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O ČASOPISU

Zbornik radova Ekonomskog fakulteta u Rijeci: časopis za ekonomsku teoriju i praksu/ Proceedings of Rijeka Faculty of Economics: Journal of Economics and Business, stalna je znanstvena publikacija Fakulteta. Izlazi od 1971. godine. U razdoblju od 1988. do 1993. izlazi u kontinuitetu jednom godišnje, a od 1993. u dva broja godišnje (proljeće i jesen). Konceptcija časopisa jest orijentacija na objavljivanje tekstova iz ekonomske teorije i ekonomske politike. Primarno je usmjeren na objavljivanje tekstova znanstvenog sadržaja, a samo iznimno i kvalitetnih stručnih radova. Drugi dio sadrži prikaze i ocjene knjiga, pregled nekih važnijih najnovijih izdanja znanstvenih djela u području ekonomskih i njima srodnih znanosti, te obavijesti o međunarodnim konferencijama, javnim pozivima i drugim važnim informacijama. Konceptiju, ciljeve i strategiju časopisa usmjerava Međunarodni savjetodavni odbor. Urednički odbor svojom politikom uređivanja časopisa provodi utvrđene odrednice Međunarodnog savjetodavnog odbora. Časopis je referiran u JEL-u (*Journal of Economic Literature*)/EconLit (*American Economic Association's Electronic Database*), Pittsburgh, Pennsylvania, USA od 1993. godine, a od 2007. i u bazama IBSS (*International Bibliography of the Social Sciences*), ProQuest, Cambridge, UK i DOAJ (*Directory of Open Access Journals*), Lund University, Sweden. Od lipnja 2008. referira se u bazi CAB Abstracts, UK, a od 31. srpnja 2008. godine do 31. prosinca 2018. godine i u bazama SSCI (*Social Sciences Citation Index*), *Social Scisearch* i JCR (*Journal Citation Reports/Social Sciences Edition*), Thomson Reuters, Philadelphia, USA. Thomson Reuters baze referiraju članke objavljene u svesku 1/2007. Časopis i nadalje, a baza Proquest – ABI/INFORM, Ann Arbor, Michigan, USA referira Časopis od sveska 1/2006. Baza SCOPUS, Elsevier, B.V., Amsterdam, The Netherlands referira sve radove objavljene od 2008. godine. Časopis referira i EBSCO, Ipswich, MA, USA u svojim bazama EconLit with Full Text i SocINDEX u Abstracts&Indexing s referencama kao i baza ERIH PLUS od 2016. godine. Od 1. siječnja 2019. Časopis se referira u ESCI – Emerging Sources Citation Index (Clarivate Analytics).

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The Journal is open for cooperation with scientists from Croatia and abroad all year round. Your contribution to economic theory and practice is welcomed.

A special section in the Journal is reserved for Letters to the Editor. Readers and authors are invited to give their comments and suggestions. The most interesting letters, comments, and discussions will be published.

Publisher does not charge “submission fee”. However, if the paper is accepted for publication, the author receives notification on paying publishing fee (285 EUR) and should pay it prior to the publication of the paper. Publisher made a decision to charge publishing fee commencing with the Vol. 33, No. 2, 2015. In addition, starting with the same volume the Publisher uses CrossRef and CrossCheck Services.

In order to maintain the highest level of publishing ethical standards the Editorial Board of the Journal follows the recommendations of the COPE Code of Conduct for Journal Editors (<https://publicationethics.org/>).

CONTENTS – SADRŽAJ

EDITOR'S NOTE	277
ARTICLES – ČLANCI	
<i>Ines Kersan-Škabić, Lela Tijanić</i>	
THE IMPACT OF REMITTANCES ON ECONOMIC DEVELOPMENT IN THE CENTRAL AND EASTERN EUROPEAN COUNTRIES Conference paper (Original scientific paper)	281-296
<i>Bojan Tomić, Saša Žiković, Lorena Jovanović</i>	
CRYPTO PORTFOLIO OPTIMIZATION THROUGH LENS OF TAIL RISK AND VARIANCE MEASURES Conference paper (Original scientific paper)	297-312
<i>Petra Adelajda Zaninović</i>	
DO ICT AND TECHNOLOGICAL DEVELOPMENT FACILITATE SUPPLY CHAIN TRADE? Conference paper (Original scientific paper)	313-327
<i>Jelena J. Stanković, Ivana Marjanović, Sandra Milanović, Milica Jovanović Vujatović</i>	
DETERMINANTS OF ENTREPRENEURIAL DYNAMICS: THE CASE OF THE EUROPEAN UNION Conference paper (Original scientific paper)	329-351
<i>Lela Nurlaela Wati, Heri Ispriyahadi, Dhika Habibi Zakaria</i>	
THE FLYPAPER EFFECT PHENOMENON OF INTERGOVERNMENTAL TRANSFERS DURING THE COVID-19: EVIDENCE FROM INDONESIA (Original scientific paper)	353-373
<i>Hoda Mansour</i>	
THE IMPACT OF ICT CAPITAL GROWTH ON ECONOMIC GROWTH: THE CASE OF EGYPT Conference paper (Original scientific paper)	375-394
<i>Phuong Mai Nguyen, Thi-Minh-Ngoc Luu, Nam D. Vo, Phuc Nguyen Nguyen</i>	
ROLE OF PERSONALITY TRAITS IN SHAPING ENTREPRENEURIAL INTENTION: COMPARATIVE STUDY OF SOUTH KOREA AND VIETNAM (Original scientific paper)	395-420

Bora Aktan

EMERGING EQUITY MARKET REACTION TO PANDEMIC
PREVENTION POLICY: EVIDENCE FROM REGRESSION
DISCONTINUITY DESIGN (Preliminary communication) 421-439

Darija Prša, Aljoša Šestanović, Ivo Ramljak

FACTORS INFLUENCING DIVIDEND PAYOUT POLICY:
EVIDENCE FROM LISTED NON-FINANCIAL FIRMS OF
THE ZAGREB STOCK EXCHANGE (Preliminary communication) 441-457

Ardi Ahmeti, Yllka Ahmeti, Skender Ahmeti

THE IMPACT OF WORKING CAPITAL MANAGEMENT
ON SME PROFITABILITY – EVIDENCE FROM KOSOVO
(Preliminary communication)..... 459-478

GUIDELINES FOR AUTHORS – UPUTE AUTORIMA 479-502

Editor's note

Dear authors, reviewers, readers and colleagues,

This year has been challenging in many ways, both in terms of economic theory and practice and in our efforts as an academic journal to reflect this reality in scholarly publications. With this in mind, we have increased our efforts to expand our editorial team and maintain our high standards of quality in the publication process. Due to the increasing intensity of our activities, we have hired two editorial assistants and a new technical editor. In addition to the new members of the editorial board, we are sure that these organizational changes will increase our capacity in the near future. We are also pleased to announce that we will be using the ScholarOne Manuscripts platform from January 1, 2023. This means that authors will need to upload their papers through the ScholarOne Manuscripts platform, which is available at <https://mc04.manuscriptcentral.com/efriproceedings>.

In June 2022, our fifth conference Digitomics – Economics of digital transformation was successfully held in a hybrid mode. The central theme of the conference was “Dealing with Uncertainty.” In addition to a series of high-profile keynotes, we held our traditional panel discussions on smart cities and the Unger Foundation transdisciplinary panel. We are also pleased to publish five papers from the conference that were selected by the editorial board as the best among the many submitted and presented in June.

Next year, our conference will be held a bit earlier – June 8-10, and as always, in hybrid mode. For more information, visit our conference website – www.edt-conference.com. The main theme of next year’s conference will be “Perspectives on Resilience of Economic Systems,” where we intend to discuss the resilience of economic systems threatened by various challenges such as the return of inflation, increasing security threats, and the current dilemmas of epidemiological developments. As always, the best papers will compete for publication in our journal.

Dear readers, authors, reviewers, and all our supporters, thank you for your contributions to our journal. We look forward to your continued engagement, whether through email correspondence or via the LinkedIn profile of our journal and the EDT conference.

We wholeheartedly wish you all the best in 2023!

Sincerely,
Professor Saša Drezgić
Editor-in-Chief

ARTICLES – ČLANKI

Conference paper (Original scientific paper)

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The impact of remittances on economic development in the Central and Eastern European Countries*

*Ines Kersan-Škabić*¹, *Lela Tijanić*²

Abstract

Emigration flows and their relations with economic development can be observed through different aspects, where one of the important questions is the role of the remittances, and transfer of foreign money to home countries. The objective of this study is to investigate the impact of remittances on economic development in Central and Eastern European countries. A review of previous research on the role of emigration and the impact of remittances on economic development is presented in the first part of the paper. This is followed by panel data analysis. The analysis covers the period after the enlargement of the European Union (EU) in 2004 till the nowadays. The results confirm the positive and statistically significant influence of personal remittances on the economic development of the new EU member states, as well as the positive and statistically significant influence of final consumption, gross fixed capital formation, external trade balance, and foreign direct investments. The positive influence of remittances on economic development should be observed with caution, regarding that remittances are the results of emigration and also are connected with the unfavourable effects of emigration. This study adds to previous research about the significance of remittances in the economies of the new EU member states.

Key words: *migrations, remittances, economic development, Central and Eastern European Countries*

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1. Introduction

Waves of the EU enlargements in 2004, 2007, and 2013 enable the free movement of people in the entire EU, among many other benefits³. This includes the possibility of finding a job in another EU member state, taking advantage of a social security system, and having the same rights and obligations as the domestic population in the labor market. The group of new EU member states (NMS) is lagging in economic development in comparison with the EU-15(14) (*old member states*), which can be confirmed through different socio-economic indicators. The workers in NMS are faced with a lower standard of living, difficulties with finding a job, lower salaries, and high corruption, which enable them to think about migration to some high-developed EU member states. The emigration from EU NMS (EU-13) in the period 2004-2020 counted more than 9 million people, where the majority of them emigrated from Poland (2.9 million) and Romania (2.7 million) (Eurostat, 2022a). In 2020, 447.3 million inhabitants were living in the EU, and 13.7 million persons, living in one of the EU Member States with the citizenship of another EU Member State (Eurostat, 2022c).

The emigration flows and their implications can be observed from different aspects: from the determinants of migrations (Bunduchi, et al., 2019; El-Sakka and McNabb, 1999), migration flows as a source of economic growth, their effects on convergence, gross domestic product (GDP) per capita, productivity, the labor market in emigrant and immigrant countries (Rausser et al., 2018; Tolmacheva, 2020; Bayar, 2015; Barbone et al., 2012), the role of remittances from workers in reducing poverty (Butkus et al., 2020), etc. Emigrations from NMS are very often seen through their unfavorable influence on home (emigrant) countries. Remittances can also represent a significant part of incomes in emigrant countries and even reduce unfavorable trends seen through other indicators (e.g. balance of payments, lower level of development, underdeveloped factors of growth, etc.). But, this should be observed by the fact that higher remittances mean also lowering the labor force and risk of permanent emigration.

Previous researches about the influence of remittances on economic development give diverse conclusions and some of them highlight that these effects differ because of socioeconomic development differences (Meyer and Shera, 2016; Kabat et al., 2020). In this paper, we will focus on the remittances from abroad and their impact on the economic development of receiving (emigrant) Central and Eastern European countries. The main hypothesis of the research is that personal remittances have a

³ EU-15 member states were afraid of large immigrations from East European countries and some of them have introduced the so-called transition period in a maximum of seven years (“2+3+2”) in which they continue to apply the (rigid) regulation of employment of workers that come from the mentioned countries that was conditioned by having a residence or work permit.

significant influence on the economic development of the new EU member states. We will include the data for the period 2004-2020 (as the first big eastern enlargement happened in 2004) and we will focus on the EU's new member states, EU-11 (EU 13 without Cyprus and Malta). Panel data analysis will be applied to estimate this influence. The novelty of this research is considering the impact of remittance flows of the group of new EU member states starting from the EU enlargement (that gradually enable more internal mobility) till the nowadays, while most of the studies cover one or a smaller sample of them and/or previous periods.

The paper is structured as follows: after the introduction, a literature review is given in the next section, followed by the methodology in the third section, and empirical data and analysis in the fourth section. The results of the panel data analysis with discussion are presented in the fifth section before the final concluding remarks.

2. Literature review

Free movement of people and migration issues represents important themes in investigating (European) integration. The migration issue in the economic theory can be explained from the neoclassical point of view with the combination of new economic geography. Both approaches deal with the changes in the physical amount of labor or the relation of labor to capital supply that is the result of i(e)migration (Badinger et al., 2004; Barro, 2015; Barro and Sala-i-Martin, 2004; Bouayad-Agha and Védrine, 2010). Incaltarau et al. (2021) explain that the migration inflows decrease the capital stock relative to workers and that this can lead to catching up in income per capita. This may be connected to further adjustments at the level of wages, employment, and unemployment between the source and destination country. According to the new economic geography models, an increase in wages will attract larger flows of migrants, which can enforce a cumulative causation mechanism (Baldwin, 1999; Krugman 1991).

