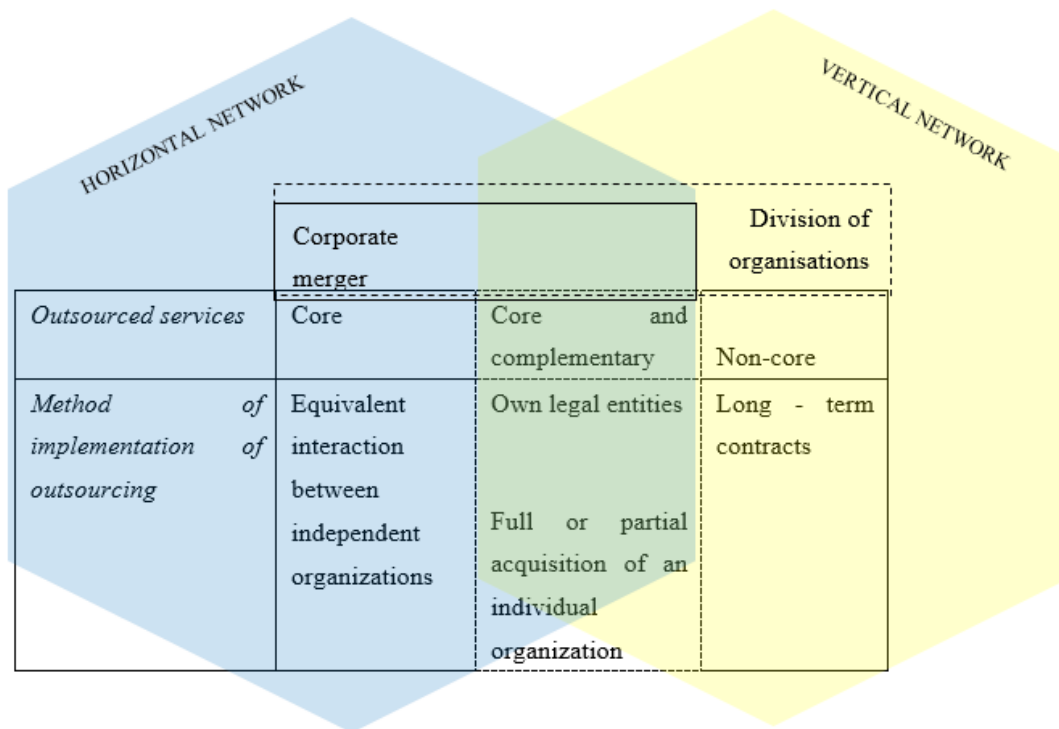


Figure 1. Outsourcing in corporate networks

Source: Qwn.

In case of networking formed on the basis of divisions, core, complementary, or non-core services are outsourced. In this case, two ways of implementing outsourcing can be distinguished: if the services are non-core, they are outsourced on a long-term basis; if the services are core or closely related to the core, then a subsidiary is established. Interconnections based networks are formed when organisations share their core competencies, forming a network of organisations with a common goal while maintaining full independence. However, there may be cases where organisations or their divisions are acquired and merged with another organisation.

1.2 Modelling the impact of outsourcing on the networking of service organisations

Looking at the typologies of the Lyons and Brennan (2014) models, it can be noted that the links between drivers of outsourcing, inter-organisational relationships, and the formation of networks are most visible in the outsourcing process models. The models of Gerbl et al. (2015), Kedia and Lahiri (2007), and others distinguish a different number of steps to the outsourcing process, and the specified process steps can be divided into two stages – i.e., preparation and implementation. The preparation phase involves the assessment of the drivers of outsourcing and the activities for which it is used. The implementation phase reveals nuances in creating inter-organisational relationships, deciding on a service provider and their location, and considering which forms of inter-organisational relationships should be used.

In order to uncover the relationship between drivers of outsourcing in the preparation phase of the outsourcing process and those in the implementation phase – which leads to networking – it is necessary to evaluate models examining the individual steps of the preparation and implementation phases.

The preparation phase involves the decision to outsource, during which the drivers of outsourcing are analysed. For example, Gewald (2010) formed a model used in business services where the outsourcing of banking services is used. The model consists of four elements: drivers of outsourcing, groups

of drivers of outsourcing, the dependence of the approach to outsourcing on positive results, and the impact of the outsourcing approach on its use. The model covering the widest range of drivers of outsourcing is the one produced by Hassanain et al. (2015): “Model of Maintenance Outsourcing Decision Factors”. Based on Assaf et al. (2011), the researchers identified groups of drivers of outsourcing, developed a model that included an analysis of internal drivers influencing the use of outsourcing, and applied it to maintenance services. The model created by Wirtz et al. (2015) covers the geographical location of outsourcing and the methods of implementing it. Das and Grover’s (2018) model identifies the steps that need to be implemented in the outsourcing provider selection process, and their model was applied to IT services.

This analysis of scientific studies draws attention to models that reflect drivers that encourage outsourcing and their influence on relations. The model produced by Gerbl et al. (2015) was based on the matrix principle, and was applied to the analysis of business services. It revealed not only the geographical locations of outsourcing (local markets, neighbouring markets, or distant markets), but also the modalities of implementation (working with an independent organisation or a legally related one). Kedia and Lahiri (2007) developed a conceptual model called the “Model of International Outsourcing of Services Partnership”, which includes the use of outsourcing at three levels of corporate governance: tactical, strategic, and transformational. The authors stressed that at each level of corporate governance outsourcing is driven by different drivers and the level of partnership between the external provider and the organisation using it is also different.

The analysis of models of the outsourcing process reveals that, as the reasons and services used for outsourcing are assessed, there is a relationship between the drivers that impel outsourcing. In addition, it is important to consider how and where outsourcing is implemented. These models include the separate stages of the outsourcing process and their components.

Based on the research on outsourcing, drivers promoting it in services, and outsourcing process models, a theoretical model of the impact of drivers of outsourcing on the formation of networks of service organisations was developed (Figure 2). The first stage of this model is to identify and group drivers, and to decide which services to outsource; the second stage is to choose the mode of implementation of the outsourcing.

As there is no consensus in the wider research on the exact definition of drivers of outsourcing, this model includes the groups proposed by Assaf et al. (2011): strategic, economic, technological, quality, management, and function. A distinction has been made between services that rely on outsourcing – i.e., core, non-core, and complementary services. It has been established that the outsourcing of non-core services, which is inherent at the strategic level of corporate governance, may include the outsourcing of core or complementary services where only strategic objectives are pursued. However, at the transformative corporate governance level, a decision is taken to use the assistance of network partners for the delivery of core or closely-related services.

The choice of groups of drivers of outsourcing and outsourced services is a feature of the preparation phase of the outsourcing process. It is possible to determine which services are covered by outsourcing according to their specific characteristics, which are linked to the need for these services and the frequency of their delivery.

The second phase of the model envisages the implementation modes of outsourcing, which are determined by the nature of the outsourced services (core, non-core, or complementary) and drivers of outsourcing at different levels of corporate governance. Contractual links are most likely when outsourcing is used at the strategic corporate governance level. At the transformation level of corporate governance, outsourcing may be carried out by a legally-linked entity, whether a subsidiary is being set up or part of an existing organisation is acquired. It should be noted that only at the transformational level, through outsourcing, is equal interaction between unrelated legal entities pursuing common objectives and providing essential services monitored.

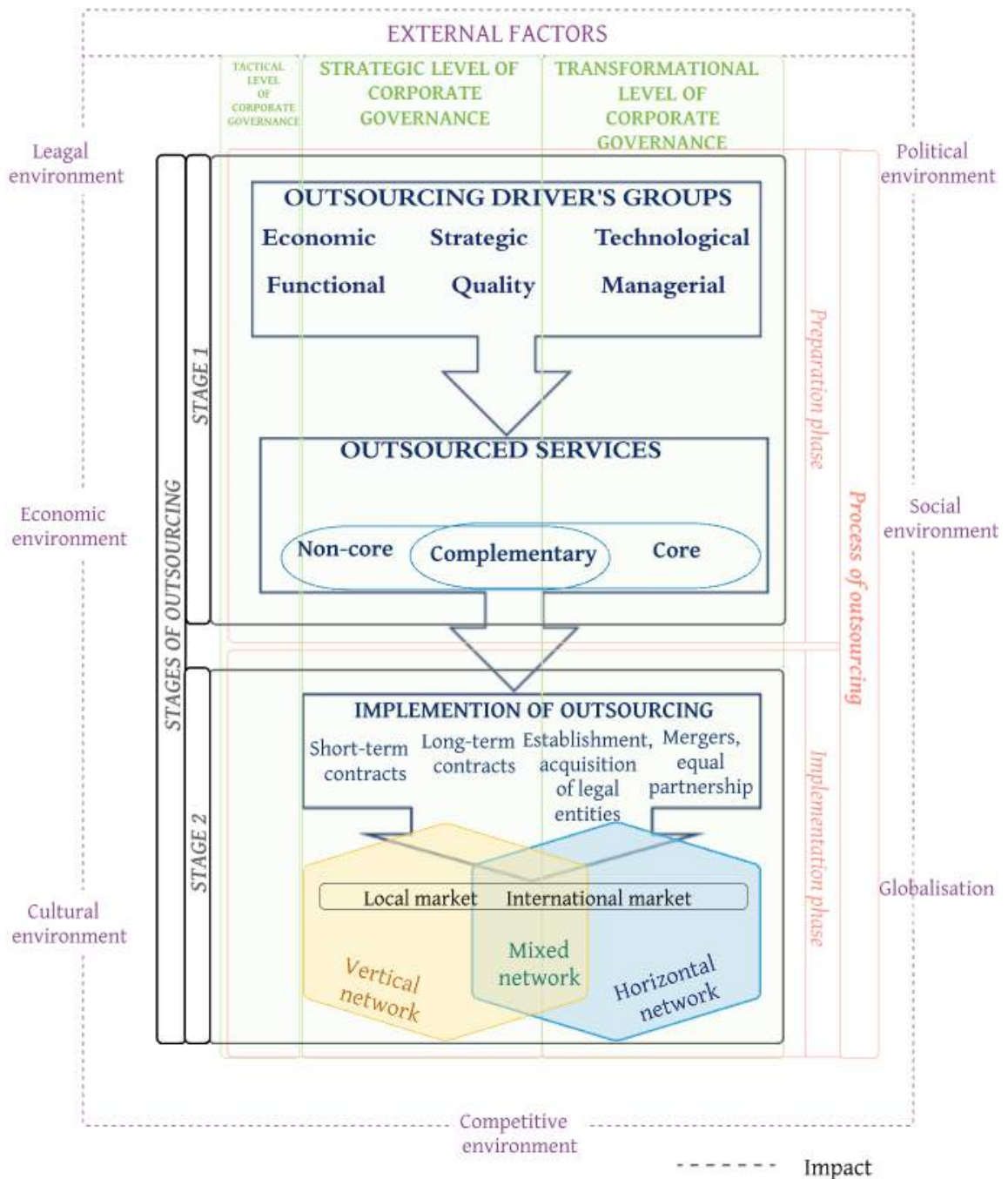


Figure 2. A theoretical model of the impact of drivers of outsourcing on the formation of networks of service organisations

Source: Own.

On the basis of the above analysis, it can be concluded that service organisations aim to outsource to the closest possible geographical location by means of contracts, resulting in the formation of vertical networks of service organisations. However, core or closely-related-to-core services are subject to implementation methods that shape horizontal networks of service organisations, both in national and international markets.

2. RESEARCH DESIGN AND RESULTS

Different service organisations were selected to test the theoretical model and to reveal the impact of the drivers that led to outsourcing on the different ways in which outsourcing was implemented and its links to networking.

The analysis unit of the first case study (I) is a business enterprise that has been active in the tourism and travel-related services group for 11 years. The organisation expands on the international market and changes its structure as a result of the establishment of subsidiaries, the purchase of organisations, mergers, and the development of the services provided (providing not only accommodation and catering, but also transport services, etc.). During the analysis of the second case study (II), an organisation providing construction services operating together with partners only in the Lithuanian market was examined, and the nature of the organisation's functioning in the network was determined.

The data for both case studies were collected by conducting interviews, and qualitative content analysis was used for processing. According to Zydziunaitė and Sabaliauskas (2017), qualitative content analysis procedures allow the researcher to summarise large amounts of information and form conclusions based on empirical data. As a result of this analysis, a study report was prepared, in which the data were divided into categories. These categories identified and analysed the organisational structures of the investigated organisations, and the impact of external activities on the formation of such structures. Each category was analysed by highlighting the expert's statements, which reflected three subcategories: services for which outsourcing was used, drivers of outsourcing, and the decision to use an appropriate organisational structure.

In the first case study (I), the activities of the selected international service organisation are characterised by a wide range of services being developed, and the structure of the organisation consists of various organisational units – subsidiaries, mergers, partnerships, etc. The organisation has been operating tourism and travel-related services for more than 11 years, and is active in the wholesale package of travel in the Baltic and Scandinavian countries. The organisation is categorised as large, as it has 83 permanent and 98 temporary employees. Its activities are widely diversified, and the organisation's operating partners are located in the regions of Europe, Scandinavia, and Asia.

The main driver which led to outsourcing belongs to the strategic drivers group: the seasonality of activity and the absence of continuous demand for services. It was determined that this driver is relevant to all of the services provided by the organisation in the context of the outsourcing of core services. It should be noted that interviews with experts identified that drivers which are in the group of strategic incentives – channelling finance to business development; management group – time saving; quality group – quality improvement; – had impact on long-term contacts.

Although the investigated organisation uses outsourcing for a wide range of complementary services, two linked strategic drivers have emerged – namely the concentration to the core services, and the specialisation of the provider in the delivery of services. All of this helps the business to save costs and time and makes administration of business easier. Moreover, the delivery of services abroad contributed to the use of outsourcing in the neighbouring geographical area.

In summary, it can be highlighted (Figure 3) that this case study (I) did not identify the impact of technological drivers on the implementation of outsourcing in the form of long-term contracts, but the outsourcing of core, closely-related-to-core, and non-core services is affected by economic, strategic, quality, managerial, and other drivers.

This case study (I) also showed that in the organisation under investigation, complex decisions were influenced by drivers and external factors in business development. On the other hand, the use of outsourcing services was the result of a strategic driver – concentration on the main activities by the establishment of a legal entity. This led to the formation of a mixed enterprise network.

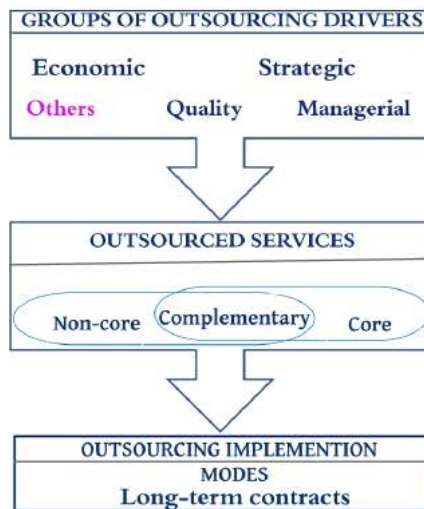


Figure 3. The impact of drivers on the implementation of outsourcing through long-term contracts

Source: Own.

In order to provide transport services, the organisation not only set up a separate legal entity, but also bought an existing transport organisation with which it had long-standing relationships. The initial drivers of such a decision were: the location of the service – i.e., that the transport service was provided in a specific market; and a strategic driver – the maintenance of a competitive advantage. However, the case study also showed that the implementation of outsourcing by acquiring an existing business was affected by the technological driver – the need for specific knowledge and skills linked to the skills and experience of the employees of the acquired organisation. The example of the organisation investigated suggests that the structure of the network may vary depending on the organisation’s strategic objectives – in this case the expansion of the delivery of services across countries or regions.

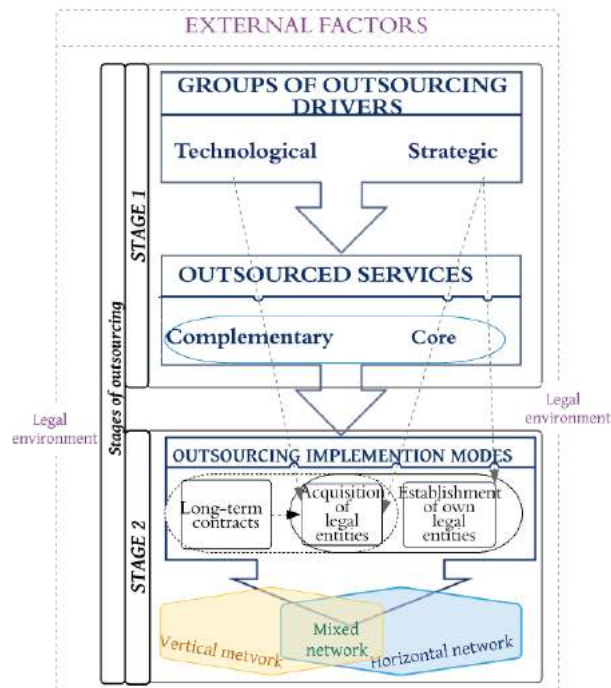


Figure 4. The impact of drivers of outsourcing on the formation of networks of organisations

Source: Own.

The assessment of the results of the case study has demonstrated that the theoretical impact of the drivers of outsourcing on network formation in service organisations can be detailed by highlighting the direct impact of the drivers concerned on the implementation of the outsourcing (Figure 4).

Within the investigated organisation, the establishment of a legal entity to provide catering services reflects a reverse process of outsourcing – i.e., rather than the service previously having been provided in the organisation and then later being outsourced, it was instead resourced back to the organisation. The organisation was influenced by strategic drivers such as maintaining market share and maintaining competitiveness, and due to the lack of appropriate services on the market the organisation had to take the initiative to create the service itself.

It should be noted that the development of a service through the creation of a legally-related entity is influenced by quality-control drivers. On the basis of the organisation’s experience, it is possible to assess the impact of service outsourcing on mergers between service organisations (see Figure 5). In short, the merger primarily results from a competitive market situation, where seasonality leads to a shortage of accommodation resources which then leads to technological and strategic drivers. In this context, the need for specific knowledge/technology and the sharing of risks between partners in creating the package of services and the expansion of activities in travel and accommodation services were important. The merger was carried out with the common objective of maintaining market share and improving competitiveness between the two organisations. This study shows that the main impact on the merger of these service organisations was caused by external factors, which directly led to the formation of technological and strategic drivers and allowed for horizontal networking among service organisations.



Figure 5. The impact of drivers of outsourcing on mergers and horizontal networking

Source: Own.

It should be noted that the investigated organisation uses as many as three different ways of implementing outsourcing for transport services: long-term contracts, the creation of a legally linked entity, and the acquisition of an existing business. It can therefore be argued that, irrespective of the nature of these services, the different drivers of outsourcing have an impact on the different ways in which out-

sourcing is implemented within these service organisations. In addition, the impact of the location driver on the use of outsourcing in near and distant (neighbouring and international) markets is clearly visible.

The organisation analysed in the second case study (II) provides a start-to-finish construction service, which covers the entire construction process of a building, from laying the foundations to the final finish. The client simply collects the keys and moves into a fully built house, with indoor and outdoor areas finished to a high standard. The enterprise has been in existence for 12 years and is classified as small, retaining 24 employees. The organisation provides services within Lithuania and uses the services of service providers operating within the country – such as engineering infrastructure installation services, specific finishing services, and business administrative services such as those that oversee accounting and worker safety – thereby operating on a network of service providers located within national boundaries. The manager stated that the outsourcing of services closely linked to the core service was driven by the desire to ensure the quality of the package of services provided, as external providers specialise in the delivery of some services and have the necessary skills and techniques. Another reason is the sharing of risks via the outsourcing of services covered by the guarantee and after-sales service. The organisation in the second case study (II) uses the services of external providers on the basis of long-term contracts and long-term partnerships, from service providers operating in the same market.

In conclusion, strategic, quality, and technological drivers in the organisation investigated have had the greatest impact on the outsourcing of services closely related to the core business. Particular emphasis should be placed on risk sharing. Strategic incentives and the “experience of others” were important for the outsourcing of non-core services. In the case of several organisations operating within a single market, the main mode of implementing outsourcing is long-term contracts, which lead to the creation of a network of partners active in the local market.

2.1 Changes in outsourcing services

There has been a recent increase in scientific research linked to the COVID-19 pandemic and its impact on business activities. Obrenovic et al. (2020) investigated support for the operation and productivity of organisations during the COVID-19 pandemic, and found that organisations with network structures were more adaptable and able to deal more effectively with the pandemic or other unforeseen situations. Crick and Crick (2020) noted that during the COVID-19 pandemic organisations began to change their business models, and showed cooperation even between competing organisations.

A study by the Deloitte Global Outsourcing Survey 2020 revealed that changing business scenarios are creating an imperative for service providers to become more agile. Firms will now accelerate overall outsourcing as they learn to collaborate in a world where speed, quality, flexibility, and cost are more important than physical location. This study showed that the motives behind the use of outsourcing are changing: now, cost reduction is again becoming increasingly critical, with over half of interviewees indicating that cost reduction is a primary reason for outsourcing. The impact of COVID-19 plays a key role here: the uncertain economic environment is switching the focus back to the numbers.

The analysis of indicators in the service sector revealed the impact of the pandemic, in particular for those service providers whose activities are characterised by direct contact with the customer.

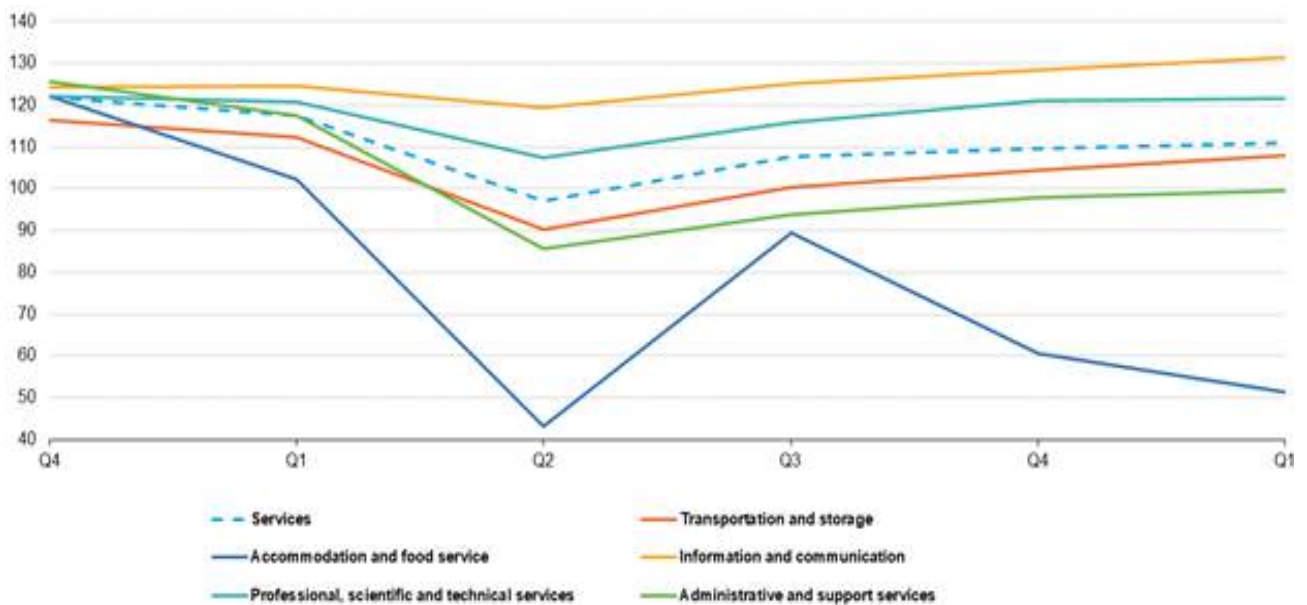


Figure 6. The evolution of the turnover of EU services, Q4 2019-Q1 2021.

Source: Eurostat (n.d.; online data code sts_sepr_m)

Eurostat data show (Figure 6) that the service sector is recovering but has not yet reached pre-pandemic levels. Due to the global need for businesses to relocate their activities and trade to the e-space, growth was only observed throughout the period of the COVID-19 pandemic in the information and communication services sector (Figure 6). In the first quarter of 2021, the turnover of services in the EU (excl. trade, financial, and public services) increased by 1.2% compared with the last quarter of 2020; the strongest increase was recorded for transportation and storage services (3.4%), whilst turnover for hotels and restaurants decreased by 15.5%.

Indicators reflecting trends in the service sector are provided by various international organisations (OECD, WTO, etc.), and they show growth in the service sector via these indicators. The World Trade Report 2019 notes that distribution and financial services account for the largest shares of global trade in services, with both groups combined accounting for almost a fifth of total services (World Trade Organization, 2019). Based on the prognosis of the WTO, global trade in services will have grown by 50% by 2040. Eurostat Statistics Data show an increase in the number of service enterprises. (n.d.) (<https://ec.europa.eu/eurostat/data/statistics-a> accessed on 27 November 2020). It can therefore be said that there is a link between the growth of the number of service organisations internationally and the ways in which trade in services occurs, which shows that trade in services takes place through branches abroad, the relocation of various services, or use of other resources (personnel, transport, etc.).

CONCLUSION

Scientific studies have shown that the direct link between drivers of outsourcing and changes in an organisation's activities is reflected in the models of the outsourcing process, the components of which reflect: the preparation phase of the outsourcing process, which assesses the external incentives and services for which it is used; and the implementation phase, where actions are envisaged for the implementation of outsourcing.

By assessing models of the outsourcing process and summarising the theoretical studies on outsourcing services and the links between outsourcing and networking – as well the various reasons, drivers, and motives for outsourcing services – a theoretical model has been developed. The elements of

this model depend on the tactical, strategic, and transformational levels of corporate governance, include the preparation and implementation stages of the outsourcing process, and lead to networking among service organisations.

The results of the qualitative survey carried out in service organisations showed a variety of modes of implementing outsourcing, which are directly linked to its drivers. Modelling confirmed the impact of technological and strategic drivers on the implementation of outsourcing by means of mergers or the creation of a legal entity. The impact and importance of the location of services driver identified for outsourcing, as well as the impact of changes in the structure of the enterprise network, have become apparent. The impact of exogenous factors on the choice of the mode of implementation of outsourcing has been confirmed, and different assumptions have been established for the development of the network through outsourcing in local and international markets. If an organisation is active in a local market, it develops a network through long-term contracts because of risk-sharing, whilst cross-border outsourcing is implemented in different modes and requires links with partners and competitiveness-related drivers within a network structure to be taken into account.

In view of the scale and duration of the COVID-19 pandemic and the performance of the service sector, it is appropriate to extend the analysis of the use of outsourcing motives and their impact on different service organisations. It is precisely because of the pandemic that not all service organisations were able to provide all or part of their services. However, flexibility and networking allow organisations and businesses to not only reduce operating costs and share risks, but also to assess the need for services in national and international markets when expanding their activities.

REFERENCES

- Achrol, R.S. (1997), "Changes in the theory of interorganizational relations marketing: Toward a network paradigm", *Journal of the Academy of Marketing Science*, Vol. 25, No. 1, pp. 56–71.
- Assaf, S. et al. (2011), "Factors affecting outsourcing decisions of maintenance services in Saudi Arabian universities", *Property Management*, Vol. 29, No. 2, pp. 195–212.
- Broekhuis, M., Scholten, K. (2018), "Purchasing in service triads: The influence of contracting on contract management", *International Journal of Operations & Production Management*, Vol. 38, No. 5, pp. 1188–1204, doi: <https://doi.org/10.1108/IJOPM-12-2015-0754>.
- Caniato, F. et al. (2015), "Location drivers, governance model and performance in service offshoring", *Production Economics*, Vol. 163, pp. 189–199.
- Crick, J.M., Crick, D. (2020), "Coopetition and COVID-19: Collaborative business-to-business marketing strategies in a pandemic crisis", *Industrial Marketing Management*, Vol. 88, pp. 206–213.
- Das, A., Grover, D. (2018), "Biased decisions on IT outsourcing: How vendor selection adds value", *Journal of Business Strategy*, Vol. 39, No. 5, pp. 31–40, doi: <https://doi.org/10.1108/JBS-03-2018-0039>.
- Deloitte (2020), "Deloitte Global Outsourcing Survey 2020", <https://www2.deloitte.com/content/dam/Deloitte/se/Documents/technology/gx-2020-global-outsourcing-survey-how-much-disruption.pdf>.
- Espino-Rodriguez, T.F., Ramirez-Fierro, J.C. (2017), "Factors determining hotel activity outsourcing. An approach based on competitive advantage", *International Journal of Contemporary Hospitality Management*, Vol. 29, No. 8, pp. 2006–2026, doi: <https://doi.org/10.1108/IJCHM-05-2016-0291>.
- Eurostat (n.d.), "Impact of Covid-19 crisis on services", https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Impact_of_Covid-19_crisis_on_services
- Franceshini, F. et al. (2003), "Outsourcing: Guidelines for a structured approach", *Benchmarking: An International Journal*, Vol. 10, No. 3, pp. 246–260.
- Gerbl, M., Mclvor, R., Humphreys, P. (2009), "Global services outsourcing: Critical aspects and future directions", *POMS 20th Annual Conference*, Orlando, Florida, USA, May 1–May 4.
- Gerbl, M. et al. (2015), "A multi-theory approach to understanding the business process outsourcing decision", *Journal of World Business*, Vol. 50, pp. 505–518.
- Hassanain, M. et al. (2015), "A multicriteria decision making model for outsourcing maintenance services", *Facilities*, Vol. 33, Issue 3/4, pp. 229–244, <https://doi.org/10.1108/F-01-2013-0003>.