By focusing on remittances, micro and macroeconomic dimensions can be implemented. While the first one comprises the personal income and its positive impact on the consumption of receiving household in the home (emigrant) country, the macro-economic approach includes different variables for measurement of the bi-directional impact of the remittances on the economic activity (balance of payments, wages, etc.) in both the home and host countries (Stark and Bloom, 1985; El-Sakka and McNabb, 1999; Buch and Kuckulenz, 2004). On the macro level, the relationship between remittances and national characteristics like government expenditures and the GDP of immigrant and emigrant country are also researched (Hathroubi and Aloui, 2016; Akkoyunlu and Kholodilin, 2008; Vargas-Silva 2008; Šimková and Langhamrová, 2015). Furthermore, the authors in this domain investigate the determinants of remittances and their impact. Kapur (2004)

indicates the importance of remittances as a source of external development finance for developing countries by comparing them with other external financing sources. Mexico, whose case has often been researched in the literature (Amuedo-Dorantes and Pozo, S, 2006; Taylor et al., 2005), is one of the countries with the highest receipt of remittances, and its case.

Within Europe, Central and Eastern Europe entered into the EU (during the beginning of the transition process in the 1990s) and consequently, with their increase in remittances, have faced a progressive emigration process. Butkus et al. (2020) researched the impact of remittances on poverty reduction in seven Central and Eastern European countries within the period 2006-2015. They applied panel data analysis (pooled OLS, fixed effects, random effects, and 3-stage least squared estimators) and came to the results that remittances have a significant positive impact on poverty (on three out of four measures). Rausser et al. (2018) found that remittances had a positive impact on economic development in Lithuania, Latvia, and Estonia. Meyer and Shera (2016) performed the panel data analysis (fixed, random effects, pooled regression, where fixed effects were used for the final interpretation) covering six Balkan countries during the period 1999–2013 and they confirmed that remittances have a positive impact on economic growth in mother countries.

Kabat et al. (2020) also researched the remittance inflows in Visegrad countries. They performed the analysis in the period 2000-2018 searching for the impact of remittances on the GDP per capita and GDP per capita growth, where the results show a positive impact on GDP per capita, while their impact on GDP per capita growth was not found. Kajdi and Ligeti (2020) studied the remittances in Hungary with two intentions: to provide empirical evidence for the major factors that determine the remittance propensity (probit regressions) and to introduce variables that are associated with money transfer (OLS regressions). Their approach is based on the characteristics of the senders and they found that older men with vocational school education have the highest remittance propensity, and the likelihood of sending private support is higher among short-term migrants. Barbone et al. (2012) found that the remittances in Poland strongly increased from 0.5 to 1.5 % of GDP from 1995-2011, peaking at 2.5 percent of GDP within the period 2006-2007. That influenced the increase in GDP growth and has contributed to welfare for some segments of the Polish population. Bayar (2015) researched the sample of Central and Eastern European countries in the period 1996-2013 by applying the causality test. The results indicate unidirectional causality from remittances and foreign direct investment inflows to economic growth. Gjini (2013) analysed the impact of remittances on economic growth in 12 Central and Eastern European countries, in the period 1996-2010, by using a fixed effects model with heteroscedasticity to correct the standard error. By applying the model where other sources of economic growth were included, gross capital formation, foreign direct investment, and openness of the economy, he found that the remittances have had negative effects on growth.

Romania became an EU member state in 2007, and at that time, it was one of the two least developed countries in the EU (another one is Bulgaria). Its GDP per capita (in PPP terms) in 2007 was at the level of 44% of the EU average⁴ (Eurostat, 2022b). Because of this, accession to the EU opened a great opportunity for the Romanians to apply for jobs in the developed EU members and to emigrate. Bunduchi et al. (2019) researched the macroeconomic determinants of remittances in Romania, by using panel data analysis. Simionescu (2019) compared the emigration flows of Romania (an EU member) and Moldova and Ukraine which are not EU members. She found that Romania, which lost 17% of its population, received 2.5 percentage points more remittances than the other two countries. This huge amount of money is analysed by many authors. E.g. Silași and Simina (2008) found that remittances had contributed to economic development in the short run. Goschin (2013) applies the OLS methodology and found a positive impact of remittance inflows on the economic growth in Romania over the 1994-2011 period. Niță (2018) determined that remittances have a positive impact on Romanian economic development. Mansoor and Quillin (2007) additionally explain that remittances positively impacted the decrease of poverty and supported saving. The inflow of remittances in the emigrant country may have different implications for the domestic country and that depends on the way of using this money. If they are used for investing in the production process, they will have a substantially positive impact, while if they are mainly absorbed in consumption, they will boost imports and the positive impact will be omitted. It is possible that the effect on economic growth will just be in a short period. In the long run, remittances did not ensure economic growth but stimulated households' final consumption and income inequality (Haller et al., 2018). Blouchoutzi and Nikas (2010) made an econometric analysis (time series analysis) of the impact of remittances on the consumption, investment, and imports of Romania, Bulgaria, and Albania. Their results indicate the positive impact of remittances on all three variables and confirm the crucial role of remittances.

In the next section, the influence of remittances on the economic development of the Central and Eastern European countries after the enlargements will be tested.

3. Methodology

The impact of remittances on economic development in the sample of the 11 EU NMS will be estimated below. This group of countries differs from the old member states, while the opportunity to migrate to more developed EU countries was recognized especially after their EU accession in 2004, 2007, 2013, so the period chosen for the analysis is from 2004–2020. In the group of the 13 NMS, Cyprus and Malta were not included regarding data limitations.

⁴ In 2020, the Romanian GDP per capita reached a level of 72% of the EU average.

The panel data methodology will be employed due the sample is characterised by the longitudinal dimension (represented by a time series ($t = 2004, \dots, 2020$) and cross-sectional dimension (represented by countries ($i = 1, \dots, 11$)). Selection of panel data analysis relies also on literature review presented in the previous section, where it can be seen that papers which deal with the similar aims, the influence of remittances on economic growth and development of the group of countries use this methodological approach. The following relationship will be estimated to determine the impact of remittances on economic development:

$$Y_{it} = \beta_1 X_{it} + \alpha_i + u_{it} \tag{1}$$

The dependent variable (Y_{it}) is GDP per capita in the country i ($i = 1, \dots, 11$), t denotes year ($t = 2004, \dots, 2020$) while X_{it} includes independent variables (see table 1 for detailed explanation on the variables included). Vučković and Škuflić (2021) have used the same equation in investigating the effects of emigration on financial and social system sustainability in the 11 NMS. The relationship in their paper is estimated with the fixed effects model (they have used country-specific effects to avoid biased estimates and robust standard errors clustered by country because of heteroscedasticity and correlation). Dependent and independent variables in our analysis are chosen regarding the previous studies, the characteristics of open economies in the group of the Central and Eastern European countries and the main aim of this research. Variables are presented below.

Table 1: Variables used in the analysis and databases

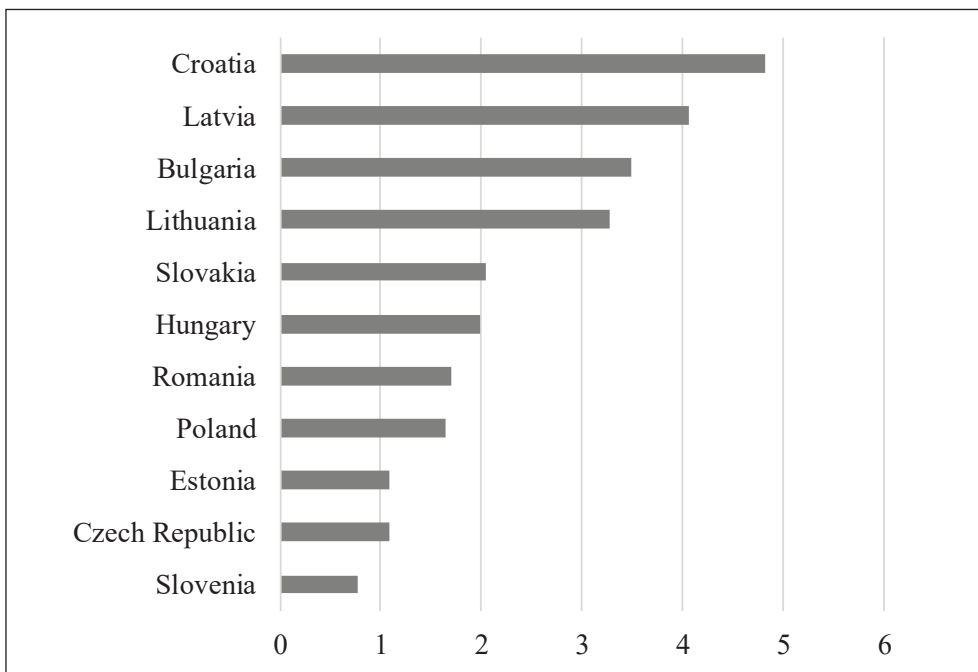
Variable	Description	Database
GDP per capita	GDP per capita (EUR)	Eurostat (2022d)
Consumption	Final consumption per capita (EUR)	Eurostat (2022b)
Gross fixed capital formation	Gross fixed capital formation (% of GDP)	Eurostat (2022b)
Government spending	Government spending (% of GDP)	Eurostat (2022b)
Trade balance	External trade balance (mil. EUR)	Eurostat (2022b)
FDI	Foreign direct investments per capita (EUR)	WIIW (2022)
Personal remittances	Personal remittances (% of GDP)	World Bank (2022)

Source: Authors' compilation

4. Empirical data and analysis

According to World Bank (World Bank, 2022) “*personal remittances comprise personal transfers (all current transfers in cash or in kind made or received by resident households to or from non-resident households) and compensation of employees (income of border, seasonal, and other short-term workers who are employed in an economy where they are not resident and of resident employed by non-resident entities)*”. Figure 1 presents the share of remittances in GDP for the analysed NMS.

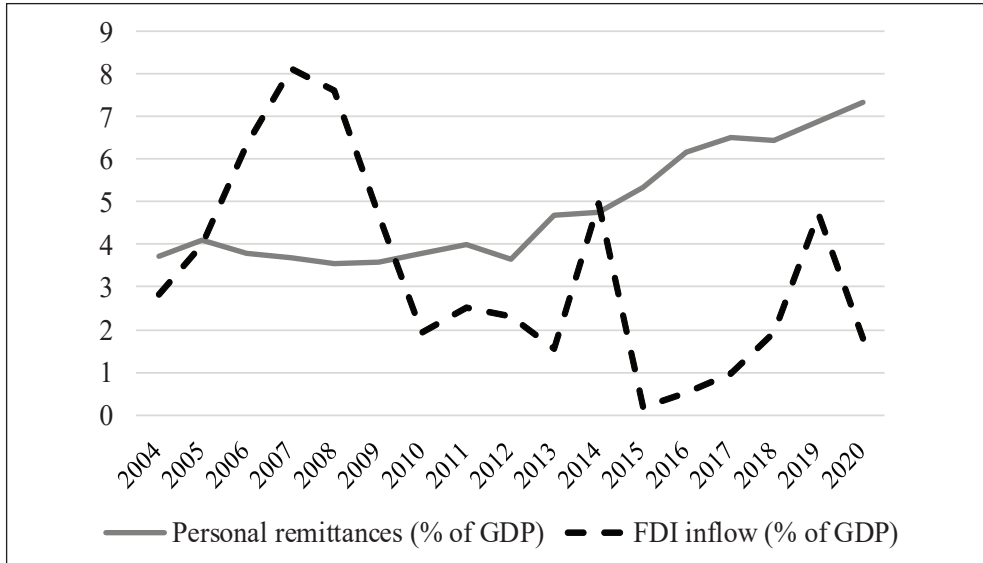
Figure 1: Share of personal remittances in GDP in 11 Central and Eastern European countries (in %), average 2004-2020



Source: Authors' compilation based on World Bank (2022)

As presented in Figure 1, in the group of the 11 NMS, countries with the highest share of personal remittances of GDP are Croatia, Latvia, Bulgaria, and Lithuania. If we look in more detail at the case of Croatia and compare the data about the share of FDI and remittances in GDP, it can be seen that in some periods, the share of personal remittances in GDP in Croatia is higher than the share of FDI in GDP. Also, there can be seen an increasing trend in the share of personal remittances in GDP after the EU accession (Figure 2).

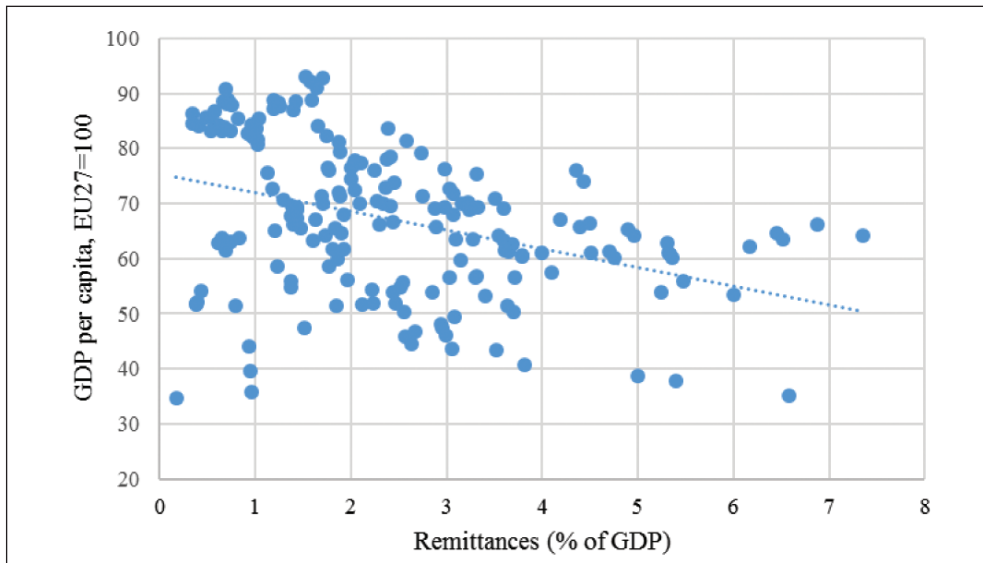
Figure 2: Share of personal remittances and FDI in GDP in Croatia (in %), 2004–2020



Source: Authors' compilation based on WIIW (2022) and World Bank (2022)

Figure 3 presents the relationship between personal remittances and GDP per capita for the 11 NMS.