- Hutzschenreuter, T., Lewin, A.Y., Dresel, S. (2011), "Governance modes for offshoring activities: A comparison of US and German firms", *International Business Review*, Vol. 20, pp. 291–313.
- Ikediashi, D.I., Aigbavboa, C. (2018), "Outsourcing as a strategy for facilities management provision in Nigerian universities", *International Journal of Construction Management*, Vol. 19, Issue 4, pp. 281–290, doi: 10.1080/15623599.2018.1435235.
- Ikediashi, D., Okwuasi, O. (2015), "Significant factors influencing outsourcing decision for facilities management (FM) services: A study of Nigeria's public hospitals", *Property Management*, Vol. 33, Issue 1, pp. 59–82.
- Juntunen, J., (2010), "Functional spin-offs in logistics service markets", *International Journal of Logistics: Research and Applications*, Vol. 13, No. 2, pp. 121–132, doi: <https://doi.org/10.1080/13675560903562056>.
- Kedia, B.L., Lahiri, S. (2007), "International outsourcing of services: A partnership model", *Journal of International Management*, Vol. 13, pp. 22–37.
- Kedia, B.L., Mukherjee, D. (2009), "Understanding offshoring: A research framework based on disintegration, location, and externalization advantages", *Journal of World Business*, Vol. 44, pp. 250–261.
- Lyons, P., Brennan, L. (2014), "A typology and meta-analysis of outsourcing relationship frameworks", *Strategic Outsourcing: An International Journal*, Vol. 7, Issue 2, pp. 135–172, <https://doi.org/10.1108/SO-04-2014-0006>.
- Lovelock, C.H. (1983), "Classifying services to gain strategic marketing insights", *Journal of Marketing*, Vol. 47, No. 3, pp. 9–20, doi: <https://doi.org/10.1177/002224298304700303>.
- Malyi, I. et al. (2021), "The institutional transformation of the digital values of Ukrainian society", *Intellectual Economics*, Vol. 15, No. 1, pp. 49–63
- Mirani, R. (2006), "Client-vendor relationships in offshore applications development: An evolutionary framework", *Information Resources Management Journal*, Vol. 19, Issue 4, pp. 72–85.
- Moller, K., Rajala, A. (2006), "Business nets: Classification and management mechanisms", *Working Papers*, W-407, Helsinki School of Economics, Helsinki.
- Munjal, S., Requejo, I., Kundu, S.K. (2019), "Offshore outsourcing and firm performance: Moderating effects of size, growth and slack resources", *Journal of Business Research*, Vol. 103, pp. 484–494. <https://doi.org/10.1016/j.jbusres.2018.01.014>.
- Obrenovic, B. et al. (2020), "Sustaining enterprise operations and productivity during the COVID-19 pandemic: Enterprise Effectiveness and Sustainability Model", *Sustainability*, Vol. 12, No. 15, 5981, <https://doi.org/10.3390/su12155981>.
- Pekkola, K. et al. (2005), "The evolution of outsourced operations - a five-phase model", in Zülch, G. et al., *Integrating Human Aspects in Production Management*, IFIP International Conference for Information Processing, Vol. 160, doi: 10.1007/0-387-23078-5_27.
- Podolny, J.M., Page, K.L. (1998), "Network forms of organization", *Annual Review of Sociology*, Vol. 24, pp. 57–76.
- Ribačonka, E., Kasnauskė, J. (2014), "Veiksniai, įgalinantys veiksmingai veikti organizacijų tinklą", *Regional Formation and Development Studies*, Vol. 2, No. 10, pp. 189–200, DOI: <http://dx.doi.org/10.15181/rfds.v10i2.154>.
- Sharma, A. et al. (2020), "Covid-19's impact on supply chain decisions: Strategic insights from NASDAQ 100 firms using Twitter data", *Journal of Business Research*, Vol. 117, pp. 443–449.
- Staniulienė, S.(2009), "Development of outsourcing in network structure design", *Organizational Management: Systematic Research*, Vol. 53, pp. 97–113 (in Lithuanian).
- Vynstra, F., Spring, M., Schoenherr, T. (2015), "Service triads: A research agenda for buyer-supplier-customer triads in business services", *Journal of Operation Management*, Vol. 35, pp. 1–20.
- Wirtz, J., Tuzovic, S., Ehret, M. (2015), "Global business services: Increasing specialization and integration of the world economy as drivers of economic growth", *Journal of Service Management*, Vol. 26, No. 4, pp. 565–587, doi: 10.1108/JOSM-01-2015-0024.
- World Bank (2020), *World Development Report 2020: Trading for development in the age of global value chains*, World Bank, Washington, DC, doi: 10.1596/978-1-4648-1457-0.
- World Trade Organization (2019), "World Trade Report 2019: The future of services trade", https://www.wto.org/english/res_e/booksp_e/00_wtr19_e.pdf.

Xiang, S. et al. (2021), "The effect of COVID-19 pandemic on service sector sustainability and growth", *Frontiers in Psychology*, Vol. 12, 633597, doi: 10.3389/fpsyg.2021.633597.

Zydzionaite, V., Sabaliauskas, S. (2017), *Qualitative research. Principles and methods*, Vaga, Vilnius (in Lithuanian).



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Citation:

Junsawang, S., Chaiyasoonthorn, W., Urbański, M., Chaveesuk, S. (2022), "How to Shift Consumer Willingness to Use the Emerging Technologies On Omnichannel", *Montenegrin Journal of Economics*, Vol. 18, No. 3, pp. 183-196.

How to Shift Consumer Willingness to Use the Emerging Technologies on Omnichannel

SUNISA JUNSAWANG¹, WORNCHANOK CHAIYASOONTHORN¹ (*Corresponding Author*),
MARIUSZ URBAŃSKI² and SINGHA CHAVEESUK¹

¹ PhD Candidate, KMITL Business School, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand

² Associate Professor, KMITL Business School, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand
e-mail: Wornchanok.ch@kmitl.ac.th

³ Associate Professor, Road and Bridge Research Institute, Warsaw, Poland,

⁴ Assistant Professor, KMITL Business School, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand

ARTICLE INFO

Received March 30, 2022
Revised from April 30, 2022
Accepted May 30, 2022
Available online July 15, 2022

JEL classification: 030, 031, 033, 035

DOI: 10.14254/1800-5845/2022.18-3.15

Keywords:

Willingness to Use,
Emerging Technologies,
Omnichannel,
Retail,
Marketing

ABSTRACT

This paper examines factors that show how to shift consumer willingness to use emerging technologies on omnichannel. The goal was to understand what parameters influence consumer tendency to adopt developing technologies on Omnichannel. The study was motivated by a desire to better understand the challenges that emerging technologies face, as they are not widely used due to concerns about operability, safety, and privacy, in contrast to established technologies. The study utilized UTAUT2 and ECM Models to create a triangulation model. Furthermore, the study used empirical data to develop 11 hypotheses, nine constructs, and one moderating factor by Structural Equation Modeling (SEM). The study was a quantitative survey using both online and offline shoppers in Thailand. A structured questionnaire was used to obtain primary data from a sample size of 520 people between May 12 and August 15, 2021. The result indicated that all the hypotheses were supported, and the variables were seen to have direct and indirect influences on the acceptance model. Finally, this paper proposes that combining the Unified Theory of Acceptance and Use of Technology, Expectation-Confirmation Model, Service Quality, and Personal Innovativeness would allow for a better understanding of factors of Willingness to Use Emerging Technologies.

INTRODUCTION

Emerging technologies have become popular in various industries that are using this new concept to help to combat the pandemic outbreak of COVID-19 globally, and this has changed everything from operations to other traditional areas such as Artificial Intelligence (AI), Blockchain, 5G technology, Smart Applications, Internet of Things (IoT), Robotics, Augmented Reality (AR), Virtual Reality (VR), and Mixed Reality (MR), etc. (Muangmee et al., 2021; Queiroz and Wamba, 2021).

Various Companies have excitedly designed a seamless retail world where customers can conduct business round the clock from any location. The word omnichannel is often used to characterize this kind of retail. Moreover, the retail era of omnichannel has impacted sales patterns and has seen the competition between consumers and retailers lead to unprecedented shopping habits and models (Beck and Rygl, 2015). Omnichannel shopping has been made possible by advances in computer-mediated technologies, which allow customers to shop in conventional establishments using mobile technologies and online resources. In addition to providing the benefit of more excellent conversion rates via multiple channels, the omnichannel model enhances the marketing strategy by incorporating multiple channels into the marketing and shopping experience (Yurova et al., 2017), through innovation, customers will have a more enjoyable shopping experience. E-commerce is being transformed by artificial intelligence, which international companies already use. Self-service pickup machines provide human-friendly interfaces and intelligent services with new information technology, such as artificial intelligence, virtual reality, etc. AR and VR are becoming popular. AR allows customers to interact with products and complete tasks without involving store personnel in any way, and these are being used to help in-store and online shops increase sales and improve the overall shopping experience (Bonetti et al., 2018; Chaveesuk et al., 2021; Wall and Khalid, 2021).

Furthermore, examples of launched emerging technologies about AR, VR, and computer vision with AI has been successfully integrated in firms such as IKEA, Shopee, Artistry, NIKE, Vket Mall-Virtual Market in Japan, BingoBox in China, Amazon Go, Amazon go grocery, etc.

Emerging technologies are challenging to obtain and are not widely used because of skepticism about the operability and safety of the technologies, whereas established or well-known technologies are easier to use because they have been validated over time by users. Therefore, this paper analyzes how to shift consumer willingness to use the emerging technologies on omnichannel using Structural Equation Modeling (SEM). In addition, this study aims to utilize empirical data to establish 11 hypotheses, nine constructs, and one moderating factor, all of which were chosen from a conceptual framework by Rodríguez-Torrico et al. (2017) to address the question "How to shift consumer willingness to use the emerging technologies on omnichannel?"

Moreover, combining this concept with the Unified Theory of Acceptance and Use of Technology (UTAUT2), Expectation-Confirmation Model (ECM), Service Quality, and Personal Innovativeness would allow for an enhanced understanding of Willingness to Use Emerging Technologies.

The following is a breakdown of the structure of this paper: The Literature Review and Hypotheses of this study are described in Section 2. The Methods are presented in Section 3. The result is shown in Section 4. Finally, the conclusion of this research is presented in Section 5.

1. MATERIALS AND METHODS

This section describes the Literature Review and Hypotheses of How to shift consumer willingness to use the emerging technologies on omnichannel, including UTAUT2, ECM, Service Quality, and Personal Innovativeness.

1.1 Omnichannel

Omnichannel Retail is referred to as a multi-channel shopping system that eliminates barriers and seamlessly integrates the online shopping experience and in-store customer experience. Consumers can buy goods and services online, in-store, or integrate both processes by starting the purchase online and completing it in-store or starting a purchase in-store and completing the order online. Table 1 presents some definitions of omnichannel according to different authors.

Table 1. Omnichannel Definitions

<i>Definition of Omnichannel</i>	<i>Reference</i>
Retail Businesses have all been on board with a seamless retail experience in which customers can shop everywhere and whenever they want. As a result, many distribution methods are commonly called "omnichannel retailing."	(Beck and Rygl, 2015)
Since the introduction of digital devices, there has been an increase in available information sources. In practice, customers engage in omnichannel behavior, which combines online and in-store shopping.	(Rodríguez-Torrico, 2017)
The omnichannel model complements the marketing strategy by adding the benefit of increased conversion through the combination of channels.	(Kaczorowska-Spychalska, 2017)
Increased computer-mediated technologies have facilitated the Omnichannel, which shops from traditional stores to mobile and online shops across all retail channels.	(Yurova et al., 2017)
Channel integration decision-making of retailers is a relatively new trend that remains an innovation process in the retail industry, mainly as cross-channel integration.	(Cao and Li, 2018)

1.2 Emerging Technologies

Shopping technologies have improved greatly with advances and innovations in technologies. Interventions ranging from shopper assistance tools to payment options and even online shopping via smartphone applications have revolutionized the marketing and shopping experience for both retailers and customers [17]. The new service benefits are service simplification and the customer experience in emerging technologies such as AI, Blockchain, 5G technology, Smart Applications, IoT, Robotics, AR, VR, MR, etc. The example emerging technologies have been listed in Table 2.

Table 2. Emerging Technologies Definition

<i>Definition of Emerging Technologies</i>	<i>Reference</i>
With advancements, customers will have a better shopping experience. International retailers already use AI that is revolutionizing e-commerce.	(Oosthuizen et al., 2021)
The increasing AR and VR have evolved to enhance in-store and online retailers to improve their sales and shopping experience through fast emerging innovations.	(Bonetti et al., 2018)
Self-service pickup machines should feature human-friendly interfaces and offer intelligent services, such as AI, virtual reality, and other modern technologies.	(Chen et al., 2018)
A critical goal of the Omnichannel project is a consistent customer experience. Digital solutions such as AI often become established. IoT is following the patterns found in the retail era of omnichannel.	(Chi et al., 2019)
Allows the robot to navigate a pre-designed route to show customers where to find what they want. In addition, the robot can inform a customer of their intent to buy.	(Lin et al., 2020)
Chatbots powered by natural language processing and deep learning algorithms could help replace human employees in online retailing.	(Haque et al., 2021)

1.3 Willingness to Use

This study used empirical data to develop 11 hypotheses, nine constructs, and one moderating factor selected from a conceptual framework (Rodríguez-Torrico et al., 2017) to answer the question, "How to shift consumer willingness to use the emerging technologies on Omnichannel?". Willingness to Use Emerging Technologies to assess to what extent an individual has deliberately established plans to use these innovative emerging technologies in their future shopping and retail activities. Various researchers have found that customers develop consequence behavior on continuance to use, intention to use, intention to adopt self-service technology, Kiosk, mobile commerce applications, etc. (Natarajan et al., 2017; Iqbal et al., 2018; Muangmee et al., 2021; Khalid et al., 2021; Rahi et al., 2019). Willingness to Use Emerging Technologies was significantly influenced by UTAUT2 with focus on three factors (facilitating conditions, price value, and social influence).

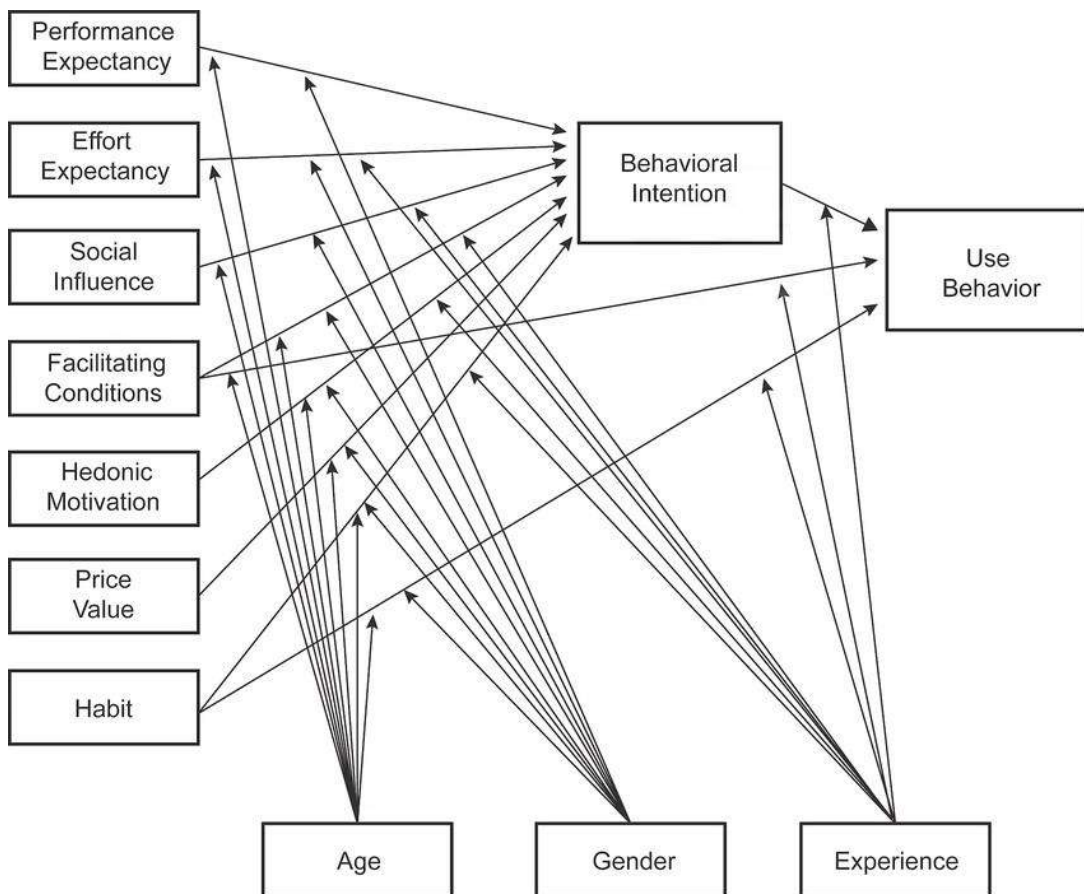


Figure 1. UTAUT2 framework
 Source: Adopted from Rahi et al., 2019.

Firstly, Facilitating Conditions refer to customers' awareness of assistance resources and ways to assist them in their shopping experience (Patil et al., 2020; Venkatesh et al., 2012). Secondly, Price Value refers to customers making financial-trade-off decisions (based on which is more valuable to them) regarding their significant profits and methodology. There was a strong correlation between consumer behavioral intention toward m-commerce adoption facilitating conditions, the service quality, and price value. These factors accounted for 65.5 percent of consumer behavioral intention (Venkatesh et al., 2012). Thirdly, Social Influence means Consumers believe as influenced by family and friends that technology should be used for specific purposes. This reflects the effects of external factors such as the user's friends, family, and superiors (Okumusa et al., 2018). In addition, social influence and facilitating conditions are important factors that explain customer willingness to use mobile banking (Oliveira et al, 2016). Moreover, predicting behavioral intention to use self-service kiosks was made more accessible with the help of facilitating conditions and social influence. Therefore, the research hypotheses are as follows:

- H1 Facilitating Conditions positively influences the Willingness to Use Emerging Technologies.*
- H2 Price Value significantly and positively influences the Willingness to Use Emerging Technologies.*
- H3 Social Influence has a positive influence on the Willingness to Use Emerging Technologies*

Willingness to Use Emerging Technologies was also significantly influenced by Expectation-Confirmation Model (ECM) focus on three factors: Perceived Usefulness, Expectation Confirmation, Customer Satisfaction. The ECM model was adapted from Okumusa et al. (2018).