Figure 3: Remittances and GDP per capita in the EU NMS, 2004-2020



Source: Authors' compilation based on World Bank (2022) and Eurostat (2022d)

The importance of remittances is decreasing with the higher level of development (GDP per capita). The importance of remittances is highest in the countries with lower GDP per capita in comparison to the EU average.

Diverse opinions on the impact of remittances on economic development can be expected according to previous studies and observed possible relations. The contribution to growth can be seen through a positive influence on consumption, savings or accelerating investments, development of financial institutions that handle remittance payments and it can help reduce debt and poverty problems. The effect on consumption depends also on the structure of consumption (in countries that depend on foreign goods the effect on productivity, growth, and development can be lower than expected or negative). A similar can be connected with the structure of investment (only productive investments will lead to positive effects). The positive impact of remittances on the balance of payments is especially important for countries with significant imports. But, remittances can influence the appreciation of the real exchange rate in the recipient countries, which can have implications for trade and competitiveness. The improvement of the current account balance, which also leads to an appreciation of the domestic currency, loss of competitiveness and a fall in exports represent signs of a *Dutch disease*⁵. In the long term, high remittances can have unfavourable effects also because of the loss of population, demographic, labour force potential which is a precondition for the development. Based on the given explanations, it is interesting to estimate the effect of remittances on the economic development of the NMS. The further section presents the results of the static panel data analysis, while implications for further studies that will include additional aspects are given in the final elaboration.

The results of the econometric panel data analysis, using the fixed effect estimator, are presented in Table 2. The model was estimated by using the fixed-effects estimator, additionally confirmed by the Hausman tests. Based on the interpretation given in Gujarati and Porter (2009), the results of the Hausman test in our study implied that the null hypothesis is rejected, so we can conclude that a fixed effect model is preferred to a random effect model (which is another panel data estimator used in case if the random effects are correlated with one or more regressors). Clustered robust standard errors are applied to control for the heteroscedasticity across the panels and autocorrelation within the panels (confirmed by the Wald test for heteroscedasticity and the Wooldridge test for autocorrelation).

⁵ Polat and Andrés (2019: 60) explained that “...adverse effect of large inflows of foreign currency on the appreciation of real exchange rates is known as the “Dutch Disease”, a term originally coined in *The Economist* (1977) in reference to the adverse impact on the competitiveness of the Netherlands’ traditional tradable sector, of windfall revenue from post-1960s natural gas exports”.

Table 2: Results of the estimation – the influence of personal remittances on economic development of the Central and Eastern European countries

Variable	Estimation results (fixed effects)
Dependent variable: GDP per capita	
Explanatory variables	
Constant	-0.0132005 (0.1492397)
Consumption	1.002166* (0.0189276)
Gross fixed capital formation	0.1402424* (0.0387031)
Government spending	-0.0648489 (0.0457686)
Trade balance	0.0111181** (0.0034355)
FDI	0.0032428** (0.0013376)
Personal remittances	0.0294189** (0.0091092)
Observations	88
R-squared	0.98

Standard errors are cluster robust (presented in parentheses), *, **, *** refer to significance at the 1%, 5% and 10% levels. All variables are included in logs.

Source: Authors' calculation

The results presented in Table 2 confirm the hypothesis that personal remittances have positive and the statistically significant influence on the economic development of the 11 NMS in the analysed period 2004–2020, after their accession in the EU.

5. Results and discussion

From the results presented above, we can see that the policymakers in the group of countries observed should be aware of all possible influences that the strong dependence on remittances can have. Different researchers confirm and very often discuss the role of the FDI in the EU's new member states, especially in the EU member states that have high emigrations, including also the movements in the period after the EU enlargements.

The results of the analysis are in line with the research presented in the theoretical part of this paper that explains possible positive channels of remittances' influence in countries that have strong emigrations and that can use remittances to solve some other economic problems. Regarding that, the role of remittances as an important economic factor here must be highlighted in addition to these total macroeconomic effects, there is the need to investigate in more detail the direct and indirect significant influences which can be the results of the higher remittances and that in the long-term can lead to undesirable effects, e.g. on the labour market, for the entrepreneurship and further development. Empirical results (for example, World Bank Group (2016)), confirm that immigration can bring benefits to receiving country economies, depending on the extent the immigrant skills are complementary to the existing workforce, which is also interesting to investigate in more detail, as well as other specificities of the receiving countries that were not the primary aim of this research. Specific direct and indirect remittance channel effects can/must be a part of future studies because direct and indirect growth effects can differ and hide some negative effects that are not seen when observing the influence of remittances on the economic development of national economies (especially across different countries). The quality of transferring institutions and good governance institutions are also important here (as mentioned in Kabat et al., 2020). Some studies highlight the relationship between corruption behaviour and remittances and this possible problem should be observed in the NMS. Estimation also shows that positive and statistically significant influences in our sample have: final consumption, gross fixed capital formation, external trade balance, and FDI, while government spending is not statistically significant and has a negative impact. The negative impact of government spending can be connected with the structure of spending. On the sample of selected Central and Eastern European countries Radulescu et al. (2019) have determined the negative impact of government spending on the GDP per capita because of non-productive public expenses, which can be one of the reasons for our results.

6. Conclusions

This study confirms the main hypothesis of the paper with the presented positive and significant influence of personal remittances on the economic development of the observed NMS, based on the analysis after their EU accession. Even though there can be expected that this will partly contribute to their convergence with the developed member states and can reduce the problems these countries are facing (e.g. debt, imports, poverty, household problems, etc.), this positive sign must be interpreted with caution and further investigated because higher remittances for the countries that have significant emigrations can influence on the characteristics and motivations of their labour force, exchange rate appreciation, competitiveness. This study adds to previous research about the contribution of emigration to home

countries and to discussions about the significance of remittances in the new EU member states. With the option to have longer time series, there is the possibility to use other methods of estimation of the considered influence. Relatively short time series and a small number of units had an influence on the decision about the panel-data estimator which should be highlighted as one of the constraints of this study. In future studies, besides that it would be interesting to include other indicators that are connected with the economic development (as the dependent variable) and to analyse the effects on the economic growth of the recipient countries, it is also necessary to estimate the influence of remittances on selected demographic variables, indicators that describe labour markets and entrepreneurial activities as well as to further develop statistics that will determine their formal and informal channels and the usage of remittances. The resilience of remittances during a COVID-19 pandemic can be a part of future estimations. Policymakers should analyse different approaches and possible effects before making recommendations connected with migration and other policies that deal with personal remittances and direct remittances towards productive investments.

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Utjecaj doznaka iz inozemstva na ekonomski razvoj zemalja srednje i istočne Europe

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Sažetak

Povezanost emigracija i ekonomskog razvoja može se sagledati prema različitim pristupima, gdje je jedno od bitnih pitanja uloga doznaka iz inozemstva, odnosno utjecaj priljeva sredstava iz inozemstva u zemljama emigracije. Cilj ovog rada je istražiti utjecaj doznaka iz inozemstva na ekonomski razvoj zemalja srednje i istočne Europe. Pregled dosadašnjih istraživanja o ulozi emigracija i utjecaju doznaka iz inozemstva na ekonomski razvoj prikazan je u prvom dijelu rada. Slijede rezultati panel analize. Analiza obuhvaća razdoblje nakon proširenja EU 2004. Rezultati potvrđuju pozitivan i statistički značajan utjecaj doznaka iz inozemstva na ekonomski razvoj novih zemalja članica EU. Utvrđen pozitivan utjecaj doznaka iz inozemstva potrebno je promatrati s oprezom, s obzirom na to da su doznake iz inozemstva rezultat emigracija te također mogu biti povezane s negativnim učincima emigracija. Rad doprinosi dosadašnjim istraživanjima o utjecaju doznaka iz inozemstva u novim zemljama članicama EU.

Ključne riječi: *migracije, doznake iz inozemstva, ekonomski razvoj, zemlje srednje i istočne Europe*

JEL klasifikacija: *F22, F24, O10, O15*

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Crypto portfolio optimization through lens of tail risk and variance measures*

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Abstract

The choice of an adequate risk measure in portfolio optimization depends to a large extent on the characteristics and dynamics of the underlying assets. For investors and asset managers, a range of potential market risks provides much-needed insights into the optimization of their portfolio of assets. Since this paper focuses on multiple risk measures, it presents the investors with a better insight into the potential magnitude of the risk they are faced with. Since the risk-reward optimization target can be adjusted for a broad choice of risk measures in this paper we will test the performance of the classical risk measure i.e. standard deviation versus a tail risk measure such as expected tail loss (ETL). Our goal is to find which of the two offers the better performance for a portfolio of cryptocurrencies and if the differences are statistically significant. The setup for our analysis is testing two optimization targets (MinVar and MinETL) on 10 portfolios of cryptocurrencies randomly chosen from a sample of 70 cryptocurrencies with the highest market capitalization.

Key words: portfolio optimization, cryptocurrency, risk evaluation, investments

JEL classification: E49, G11, P45

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1. Introduction

The introduction of Bitcoin protocol in 2008 and its operational launch in January 2009 created a revolution in the world of alternative financial investments giving life to a new concept of a decentralized transaction system. Bitcoin, a pioneer in decentralized finance, also offered other appealing features such as small fees and almost instantaneous transactions involving no “middle-man” in the sense of a central governing body or an intermediary. Therefore, our paper looks at the risk profile of these investments.

When choosing the optimal portfolio for a given investor, it is paramount to consider the risk vs. expected return trade-off. Portfolio optimization is an area of interest that has gained attention during the last decades. Financial services and products have grown in number and sophistication. Nowadays, most trades are executed by a computer; retail investors have access to robo-advisors or even by themselves with their smartphones or computers through an online broker like Interactive Brokers or Robinhood.

Technology also catalysed the emergence of new asset classes like cryptocurrencies and Exchange Traded Funds (ETFs). Global assets invested in ETFs grew from merely 203.4 billion USD in 2003 to 9.1 trillion USD in 2021. Through the innovations in Blockchain, the asset of cryptocurrencies was developed. As of, September 23rd, 2020, the total capitalization of the 5,884 cryptocurrencies is of 334.8 billion USD according to CoinGecko. Harry Markowitz got a powerful insight into the selection of an optimal portfolio for an investor’s given risk aversion. In his paper “Portfolio Selection”, Markowitz (1952) considers that investors maximize expected returns and perceive variance as undesirable. For the lack of a better metric, he proposed the use of variance as the risk measure of an asset. He describes the feasible efficient line where a set of efficient portfolios are obtained for different risk profiles along the efficient frontier. Along the efficient frontier investor can find portfolios that maximize returns for an additional unit of risk (maximum Sharpe ratio portfolio) and the Global Minimum Variance (GMV) portfolio. Diversification is the key idea behind Markowitz’s idea of risk-reward trade-off. The diversification is set through the variance of assets and covariances between them in a portfolio.

With the development of information technologies and the Internet in the last two decades, work on already existing ideas of digital money is intensifying. Parallel to this, the focus of academia and industry has been placed on preserving the value of asset holdings to which our paper is devoted. As a result of that work, a document entitled “Bitcoin: A Peer-to-Peer Electronic Cash System” was presented in 2008, describing a new decentralized transaction system that does not involve intermediaries between the entities of interest. The Bitcoin protocol was released on 9 January 2009, thus creating the infrastructure for the first cryptocurrency – bitcoin. Cryptocurrencies are a type of novel digital asset that is very hard to link to a classical approach of

typing intrinsic value to market fundamentals which is common in financial markets. Bitcoin technology intends to enable almost instantaneous execution of transactions, with negligible fees without intermediaries or a central body and has therefore attracted great attention. An important feature of the Bitcoin transaction protocol is its open-source license. Namely, all algorithms and solutions used in its construction are available through the platform for the collaboration of developers. Anyone with an interest could access the program code, study it, and work on the Bitcoin protocol. If the proposals are in the direction of improvement, the community will accept the changes and improve the protocol. However, this also means that the existing protocol was easy to replicate, change and adapt to some needs, create a new cryptocurrency with new properties, and release it to the public. Open source feature has also contributed to the growth of many young, technology companies that develop their business idea on the public distributed ledger technology. Practical implementation of blockchain technology on the one hand, and positive public reactions to the idea of decentralization, on the other hand, contributed to supply and demand thus a completely new primary cryptocurrency market emerged. On the one hand, there were innovative companies that financed their idea by issuing cryptocurrencies, and on the other hand, there were investors who wanted to invest in this idea based on blockchain. With the development of the primary market, the number of exchanges also increased, thus creating a new, independently sustainable, ecosystem of the primary and secondary cryptocurrency market.

For the time being, the cryptocurrency market is burdened heavily by the absence of any regulatory framework, which means it is subject to all sorts of manipulations. Furthermore, there is no quantitative approach to calculating an intrinsic/fundamental value that would serve as a price stabilizer. On the other hand, the cryptocurrency market, its complexity, and its entire infrastructure is continuously growing. Due to its availability, an ever greater number of investors are investing and trading in cryptocurrencies, creating the need for greater academic research into the subject. Our primary aim in this paper is to define investment opportunities, but also the most appropriate risk measure in cryptocurrency portfolio optimization. The main hypothesis of our paper is that even when using very different risk measures as optimization targets in a crypto portfolio setup it is extremely difficult to achieve better performance than the general cryptocurrency market.

The objectives of this paper are as follows: (I) Evaluate the potential risk for a portfolio of cryptocurrencies; (II) Focus on current research about portfolio optimization; (III) Evaluate and interpret the results for risk management purposes; (IV) Conduct out-of-sample backtesting of tail risk and variance measures to ensure the appropriateness for risk management; (V) Ensure that proper risk measures are utilized in portfolio optimization.

The paper consists of six sections. Following the Introduction, Section 2 provides a literature review on portfolio optimization involving cryptocurrencies. Section

3 gives an overview of the data and methodology used, while Section 4 presents the empirical results and provides economic interpretation of the findings. Section 5 discusses the obtained results and outlines the economic implications of our findings. Finally, Section 6 draws conclusions, formulates implications and gives recommendations for future research.

2. Literature review

Although in this paper we use a slightly different methodology from previous research, we present the research results involving the construction and optimization of the portfolio in the secondary cryptocurrency market. Adding cryptocurrencies to traditional financial assets is beneficial to portfolio performance (Chuen et al., 2017). The authors optimized a portfolio of ten cryptocurrencies along with traditional financial assets, consisting of stock indices, gold, and real estate market index. Their results for all the optimization goals indicate the benefit of adding cryptocurrencies to a portfolio made up of traditional assets. Trimborn et al. (2019) similarly introduced cryptocurrencies into a portfolio composed of traditional financial instruments. Optimization was carried out with and without liquidity limitation and portfolio performance was compared. All portfolios that included cryptocurrencies performed better than portfolios composed only of traditional assets. Liquidity-constrained portfolios of equities and cryptocurrencies produce better cumulative returns than non-restricted portfolios.

Evaluation of portfolio performance composed of cryptocurrencies and traditional assets was also conducted by Petukhina et al. (2021). The authors divided the existing optimization models into four strategies: return-oriented strategies, risk-oriented strategies, risk-return-oriented strategies, and combined strategies. The authors applied these models to portfolios composed of 55 cryptocurrencies and 16 variables represented by five types of traditional assets. The performance of all the portfolios indicated the benefits of including cryptocurrencies in a portfolio along with traditional assets. The same portfolios achieved a lower cumulative return in a case when the liquidity limits were raised.

The benefits of constructing a portfolio of traditional financial assets and cryptocurrencies during the negative stock market movements caused by the COVID-19 pandemic were examined by Conlon et al. (2020) and Goodell and Goutte (2021). Both studies concluded that cryptocurrencies do not represent a safe haven for the majority of international equity markets and that cryptocurrencies in general do not provide a diversification benefit during market downturns. Both studies point out that the cryptocurrency USDT, whose value is pegged to the US dollar, can still serve as a safe haven investment for all of the international indices examined during times of market turmoil. This finding is logical, and actually has

nothing to do with cryptocurrencies since it is actually a cash position in the US dollar during stock market crashes.

The cryptocurrency market can be viewed as a standalone niche financial market and thus it is useful to examine the possibility of constructing an efficient portfolio composed solely of cryptocurrencies with different allocation objectives. Liu (2018), Brauneis and Mestel (2018) and Platanakis et al. (2018) investigate the benefits of this approach. The abovementioned authors form multiple portfolios with different optimization goals, namely: risk minimization, returns maximization, and return to risk ratio maximization. Their results run contrary to widespread expectations and logic. All of their findings show that no optimization strategy can outperform the portfolio performance of an equally weighted portfolio, and thus they conclude that such a portfolio is the best choice when creating and modelling a portfolio in the secondary cryptocurrency market.

Cryptocurrency portfolio optimization issues were also examined by Tomić (2020) and Čuljak et al. (2022). Tomić (2020) used six different optimization objectives while taking into account the significant systematic impact of Bitcoin on the dynamics of the entire secondary cryptocurrency market. His results suggest that by controlling the exposure to the Bitcoin factor, better overall portfolio performance can be achieved through higher returns and risk-reward ratio. Following a similar logic, Čuljak et al. (2021) identified and described the benefits of sectoral cryptocurrency portfolio optimization using six portfolio optimization targets. Their results show that portfolio strategies performed better if they include sectoral cryptocurrencies from the financial, exchange, and business services sectors. Their findings confirm the existence of the possibility of modelling and optimizing the portfolio in the secondary market composed only of cryptocurrencies.

In line with this research overview, it is evident that our paper: (a) Focuses on a portfolio risk-range evaluation of cryptocurrencies, and this may in turn (b) Enrich the knowledge about their return-risk contribution when added into a portfolio of traditional assets, (c) Improve the understanding of liquidity of the combined portfolios, (d) Give economic bounds on the evaluated risk measures during market movements, (e) Weighted optimization leads to capturing economic relevant risk, (f) Support the primary and secondary market investments, (g) Provide a framework for individual and integrated risk management at financial markets.

3. Methodology

In the presented research papers, the authors examined the possibility of portfolio optimization in the cryptocurrency market with different optimization objectives, but only on a single sample of potential portfolio constituents. This sort of methodology is desirable when one wants to highlight the possibilities of different

optimization goals, but it is not adequate when one wants to find the risk measure that is best suited to the dynamics of the cryptocurrency market. In this paper, we will create 10 portfolios (N-1 ... N-10) out of 20 randomly selected potential components from a population of 70 cryptocurrencies selected by market capitalization. After taking the top 70 cryptocurrencies sorted by market capitalization we apply pseudo-randomness generation algorithms (PRNG) to randomly choose 20 components (out of 70) that created the portfolios. Being repeated ten times, this generation process has created ten portfolios composed of 20 random components out of the top 70 cryptocurrencies sorted by market capitalization. We will analyse the portfolio results for two optimization strategies that define the minimal risk from the potential efficient frontier. The main difference between the two analysed optimization strategies is that the first optimization strategy uses the standard deviation as a risk measure (STDEV), while the second optimization strategy uses Expected Tail Loss (ETL) as a risk measure. By using this approach, we aim to complement previous research by finding the risk potential (range) that is suitable for cryptocurrency portfolio optimization.

In our analysis we use publicly available daily price data (in US dollars), collected from the Coinmarketcap – CMC platform. We use the daily observations within the period of 25/01/2018 – 01/08/2019, which is a sample of 554 daily observations. We chose the particular observation period in order to measure the portfolio performance during a volatile market regime. Throughout 2018, the cryptocurrency market had a drop in total market capitalization of 77%, while throughout 2019, it achieved a significant growth of total market capitalization by 106%. Considering such market swings, the observed period represents an extremely volatile regime.

Two portfolios with the following risk minimization optimization targets were formed: minimum variance (MinVar) and minimum ETL (MinETL). Taking into account the previous research by Briere et al. (2015), Chuen et al. (2017), and Goodell and Goutte (2021), as well as the absence of a normal distribution of returns, apart from the variance (standard deviation), we chose to use a more robust tail risk measure as a portfolio risk measure, namely ETL. Our ETL approach follows the methodology of Rockafellar and Uryasev (2000), Conlon et al. (2020), and Čuljak et al. (2022). The ETL confidence level is set at 95%. The optimization is performed out of the sample, with equal parameters for each optimization target. The initial assessment of parameters and portfolio weights was performed on a sample of the first 30 days. Since cryptocurrency market is very volatile, a rolling window monthly rebalance ($K = 30$ days) was chosen. For each period $k + 1$, portfolio returns are extracted with respect to the results of the allocation optimization in the previous k and $k + K$ moments.

3.1. Global mean variance

In its original form, Modern Portfolio Theory focuses on minimizing the variance of the portfolio for a given level of expected return within certain theoretical assumptions, which is why it is often referred to as the mean variance (M-V) model. If the limitation of the required rate of return is omitted from the model, the optimization of the portfolio leads to Global Minimum Variance Portfolio – GMV. The formulation for GVM is given by:

$$\begin{aligned} \min_w \quad & \sigma_p^2(w) = w^T \hat{\Sigma} w \\ \text{s. t.} \quad & \mathbf{1}_N^T w = 1, \quad w_i \geq 0, \quad i = 1, \dots, N \end{aligned} \quad (1)$$

where σ_p^2 is the variance of the portfolio, $w = (w_1, w_2, \dots, w_N)^T$ are the weights of individual assets in the portfolio and $\hat{\Sigma}$ is the estimated covariance matrix of assets N and their returns T . Additional constraints that are used: $\mathbf{1}_N$ represents a $(N \times 1)$ vector where all elements of the vector represent the portfolio weights and their sum must be 1 (full investment constraint), and there is no short selling.

3.2. ETL as a risk measure

The drawback of the GMV approach is the assumption of a Gaussian distribution of asset returns for which the parameters are estimated. Considering the results of the study by Briere et al. (2015) and Chuen et al. (2017), which show the presence of a heavy-tailed cryptocurrency return distribution, we use, similar to Čuljak et al. (2021) and Petukhina et al. (2021), an approach based on the ETL methodology by Rockafellar and Uryasev (2000). By using the ETL as a risk measure, Global Minimum Variance Portfolio (GMV) becomes the Global Minimum ETL model (GMETL).

The cumulative distribution function of a loss function $z = f(w, y)$ is given by:

$$\Psi(w, \zeta) = P\{y | f(w, y) \leq \zeta\} \quad (2)$$

where w is fixed decision vector (i.e. portfolio weights), ζ loss associated with that vector and y uncertainties (e.g. market variables) that influence the loss. For a given confidence level α , the Value at Risk (VaR_α) is given by:

$$VaR_\alpha(w) = \min\{y | \Psi(w, \zeta) \geq \alpha\} \quad (3)$$

If $f(w, y)$ exceeds the VaR, then the expected value of the loss (ETL) is given by:

$$ETL_\alpha(w) = \frac{1}{1 - \alpha} \int_{y(w) \leq VaR_\alpha(w)} y f(y|w) dy \quad (4)$$

Adjusting to the optimization goal, with a confidence level of 95%, gives us.

$$\begin{aligned} \min_w \quad & \text{ETL}_\alpha(w) \\ \text{s. t.} \quad & \mathbf{1}_N^T w = 1, \quad w_i \geq 0, \quad i = 1, \dots, N \end{aligned} \quad (5)$$

4. Empirical data and analysis

Based on the obtained optimization results we present and interpret out-of-sample backtesting results for each of the implemented optimization objectives. The success of a particular strategy was estimated through performance measures that include the CRYPTOcurrency INDEX – CRIX as a benchmark for the crypto market over the observation period. CRIX index is a crypto market index that represents one of the first cryptocurrencies indices and it was created by a team from Humboldt University of Berlin led by prof. Wolfgang Karl Härdle (Trimborn and Härdle, 2018). The index is weighted by its components' market capitalization and its methodology also adjusts to the sometimes illiquid cryptocurrency market. Each quarter, the components are evaluated and rebalanced.

The results are presented and interpreted in two steps. First, the results are compared and interpreted at the level of the asset allocation model and compared with the CRIX index. Second, in order to find the range of risk measures for cryptocurrency portfolio optimization, the results are compared between portfolios that differ in targeted risk measures that were used for portfolio optimization.

Table 1 shows the results of performance measures for the MinVar optimization strategy. We use the realized portfolio return annual geometric average return $R_{Gi} = \text{prod}(1 + R_{d,i})^{\frac{\text{scale}}{n}} - 1$, where $R_{d,i}$ is the daily realized return of portfolio i for period t , n the total number of existing observations and scale number of observations in one year 252. Standard deviation, VaR and ETL is expressed annually by applying the square root of time rule $\text{risk}_{a,i} = \text{risk}_{d,i} \times \sqrt{252}$, where $\text{risk}_{d,i}$ is the daily risk measure.

The first column shows the absolute and relative performance measures used with the corresponding notations. The next 10 columns show the results of implemented performance measures for 10 portfolios in accordance with the optimization strategy, and the last column shows the results of performance measures of the CRIX index (i.e. benchmark of the cryptocurrency market).

The first two rows of the tables show the parameters of the fitted regression line between the portfolio returns as a dependent variable and the CRIX index as an independent variable. All portfolios have negative beta, indicating that they were moving in the opposite direction of the general cryptocurrency market. From the aspect of systemic risk, it can be said that strategy is less volatile than the general

cryptocurrency market. On the other hand, only 1 portfolio achieved higher average returns than the CRIX index, as indicated by regression alpha, meaning that, on average, portfolios achieve weaker returns than the CRIX index. The same is confirmed by the realized geometric and cumulative return of the portfolio, where only two portfolios achieved a higher annualized and cumulative return compared to the general market. Risk measures (std dev, VaR, ETL) also suggest the superiority of the CRIX index compared to the created portfolios, where the CRIX index achieved lower risk values, except for the N-3 and N-6 portfolios. In the same way, relative performance measures also consider the index as an appropriate expected market risk measure in the observed period. All values, except for the N-2 and N-8 portfolio where the Sharpe Ratio value is less negative relative to the CRIX index, indicate that the CRIX index, during the period used in this study, is a significantly better choice compared to the MinVar optimization strategy.