Firstly, Perceived Usefulness about people feels that working with a particular system will improve their productivity. According to the findings of the empirical studies, expected value is a significant indicator of technology use and is correlated with Willingness to Use Emerging Technologies (Natarajan et al., 2017; Taufik and Hanafiah, 2019) and Customer Satisfaction (Natarajan et al., 2017; Yang and Geetha, 2019). Users' satisfaction and continuance intention to use mobile instant messaging is influ-

enced by Perceived Usefulness (Yang and Geetha, 2019). Secondly, Expectation confirmation and customer satisfaction is verified because it measures whether customer expectations have been exceeded or met, based on how they have experienced the service, related to Perceived Usefulness and Customer Satisfaction (Yang and Geetha, 2019). For example, online food m-shoppers' satisfaction and intention to continue mobile shopping were influenced by the perceived value for money they received. Thirdly, Customer satisfaction is considered an adequate response. Satisfaction can be achieved if customers are confident that their service requirements are met and are willing to use Emerging Technologies (Natarajan et al., 2017; Gu et al., 2021). Based on the reviewed literature, therefore, the study explored the following research hypotheses:

- H4 Perceived Usefulness positively influences the Willingness to Use Emerging Technologies*
- H5 Perceived Usefulness significantly and positively influences Customer Satisfaction*
- H6 Expectation Confirmation has a positive effect on Perceived Usefulness*
- H7 Expectation Confirmation has a positive influence on Customer Satisfaction*
- H8 Customer Satisfaction significantly and positively influences Willingness to Use Emerging Technologies*

Service Quality has been used to describe the Emerging Technologies service's quality. Service Quality was tested using a scale replication process on several samples from the company and consumer behavior. Efficiency and validity tests have been tracked in various settings and have been shown to be significant with Customer Satisfaction (Iqbal et al., 2018; Mango et al., 2017) and Willingness to Use Emerging Technologies (Iqbal et al., 2018; Joshi, 2020). Furthermore, Iqbal et al. (2018) summarized Service Quality, where : (1) Reliability and ease of use lead to the features like "response." (2) The term "enjoyment" refers to the customer's feelings toward the system after using it. (3) Customers' concerns about security/privacy are reflected in security/privacy measures. (4) The overall layout of a system is what design considers the most important factor. (5) Assurance shows that a service provider is competent and well-known in the industry. (6) Convenience has to do with how simple it is for a customer to use the company's services. (7) Customization is defined as knowing what a customer wants and needs and then shaping these services in response to that knowledge. And Self-service technology, which has profound effects on how customers interact with businesses to create positive service outcomes, such as customer satisfaction, loyalty, and behavioral intentions (Iqbal et al., 2018; Kazancoglu and Yarimoglu, 2018). Therefore, the following research hypotheses were proposed as follows:

- H9 Service Quality positively influences Customer Satisfaction.*
- H10 Service Quality has a significant and positive relationship with Willingness to Use Emerging Technologies*

An individual's ability to experiment with new IT is referred Personal Innovativeness. Consumers' purchase intent at retail is influenced by an AI-enabled checkout. Furthermore, arousal has been moderated by the importance of innovativeness in consumers' responses to AI-enabled checkouts (Lin et al., 2020). Purchase intention is influenced by social influence, and the perceived value of products plays a role in mediating these relationships to some extent. Furthermore, the personal characteristic of "consumer innovativeness" affects the moderates of these relationships (Persaud and Schillo, 2017). Moreover, the social influence of self-driving cars is positively related to purchase intentions. The relationships between the constructs are moderated by consumer innovativeness, with the effects being stronger when consumer innovativeness is high rather than low (Ayu et al., 2020). Therefore, the research hypotheses are as follows:

- H11 Personal Innovativeness moderates the relationship between Social Influence and Willingness to Use Emerging Technologies*

2. METHODOLOGY

This study investigated how to shift consumer willingness to use emerging technologies on Omnichannels among Thai shoppers. The research was designed to adopt a triangulation model using UTAUT2 and the ECM Models. The study adopted a quantitative survey research design using online and offline

shoppers across Thailand. Primary data was collected between from May 12 – August 15, 2021, using questionnaire from a sample size of 520. The questionnaire was divided into two sections; the first section collected data on the demographics of the study population, such as age, gender, education, shopping frequency, and preferred channel. The second section collected data on the study constructs that measured different relations which are summarized in Table 3. The constructs were all developed from prior literature and discussed in the conceptual framework. The data were collected using Google Forms. The survey link was distributed using popular social media groups in Thailand (Shopee, Lazada, Facebook, Line, Instagram, and Twitter), some colleagues also helped in distributing the questionnaire among their networks. Respondents to the survey were mainly residents of Bangkok, Chiang Mai, Chiang Rai, Krabi, and Phuket where large populations are already familiar with the dynamics of online shopping and e-commerce.

3. RESULTS

The respondents were categorized into Gender, Age, Education, Frequency, Chanel (Online, In-Store), a breakdown of the findings are presented in Table 3.

Table 3. Characteristics of the study sample

		<i>Frequency</i>	<i>Percent</i>
Gender	Male	141	30.7
	Female	319	69.3
Age	< 21	20	4.3
	21 – 30	303	65.9
	31 – 40	72	15.7
	41 – 50	25	5.4
	>51	40	8.7
Education	Undergraduate	53	11.5
	Bachelor's degree	294	63.9
	Postgraduate degree	113	24.6
Frequency of shopping	1-3 days per week	121	26.3
	4-6 days per week	73	15.9
	Every day	266	57.8
Chanel	Online	129	28
	In-Store	79	17.2
	Online and In Store	252	54.8

Source: autors

Highlights of the demographic information revealed that females were dominant over the male gender; the age range of 21-30 were the most represented with 65.9% of the study population, while those below 21 were the least represented with 4.3%. Those with a bachelor's degree education were more represented with 63.9%, while those who are undergraduates constitute the smallest educational qualification level with 11.5%. In terms of frequency of shopping, those who shopped every other day were the dominant group with 57.8%, while those whose shopping frequency was 4-6 per week were the least with 26.3%. When analyzing the channel employed by the shoppers, those who used a combination of both online and in-store channels were dominant with 54.8% and those relying on in-store channel were least represented with 17.2%.

3.1 Confirmatory Factor Analysis (CFA)

The Cronbach's alpha coefficient was utilized to evaluate the reliability of the study results. The metric used to assess the inter-item consistency of the measurement variables. According to (Kline 2005), the Cronbach's Alpha values should be greater than 0.7, while 0.60 are also considered moderate but

acceptable. They indicated that the reliability is considered excellent when it is >0.9, adequate if >0.8, and acceptable if >0.6. In Table 4, the constructs exceed the minimum acceptable threshold at 0.684, which is accepted because it is above 0.60. The result shows a high level of internal consistency, which has important implications.

Table 4. Results of CFA, validity analysis, and reliability test

<i>Latent variable</i>	<i>Observed variable</i>	<i>Loadings</i>	<i>Cronbach's Alpha</i>
FC	Resources	0.77	.900
	Knowledge	0.85	
	Compatible	0.82	
	Assistance	0.59	
PV	Price	0.72	.793
	Value	0.81	
SI	Influence	0.64	.684
	Important	0.75	
PU	Useful	0.84	.797
	Helpful	0.78	
EC	Experience	0.85	.817
	Service	0.77	
PI	Experiment X Influence	0.93	.816
	Experiment X Important	0.62	
	Trying X Influence	0.71	
	Trying X Important	0.47	
CS	Satisfied	0.88	.899
	Pleased	0.91	
SQ	Functionality / Customization / Convenience / Security	0.90	.910
	Assurance	0.83	
	Design / Enjoyment	0.84	
WTU	Continue Use	0.76	.837
	Intend to use	0.77	
	Intend to adopt	0.77	

The required threshold of the CFA fitness indices according to studies (Hair et al., 2010) should be as follows: RMSEA < 0.08; GFI/NFI/CFI/TLI > 0.9 (satisfactory fit) and > 0.8 (acceptable fit); X²/df < 0.5. The results of CFA using Structural Equation Model (SEM) analysis found that the model according to the hypotheses did not match the empirical data, as determined by the fit index, which was as follows: The value different without statistical significance (TLI = 0.756, GFI = 0.702, AGFI = 0.629, CFI = 0.787, RMSEA = 0.120, RMR = 0.139, X²/df = 7.621) as shown in Table 5 under the “Before” column.

In the research model, the model Willingness to Use has second-order latent variables were used to adjust the findings and presented in Table 5 under the “After” column. The obtained results as shown in Table 6 which illustrate the overall fit indexes of the model > It also shows good results for Tucker-Lewis Index (TLI), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI), Root Mean Square of Error of Approximation (RMSEA), Root Mean Residual (RMR) and X²/df. As a result of the findings, the model has reached an acceptable level and can be used to explain the set hypotheses.

In addition, Table 5 also highlights the results of the reliability and validity measurements and the results of the model. The adjusted model of the presented results is presented in Table 6 and show the hypotheses were all supported under type II error. In addition, Figure 2 is used to represent the Empirical model.

Table 5. Goodness of Fit

<i>Indices</i>	<i>Threshold</i>	<i>Before</i>	<i>After</i>
TLI	≥ 0.90	0.756	0.963
GFI	≥ 0.90	0.702	0.944
AGFI	≥ 0.90	0.629	0.908
CFI	≥ 0.90	0.787	0.976
RMSEA	≤ 0.05	0.120	0.046
RMR	< 0.08	0.139	0.068
X ² /df	≤ 2.0	7.621	1.992

Source: authors.

Table 6. Relative Influence of Items (Standardized Regression Weights) (N=460) Results after Model Adjustment

<i>Hypotheses</i>	<i>Estimate</i>	<i>S.E.</i>	<i>C.R. (t-value)</i>	<i>P-value</i>	<i>Hypothesis testing results</i>
H1: FC →WTU	.105	.040	2.606	.009**	Supported
H2: PV →WTU	.112	.055	2.027	.043*	Supported
H3: SI →WTU	.117	.056	2.074	.038*	Supported
H4: PU →WTU	.332	.083	3.980	***	Supported
H5: PU →CS	.335	.084	3.981	***	Supported
H6: EC →PU	.982	.065	15.098	***	Supported
H7: EC →CS	.314	.083	3.766	***	Supported
H8: CS →WTU	.235	.077	3.050	.002**	Supported
H9: SQ →CS	.357	.060	5.946	***	Supported
H10: SQ →WTU	.233	.095	2.436	.015*	Supported
H11: PI X SI →WTU	.048	.024	1.994	.046*	Supported

Source: authors.

Note. *p < 0.05, **p < 0.01 and ***p < 0.001.

Table 7 shows the extent to which variables have a direct, indirect, and total influence on the acceptance model of Willingness to Use Emerging Technologies.

Table 7. Summary of Direct Influence and Indirect Influence and Total Influence on Willingness to Use Emerging Technologies.

<i>Variable</i>	<i>Direct influence</i>	<i>Indirect influence through other variables</i>	<i>Total influence</i>
FC	.105		.105
PV	.112		.112
SI	.117		.117
PU	.332	(.335 x .235) = .079	.411
CS	.235		.235
SQ	.233	(.357 x .235) = .084	.317
EC		(.982 x .332) + (.982 x .335 x .235) + (.314 x .235) = .477	.477
PI moderating SI and WTU	.048		.048

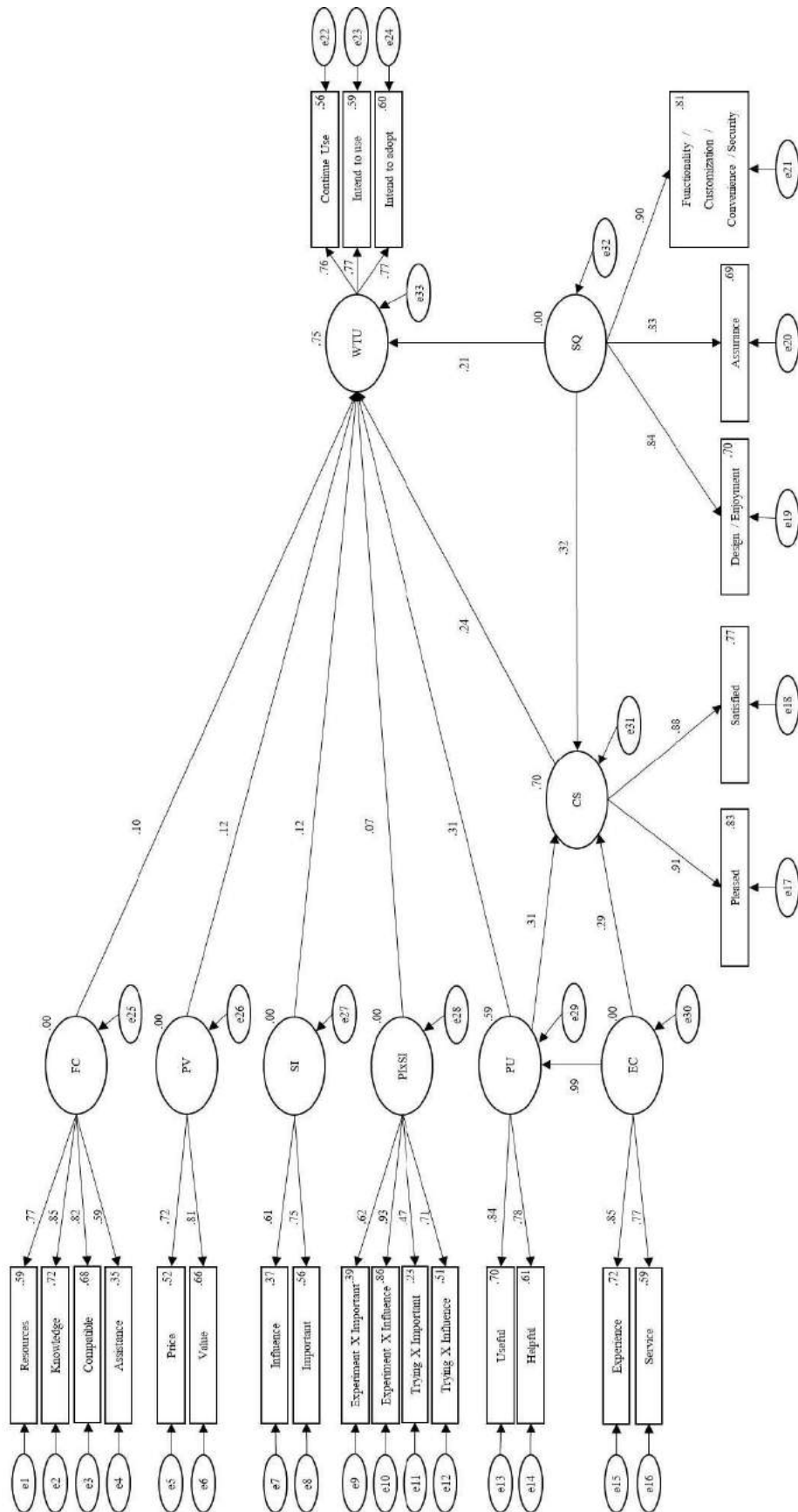


Figure 2. Empirical model from SEM analysis

Source: Researcher's own data

4. DISCUSSIONS

Table 7 are shown the total influence following; FC = .105, PV = .112, SI = .117, CS = .235, PI moderating SI and WTU = .048 are direct influence, EC = .477 is indirect influence, PU = .411 and SQ = .317 are direct and indirect influence, as well as all variable positive effects on Willingness to Use Emerging Technologies. Facilitating Conditions has a positive effect on Willingness to Use with the correlation coefficient 0.105 and $p < 0.01$. Therefore, H1 is supported. The finding was in addition supported by several studies (Khalid et al., 2021; Muangmee et al., 2021, Venkatesh et al., 2012) where Facilitating Conditions was ascertained to have a positive direct effect on Willingness to Use, and this is based on consumers' knowledge of resources and behavioral support that is available.