Table 1: Comparative presentation of the results of performance measures for the MinVar optimization strategy

Performance Metrics		Asset Allocation										
		10 portfolios of 20 randomly selected cryptocurrencies										Index
		N-1	N-2	N-3	N-4	N-5	N-6	N-7	N-8	N-9	N-10	CRIX
Beta	β_i	-0.09	-0.09	-0.19	-0.10	-0.10	-0.09	-0.06	-0.07	-0.07	-0.05	1.00
Annualized Alpha	$\alpha_{a,i}$	-0.23	0.02	-0.17	-0.24	-0.27	-0.13	-0.31	0.00	-0.37	-0.40	0.00
Annualized Return	$R_{G,i}$	-0.42	-0.17	-0.30	-0.41	-0.43	-0.27	-0.50	-0.17	-0.52	-0.53	-0.18
Cumulative Return	CY	0.32	0.69	0.48	0.33	0.32	0.52	0.24	0.68	0.22	0.21	0.66
Annualized Std Dev	$\sigma_{a,i}$	0.76	0.64	0.58	0.72	0.70	0.61	0.82	0.63	0.73	0.72	0.63
Annualized VaR	$VaR_{a,i}$	1.26	1.05	0.97	1.20	1.17	1.00	1.37	1.03	1.22	1.30	1.04
Annualized ETL	$ETL_{a,i}$	1.58	1.32	1.22	1.50	1.46	1.26	1.72	1.29	1.53	1.63	1.31
Worst Drawdown	WD	0.87	0.74	0.69	0.87	0.85	0.73	0.92	0.71	0.92	0.87	0.78
Sharpe Ratio	$SR_{d,i}$	-0.56	-0.26	-0.51	-0.58	-0.61	-0.45	-0.60	-0.28	-0.71	-0.74	-0.29
MSquared	M^2	-0.35	-0.17	-0.33	-0.37	-0.39	-0.29	-0.38	-0.17	-0.45	-0.47	-0.18
Jensen's Alpha	α_i	-0.44	-0.18	-0.31	-0.43	-0.45	-0.29	-0.51	-0.18	-0.53	-0.54	0.00
Information Ratio	IR	-0.23	0.02	-0.13	-0.23	-0.25	-0.09	-0.30	0.02	-0.33	-0.35	/

Source: Author's calculation

Table 2 presents the results of the MinETL optimization strategy, with the identical structure to Table 1. With regards to the CRIX index, the presented results are similar to the MinVar ones. All portfolios achieved a negative value of the beta parameter, but in the case of MinETL two portfolios (N-5 and N-7) on average achieve a higher return than the CRIX index as indicated alpha regression. Only one portfolio (N-7) achieved a significantly higher geometric and cumulative returns than the general market. Marginally, compared to N-5 and N-7 portfolio, but still CRIX index managed to achieve lower risk values in the observed period. Relative performance measures also consider the index as an appropriate expected market risk measure. Apart from the N-5 and N-7 portfolios where the MSquared value is less negative relative to the CRIX index, all values indicate the superiority of the CRIX index over randomly created portfolios optimized by the MinETL strategy, at the 95% confidence level.

Table 2: Comparative presentation of the results of performance measures for the MinETL optimization strategy

Performance Metrics		Asset Allocation										
		10 portfolios of 20 randomly selected cryptocurrencies										Index
		N-1	N-2	N-3	N-4	N-5	N-6	N-7	N-8	N-9	N-10	CRIX
Beta	β_i	-0.10	-0.10	-0.24	-0.14	-0.14	-0.11	-0.13	-0.09	-0.11	-0.09	1.00
Annualized Alpha	$\alpha_{a,i}$	-0.18	-0.01	-0.33	-0.39	0.09	-0.38	0.97	-0.15	-0.44	-0.48	0.00
Annualized Return	$R_{G,i}$	-0.40	-0.26	-0.45	-0.56	-0.21	-0.51	-0.02	-0.31	-0.57	-0.62	-0.18
Cumulative Return	CY	0.35	0.54	0.29	0.19	0.61	0.23	0.96	0.46	0.17	0.14	0.66
Annualized Std Dev	$\sigma_{a,i}$	0.79	0.77	0.63	0.78	0.81	0.68	1.35	0.65	0.73	0.77	0.63
Annualized VaR	$VaR_{a,i}$	1.31	1.26	1.07	1.32	1.32	1.15	2.17	1.09	1.24	1.37	1.04
Annualized ETL	$ETL_{a,i}$	1.64	1.59	1.33	1.65	1.66	1.43	2.73	1.36	1.55	1.72	1.31
Worst Drawdown	WD	0.89	0.85	0.85	0.93	0.89	0.85	0.95	0.82	0.90	0.90	0.78
Sharpe Ratio	SR	-0.50	-0.33	-0.71	-0.71	-0.27	-0.75	-0.01	-0.48	-0.78	-0.80	-0.29
MSquared	M^2	-0.32	-0.21	-0.45	-0.45	-0.17	-0.48	-0.01	-0.30	-0.50	-0.51	-0.18
Jensen's Alpha	α_i	-0.42	-0.28	-0.47	-0.58	-0.24	-0.53	-0.04	-0.33	-0.59	-0.63	0.00
Information Ratio	IR	-0.20	-0.07	-0.29	-0.35	-0.03	-0.33	0.11	-0.13	-0.38	-0.41	/

Source: Author's calculation

5. Results and discussion

The first two rows of the tables show the parameters of the fitted regression line between the portfolio returns as a dependent variable and the CRIX index as an independent variable. All portfolios have negative beta, indicating that they were moving in the opposite direction of the general cryptocurrency market. From the aspect of systemic risk, we can say that strategy is less volatile than the general cryptocurrency market. On the other hand, only 1 portfolio achieved higher average returns than the CRIX index, as indicated by regression alpha, meaning that, on average, portfolios achieve weaker returns than the CRIX index. The obtained results of our research in this paper support our main hypothesis that even when using very different risk measures as optimization targets in a crypto portfolio setup, it is extremely difficult to achieve better performance than in the general cryptocurrency market. In our research, we opted to use the CRyptocurrency IndeX – CRIX as the general crypto market benchmark index. Against the performance of the crypto market benchmark – CRIX, we tested two competing optimization strategies that define the minimal risk from the potential efficient frontier. One optimization strategy uses the variance/standard deviation as a risk measure, and its optimization target is the minimization of variance/standard deviation (MinVar). The other tested optimization strategy uses a tail risk measure - Expected Tail Loss (ETL) as a risk measure, and its optimization target is the minimization of Expected Tail Loss (MinETL).

Evaluating the obtained results and performance measures between the two implemented optimization strategies, namely MinVar and MinETL, we find several interesting points. There is no significant difference between the values of the beta regression coefficients, all values in both tables are negative, which indicates the opposite direction of movement concerning the general crypto market movement (represented by the CRIX index). The economic consequence of these results is that, in the analysed period, our random optimized portfolios under both risk measures tend to act as a contrarian investment compared to the general crypto market trends and movements.

Looking at the alpha regression coefficient there is a slight difference between the two strategies and surprisingly it is favoring the MinVar approach in the prevailing market situation. Similar conclusion regarding the MinVar approach, in the prevailing market situation, is derived when looking at the geometric and cumulative returns, which are somewhat higher for MinVar approach compared to MinETL. The economic consequence of the obtained results in this regard is that optimization under a simpler and widely better known risk metric – variance, yields higher annualized returns for the investor compared to the more complex approach based on optimization under the tail risk measure – expected tail loss.

In terms of risk, the MinETL strategy gives higher values of all risk measures, standard deviation, VaR, and ETL, which is surprising since it should, by its

construct, focus on the extreme tails of the underlying distribution. Taking into account the lower annualized returns and the higher risk estimates relative performance measures favor the MinVar approach at the 95% confidence level. Under the MinVar optimization strategy, only three portfolios (N-1, N-5, and N-7) have achieved worse values of relative performance measures. The economic consequence of such performance is that investing under MinETL optimization target will result in higher reserves on average creating additional, and in this case, unnecessary, opportunity costs compared to the MinVar optimization target.

Taking into account the lower annualized returns and the higher risk estimates the relative performance measures also favour the MinVar approach. This finding is somewhat surprising but could be contributed to several factors such as the observation period chosen but also the level of confidence being 95%. Since ETL as a tail risk measure focuses on the tails of the distribution it is possible that its true performance should be measured at higher quantiles, such as 99% or higher probabilities.

When comparing the results of optimized random portfolios under both analyzed risk measures to the general crypto market movement, represented in our research by the CRIX index we see a clear domination of the CRIX index. CRIX index, compared to both the MinVar and MinETL optimized portfolios, achieves higher regression alpha, realized geometric and cumulative return. Risk measures also show the superiority of the CRIX index compared to the optimized random portfolios, where the CRIX index achieved lower risk values. Consequently, relative performance measures also favor the CRIX index in the observed period, which supports the previous findings. All measures (Sharpe ratio (1963), Jensen's Alpha (1968), MS2, and Information ratio indicate that the CRIX index, representing the general crypto market, provides a most likely / expected risk values in addition to the other considered measures compared to the two employed optimization strategies.

Our research contributes to the current literature on optimization in financial markets, market risk measures, and cryptocurrency markets in general. Our research findings, to some extent, go contrary to some of the previous findings in the field of risk measures and optimization since our results prefer variance/standard deviation as the risk measure being optimized as opposed to a tail risk measure such as expected tail loss ETL (e.g., Žiković, 2008; Žiković and Pečarić, 2010; Žiković, 2011; Žiković et al., 2015). On the other hand, our results with regard to the performance of the CRIX index in the general cryptocurrency market support previous findings in this field (e.g., Trimborn and Härdle, 2018; Trimborn et al., 2019; Čuljak et al., 2022).

The findings suggest that since all of the obtained results and all the employed metrics show that randomly created portfolios, even with optimized weights, perform inferior to the general cryptocurrency market (represented by the CRIX

index), i.e., optimized randomly selected portfolios cannot beat the general market movement, i.e., crypto market index.

6. Conclusion

Our research addresses the question of whether random optimized portfolios of cryptocurrencies, optimized under different risk measures can beat the general market movement and to evaluate the performance of random portfolios optimized under different risk measures. In order to perform our analysis, we created 10 portfolios out of 20 randomly selected potential components from a population of 70 cryptocurrencies selected by market capitalization. In our analysis we used publicly available daily price data (in US dollars), collected from the Coinmarketcap – CMC platform. We had daily observations within the period of 25/01/2018 – 01/08/2019, creating a sample of 554 daily observations. Portfolios were formed with the following risk minimization optimization targets: minimum variance (MinVar) and minimum ETL (MinETL), and their performance at a 95% confidence level was evaluated against the CRYPTOcurrency INDEX – CRIX, used as a general crypto market benchmark index. We implemented our research methodology in two steps. First, we compared individual optimization results from two portfolio-optimization objectives to the CRIX index representing the cryptocurrency market benchmark. In the second step, in order to determine a risk measure (optimization objective) that achieves overall better portfolio performance, we compared the difference in performance between portfolio optimization under different risk goals

When comparing optimized random portfolios to the CRIX index, we see a prevailing domination of the CRIX index. The CRIX index, compared to both the MinVar and MinETL optimized portfolios, achieves higher regression alpha, realized geometric and cumulative return. Risk measures also show the superiority of the CRIX index compared to the created portfolios, where the CRIX index achieved lower risk values. Since all of the obtained results show that the CRIX index (representing the general cryptocurrency market) performs much better than the randomly created portfolios with optimized weights, both in terms of risk and return, we can conclude that for the analyzed time period, data frequency and at 95% confidence level, cryptocurrency market index is superior in performance to optimized randomly selected portfolios of cryptocurrencies, better portfolio performance, we compared the difference in performance between portfolio optimization under different risk goals.

The main limitations of our research are: (I) the time period sample used since we used two years of daily data, (II) using only a single confidence level of 95% in our analysis since it does not show the whole range of probabilities and likely leads to underperformance of tail risk measure (ETL). Tail risk measures are not adapted

to measuring risk at such “low” probability levels, being more suitable for more extreme levels such as probability levels higher than 99%. Another possible limitation and a definitively promising alley for future research is our choice of sampling population. We used the market capitalization of cryptocurrencies as a must to form the population from which the random samples were drawn but definitively out rules for choosing the initial population could be used to test whether there are other, more important factors driving the crypto market besides the market capitalization which could improve the performance of random portfolios.

For further research, it is important to look into initial conditions, i.e., consider the importance of the adequate initial selection of potential portfolio components. This could be achieved by selecting the cryptocurrencies based on the crypto sector the cryptocurrencies are coming from, their public adoption, technological complexity, usefulness, and additional/further risk measures and metrics.

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Optimizacija portfelja kriptovaluta koristeći mjere rizika repa distribucije i varijancu

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Sažetak

Odabir odgovarajuće mjere rizika u velikoj mjeri ovisi o karakteristikama i dinamici imovine u koju se ulaže. Za investitore i upravitelje imovinom, raspon potencijalnih tržišnih rizika pruža prijeko potrebni uvid u optimizaciju portfelja imovine kojom upravljaju. Budući da je fokus ovog rada uspješnost više mjera rizika, investitorima se daje bolji uvid u potencijalnu veličinu rizika s kojim su suočeni. Budući da se cilj optimizacije rizika i dobiti može prilagoditi širokom izboru mjera rizika, u ovom ćemo radu testirati uspješnost klasične mjere rizika, tj. varijance/standardne devijacije u odnosu na mjeru rizika repa distribucije kao što je npr. očekivani gubitak u repu distribucije (ETL). Naš cilj je pronaći koja od ove dvije mjere rizika nudi najbolje rezultate za portfelj kriptovaluta i jesu li razlike statistički značajne. Osnova naše analize je testiranje dva cilja optimizacije (MinVar i MinETL) na 10 portfelja kriptovaluta koji su nasumično odabrani iz uzorka od 70 kriptovaluta s najvećom tržišnom kapitalizacijom.

Ključne riječi: *optimizacija portfelja, kriptovalute, procjena rizika, investicije*

JEL klasifikacija: *E49, G11, P45*

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Do ICT and technological development facilitate supply chain trade?*

Petra Adelajda Zaninović¹

Abstract

This paper aims to estimate the impact of ICT and technological development of countries on supply chain trade. As proxy measures of supply chain trade, the author applies domestic value added (DVAFX) included in gross-foreign exports, and foreign-value added included in domestic exports (FVA) from the Eora MRIO database while constructing the ICT variable by using confirmatory factor analysis. Furthermore, as a proxy variable for the country's technological development, the author applies the economic complexity index developed by Harvard's Growth Lab, conducting her analysis based on the structural gravity model estimated with the Poisson Pseudo-Maximum Likelihood Estimator (PPML). Together with the standard gravity regressors, the model includes the bilateral position of countries in the supply chain. Our panel dataset covers the 2000-2019 period, including 130 world countries. To control for the potential source of endogeneity, the model includes reporter and partner country fixed effects, yearly fixed effects, and country-pair fixed effects. The results confirm a statistically significant relationship between the country's technological development and supply-chain trade. Technological development enables a country to produce more complex, higher value-added products and thus to be more upstream positioned in the supply chain. The more upstream the country is in the supply chain, the higher the domestic value added is included in its exports.

Key words: ICT, technology, supply chain trade, trade in value-added, PPML

JEL classification: C23, F14, O33

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1. Introduction

Nowadays, most international trade consists of parts and components usually traded through a supply chain. A supply chain is a network that connects companies with their suppliers to produce and deliver a specific product to the end user, the customer, involving various activities, people, companies, information, and resources. The supply chain also refers to the stages necessary to move a product or service from its initial state to its final destination. Unlike traditional gross trade statistics, supply chain trade is often measured by the value added to the trade products. The logic behind this is that the parts and components are traded across the globe, typically crossing several national borders before becoming the final product. In traditional statistics, trade is counted each time the product crosses the border, leading to double counting and overestimated trade statistics. In the supply chain, only the value added by each country (firm) to the products is counted, and this is a more reliable measure of the global trade value (Saslavsky and Shepherd, 2014). Given the high complexity of supply chains, the many actors involved, and the large amount of information that needs to be shared, it is expected that information and communication technology (ICT) and technology itself can have a significant impact on supply chain trade. ICTs facilitate communication among stakeholders, speed up the documentation and border procedures, shorten trade times, and reduce trade costs. Felipe and Kumar (2012) argue that trade facilitation implies facilitating cross-border trade in goods, efficient physical and telecommunication infrastructure, customs, other trade-related authorities, and logistics services. Therefore, one can agree that ICT can serve as trade facilitation. Recent empirical evidence (Hoekman and Shepherd, 2013; Saslavsky and Shepherd, 2014; Yadav, 2014; Zaninović, 2022) confirms that trade facilitation is more relevant to the supply chain than to traditional trade. However, there is a gap in scholarly work addressing the impact of ICT and technological development on supply chain trade. Most of this work focuses on traditional trade, presented in the second part of this paper, the literature review.

The aim of this paper is to examine the impact of ICT on supply chain trade as measured by domestic value added in gross foreign exports and foreign value added in domestic exports. In addition, this paper also addresses the issue of the impact of a country's technological development on supply chain trade. The surrogate variable used for technological development is the economic complexity index developed by Harvard's Growth Lab. Technology can help countries produce higher value-added products and position countries upstream in the supply chain. Therefore, technologically advanced countries (firms) can be expected to have more domestic value-added content in their exports. This paper explains both the benefits of ICT and technology and the problems that supply chains face today. ICT and technological development have enabled unprecedented cross-border trade in goods and services and removed many practical barriers to cross-border trade.

The remainder of the paper is organized as follows. The second part of the paper reviews the literature on the relationship between ICT, technology, and trade in the supply chain. The econometric model specification is presented in the third part of the paper. The data and variables are described in the fourth part of the paper. The results are presented and discussed in the fifth part. The limitations of the research and concluding remarks are presented in the sixth part.

2. Literature review

The relationship between ICT and international trade is not new in the academic literature, and many scholars have researched the impact of information and communication technology on international trade. However, most studies have mainly focused on traditional gross trade statistics while often neglecting value-added trade statistics. It is partly because value-added trade statistics are relatively new, and partly because the literature on supply chain trade is mainly empirical (Vrh, 2018), although many authors nowadays model value-added trade (Koopman et al., 2010; Noguera, 2012; Antràs and Chor, 2013; Koopman et al., 2014; Timmer et al., 2014; Antràs and Chor, 2018; Antràs and de Gortari, 2020; Antràs, 2020, etc.). In the absence of literature on the relationship between ICT and supply chain trade, Table 1 below provides a summary of the literature on the relationship between ICT and technology and gross international trade.

Table 1: Summary of research on the relationship between ICT, technology, and international trade

Author(s)/year	Research questions	Sample/data	Methods	Results
Clarke (2002)	ICT → X	Eastern Europe and Central Asia, 1999	Gravity model, OLS + treatment effects	ICT → X↑
Wilson et al. (2003)	TF (e-business usage) → X and M (manuf.)	75 countries, 2000-2001	Gravity model, OLS	TF → X, M↑
Freund and Weinhold (2004)	Internet → X	56 countries, 1995-1999	Gravity model, OLS, Tobit	TF → X↑
Fink et al. (2005)	communication costs → IT	World countries, 1999	Gravity model, OLS	CC → IT↓
Soloaga et al. (2006)	TF (e-business usage) → X and M	Mexico, 2000-2003	Gravity model, Poisson	TF → X, M↑

Author(s)/year	Research questions	Sample/data	Methods	Results
Demirkan et al. (2009)	ICT → bilateral trade	175 countries, 2005	Gravity model, OLS	ICT → IT↑
Márquez-Ramos and Martínez-Zarzoso (2010)	technological innovation → X	bilateral trade data by commodity SITC 4-digit; 13 X, 167 M, 2000	Gravity, OLS, PPML, Harvey	TI → X↑
Hernandez and Taningco (2010)	TF (telecom. services) → bilateral trade (import data) (BEC) 1 digit	East Asia, 2006-2008	Gravity model, OLS, FE	Tel.(qual) → M↑
Portugal-Perez and Wilson (2012)	TF (ICT) → export	101 countries, 2004-2007	Gravity model, OLS, PPML	TF (ICT) → X↑
Yadav (2014)	TF (ICT) → total and parts and components	77 countries, 2004-2007	Gravity model, OLS, PPML	TF → X, M↑
Wang and Choi (2019)	ICT → X; M	BRICS, 2000-2016	Gravity model, POLS, FE, RE	TF → X, M↑

Source: Author's elaboration

The existing literature on the relationship between ICT and international trade shows the positive effects in the case of all ICT measures such as Internet use, ICT technology, or even communication costs. All studies use the gravity model specification as the basis for modelling international trade. As mentioned earlier, supply chain trade modelling is mainly empirical, and a theoretical model does not exist. Noguera (2012) was the first to include value-added trade in the gravity model. Furthermore, he proved that by applying gravity variables the supply chain trade could be explained. Koopman et al. (2014) and Antràs and Chor (2013; 2018) argue that value-added trade modelling should control for a position in the supply chain because the position in the supply chain implies whether a country participates move forward or backward in the supply chain. Position and participation are related to the value added by the country to the products being traded. The position is also closely related to technology because if a country is more technologically advanced, it may be in an upstream position and produce more value added. However, technology could also be an endogenous variable, as Antràs (2020) argues that higher levels of trade in the supply chain led to technology transfer and that countries that trade more are more likely to invest in technology. However, the higher a country's technology level, the more likely it is

to affect supply chain trade significantly and positively. This study uses the gravity model and controls for endogeneity by including several fixed-effects dummy variables, which are described in another part of the study.

3. Methodology

Our model specification is based on the gravity theory of international trade, first introduced by Tinbergen (1962). The original gravity model states that trade between countries A and B is proportional to their mass (often measured as the natural logarithm of their gross domestic products) and inversely proportional to the distance between them (often measured as the weighted distance between the capitals of the trading countries). The gravity model is one of the most successful empirical models and is widely used in modelling international trade. Although the original model has only two variables, later models have been extended to include the various socioeconomic variables that affect bilateral trade (Behar and Manners, 2008; Behar and Venables, 2011; Host et al., 2019; Zajc et al., 2016, Bugarčić et al., 2020; Zaninović et al., 2021). Despite their successful predictability, the majority of standard gravitational regressors can be a source of endogeneity problems that lead to bias coefficients. To address endogeneity problems, the literature suggests performing a panel data regression analysis and including reporter and partner country fixed effects, year fixed effects, and country pair fixed effects (Anderson and van Wincoop, 2004; Baldwin and Taglioni, 2006; Baier and Bergstrand, 2007). Including reporter and partner fixed effects also helps control for the multilateral resistance terms (MTS) originally proposed by Anderson and van Wincoop (2004).

The traditional gravity equation where both right and left hand side variables are in log form:

$$\ln(IT_{ij}) = \beta_0 + \beta_1 \ln(gdp_i) + \beta_2 \ln(gdp_j) + \beta_3 \ln(dist_{ij}) + \varepsilon_{ij} \quad (1)$$

however, estimating the gravity equations with OLS leads to inconsistencies in the presence of heteroscedasticity and also zero trade cannot be accounted for. To solve the problem of zero trade and heteroscedasticity, Santos Silva and Tenreyro (2006) propose to estimate gravity models in multiplicative form.

Therefore, our econometric model for value-added has the following structure:

$$\begin{aligned} SCT_{ijt} = \exp & (\beta_0 + \beta_1 \ln gdp_{it} + \beta_2 \ln gdp_{jt} + \beta_3 rta_{ijt} + \beta_4 \ln dist_{ij} + \\ & + \beta_5 contig_{ijt} + \beta_6 comlang_{ijt} + \beta_7 ict_{it} + \beta_8 ict_{jt} + \beta_9 tech_{it} + \\ & + \beta_{10} tech_{jt} + \beta_{11} position_{ijt} + \delta_i + \pi_j + \lambda_t + \varphi_{ij} + \varepsilon_{ijt}) \end{aligned} \quad (2)$$

where SCT_{ijt} represents the supply chain trade, measured as domestic value added embodied in gross foreign exports (DVAFX) and foreign value added embodied

in gross domestic exports (FVA). DVAFX corresponds to traditional exports while FVA corresponds to traditional imports. The value of trade is expressed in US dollars. The term i stands for the reporting country, while the term j stands for the partner country. Term t stands for the observed year. $\beta_1 - \beta_{11}$ are coefficients of elasticities. $\ln gdp_{it}$ and $\ln gdp_{jt}$ are the reporting and partner countries' gross domestic products that are log transformed. $rtaj_{ij}$ is a free trade agreement dummy variable that has the value one if the trading partners has signed free trade agreement and it has value zero if they don't. Indistw_{ij} is the weighted distance between the capital cities of the trading partners. contig_{ij} is a dummy variable with value one if trading partners share common border and with value zero if they don't. Likewise, variable comlang_{ij} is a dummy variable with value one if countries share common official or first language and with value zero if they don't. The variables ict_{it} and ict_{jt} represent the quality of the ICT infrastructure of trading partners, while the variables tech_{it} and tech_{jt} stands for the technological development of the countries. The quality of the ICT infrastructure of trading partners. position_{ijt} denotes the position of the country i in year t in the supply chain. Terms $\delta_i + \pi_j + \lambda_t + \varphi_{ij}$ stands for the reporting country fixed effects, partner country fixed effects, yearly fixed effects, and country pair fixed effects.

In the estimation are included country-pair clusters to account for the correlation of error terms within country-pairs. To reduce potential endogeneity issues, all regressors are lagged by one year. The gravity equation is estimated with Poisson Pseudo Maximum Likelihood (PPML) proposed by Santos Silva and Tenreiro (2006), but we also report the results of the estimation with Pooled Ordinary Least Squares (POLS) just to compare the results with these two estimators. However, the POLS often proved to give biased and overestimated results.

4. Empirical data and analysis

The data for the analysis were gathered mainly from secondary sources. Data for supply chain trade, namely domestic value added (DVAFX), which is included in gross foreign exports, and foreign value added (FVA), which is included in gross domestic exports, were obtained from the Eora MRIO (2020) database. Standard gravity variables such as gross domestic product, free trade agreement data, weighted distance, contiguity, and common language are from the CEPII (2019) database. Our key variable of interest, ICT technology, is constructed using factor analysis (following the approach of Portugal-Perez and Wilson, 2012) based on the World Economic Forum (2019) three indicators: Availability of Latest Technologies, Technology Absorption at the Enterprise Level, and Government Procurement of Advanced Technology. The loading factors of the ICT technology variable are shown in Table 2.