Price Value has a positive effect on Willingness to Use with the correlation coefficient of 0.112 and $p < 0.05$. Therefore, H2 is supported as the 'customers' mental trade-offs between the methodological gain and the deal's financial expense. This is consistent with the previous research (Muangmee et al., 2021, Patil et al., 2020). Social influence has a positive effect on Willingness to Use with the correlation coefficient 0.117 and $p < 0.05$. Therefore, H3 is supported. This was also in congruence with the prior studies (Khalid et al., 2021; Okumusa et al., 2018; Oliveira et al., 2016) who found that consumers believe others (e.g., family and friends) think that technology should be used for specific purposes. This reflects the effects of environmental factors like friends, family, and superiors.

Perceived Usefulness has a positive effect on Willingness to Use with the correlation coefficient 0.332 and $p < 0.001$. Therefore, H4 is supported. This finding is supported by several studies (Chiu et al., 2020; Haque et al., 2021; Yang and Geetha, 2019) where it was found that people believe their work performance would be improved by the adoption of a particular system. The empirical findings show that the expected is a significant indicator of technology use. Perceived Usefulness has a positive effect on Customer Satisfaction with the correlation coefficient of 0.335 and $p < 0.001$. Therefore, H5 is supported. This is consistent with the previous research from (Haque et al., 2021; Yang et al., 2019) found that Perceived Usefulness affects Customer Satisfaction.

Expectation Confirmation has a positive effect on Perceived Usefulness with the correlation coefficient of 0.982 and $p < 0.001$. Therefore, H6 is supported. The support for this positive effect of perceived usefulness as seen in the literature (Kazancoglu and Yarimoglu, 2018), provides key indices measuring the positive effect of Expectation Confirmation on Perceived Usefulness. Expectation Confirmation has a positive effect on Customer Satisfaction with a correlation coefficient of 0.314 and $p < 0.001$. Therefore, H7 is supported. This is supported by (Kazancoglu and Yarimoglu, 2018; Muangmee et al., 2021) where they determined that the actual user experience matches the original requirements or exceeds them; customer satisfaction is verified.

Customer satisfaction has a positive effect on Willingness to Use with the correlation coefficient 0.235 and $p < 0.01$. Therefore, H8 is supported as considered an adequate reciprocation, and satisfaction can be reached if a customer is sure that its demands from service are fulfilled. This is consistent with the previous research from (Haque et al., 2021; Iqbal et al., 2018; Kazancoglu and Yarimoglu, 2018; Taufik and Hanafiah, 2019; Venkatesh et al., 2012) where customer satisfaction can be achieved.

Service Quality has a positive effect on Customer Satisfaction and Willingness to Use. Firstly, service quality positively affects customer satisfaction with the correlation coefficient of 0.357 and $p < 0.001$. Therefore, H9 is supported; the finding is supported by (Gu et al., 2021; Taufik and Hanafiah, 2019). Secondly, Service Quality has a positive effect on Willingness to Use with a correlation coefficient of 0.233 and $p < 0.05$. Therefore, H10 is supported. This is consistent with the previous research from (Iqbal et al., 2018; Gu et al., 2021). Therefore, Service Quality has been used to describe the quality of the self-service technology. SQ was tested using several samples around the company and consumer behaviors, using a scale replication process. In multiple settings, efficiency and validity tests have been tracked.

Personal Innovativeness has moderate Social Influence and Willingness to Use with the correlation coefficient of 0.048 and $p < 0.05$. Therefore, H11 is supported. This is consistent with the previous research from (Mango et al., 2017) which is an individual's ability to try out some new IT. The findings of this study confirm a literature review on the effect of willingness to use emerging technologies on Omni-

channel. The result has three levels of significance: very highly significant, highly significant, and statistically significant. As the result, H4, H5, H6, H7, and H9 are very high significance levels. Perceived Usefulness refers to emerging technologies that help customers do things better and effectively and perform many things more conveniently, which affect Willingness to Use and Customer satisfaction. Customer experience with emerging technologies was better than what customers expect. And the service level or function provided by emerging technologies was better than customers expected. Therefore, customer experience has exceeded expectation that means Expectation Confirmation, which affects Perceived Usefulness and Customer satisfaction. Moreover, the service process of the firm's emerging technologies is clear, easy to use, and reliable in Functionality, Customization, Convenience, Security, layout esthetically appealing, a good firm reputation which Service Quality affects Customer satisfaction.

In addition, H1 and H8 are both highly significant levels. The resources required knowledge and necessary guidance for applying emerging technologies compatible with other technologies while Facilitating Conditions affect the Willingness to Use. This leads to the point of making the customer satisfied and pleased with using emerging technologies which shows how customer satisfaction affects the Willingness to Use.

Furthermore, H2, H3, H10, and H11 have statistically significant levels. Emerging technologies provide good value for reasonably priced money and worth using or payment which Price Value affects Willingness to Use. Customers use emerging technologies for purchases that are influenced by influencers, thus, showing how social influence affects Willingness to Use. Service Quality refers to Functionality, Customization, Convenience, Security, Assurance, Design, and Enjoyment, which affect Willingness to Use. Moreover, Personal Innovativeness relates to customers who enjoy experimenting and are often among the first to try new ways of purchasing via emerging technologies that moderate between Social Influence and Willingness to Use.

Overall, these findings imply all hypotheses answer how the willingness to use emerging technologies on Omnichannel. The person interested in innovativeness is affected if they have watched, listened to influencers, then, are willing to use emerging technologies. Therefore, personal Innovativeness is an important factor in trying new ways of purchasing via emerging technologies. Moreover, the use of emerging technologies is compatible with other technologies that require resources, knowledge, and guidance, and Perceived Usefulness aids consumers in doing tasks more efficiently and effectively.

CONCLUSIONS

Various Emerging technologies include AI, Blockchain, 5G technology, Smart Applications, IoT, Robotics, AR, VR, MR, etc. These will make things easier for customers and provide a better service. For example, customers can shop via omnichannel anytime, anywhere, such as IKEA, Shopee, Artistry, NIKE, Vket Mall-Virtual Market in Japan, BingoBox in China, Amazon Go, Amazon go grocery, etc.

This paper used empirical data to develop 11 hypotheses, nine constructs, and one moderating factor using SEM. In the research model, the model Willingness to Use has second-order latent variables. The obtained results illustrate the overall fit indexes of the model, which include good results TLI = 0.963, GFI = 0.944, AGFI = 0.908, CFI = 0.976, RMSEA = 0.046, RMR = 0.068, X²/df = 1.992. As a result of the findings, the model has reached an acceptable level and can be used to explain the set hypotheses.

Collected data, 460 persons completed the questionnaire. Gender, Age, Education, Frequency, and Channel (Online, In-Store) were used to categorize the respondents. As a result, all hypotheses are acceptable, and variables have both direct and indirect effects on the acceptance model. These findings provide an answer to the question, "How to shift consumer willingness to use emerging technologies on Omnichannel?" These findings include UTAUT2 (facilitating conditions, price value, social influence), ECM (Perceived Usefulness, Expectation Confirmation, Customer Satisfaction), Service Quality, and Personal Innovativeness.

This study is acceptable on willingness to use emerging technologies on Omni-channel and supported by literature review. Moreover, the result has three levels of significance: very highly significant, highly

significant, and statistically significant. In addition, this study also found Personal Innovativeness to be a moderator of Social Influence and Willingness to Use Emerging Technologies.

Customer's Willingness to Use and Customer Satisfaction go up when Emerging technologies assist them in getting things done more efficiently or quickly and easily. Emerging technologies provided an exceptional customer experience. Even more excellent service has been provided as a result of Emerging technologies. Expectation confirmations impact perceived usefulness and customer satisfaction. Clear, easy-to-use, and trustworthy service procedures influence customer satisfaction, which is the foundation of a good company's reputation.

In addition, Facilitating Conditions affect a user's willingness to use Emerging technologies by providing the necessary resources, expertise, and assistance for them to be used. Customers' willingness to use emerging technologies increases when they are pleased with them.

Furthermore, Advances in technology provide consumers excellent value for their money, making them more willing to use or pay for them. And when it comes time to purchase, customers are affected by influencers and employ new technologies that positively impact their willingness to use. Functionality, Customization, Convenience, Security, Assurance, Design, and Enjoyment are aspects of service quality that affect customers' willingness to use a service. As a result, customers with a high level of Personal Innovativeness tend to be early adopters of developing technologies such as social influence and willingness to use.

Limitations of the study include the small number of variables examined, the lack of other variables that may have enriched the findings, and the number of respondents should be increased. However, the authors consider this and other variables and increase respondents potentially impact other disorders for further surveys.

Therefore, the answer for “How to shift consumer willingness to use the emerging technologies on Omnichannel?” which are Willingness to Use Emerging Technologies was significantly influenced by facilitating conditions, price value, social influence, Perceived Usefulness, Expectation Confirmation, Customer Satisfaction, Service Quality, and Personal Innovativeness moderating Social Influence and Willingness to Use Emerging Technologies. Finally, further research will look at additional variables and increase respondents for the understanding of this phenomenon fully.

REFERENCES

- Ayu, M., Lindrianasari, G.R.R., Urbański, M. (2020), “The Impact of Environmental and Social Costs Disclosure on Financial Performance Mediating by Earning Management”, *Polish Journal of Management Studies*, Vol. 21, No. 2, pp. 74-86.
- Beck, N., Rygl, D. (2015), “Categorization of Multiple Channel Retailing in Multi-, Cross-, and Omni-Channel Retailing for Retailers and Retailing”, *Journal of Retailing and Consumer Services*, Vol. 27, pp. 170–178.
- Bonetti, F., Warnaby, G., Quinn, L. (2018), “Augmented Reality and Virtual Reality in Physical and Online Retailing: A Review, Synthesis and Research Agenda” In Jung T, tom Dieck M, editors, *Augmented Reality and Virtual Reality: Empowering Human, Place and Business*. Switzerland: Springer-Verlag London Ltd. pp. 119-132. https://doi.org/10.1007/978-3-319-64027-3_9
- Cao, L., Li, L. (2018), “Determinants of Retailers' Cross-channel Integration: An Innovation Diffusion Perspective on Omni-Channel Retailing”, *Journal of Interactive Marketing*, Vol. 44, pp. 1-16. <https://doi.org/10.1016/j.intmar.2018.04.003>
- Chaveesuk, S., Khalid, B., Chaiyasoonthorn, W. (2021), “Digital Payment System Innovations: A Marketing Perspective on Intention and Actual Use in the Retail Sector”, *Innovative Marketing*, Vol. 17, No. 3, pp. 109–123, 2021. [https://doi.org/10.21511/im.17\(3\).2021.09](https://doi.org/10.21511/im.17(3).2021.09)
- Chen, Y., Yu, J., Yang, S., Wei, J. (2018), “Consumer’s Intention to Use Self-Service Parcel Delivery Service in Online Retailing”, *Internet Research*, Vol. 28,, No. 2, pp. 500-519. <https://doi.org/10.1108/IntR-11-2016-0334>

- Chi, S.-C., Chang, C.-Y., Chang, C.-H. (2019), "Exploring the Application of both Internet of Things and Artificial Intelligence under the Omni Channel from the Perspective of Drama Theory", *Proceedings of the 5th International Conference on Industrial and Business Engineering (ICIBE)*, September 27-29, Hong Kong, pp. 71–75. <https://doi.org/10.1145/3364335.3364343>
- Chiu, W., Cho, H., Chi, C.G. (2020), "Consumers' Continuance Intention to Use Fitness and Health Apps: An Integration of the Expectation–Confirmation Model and Investment Model", *Information Technology & People*, Vol. 34, No.3. , pp. 978-998. <https://doi.org/10.1108/ITP-09-2019-0463>
- Gu, S., ŚLusarczyk, B., Hajizada, S., Kovalyova, I., Sakhibieva, A. (2021), "Impact of the COVID-19 Pandemic on Online Consumer Purchasing Behavior", *Journal of Theoretical and Applied Electronic Commerce Research*, Vol. 16, No. 6, pp. 2263–2281.
- Hair, J.F., Celsi, M., Ortinau, D.J., Bush, R.P. (2010), *Essentials of Marketing Research (Vol. 2)*,: McGraw-Hill/Irwin, New York, NY.
- Haque, A.U., Basuki, B., Aston, J., Widyanti, R. (2021), "Do Different Stressors Affect Working Efficiency of Public University Personnel Differently?", *Polish Journal of Management Studies*, Vol. 23, No. 1, pp. 172–187. <https://doi.org/10.17512/pjms.2021.23.1.11>
- Iqbal, M.S., Hassan, M.U., Habibah, U. (2018), "Impact of Self-Service Technology (SST) Service Quality on Customer Loyalty and Behavioral Intention: The mediating role of customer satisfaction", *Cogent Business & Management*, Vol. 5, No. 1, pp. 1-23.
- Joshi, D.V.K. (2020), "Empirical Study of Technology Based Auto-Rickshaw Service Quality Perception using SSTQUAL", *International Journal of Management*, Vol. 11, No. 6, pp. 1-15.
- Kaczorowska-Spychalska, D. (2017), "Consumer Perspective of Omnichannel Commerce", *Management*, Vol. 21, No. 2, pp. 95-108.
- Kazancoglu, I., Yarimoglu, E.K. (2018), "How Food Retailing Changed in Turkey: Spread of Self-Service Technologies" *Brititish Food Journal*, Vol. 120, No. 2, pp. 290-308.
- Khalid, B., Chaveesuk, S., Chaiyasoonthorn, W. (2021), "MOOCs Adoption in Higher Education: A management Perspective", *Polish Journal of Management Studies*, Vol. 23, No. 1, pp. 239–256.
- Kline, R.B. (2005), *Principles and Practice of Structural Equation Modeling*, 2nd ed. Guilford Press, New York.
- Lin, P.-H., Lin, C.-Y., Hung, C.-T., Chen, J.-J., Liang, J.-M. (2020), "The Autonomous Shopping-Guide Robot in Cashier-Less Convenience Stores", *Proceedings of Engineering and Technology Innovation*, Vol. 14, 9-15.
- Mango, W., Muceldili, B., Erdil, O. (2017), "An Investigation of Self-Service Technology (SST) of Participation Banking in Turkey", *Journal of Economics, Finance and Accounting*, Vol. 4, No. 2, pp. 145-153.
- Muangmee, C., Kot, S., Meekaewkunchorn, N., Kassakorn, N., Khalid, B. (2021), "Factors Determining the Behavioral Intention of Using Food Delivery Apps during COVID-19 Pandemics", *Journal of Theoretical and Applied Electronic Commerce Research*, Vol. 16, No. 5, pp. 1297–1310, 2021. <https://doi.org/10.3390/jtaer16050073>
- Natarajan, T., Balasubramanian, S.A., Kasilingam, D.L. (2017), "Understanding the intention to use Mobile Shopping Applications and its influence on price sensitivity", *Journal of Retailing and Consumer Services*, Vol. 37, pp. 8-22.
- Okumusa, B., Ali, F., Bilgihan, A., Ozturk, A.B. (2018), "Psychological Factors Influencing Customers' Acceptance of Smartphone Diet Apps when ordering Food at Restaurants", *International Journal of Hospitality Management*, Vol. 72, pp. 67–77.
- Oliveira, T., Thomas, M., Baptista, G., Campos, F. (2016), "Mobile payment: Understanding the Determinants of Customer Adoption and Intention to Recommend the Technology" *Computers in Human Behavior*, Vol. 61, pp. 404-414.
- Oosthuizen, K., Botha, E., Robertson, J., Montecchi, M. (2021), "Artificial intelligence in retail: The AI-enabled Value Chain", *Australasian Marketing Journal*, Vol. 29, No. 3, pp. 264-273. [doi:10.1016/j.ausmj.2020.07.007](https://doi.org/10.1016/j.ausmj.2020.07.007)
- Patil, P., Tamilmani, K., Rana, N.P., Raghavan, V. (2020), "Understanding Consumer Adoption of Mobile Payment in India: Extending Meta-UTAUT Model with Personal Innovativeness, Anxiety, Trust, and Grievance Redressal", *International Journal of Information Management*, Vol. 54, 102144. <https://doi.org/10.1016/j.ijinfomgt.2020.102144>