Table 2: ICT technology variable – loading factors

ICT technology Cumulative variance				
	Reporter country		Partner country	
Factor	Variance	Proportion	Variance	Proportion
ICT technology	1.88978	1.0187	1.90422	1.0576
Factor loadings				
Variable	Factor1	Uniqueness	Factor1	Uniqueness
Availability of latest technologies	0.8083	0.2639	0.8140	0.2704
Firm-level technology absorption	0.7457	0.1580	0.7715	0.1741
Government procurement of advanced technology	0.3724	0.5784	0.4061	0.6092

Source: Author's calculation

Because values were missing in some years, data for the ICT technology variables were extrapolated by simple linear extrapolation for 2000-2006 and 2018-2019. We use the Harvard Growth Lab's Economic Complexity Index (ECI) for the technology (tech) variable. The ECI assigns countries a score based on the diversity and complexity of their export goods. Because of their specialized and developed capabilities, countries that rank high on the complexity index produce complex products with higher value added (Harvard's Growth Lab, 2021). The variable position is calculated using the approach of Koopman et al. (2010).

Supply chain position is calculated based on DVAFX and FVA, our dependent variables. The first step is to calculate the forward (FP) and backward (BP) participation of countries as follows:

- $FP = (DVAFX_{ijt} / \text{grossexports}_{it}) * 100$

- $BP = (FVA_{ijt} / \text{grossexports}_{it}) * 100.$

After calculating the forward and backward participation, the next step is to calculate the position. The log ratio of forward and backward participation is then used to calculate the position of countries in the supply chain. A higher ratio means a higher position in the supply chain. To obtain the position in the supply chain, the following formula was used:

- $\text{position}_{ijt} = \ln((1+FP)/100) - \ln((1+BP)/100).$

Table 3 presents summary statistics for all variables in our model. Our dataset includes 130 reporting countries and 131 partner countries over the period 2000-2019.

Table 3: Summary statistics

VarName	Obs	Mean	SD	Min	Median	Max
FVA	145,023	24,7641.08	2.02e+06	0	1,537.425	1.14e+08
DVAFX	145,023	27,5057.96	2.29e+06	0	1,392.731	1.10e+08
gdp_i	292,523	5.28e+08	1.75e+09	860,550.3	6.67e+07	2.14e+10
gdp_j	290,997	4.79e+08	1.66e+09	409,000	5.69e+07	2.14e+10
rta	293,405	0.20	0.399	0	0	1
distw	293,405	7,241.68	4,336.073	14.136	6,891.347	19,650.13
contig	290,026	0.03	0.156	0	0	1
comlang	290,026	0.11	0.309	0	0	1
ict_i	218,096	-0.01	1.236	-4.322591	-.0052789	2.419836
ict_j	213,029	0.04	1.208	-5.144729	.0435262	2.636351
tech_i	293,538	0.16	0.974	-2.7013	.0559	2.8242
tech_j	293,421	0.04	0.996	-2.7989	-.0746	2.8242
position	145,023	0.00	0.000	-.0009062	-3.69e-10	.0041776

Source: Author's calculation

Table 4 presents the results of the supply chain trade estimation in four columns, where the first two columns contain the results of estimating supply chain exports (DVAFX) and supply chain imports (FVA) with the POLS -estimator, while the third and fourth columns contain the results of estimating supply chain exports (DVAFX) and supply chain imports (FVA) with the PPML-estimator. In the case of the POLS estimator, the dependent variables are log-transformed, while they are not in the case of the PPML estimator, as suggested in the gravity estimation literature (Yotov et al., 2016).

Table 4: Results of the POLS vs. PPML regression

VARIABLES	(1) POLS lnDVAFX	(2) POLS lnFVA	(3) PPML DVAFX	(4) PPML FVA
lngdp _i	0.497*** (0.0191)	-0.459*** (0.0229)	0.502*** (0.0605)	0.0327 (0.0331)
ln gdp _j	-0.236*** (0.0197)	0.587*** (0.0173)	0.0279 (0.0377)	0.484*** (0.0310)
l.rta	0.228*** (0.0269)	0.260*** (0.0271)	0.0333 (0.0534)	0.0300 (0.0221)
Indistw	-0.714*** (0.0218)	-0.717*** (0.0214)		
contig	0.911*** (0.0964)	0.738*** (0.0987)		
comlang	0.336*** (0.0421)	0.297*** (0.0384)		
ict _i	0.00208 (0.00547)	-0.0211*** (0.00433)	0.0230* (0.0138)	0.0334** (0.0141)
ict _j	-0.0109** (0.00554)	0.0276*** (0.00533)	-0.00587 (0.0153)	-0.0288*** (0.0110)
tech _i	0.0372*** (0.0132)	0.266*** (0.0182)	0.0622*** (0.0194)	-0.0847** (0.0355)
tech _j	0.0614*** (0.0116)	0.0160 (0.0100)	0.0467 (0.0696)	0.0136 (0.0211)
position	58,434*** (6,632)	-37,277*** (8,156)	13,648*** (3,099)	-30,562*** (2,443)
Yearly FE	Yes	Yes	Yes	Yes
Reporter FE	Yes	Yes	Yes	Yes
Partner FE	Yes	Yes	Yes	Yes
Country-pair FE	No	No	Yes	Yes
Constant	5.840*** (0.503)	9.539*** (0.549)	4.341*** (1.433)	4.763*** (0.872)
Observations	98,459	98,459	98,459	98,459
R-squared	0.931	0.933		

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Source: Author's calculation

5. Results and discussion

The GDP variables of the reported country and the partner country have statistically significant positive effects on supply chain exports, while the effects are statistically significant but negative in the case of supply chain imports with POLS, and not significant in the case of PPML. These results suggest that larger and developed economies are usually able to produce higher value-added products because they attract more foreign investment, technology, and knowledge, and thus have higher value-added production, which naturally leads to higher value-added exports. On the other hand, economic size is not significant in the best case for supply chain imports, as more developed economies are more forward oriented in the supply chain of higher value added products, rather than having more foreign content in their exports. The *RTA* (free trade agreement) variable has statistically significant effects in the case of the POLS estimation, while it is not significant in the case of the PPML estimation. However, the majority of trading partners signed RTAs throughout the observed period, with only 0.96% of RTAs entering into force during the observed period. Consistent with our expectations, the dummy variables contiguity and common official language have statistically significant effects on supply chain trade, as most supply chain trade is regional rather than global. In the case of the PPML estimation, these variables were omitted from the estimation because of the included country pair fixed effects.

As for our main variables of interest, ICT and technological development, ambiguous results emerge. In some cases, the reporting country's ICT quality has statistically significant and positive effects on supply chain trade, both exports and imports; in the case of the partner country's ICT, the results are statistically significant and negative. One would expect ICT to have only positive effects on trade because it speeds up trade processes, documentation, and communication, thus reducing trade costs, but on the other hand, it can also have some negative effects. For example, Antràs (2020) claims that new ICT technologies can affect the relative bargaining strength of different partners in the supply chain. Large buyers in wealthy countries can use ICT infrastructure to obtain information about a larger number of potential suppliers, which enables them to put these suppliers in competition with each other. As a result, the largest companies in wealthier countries can benefit from better trade conditions, while producers in developing countries receive a smaller share of the supply chain's trade profits. Finally, supply chain position, i.e., relative upstreamness, shows statistically significant and positive effects on supply chain exports, i.e., the higher the country's position in the supply chain, the more domestic value added goes into their exports. On the other hand, a higher position in the supply chain also means less foreign value added in exports, which is logical as countries strive to participate more in the supply chain and take an upstream position in the supply chain, which is associated with higher value added production and thus higher exports.

In general, the results suggest that ICT and technological development are important factors in value-added trade, and economic policymakers should focus on trade facilitation measures related to technological adaptation and implementation to increase domestic value-added exports. The findings also highlight the importance of supply chain position and show that countries should strive to take an upstream position in the supply chain and participate more forward in it. This study contributes to the current, mainly empirical literature on value chain trade and the role of ICT and technology in this context.

6. Conclusions

The aim of this paper was to examine the role that ICT and technology play in supply chain trade. Supply chain trade is measured by the domestic and foreign value-added share of exports. The analysis was based on the structural gravity model of international trade. In addition to the “standard” gravity variables, the estimation also controlled for relative bilateral position in supply chain trade. The technology variable used was the economic complexity index, a relatively new measure that indicates countries’ technological capabilities to produce more complex and sophisticated products, and thus to attach a higher domestic value to the product, corresponding to the higher share of domestic value added in exports. Although most variables show the expected results, the results for ICT are ambiguous and indicate some negative effects of ICT that could be due to the misuse of the technology. However, the study should be seen as only a first step in understanding the role of ICT in supply chain trade. Its broader goal is to stimulate both theoretical and empirical research in this area. The analysis conducted at the country level somewhat limits the research scope, as supply chains differ across industries, and it would be interesting to examine how ICT affects supply chain trade across industries. Future research could focus on this area to analyse the impact of ICT at the industry level.

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IKT i tehnološki razvoj zemalja – olakšavaju li trgovinu lancem opskrbe?

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Sažetak

Cilj ovog rada jest procijeniti učinke IKT-a i tehnološkog razvoja zemalja na trgovinu u opskrbnom lancu. Kao zavisne varijable koje predstavljaju trgovinu lancem opskrbe su koriste se domaća dodana vrijednost (DVAFX) uključena u bruto inozemni izvoz i strana dodana vrijednost uključena u domaći izvoz (FVA). IKT varijabla je dobivena pomoću potvrđne faktorske analize, dok se za varijablu tehnološki razvoj zemlje koristi Indeks ekonomske složenosti, razvijen od strane Harvard's Growth Lab. Analiza se temelji na strukturalnom gravitacijskom modelu, a model se procjenjuje Poissonovim procjeniteljem pseudo-maksimalne vjerodostojnosti (PPML). Uz standardni set gravitacijskih varijabli, model uključuje bilateralni položaj zemalja u opskrbnom lancu. Panel podaci obuhvaćaju razdoblje od 2000. do 2019. i uključuju 130 zemalja svijeta. Kako bi se kontrolirao potencijalni izvor endogenosti, u model se uključuju fiksni učinci zemalja izvoznica i partnera, fiksni učinci trgovinskih parova i godišnji fiksni učinci. Rezultati regresijske analize potvrđuju statistički značajnu vezu između tehnološkog razvoja zemlje i trgovine u opskrbnom lancu. Tehnološki razvoj omogućuje zemlji proizvodnju složenijih proizvoda s većom dodanom vrijednošću i time višu poziciju u opskrbnom lancu. Što je zemlja uzvodnije u opskrbnom lancu, to je više domaće dodane vrijednosti sadržano u njezinom izvozu.

Ključne riječi: IKT, tehnologija, trgovina opskrbnim lancem, trgovina u dodanoj vrijednosti, PPML

JEL klasifikacija: C23, F14, O33

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Determinants of entrepreneurial dynamics: The Case of the European Union*

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Abstract

Since economic theory identifies new enterprises as one of the basic drivers of economic growth, it brings to the forefront the need to understand the existing dynamics of entrepreneurship. Consequently, the identification of the basic entrepreneurship's determinants is a central issue from both a theoretical and a practical point of view in contemporary literature. A better understanding of the factors influencing the dynamics of entrepreneurship is a basic precondition for creating effective policies aimed at encouraging the creation of new companies, and consequently, the creation of new jobs. Therefore, this paper addresses several important issues. From the theoretical standpoint, the role of entrepreneurial determinants in creating a new business is examined. From a practical standpoint, the basic formal institutional factors influencing the birth rate of new companies are analyzed. The analysis was conducted on a sample of European Union countries for the period from 2010 to 2019 using data from the World Bank's Doing Business database, as well as data on business dynamics from the Eurostat database. A panel data regression analysis using the fixed-effects estimation procedure with Driscoll-Kraay standard errors was conducted, and the results

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indicate that the dynamics of new enterprises' foundation are negatively affected by the total tax burden, as well as the cost of property registration, while the amount of initial capital required to open a business has a positive impact. The results of the research can serve as a basis for fine-tuning policies that will facilitate and encourage the creation of new enterprises.

Key words: *enterprise birth rates, formal institutional factors, Doing business, EU countries, panel analysis*

JEL classification: *M13, G30, M21, O52, C33*

1. Introduction

Business entities could be under the influence of factors whose effects are twofold. While one group of factors influences a business' establishing process, another has an effect prolonged throughout the lifetime of a business (Canton et al., 2017). According to Sendra-Pons et al. (2022) these factors represent not only institutional factors and factors such as ones defined in regulatory documents or by government bodies, but also cultural and social constraints. Specifically, the low level of a country's GDP per capita is connected to the higher rates of starting new ventures because people see entrepreneurship as a solution to generate necessary income (Sendra-Pons et al., 2022). On the other hand, entrepreneurship is also driven by an opportunity that an entrepreneur recognizes in some country or area (Cinar et al., 2019; Silva et al., 2022). Silva et al. (2022) marked the level of unemployment, human capital, family earnings, and amount of money invested in research and development as significant indicators of entrepreneurship. Budak et al. (2014) indicate a factor that has a detrimental effect on entrepreneurial activity is the level of corruption in the country.