- Persaud, A., Schillo, S.R. (2017), "Purchasing Organic Products: Role of Social Context and Consumer Innovativeness", *Marketing Intelligence & Planning*, Vol. 35, No. 1, pp. 130-146. <https://doi.org/10.1108/MIP-01-2016-0011>
- Queiroz, M.M., Wamba, S.F.A (2021), "Structured Literature Review on the Interplay Between Emerging Technologies and COVID-19 - Insights and Directions to Operations Fields", *Annals of Operations Research*, pp. 1-27. <https://doi.org/10.1007/s10479-021-04107-y>
- Rahi, S., Mansour, M.M.O., Alghizzawi, M., Alnaser, F.M. (2019), "Integration of UTAUT Model in Internet Banking Adoption Context: The Mediating role of Performance Expectancy and Effort Expectancy", *Journal of Research in Interactive Marketing*, Vol. 13, No.3 pp. 411-435. <https://doi.org/10.1108/JRIM-02-2018-0032>
- Rodríguez-Torrico, P. Cabezudo, R. S. J., San-Martín, S. (2017), "Tell me what they are like and I will tell you where they buy. An Analysis of Omnichannel Consumer Behavior" *Computers in Human Behavior*, Vol. 68, pp. 465-471.
- Taufik, N., Hanafiah, M.H. (2019), "Airport Passengers' Adoption Behaviour towards Self-Check-in Kiosk Services: the Roles of Perceived Ease of Use, Perceived Usefulness and need for Human Interaction", *Heliyon*, Vol. 5, No. 12, e02960, pp. 1-9. <https://doi.org/10.1016/j.heliyon.2019.e02960>
- Venkatesh, V., Thong, J.Y.L., Xu, X. (2012), "Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology. *MIS Quarterly*, Vol. 36, No. 1, pp. 157-178.
- Wall, W.P., Khalid, B., Urbański, M., Kot, M. (2021), "Factors Influencing Consumer's Adoption of Renewable Energy", *Energies*, Vol. 14(17), 5420. <https://doi.org/10.3390/en14175420>
- Yang, T.H., Geetha, S. (2019), "Factors Influencing Consumers' Intention to Use Mcdonald's Self-Service Kiosks in Klang Valley", *BERJAYA Journal of Services & Management*, Vol. 12, pp. 56 -77.
- Yurova, Y., Rippé, C.B., Weisfeld-Spolter, S., Sussan, F., Arndt, A. (2017), "Not all Adaptive Selling to Omni-Consumers is Influential: The moderating effect of product type. *Journal of Retailing and Consumer Services*, Vol. 34, pp. 271-277. <https://doi.org/10.1016/j.jretconser.2016.01.007>



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Citation:

Yerznkyan, B.H., Gataullin, T.M., Gataullin, S.T. (2023), "Mathematical Aspects of Synergy", *Montenegrin Journal of Economics*, Vol. 18, No. 3, pp. 197-207.

Mathematical Aspects of Synergy

BAGRAT H. YERZKNKYAN¹, TIMUR M. GATAULLIN² and SERGEY T. GATAULLIN³

¹ Professor, Chief Researcher, Head of Lab., Central Economics and Mathematics Institute, RAS; Deputy Director of Center at the State University of Management, Moscow, Russia, e-mail: lvova1955@mail.ru, yez@cemi.rssi.ru.

² Professor, State University of Management, Center for Digital Economy, Department of Mathematical Methods in Economics and Management, Moscow, Russia, E-mail: gataullin@inbox.ru

³ Candidate of Sciences, Financial University under the Government of the Russian Federation, Moscow, Russia. e-mail: stgataullin@fa.ru

ARTICLE INFO

Received March 07, 2022
Revised from April 08, 2022
Accepted May 08, 2022
Available online July 15, 2022

JEL classification: A10, B41, C00, O40.

DOI: 10.14254/1800-5845/2022.18-3.16

Keywords:

synergy,
mathematical aspects,
consumption theory,
firm theory,
tax savings.

ABSTRACT

The paper is devoted to the concept of "synergy" and its semantic characteristics - an interdisciplinary direction of scientific research, synergistic effects, joint actions. The line between them is not always clear. And while the thought of synergy seems trivial enough, it has not yet penetrated the mass consciousness of economists. In the paper, attention is paid to such an understanding of synergy, which may be more in demand for economists and will help mathematically support some economic considerations. The paper considers four mathematical examples that can be used to express synergy: production synergy in the theory of the firm, synergy effect in the theory of consumption, tax savings and synergy in management.

INTRODUCTION: SYNERGY AND ITS SEMANTICS

We will talk about the fundamental property of the economy and, even more broadly, of the entire human civilization, especially under the new paradigm of the entrepreneurial economy (Sieja and Wach, 2019). This property is synergy. This word is used by scientific institutions, international scientific journals devote conferences to this concept, and this word is freely used in the general press. But it turns out that today there are two understandings of the term "synergy". Both of them appeal to the Greek word "synergos" - "jointly acting". It is difficult to decide which of them is earlier, more fundamental. There are three similar words that are often confused - these are synergetics, synergism and synergy. Synergetics

is a science that studies the general laws of phenomena and processes in complex non-equilibrium systems. Synergism studies the self-organization of systems or the appearance of structures. It does not affect the synergistic effect that results from the appearance of synergy. Synergy is the equivalent of the concept of "synergy", it is used in works related to chemistry and biology. It is considered incorrect to use this term in the financial literature.

The paper will address the mathematical aspects of synergy and consider approaches to its understanding. Synergy is a complex concept that is currently receiving a lot of attention, and synergy can be quantified only in a few special cases. There are the following approaches to understanding synergy – the first approach was introduced by G. Haken, the second – by I. Ansoff. The paper will focus mainly on the second approach and touch a little on the first one.

We will conditionally consider the first understanding of synergy, introduced by the West German Professor G. Haken in 1969 (see: Haken, 1980). According to Haken, the meaning of the term "synergy" was that complex nonlinear systems are capable of self-organization and self-improvement. In this understanding of the term "synergy", Haken put two meanings: the first is the theory of the emergence of a new property in a whole consisting of actively interacting objects; the second is an approach that requires the cooperation of specialists from different industries for its development. The emergence of synergetics as an independent direction of scientific research can be dated back to 1969. It was then that the German physicist Hermann Haken began to use the term "synergetics" in his course on the theory of laser radiation, which he read at the University of Stuttgart. The new term was formed by him from the Greek expression Synergia, which means cooperation, concerted action, complicity.

What does the coordinated action effect have to do with the behavior of emitting atoms during the formation of a laser light beam? According to Haken, in a laser, a large number of atoms are immersed in an active medium, for example, in a crystal such as ruby. After being pumped from the outside, the atoms are excited and can emit separate arcs of light waves. Thus, each atom emits a signal, that is, it creates information carried by the light field. In the laser cavity, the emitted waves can collide with another excited atom, which will lead to an amplification of the wave emitted by it... Since individual atoms can emit light waves independently of each other, and since these waves can then be amplified by other excited atoms, a superposition of uncorrelated, though amplified, wave trains occurs, and we observe a completely irregular pattern. But when the signal amplitude becomes large enough, a whole new process begins. The atoms begin to oscillate coherently, and the field itself becomes coherent, that is, it no longer consists of separate uncorrelated wave trains, but turns into one almost infinitely long sinusoid.

Here is a typical example of self-organization: the temporal structure of a coherent wave arises without external interference. Chaos is replaced by order. A detailed mathematical theory shows that the resulting coherent light wave serves as a kind of order parameter, forcing the atoms to oscillate coherently, or, in other words, subjugates the atoms". In the above passage, we will first highlight one concept – self-organization. It is the key to understanding the essence of synergy. Synergetics is defined as the science of self-organization or, more broadly, of the spontaneous emergence and self-maintenance of ordered temporal and spatial structures in open nonlinear systems of various natures.

In describing the process of coherent light wave formation, Haken uses a number of other fundamental concepts. Energy pumping means that the system in question is open, that is, it has an intense inflow of energy from outside, as well as outflows of energy. The resulting temporal or spatial structure is formed in the active environment and represents the identification of one of its potentially inherent discrete states. The system reacts non-linearly, that is, the transition from the disorganized behavior of atoms to the fusion of their radiation into a coherent light wave does not occur smoothly, in linear proportion to the increase in energy, but abruptly – at the moment when the energy inflow exceeds a certain barrier. The disjointed and disordered behavior of individual atoms corresponds to the chaotic state of the system, macroscopic chaos, from which order is born through a phase transition. For any system, you can define order parameters that allow you to describe its complex behavior in a fairly simple way, as well as select certain control parameters, when changing which significantly changes the macroscopic behavior of the system. The order parameters subordinate the behavior of individual elements of the system – which is the principle of subordination introduced by Haken.

Over the course of several decades, Haken's followers have written hundreds of articles and held numerous scientific meetings. This direction is associated with the names of I. Prigogine (1984) (Nobel laureate), G. Nikolis (1977, 1989), Soviet and Russian scholars: N.N. Moiseev, V. S. Stepin, S.P. Kapitsa, S.P. Kurdyumov, E.N. Knyazeva, D.S. Chernavsky and others. Synergy is a vivid example of international cooperation between scientists from different countries. In many countries around the world, there are research centers that explore various aspects of this understanding of synergy. In Germany, there is a Center for Synergetics at the Institute of Theoretical Physics, the Center is headed by Haken. The Prigogine School of Science operates in Brussels, in Paris, the Edgar Moreno Center. In our time, in this direction, synergetics is defined as an interdisciplinary direction of scientific research, in which the processes of transition from chaos to order and back (the processes of self-organization and self-organization) in open nonlinear environments of very different nature are studied (Knyazeva & Kurdyumov, 2005, 2007; Raisiené et al., 2019).

Synergetics includes the theory of dissipative structures (I. Prigogine, G. Haken), the theory of auto-oscillations and autowave processes (L.I. Mandelstamm, A.A. Andronov, R.V. Khokhlov, A.M. Zhabotinsky), the theory of "strange attractors" (Lorenz, 1992), B. Mandelbrot, the theory of "catastrophes" (R.V. Khokhlov; A.M. Zhabotinsky; Arnold, 1983; Gilmore, 1984), the theory of bifurcations of dynamical systems (Poincare, V.I. Arnold) and some other theories. We can also say briefly that synergetics is the theory of non-stationary rapidly developing systems. There are three key ideas of synergetics: self-organization, openness of systems, and non-linearity.

The openness of the system means the presence of sources or drains in the system, through which the exchange of matter or energy with the surrounding external environment is carried out. Non-linearity is the fundamental conceptual node of the new scientific paradigm underlying synergetics. Perhaps we can say that the new paradigm is the paradigm of non-linearity.

The described understanding of synergetics is now more fashionable than ever. Everything is included in synergetics – if something is not included in the classical established areas of research, then it is included in synergetics. The mathematical apparatus used in synergetics is also very complex – it includes everything that is possible: from unrecognized (and, perhaps, unscientific) concepts of time to the most complex chapters of the theory of differential equations.

One of the most well-known domestic developers of synergetics is the Nobel Prize winner in chemistry I. Prigogine (who left us in 2003 in Belgium). He gives the broadest interpretation of synergetics as an interdisciplinary science that studies the interaction of elements of different systems, leading to the emergence of spatial, temporal and spatiotemporal structures at microscopic scales. He considers synergetics as a theory of self-organization, based on such disciplines as the theory of catastrophes, system dynamics, the theory of dissipative structures, etc.

The main question of synergetics is: how does order arise from chaos, i.e. something stable, integral and harmonious; what gives mutual reinforcement of action; how does the whole produce a greater effect than the sum of the individual parts. According to I. Prigogine, the relationship between order and disorder characterizes scattered (dissipative) structures. Some of them develop in the direction of a "chaotic goal". A "*chaotic goal*" is neither a state of stability nor a mode of regular behavior. Apparently random, indeterminate walks occur. Therefore, in the process of evolution of two identical systems, the same conditions and causes do not lead to the same results. In the course of the development of economic and social systems, the same causes can cause similar effects only in very limited spaces and time intervals. All the rest of the time, historical development is carried out non-linearly.

Some researchers (and G. Haken himself among them) go even further and point out that for the first time the term "*synergetics*", or "*synergy*" (from the Greek *synergeia*), was introduced more than a hundred years ago by the English physiologist Sherrington during the study of muscle systems and their control by the spinal cord. Since then, in biology, synergy refers to the effect of mutual complementarity of different bio-systems or individual species of flora and fauna. In a broad sense, this effect consists in the fact that the result of the activities of the elements combined in the system exceeds the sum of the results of the work of these elements acting separately. It is this understanding of synergy that the authors of the report will use in the future.

This second understanding of synergy is based on the fact that often the combination of parts into a single whole gives a greater effect than their mechanical sum. In this case, the synergistic effect is said to be positive.

This understanding of synergism is no less important than understanding the synergy of Haken.

The above definition gives the second understanding of synergy only a qualitative character. This definition is also based on the fact that often the whole has more reality than its parts. The quantitative measurement of synergy has been found so far only in some special cases. But even a qualitative understanding of synergy allows us to see the fundamental significance of this concept for the economy, moreover, for the entire civilization. In fact, anything designed, built, or functioning without a synergistic effect does not bear the stamp of perfection, on the contrary, it bears a tinge of inferiority. After all, in this case, the use, processing of resources, and in particular, human labor, occurs with a partial waste of their potentials, and it should be with their multiplication (Kosowski, 2020). It should be noted that human civilization has, in fact, one single resource-living human labor and it must be spent very carefully, achieving the necessary synergistic effect at each stage (Androniceanu et al., 2021; Wielechowski et al., 2021; Bareas et al., 2019).

The very idea of the need for a synergistic effect seems trivial, but in fact it has not yet penetrated the mass consciousness of economists and other specialists, although this understanding of synergy slips through in many publications, even in the public press.

In contrast to the first understanding of the term "synergy" of such a well-recognized founder as G. Haken, the second understanding of the term "synergy", perhaps, does not have. This understanding was born even earlier than the first one – in the 50s of the 20th century in the works of *inter alia* H.I. Ansoff (1989), K.I. Shilin (2003) on strategic planning and strategic management. Among the most famous foreign developers of synergy, it is possible to single out Ansoff, who proposed a fundamental concept that has practical significance. Having defined the economic basis of synergy as the possibility that the result of joint actions of several business units will exceed the final indicator of their independent activity, Ansoff considers both tangible and intangible assets as determining factors in close connection with the capabilities of companies. He identifies two forms of synergy: initial (savings at the stage of formation of the enterprise) and operational (savings at the stage of current activity), the measurement of which is associated with a certain combination of three variables: a higher amount of cash revenue from sales; lower operating costs and investment costs. We will give a very brief description of the second understanding of synergy under consideration.

It is also associated with such names as M. Porter (1985), H. Itami, (Campbell and Luchs, 1998) and others. M. Porter, one of the most authoritative scientists in the field of strategy, argued that managing the relationships between business areas (divisions, business units) is the essence of corporate-level strategy. According to the scientist, in the absence of rational management of relationships, a diversified company is "nothing more than a mutual fund". M. Porter examines the process of creating and strengthening a company's profitable positions in one or more industries based on the analysis of their value chain. The advantage of its concept is that it explains how material relationships or joint activities can achieve a competitive advantage, as well as helps to identify the synergistic potential and assess existing opportunities.

Japanese researcher H. Itami considers synergy as a process of increasing the efficiency of resource use. It defines two types of resources: physical (tangible) assets (such as production capacity) and invisible (intangible) assets. The latter are understood as intangible resources, which can include a brand name, consumer knowledge, technology, a strong, highly engaged employee, and a corporate culture. According to H. Itami, such invisible aspects, due to their uniqueness, are the best long-term source of the company's competitive advantages. They can not be purchased for money, they can be used and developed in different divisions of the company, as well as combined or used in new directions, ensuring the growth of the company.

The firm should strive to improve the results of using all available resources (Zheng et al., 2020; He et al., 2020; Iwashita, 2021). Ways to achieve this goal are to increase the utilization rate of all physical resources (expanding the product range without increasing production capacity) or to enter a new market

in conditions of overproduction at the current one. By increasing the efficiency of the use of physical resources, the organization reduces costs, which is H. Itami defines it as a "complementary effect".

In theoretical terms, approach H. Itami's approach to synergy is very similar to the company's resource concept. Proponents of this concept argue that the company should not be considered as a discrete business, but as a set of tangible and intangible assets, or resources. The works of resource approach theorists emphasize the influence of internal and external sources (market position or industry attractiveness) of competitive advantages (Butkeviciene and Sekliuckiene, 2022). From this point of view, synergy as an effect that occurs in the process of using valuable internal resources is expressed in various end products.

Such scientists-specialists in strategic management K. Clark and K. Brennan offer a broader interpretation of synergy, according to which the corporation is divided into four portfolios: commodity, resource, consumer and technology. Each of them is analyzed using special matrices in accordance with certain criteria. Comparing the results of the analysis of corporate portfolios allows you to determine the potential for synergy of resources, products, consumers and technologies. For example, if the value of a certain group of customers increases, the corporation should focus its efforts on providing it with resources and technologies as a priority. When evaluating the planned integration processes, the company, according to the authors, should identify at least three or four areas of potential synergy, which will provide it with opportunities to use current strengths and develop new ones.

Despite the obvious advantage of synergy, its achievement, as evidenced by the experience of numerous foreign companies (see in fact the review: Campbell and Luchs, 1998), may be limited by the following circumstances:

- the possibility of obtaining a negative result if the combination (cooperation) leads to a non-optimal variant of the formed set of elements, which reduces the stability of the interaction and the equilibrium order;
- the complexity of the task of forming the structures of mechanisms and procedures necessary to create synergistic effects that require appropriate conceptual and methodological justification;
- the need to choose strict criteria for evaluating the effects of the development of quantitative methods for measuring them;
- the need for comprehensive consideration of the entire spectrum of emerging types and forms of synergistic effects, requiring their scientific classification and selection of relevant effects for the field of activity under study, etc.

Any economically organized system is based on certain elements that make up it. Each element has its own potential, its own functions and capabilities. The task of management is to combine the efforts of individual elements into a single mechanism and systemically organize their interrelated actions in such a way that the resulting end result exceeds the effect of independent actions. The activity of individual elements in joint activities will give greater effectiveness, i.e. the qualitative measurement of the result obtained will be superior to the quantitative measurement when all the individual components are added together.

In the process of functioning of complex economic systems, two opposite approaches to responding to the complexity of emerging problems have been developed. The first is based on the principle of "necessary diversity", proposed by R. Ashby. According to this principle, in order to cope with the increasingly complex problems of their environment, the complexity and speed of decision-making must correspond to the complexity and speed of changes in the external environment, i.e., it is necessary to develop increasingly complex organizational structures and management systems. The second approach is related to the principle of "*bounded rationality*", proposed by G. Simon and very similar to the above-mentioned principle of Ashby, according to which both individual managers and entire organizations are unable to cope with problems whose complexity exceeds a certain level corresponding to the ability of managers to make rational decisions.

The contradiction between these approaches is resolved on the basis of: reducing the complexity of the situation by simplifying the strategic position (getting out of unstable areas of activity); setting priori-

ties for emerging problems and ensuring the next solution to the most important of them; reorienting the system or modifying its purpose if the solution to the problem it faces is too expensive or almost impossible; building hierarchical organizational structures to reduce diversity and identify the interaction of external conditions, as well as an orderly representation of the elements of the problem – the actors (stakeholders), their goals, criteria, strategies, alternative outcomes; the choice or development of more effective adaptive management systems (Yerznkyan, 2019; Lu et al., 2021; Prasalska-Nikoniuk et al., 2021).

Problems in which the predominant characteristic is "speed/surprise" are associated with an increase in the dynamics and a decrease in the predictability of processes occurring in the external environment. Such problems appear and develop too quickly to be able to prepare for them in advance and make the necessary decisions in time for the next planning cycle. Their impact causes two types of losses:

- related to the decline in operating profit (impact of the problem);
- the cost of loss prevention (reaction cost). The task of management is to minimize the total losses.

At relatively moderate rates of occurrence of new problems, comparable to the planning period, when solving them, the following methods are used: ranking of emerging problems and differentiated response to them in order of their urgency and importance; formation on the basis of previous experience of a model of success of actions, which allows you to quickly respond to changes in the external environment and choose an effective line of behavior; changing the type of management response to dynamic problems; improving the system of studying and diagnosing the external environment in order to increase the reliability of the information received and the speed of its processing, which reduces the response time to emerging problems.

An important methodological approach to solving such problems is to increase the strategic flexibility of the corporation (external and internal), the end result of which is to increase the ability to make effective management decisions. Strategic flexibility in the external environment is to diversify the economic activities of the corporation, which makes it possible to: provide additional growth in production and profit; reduce the risk of negative impact of possible problems. The internal flexibility of the corporation is expressed in the organization of its funds and structure, which allows you to quickly and effectively switch to the production of new types of products, to develop new markets. The elements of internal flexibility are: the flexibility of the management system, which allows you to respond to changes and emerging problems in a timely manner; the psychological readiness of management for changes; the liquidity of resources, a wide range of personnel qualifications and optimal management, a modular production structure, the readjustment of equipment and equipment!

Problems in which the predominant characteristic is "uncertainty/reliability" are associated with the possible risk of economic losses in achieving the final result. The uncertainty of the final result is influenced by the increasing complexity of relationships with the external environment, the unpredictability of the behavior of market participants, and the interdependence and variability of emerging problems. As the analysis has shown, problems do not exist in isolation, and therefore they cannot be isolated from the whole, explained separately, and integrated into the overall solution.

One of the possible ways to reduce uncertainty in solving complex problems is their hierarchical structuring, i.e. decomposition into components (elements) characterized by different nature and dynamic stability, as well as the gradual establishment of the strength of their relationship (priorities) in the hierarchy. Depending on the increase in the degree of uncertainty of the final result and the impossibility of its prediction, the management tools become more complex, and the role of risk management mechanisms increases.

As it is well known, the creation and functioning of integrated corporate structures is primarily aimed at obtaining a synergistic effect that ensures an increase in economic efficiency.

Returning again to the relationship between the two understandings of synergy, we state: it is very surprising – these two areas of research, two fairly large groups of researchers do not notice each other!

Thus, the monograph (Gataullin and Malykhin, 2007) provides an extensive bibliography of works on the first understanding of synergy, and among the 473 sources, neither Ansoff, Porter, nor Itami are mentioned! And in the no less fundamental monograph (Campbell and Luchs, 1998), in the list of about 200 scientists - researchers of the second understanding of synergy, Haken is not mentioned!

In this paper, we will deal with the second understanding of "synergy". Actually, it is closer to the economy than the first one. Moreover, it is important to emphasize that synergistic effects arise and must be maintained not only at "high" levels, but also, so to speak, in everyday life, at any level of management: at the enterprise level, at the level of municipal, city administration, etc.

1. PRODUCTION SYNERGY IN THE THEORY OF THE FIRM

The activity of any company can be described by the production function f . This function is shown and establishes a relationship between the resources (costs) that enterprise X uses and the output of Y. The production function is an increasing concave function of the cost vector. In the differential positive form, this can be expressed in the first partial derivatives of the function f and the negative definiteness of the Hesse matrix, which is composed of the second derivatives of the function f .

Output Y is usually expressed in kind if the company produces one type of product, and in money – if there is a total value of all products produced. The second approach can be reduced to the first if the unit price v is entered and in the second case v_1 .

Thus, $Y = vf(X)$ is the income of this company or the revenue for the products sold. In the sense of the production function $f(0) = 0$.

As an example, let the firm expend a vector of resources $X = (x_1, \dots, x_n)$ (this is a column vector). Let the firm be able to X . The value $v(\partial f / \partial x_i)$ where the partial derivative is taken at the point X is called the marginal income (in the state X). In terms of content, this means that if another resource unit is involved in the state X , it brings additional revenue in the number of units $v(\partial f / \partial x_i)$. It is important to note that in the state X is not only the involvement of another unit of resource in production brings additional income in quantity $v(\partial f / \partial x_i)$, this is true for any unit of this resource-in particular, because of the indistinguishability in this theory of various units of resource, including living labor. It follows that the resource that is consumed in quantity can generate revenue in size x_i , and the sum of these revenues $V_i = v(\partial f / \partial x_i) \cdot x_i$ across all resources gives the value $\sum_i v(\partial f / \partial x_i) \cdot x_i$ (vector view - $vf'(X) \cdot X$, where $f'(X) = (\partial f / \partial x_1, \dots, \partial f / \partial x_n)$ (this is a vector-string)). Let this value be denoted $\sum_i V_i(X)$ and called the sum of income.

Now we can assume that the production function f is a linearly homogeneous function, i.e., $f(\lambda x_1, \dots, \lambda x_n) = \lambda f(x_1, \dots, x_n)$ or $f(\lambda X) = \lambda f(X)$. Linear homogeneity has the following economic meaning: an increase in λ costs by a factor entails an increase in output by the same number of times. It is given that a linearly homogeneous function satisfies the Euler equation $f(X) = f'(X)X$. This means that for such a function there is $vf'(X) \cdot X = vf(X)$, that is, the amount of revenue is equal to the revenue of this company.

The violation of the linear homogeneity of the production function can be interpreted as follows: let, for example, $f(X) > f'(X)X$. For such a function, it follows that the revenue is greater than the amount of revenue. With this outcome of events, it is said that the synergy effect in the joint (that is, complex)

processing of resources is positive. It can also be concluded that the synergy of such a production function is positive.

Let's define the word "synergy": the value $f(X) - f'(X)X$ is called the synergy of the function f (at the point X) and is denoted $Cin(f)$ (or more precisely $Cin(f)(X)$).

We give the following two theorems without proof.

The first theorem is: the synergy of a linearly homogeneous function is 0.

The second theorem is: let be f is differentiable and $f(0) = 0$, then concavity f implies non-negativity of the synergy at any point. In particular, this is the position for the production function.

If $f(X) < f'(X)X$, then they say that in this case there is a crowding effect. He says that the total processing of resources usually leads to a deterioration in the processing conditions of individual resources, and the effect of total processing is less than the sum of the effects of processing individual resources. In this case, the synergy is also said to be negative. Both (i.e., the synergy effect and the crowding effect) can be observed in reality. Sometimes a real production function gives a crowding effect, for example, when such a function is a Cobb - Douglas function $Y = AK^\alpha L^\beta$ and $\alpha + \beta > 1$. see below. (Note that under this assumption, i.e., the Cobb-Douglas function $\alpha + \beta > 1$ is not concave).

Further, for a more complete representation, we should find the synergy of the Cobb-Douglas production function $AK^\alpha L^\beta$. We have: $Cin = AK^\alpha L^\beta - (\alpha AK^{\alpha-1} L^\beta K + \beta AK^\alpha L^{\beta-1} L) = AK^\alpha L^\beta (1 - (\alpha + \beta))$ and we see that when the synergy $(\alpha + \beta) < 1$ is positive, and when $(\alpha + \beta) > 1$ the crowding effect may appear, when $(\alpha + \beta) = 1$ the synergy is 0.

2. THE SYNERGY EFFECT IN THE THEORY OF CONSUMPTION

This effect shows a second mathematical illustration of synergy. The utility function u is an increasing concave function of the vector of the quantity of goods consumed X . In differential form, this can usually be expressed in the positivity of the first partial derivatives of the function u and the negative definiteness of the Hesse matrix, which is composed of the second partial derivatives of the function u (Gossen's first law). Here it should be assumed that $u(0) = 0$.

Let them consume a vector of goods $X = (x_1, \dots, x_n)$. The quantity $\partial u / \partial x_i$ where the partial derivative taken at a point X is called the marginal utility of the commodity (in the state X), then $(\partial u / \partial x_i) x_i$ is the utility of the total quantity consumed of the commodity x_i , and $u'(X) \cdot X = \sum_i (\partial u / \partial x_i) \cdot x_i$ is the sum of the utilities of all the commodities. The synergy effect in this case is as follows: the utility of a set of goods is greater than or, in extreme cases, equal to the sum of their utilities, i.e. when $u(X) \geq u'(X)X$. Since the utility function is assumed to be concave and differentiable, according to the second theorem, the synergy of the utility function is non-negative.

Further, it can be argued that another reason has been found for the production function and the utility function to be concave (this does not apply to the law of decreasing returns to labor and decreasing marginal utility with increasing consumption). First, we should explain why the production function should be concave. Any human civilization must organize its production in such a way that, in any case, it receives no less from the resources that a civilization has, than it "contains", i.e., from the resources that it has. so that the synergistic effect is non-negative (otherwise, the civilization may disappear). It follows from point 1 that this follows from the concavity of the production function. Next, why should the utility

function be concave? For the same reason – thanks to evolution, man has learned to combine the consumption of products so that as a result of this consumption (Draskovic, 2022; Delibasic, 2022; Yerznkyan and Draskovic, 2022;), at least no less than they contain "singly" (in each individual product), this gives a non-negative synergistic effect.

3. SAVING ON TAXES

Tax savings are the third mathematical illustration of synergy. Under a certain tax system, it is advantageous to combine business units into one. A tax N is called infra-additive (see, for example) if $N(a) + N(b) \geq N(a + b)$. For the sake of specificity, let's assume that we are talking about income tax. Then it follows that even in a completely formal association, the tax paid by the association on the combined profits does not exceed the amount of taxes paid on the profits by the members of this association, and may be less. This is exactly what shows the manifestation of the synergy effect when combining. Note that an infra-additive tax can be called, for example, a tax that is set by a regressive scale. It is clear that such a tax encourages the merger of business units.

On the other hand, a tax N is called ultra-additive (see, for example: Gataullin, 2010; Gataullin et al., 2020) if $N(a) + N(b) \leq N(a + b)$. Again, for the sake of concreteness, we will leave the income tax. Then, even in a completely formal association, the tax paid by the association on the combined profits is not less than the amount of taxes paid on the profits by the members of the association, and may be even more. Note that ultra-additive can be called, for example, a tax set by a progressive tax scale. It is absolutely clear that such a tax encourages the separation of business units.

Next, we will draw up the specified synergistic properties of taxes in the following sentence:

Proposal 1. With a progressive (even ultra-additive) income tax, it is better for the taxpayer to employ several of his relatives and divide his salary between them - the total income tax will decrease; with a regressive (even ultra-additive) income tax, it is better to do the opposite.

4. SYNERGY IN MANAGEMENT

4.1 General provisions

Assume that the energy of the system depends on two parameters $E = (a, i)$ and let the second parameter i is discrete. To bring the system to the state with the parameter i value, you need to expend energy $u(i)$. If $(a, i) > u(i)$, then this can be interpreted as a synergistic management effect. It is natural to achieve management with the maximum synergistic effect. Similar considerations can be developed in the case of a non-continuous parameter.

Example 1. The cost of increasing the unit of labor is u , and the production function is the Cobb-Douglas function $AK^\alpha L^\beta$. Need to study the synergetic effects of managing the volume of labor resources.

Decision. We will assume that the production function gives a monetary estimate of the product produced. Therefore, if $AK^\alpha L^\beta > uL$, then the synergistic effect of the control is positive and equal $\Delta(L) = AK^\alpha L^\beta - uL$. This effect is maximal when the derivative is $\frac{d\Delta(L)}{dL} = 0$. We have

$\frac{d\Delta(L)}{dL} = AK^\alpha (\beta L^{\beta-1} - u) = 0$. Hence, the optimal L is $L^* = (u/\beta)^{1/\beta-1}$. Meaningfully, this means: find the volume of labor resources at which labor resources and fixed assets are in a good relationship with each other.

Example 2. The cost of increasing the unit of funds is u and the production function is the Cobb-Douglas function $AK^\alpha L^\beta$. To study the synergistic effects of managing the volume of funds.

Decision. We assume that the production function gives a monetary estimate of the product produced. Therefore, if $AK^\alpha L^\beta > uK$, then the synergistic effect of the control is positive and equal $\Delta(K) = AK^\alpha L^\beta - uK$. This effect is maximal when the derivative $\frac{d\Delta(K)}{dK} = 0$. We have

$\frac{d\Delta(K)}{dK} = (A\alpha K^{\alpha-1} - u)(L^\beta) = 0$. Hence, the optimal K is $K^* = (u/\alpha)^{1/\alpha-1}$. Meaningfully, this means: find the volume of funds at which labor and fixed assets are in a good relationship with each other.

The considerations given in these examples are valid if the increase in resources or funds occurs from scratch.

It should be noted that the research topics we have mentioned only confirm the idea that the concept of synergy is central to all economic theory and is subject to further more thorough research.

CONCLUSION

In order to approach the mathematical aspects of synergy, which was the subject of the paper, it was first necessary to deal with the very concept of *synergy*. The fact is that, appealing to the Greek word "synergos", various scientists put into it similar, but irreducible concepts. Of these concepts, in which some focus on synergetics as an interdisciplinary science, others on the ability of the system to achieve a synergistic effect, and others on the possibility of cooperation, i.e. the joint action of the actors or other elements involved in the process, in the paper attention was paid to the second of them.

At the same time, it should be remembered that it is often problematic in practice to draw a clear distinction between the various semantic characteristics of synergy. The choice of the semantics we are interested in is explained by the fact that it turned out to be the most suitable for illustrating some of the economic and at the same time mathematically described problems presented in the paper: production synergy in the theory of the firm; the synergy effect in the theory of consumption; savings on taxes; synergy in management.

REFERENCES

- Androniceanu, A., Kinnunen, J., Georgescu, I. (2021), "Circular economy as a strategic option to promote sustainable economic growth and effective human development", *Journal of International Studies*, Vol. 14, No. 1, pp. 60-73. doi: 10.14254/2071-8330.2021/14-1/4
- Ansoff, H. I. (1989), *Strategic Management*, Ekonomika, Moscow (in Russian).
- Arnold, V.I. (1983), *The theory of catastrophes*, Nauka, Moscow (in Russian).
- Bareas, A.K., Alhimyari, B.A., Aljanabi, A.A.A. (2019), "Test the relationship between strategic consensus and organizational performance", *Polish Journal of Management Studies*, Vol. 20, No. 2, pp. 124-133.
- Butkeviciene, J., Sekliuckiene, J. (2022), "Exploring the institutional pressures that affect international new ventures", *Entrepreneurial Business and Economics Review*, Vol. 10, No. 1, pp. 97-112. DOI: 10.15678/EBER.2022.100107
- Campbell, A., Luchs, K.S. (1998), *Strategic Synergy*, International Thomson Business, London.
- Delibasic, M. (2022), "Institutional Failure of Transition", *Media Dialogues / Medijski dijalozi*, Vol. 15, No. 2, pp. 7-23.
- Draskovic, V. (2022), "Neoliberalism as a Quasi-paradigm", *Media Dialogues / Medijski dijalozi*, Vol. 15, No. 2, pp. 83-108.
- Gataullin, T.M (2010), "About the Russian Tax System" Administration, No. 6 (in Russian).
- Gataullin, T.M., Malykhin, V.I. (2007), *Synergy and its manifestations*, Center "Transport", Moscow (in Russian).

- Gataullin, T.M., Gataullin, S.T., Ivanova, K.V. (2020), "Synergetic Effects in Game Theory", *Management of Large-Scale System Development (MLSD'20)*, [El. Resource]: *Proceedings of the XIII International Conference, October 01-03, Moscow, Russia / Under the general Edition of Acad. S.N.Vasil'ev and Dr. A.D.Tsvirkun, / V.A. Trapeznikov Institute of Control Sciences, Moscow (CD-R)*, pp. 1-5 (in Russian).
- Gilmore, R. (1984), *Applied theory of catastrophes*, Vol. 1, 2, Mir, Moscow (in Russian).
- Haken, G. (1980), *Synergetics*, Mir, Moscow (in Russian).
- He, Q., Zhang, J.B., Wang, L.J., Zeng, Y Li, L., Zheng, X., Zhang, J. (2020), "Financial Reporting Quality and Firm Innovation: Evidence from China", *Transformations in Business & Economics*, Vol. 19, No 3C (51C), pp. 508-521.
- Iwashita, H. (2021), "The future of remote work in Japan: Covid-19's implications for international human resource management", *Entrepreneurial Business and Economics Review*, Vol. 9, No. 4, pp. 7-18. DOI: 10.15678/EBER.2021.090401
- Knyazeva, E.N., Kurdyumov, S.P. (2005), *Fundamentals of Synergetics*, KomKniga, Moscow (in Russian).
- Knyazeva, E.N., Kurdyumov, S.P. (2007), *Synergetics*. URSS, KomKniga, Moscow (in Russian).
- Kosowski, T. (2020), "Older workers from the viewpoint of their younger colleagues. Do organisations fail to harness the potential of an ageing workforce?", *International Entrepreneurship Review*, Vol. 6, No. 2, pp. 83-94. <https://doi.org/10.15678/IER.2020.0602.06>.
- Lorenz, G. (1992), *Nonlinear Dynamical Economics and Chaotic Motion*, Springer-Verlag, Berlin.
- Nikolis, J. (1989), *Dynamics of hierarchical systems. Evolutionary representation*, Mir, Moscow (in Russian).
- Nikolis, G., Prigogine, I. (1977), *Self-Organization in Non-Equilibrium Systems*, Wiley, New York.
- Porter, M.E. (1985), *Competitive Advantage. Creating and Sustaining Superior Performance*, Free Press, New York.
- Prasalska-Nikoniuk, J., Stegienko, K., Ulewicz, R. (2021), "Managing the process of supervision over the certificate during a pandemic – remote inspections", *Polish Journal of Management Studies*, Vol. 24, No. 1, pp. 268-280.
- Prigogine, I., Stengers, I. (1984), *Order out of Chaos. Man's New Dialogue with Nature*, Bantam Books, New York.
- Raisiene, A. G., Podvieszko, A., Skulskis, V., Baranauskaitė, L. (2019), "Interest-balanced agricultural policy-making: Key participative and collaborative capacities in the opinion of NGOs' experts", *Economics and Sociology*, Vol. 12, No. 3, pp. 301-318. doi:10.14254/2071-789X.2019/12-3/20
- Shilin, K.I. (2003), *Sociology of managerial creativity*, Vol. 10, Moscow (in Russian).
- Sieja, M., Wach, K. (2019), "The Use of Evolutionary Algorithms for Optimization in the Modern Entrepreneurial Economy: Interdisciplinary Perspective", *Entrepreneurial Business and Economics Review*, Vol. 7, No. 4, pp. 117-130. <https://doi.org/10.15678/EBER.2019.070407>
- Yerznkyan, B.H. (2019), "The Imperatives of Constructing the Large-Scale Corporative Systems of the Meso-Economic Level", *Management of Large-Scale System Development (MLSD'19)*, [El. Resource]: *Proceedings of the XII International Conference, October 01-03, Moscow, Russia / Under the general Edition of Acad. S.N.Vasil'ev & Dr. A.D.Tsvirkun / V.A. Trapeznikov Institute of Control Sciences, Moscow (CD-R)*, pp. 1239-1245 (in Russian).
- Yerznkyan, A.B., Draskovic, V. (2022), "Klockotrization in a Transitional Society and the Media", *Media Dialogues / Medijski dijalozi*, Vol. 15, No. 3, pp. 21-41.
- Wielechowski, M., Cherevyk, D., Czech, K., Kotyza, P., Grzęda, Ł., Smutka, L. (2021), "Interdependence between human capital determinants and economic development: K-means regional clustering approach for Czechia and Poland", *Entrepreneurial Business and Economics Review*, Vol. 9, No. 4, pp. 173-194. <https://doi.org/10.15678/EBER.2021.090411>.
- Zheng, X., Zhai, Y., Wang, Z., Song, J., Wu, S. (2020), "Firm Valuation Based on an Improved Ohlson Model", *Transformations in Business & Economics*, Vol. 19, No 2 (50), pp. 74-91.



ELIT

Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

Author Guidelines

Submit to the journal

Submissions should be sent via e-mail to: Professor Veselin Draskovic
E-mail: vesodraskovic@gmail.com

Review process

Each paper is reviewed by the editor and, if it is judged suitable for this publication, it is then sent to two referees for double blind peer review. The authors' names are anonymous to the reviewers. Based on their recommendations, the editor then decides whether the paper should be accepted as is, revised or rejected.

The Editorial Board retains the right to methodologically adjust the article to the journal propositions and standards of the English language, as well as not to consider articles which do not meet the requirements of these guidelines.

Copyright

Articles submitted to the journal should not have been published before in their current or substantially similar form, or be under consideration for publication with another journal. Use this in conjunction with the points below about references, before submission i.e. always attribute clearly using either indented text or quote marks as well as making use of the preferred Harvard style of formatting. Authors submitting articles for publication warrant that the work is not an infringement of any existing copyright and will indemnify the publisher against any breach of such warranty.

The author is responsible for ensuring the authenticity of data, facts, quotations and other information. The Editorial Boards may publish articles for discussion, without necessarily sharing the author's views.

Manuscript requirements

Please prepare your manuscript before submission, using the following guidelines:

Format

All files should be submitted as a Word document, A4 format, Franklin Gothic Book, font size 11 pt.

Article Length

Articles should be between 5000 and 10000 words in length. For long articles, compliance of editor-in-chief is required. Pictures, graphics and other attachments should be marked and sent as separate files, or in text, and must not exceed the journal format with margins.

Article Language

It is strongly recommended to send articles in the English language. Authors from Montenegro and surrounding countries should submit articles both in English and mother tongue due to the bilingual nature of the website.

Article Title Page - An **Article Title Page** should be submitted alongside each individual article. This should include:

- **Article Title** - A title of not more six eight words should be provided.
- **Author Details** - Details should be supplied on the **Article Title Page** including: Full name of each author, Affiliation of each author, E-mail address of the corresponding author
- **Structured Abstract** - Authors must supply a structured abstract: Purpose, Methodology, Approach, and Findings. Maximum is 250 words in total.
- **Keywords** - Immediately after the abstract, provide a maximum of 6 keywords.
- **Classification codes** - Please provide up to 6 standard JEL codes. The available codes may be accessed at JEL: http://www.aeaweb.org/journal/jel_class_system.html
- **Article structure** - The structure of article should comprise: the title, abstract, key words, introduction, subtitles, conclusion and bibliography. Articles can also be structured in the following way: introduction, starting hypotheses, solutions, discussion, conclusion and bibliography. Divide your article into clearly defined and numbered sections (1, 2, 3 ...). Subsections should be numbered 1.1 (then 1.1.1, 1.1.2 ...), 1.2, etc. (the abstract is not included in section numbering).
- **Abstract** - The abstract must include sufficient information for readers to judge the nature and significance of the topic, the adequacy of the investigative strategy, the nature of the results and the conclusions. The abstract is not an introduction, it summarizes the substantive results of the work, not merely listing the topics that are discussed in the paper. The abstract should contain the main idea of the paper, the subject and the goal of the research, methods used, hypotheses, research results and a brief conclusion. It must have 200 to 250 words.
- **Technical presentation** - Main body of the text should be printed in Franklin Gothic Book, 11pt with single line spacing. Subtitles must be short, clearly defined and numbered, except for Introduction and Conclusion. All tables and figures need to support your research findings. They should be clearly referred to and numbered consecutively in Arabic numerals. They should be placed in the text at the appropriate paragraph, immediately below their name. Below them, the source should be listed. All tables and figures must have captions. In all tables and figures taken or adapted from other sources, a brief note to that effect is obligatory, below the figure
- **Footnotes** - Footnotes should be used as least as possible, and only for the necessary explanations, with the continuous use of Arabic numbers.

References

SSCI recommends that self-citation for the best journals in the field goes around 10%. Accordingly we encourage authors to pay attention to this and cite their own works accordingly.

References is not to be numerated. It is to be arranged in alphabetic order of authors and chronologically for the articles of the same author. Literature is to be quoted according to the examples for books, magazines and other sources. References to other publications must be in *Harvard style* and carefully checked for completeness, accuracy and consistency. You should cite publications in the text: (Ilic, 2009) using the first named author's name or (Ilic and Tot, 2009) citing both names of two, or (Tot et al., 2009), when there are three or more authors. At the end of the paper a reference list in alphabetical order should be supplied:

□ **For books** - Surname, Initials (year), *Title of Book*, Publisher, Place of publication.

e.g. Bagdikian, B.H. (1983), *The Media Monopoly*, Beacon Press, Boston.

□ **For book chapters** - Surname, Initials (year), "Chapter title", Editor's Surname, Initials, *Title of Book*, Publisher, Place of publication, pages.

e.g. Picard, R.G. (2005), "Money, Media, and the Public Interest" in Overholster, G., Jamieson, K.H. (Ed.), *The Press*, Oxford University Press, Oxford, pp. 337-350.

□ **For journals** - Surname, Initials (year), "Title of article", *Journal Name*, volume, number, pages.

e.g. Thacher, D., Rein, M. (2004), „Managing Value Conflict in Public Policy”, *Governance*, Vol. 17, No. 4, pp. 457-486.

□ **For published conference proceedings** - Surname, Initials (year of publication), "Title of paper", in Surname, Initials (Ed.), *Title of published proceeding which may include place and date(s) held*, Publisher, Place of publication, Page numbers.

e.g. Draskovic, V., Grego, Z., Draskovic, M. (2011), "Media Concentration, Neoliberal Paradoxes and Increase in Virtuality" in *Media Concentration proceedings of the international conference in Podgorica*, Montenegro, 2011, Elit, Podgorica, pp. 33-45.

□ **For working papers** - Surname, Initials (year), "Title of article", working paper [number if available], Institution or organization, Place of organization, date.

e.g. Draskovic, V. (2007), "Specificities and problems of Montenegrin transition", working paper, No. ..., Leeds University Business School, TIGER, Warsaw, September.

□ **For newspaper articles (authored)** - Surname, Initials (year), "Article title", *Newspaper*, date, pages.

e.g. Miller, M. C. (1997), "The Crushing Power of Big Publishing", *The Nation*, 17 March, p. 10.

□ **For newspaper articles (non-authored)** - *Newspaper* (year), "Article title", date, pages.

e.g. *Vijesti* (2011), „The New Media“ 2 December, p. 5.

□ **For electronic sources** - If available online, the full URL should be supplied at the end of the reference, as well as a date that the resource was accessed.

e.g. Compaine, B.M. (2005), „The Media Monopoly Myth: How New Competition is Expanding our Sources of Information and Entertainment”, available at: http://www.NewMillennium Research.org//archive/final_Compaine_Paper_050205.pdf (accessed 10 december 2011).