Even though entrepreneurship is positively connected to economic growth (Opute et al., 2021), there is also an influence of the economic growth of the country on entrepreneurship and on the increase in the number of new firms established. Both lower country risk and greater GDP per capitadetermine levels of entrepreneurship primarily led by opportunity recognition (Cervelló-Royo et al., 2020). Moreover, an encouraging environment in developed countries triggers their entrepreneurial activities based on innovation and high-level processing product development (Silva et al., 2022). Therefore, policymakers and public administration should create a competitive environment to secure the allocation of resources to successful businesses and foster their resilience to external shocks (Canton et al., 2017). Furthermore, through the new firm establishment, the country decreases its level of unemployment. However, there are examples of countries in which unemployment does not encourage entrepreneurship. The reason may be in social policies and money support that unemployed people get, and thus, they are not pushed into entrepreneurship (Silva et al., 2022). Besides unemployment, entrepreneurship is also related to production and land prices in regions (Nakamura, 2019).

As previously stated, there are numerous determining factors connected to the entrepreneurial process so the existing research on the topic of entrepreneurship could be grouped as those that examined the influence of factors named ‘informal institutions’ (Samila and Sorenson, 2017; Zelekha and Dana, 2019), ‘formal institutions’ (Eberhart et al., 2017; Chowdhury et al., 2019) or even both (Estrin et al., 2013; Fuentelsaz et al. 2019). When it comes to the first group of factors is seen through the lenses of the social and cultural capital influences on entrepreneurial activity. Countries with both significant social capital, especially in the form of trust, and some level of cultural capital certainly have a higher level of entrepreneurship in reality (Zelekha and Dana, 2019). But if these factors or conditions are not met, then formal institutions come to the fore. Actually, it is the interplay between these two groups of determinants that designates the level of achieved entrepreneurial activity in one country (Fuentelsaz et al. 2019). Therefore, this paper aim is to investigate the influence of formal institutional factors such as enforcing contracts costs, total tax and contribution rate, registering property costs, and minimum amount of capital needed for starting a business on the dynamics of enterprises’ birth rates in EU countries as a proxy of entrepreneurship in these countries. The main hypothesis of the research is that the formal determinants of entrepreneurial dynamism (i.e., enforcing contract costs, total tax and contribution rate, registering property costs, and minimum amount of capital needed for starting a business) have a negative influence on the enterprises’ birth rates in EU countries.

Given the existing literature on this topic, the paper will bridge the gap in the research that analyses the effects of formal institutional factors on entrepreneurial dynamism, in particular by exploring the influence of access to the financial capital needed for starting a venture that is explored either separately (Henrekson and Sanandaji, 2020) or in combination with many other non-institutional factors (Chowdhury et al., 2019). Except for mentioned theoretical contribution, the paper will develop recommendations for policy-makers to adjust policies and create a favorable business environment for future entrepreneurs. During the decision-making process, investors could under or overestimate the conditions of doing business in some environments (Bardy et al., 2012), and thus the paper results will be indicative in the segment of determining the sign of the factors influencing the business establishment process. The methodological contribution of the study will be observed through the integration of two databases and indicators of business activity into a balanced panel dataset of EU countries’ indicators. This study exploited the World Bank database to obtain independent variables. Especially its part created at the same time as the globally accepted indicator, the Doing Business index, which is aimed to access the ease of doing business in one country and shed the light on important indicators of a successful business environment. On the other hand, the Eurostat database’s indicator of business birth rate is implemented in this paper as a dependent variable under the influence of four independent variables.

The paper is structured as follows: After the introduction, the second section presents the overview of the contemporary analysis of the ease of doing business in EU countries and the literature review of the existing research on determinants of new enterprise formation. The third part explains the methodology applied for data analysis, while the succeeding part gives an overview of the empirical results and their discussion. Finally, the conclusion is presented in the last part of the paper.

2. Literature review

When deciding on establishing a new business, investors are interested in revealing determining factors of the entrepreneurial ecosystem in which they opt to base their venture. One of the progressive steps made to capture the business environment of 190 countries is the World Bank's Doing Business index. It should be kept in mind that Doing Business covers 12 areas of business regulation that most often indicate the conditions for small and medium size enterprises' business operations. Ten of these areas – starting a business, building permits, obtaining electricity, registering property, obtaining loans, protecting minority investors, paying taxes, cross-border trade, enforcing contracts, and resolving insolvency – are included in the rankings' calculation measuring while regulations on hiring workers and contracting with the government are not included in the ease of doing business and ranking (Doing Business 2019) (World Bank, 2019). One more advantage of this ranking procedure is that it assesses the real business environment rather than regulations.

The Doing Business index observes five sections of data in order to assess the business environment of the country (World Bank, 2020). But the question that arises is how these factors influence the number of new enterprises established. Therefore, procedural aspects of the business foundation named 'formal institutional factors such as enforcing contract costs, total tax and contribution rate, registering property costs, and minimum amount of capital needed for starting a business are considered in this paper. The subsequent table presented an overview of the supporting literature for the proposed research hypothesis (Table 1). Some of the literature sources are derived by following the study of Wurth et al. (2022) on determinants involved in shaping the entrepreneurial ecosystem.

Table 1: Literature review

Source	Methodology	Data source	Variable	Sample	Main findings
Bennett (2021)	Panel data econometric methods	Metropolitan Area Economic Freedom Index; period of 1972-2012 (every 5th year)	Taxation Index	up to 382 US metropolitan statistical areas	The author analyzed three indexes of taxation and revealed that there is a significant positive influence of income tax on the firm entry rate, while sales tax and property tax have a negative influence on the firm entry rate.
Dilli et al. (2018)	Simple OLS regression	Doing Business and Eurostat database; period of 2004-2014	Institutional dimensions such as finance (i.e., paid-in minimum capital); Inter-firm relations (i.e., enforcing contracts)	21 Western developed economies	An influence on enterprise's birth rates in low-technology sectors of the finance-related group of factors is positive in the sample of some Nordic and Mediterranean countries, while it is negative in medium-low-technology sectors in financially restrictive Mediterranean countries. On the other hand, the influence of the reliability of inter-firm institutions in Eastern and Mediterranean countries is negative on the birth rate of high-tech and medium-high-tech enterprises.
Martinez-Fierro et al. (2020)	Correlation and analysis of variance	Global Entrepreneurship Monitor (GEM) and GEM National Expert Survey (NES)	Financing, government policies; Commercial infrastructure	62 GEM countries	In this research total, entrepreneurial activity only negatively correlates with the country's financial environment. Moreover, there is a relationship between the level of economic development and the entrepreneurial ecosystem, so the financial environment as a factor of entrepreneurial activity differs between countries with different levels of economic development.
Levie and Autio (2008)	Panel data econometric methods	GEM and NES; period of 2000-2006	Finance (i.e., various funding options); Regulations (i.e., taxes, and bureaucracy)	54 countries and 232 cases	The researchers revealed only the positive effect of regulations on total entrepreneurial activity in high-income countries.

Source	Methodology	Data source	Variable	Sample	Main findings
Hechavarría, and Ingram (2019)	Panel data econometric methods	GEM and NES; period of 2011-2014	Financial environment, Government policy, taxes, Commercial infrastructure access	75 countries and 403 cases	The study identifies the positive influence of government policy and support on the total entrepreneurial activity (TEA) rates for both men and women entrepreneurs but not of government policy and taxes as a factor, while the same study assesses the negative influence of commercial infrastructure access on TEA rates of women but not for men. No influence of the financial environment was identified in this research. During the robustness check, the financial environment shows a negative influence on both male and female TEA rates in factor, efficiency, and innovativeness-driven countries.
FuenteIsaz et al. (2019)	Panel data econometric methods – Tobit model	GEM, Worldwide Governance Indicators; period of 2002-2015	Formal institutions such as quality of government activities, regulations, and law	80 countries and 586 cases	When a total influence of formal institutions (i.e., quality of government sectors concerning the activities and interests of entrepreneurs) on the TEA rate is assessed, the results indicate that when the quality of formal government institutional factors increases, the TEA increases, as well. Consequently, the influence of formal institutions is positive and significant.
Sendra-Pons et al. (2022)	fuzzy-set qualitative comparative analysis (fsQCA)	GEM, Worldwide Governance Indicators; period of 2018-2019	Regulatory requirements to establish an enterprise; governance indicators (i.e., quality of government activities, regulations, and law)	48 countries	In this research, it was confirmed that countries with solid institutional regulations lead by a strong government that created the sense of rule of law and absence of unnecessary administrative procedures have high TEA rates. Moreover, the same countries have positive results in TEA rates if the access to financial resources is lessened.

Source	Methodology	Data source	Variable	Sample	Main findings
Chowdhury et al. (2019)	Panel data econometric methods	Doing Business Database (2022), GEM, World Development Indicators (WDI), World Economic Forum; period of 2005-2015	Capital availability; Regulations; Government support	70 countries and 626 cases	The authors assess the effect of various formal and informal institutional indicators on the quality and quantity of entrepreneurship. The research sample is combined of developed and developing countries. The panel regression analysis of fixed effect has presented that on quality of entrepreneurship (measured as entrepreneurship productivity) indicators of simplicity to access capital (venture capital and equity) have a positive effect, the tax rate levied to business has a negative effect, the number of procedures compulsory to register property and number of days needed to enforce contract have a positive effect. Oppositely, on the quantity of entrepreneurship defined as a percentage of a new ownership rate of a population between 18-64 years old who have established and managed a business between 3 and 42 months the access to equity has negative and mandatory requirements for registering the property expressed in days has a positive influence.
Chowdhury et al. (2015)	Panel data econometric methods – random effect model	GEM, WDI, Doing Business, World Bank; period 2001-2005	Tax rates; Start-up procedures; Capital disposal	44 countries	The study supports the connotations that taxes are factors with a negative sign, so countries with higher tax rates will show lower rates of entrepreneurship. Secondly, administrative procedures and the availability of capital for entrepreneurial activities could have different influences in the case of start-ups, nascent entrepreneurs, or self-employed persons. In the case of capital, it has a positive influence on start-ups, but a negative to the other two types of entrepreneurial activity.

Source: Authors' presentation

Given literature review support the proposed main research hypothesis:

H1: Formal determinants of entrepreneurial dynamism such as enforcing contract costs, total tax and contribution rate, registering property costs, and minimum amount of capital needed for starting a business have a negative influence on the enterprises' birth rates in EU countries.

The proposed hypothesis will be tested by applying panel data regression analysis and the results will be presented in the succeeding parts of the paper.

3. Methodology

When conducting empirical research, data can usually be classified into three categories: cross-sectional data, time series data, and panel data. The cross-section data category refers to data collected on several units at a given time, the time series data category is a collection of observations over some time concerning several variables, while the panel data category refers to data covering several units over some time. It can be concluded that panel data is a combination of cross-sectional data and time series data. Recently, the use of panel data in empirical research in both developed and developing countries has become increasingly important, on the one hand, due to the need for harmonization of regional policies, while on the other hand the inherent benefits for empirical research are cited as the reason for increased use of panel data (Hsiao, 2007). In particular, the inherent benefits of panel data for empirical analysis include (Baltagi, 2008): (a) an increase in the number of observations provides more sample variability, less collinearity, and more precise inference of model parameters; (b) better coverage of the intricacy of human behavior than cross-sectional or time series data; (c) capturing of the heterogeneity inherent in each individual unit; (d) covering the dynamics of the behavior of economic operators; (e) more accurate forecasts. Therefore, the assessment of the determinants of entrepreneurial dynamics was performed using regression analysis on panel data. Mathematically, the panel data regression model can be formulated as (Baltagi, 2008):

$$y_{it} = \alpha + X'_{it}\beta + u_{it} \quad i = 1, 2, \dots, N, t = 1, 2, \dots, T \quad (1)$$

Wherein:

y_{it} – the value of the dependent variable for the i^{th} observation unit in the period t

α – intercept

X_{it} – i^{th} observation on K explanatory variables in the period t

β – vector of regression parameters

u_{it} – disturbance term, where $u_{it} = \mu_i + v_{it}$, μ_i denotes unobservable individual-specific effect and v_{it} denotes the remainder disturbance.

The effects of unobserved individual-specific effects may either be assumed as random variables or fixed parameters. The former case represents the random effects model, while the latter case represents the fixed effects model.

One of the most important questions when analyzing panel data is whether it is better to use a model with fixed effects or a model with random effects. Various controversies on this topic can be found in the literature, but the conclusion is that there is no single answer and that the choice of adequate model specification depends on the nature of the data. Gujarati (2004) believes that the choice of the model depends on the probability that there is a correlation between individual-specific effects and explanatory variables. Specifically, if there is no probability of a correlation between individual-specific effects and explanatory variables, it is considered better to choose the random effects model. However, in case there is a correlation between individual-specific effects and explanatory variables, it is stated that it is better to use a fixed effects model. The Hausman specification test is used to compare the estimated coefficients obtained with the fixed-effects model and the random-effects model. The null hypothesis in the Hausman specification test is that random error is not correlated with any regressor (independent variable). In the case when the test shows that the null hypothesis should not be rejected, the conclusion is that the random effect estimate is more efficient.

If the test shows that the null hypothesis should be rejected, it can be concluded that the estimate of the random effect is not consistent and that the estimate of the fixed effect is necessary (Wooldridge, 2010). After selecting the appropriate model specification, it is necessary to check the fulfillment of the basic assumptions of panel data models, since they are often violated. Assumption testing means testing the model for the existence of multicollinearity, heteroskedasticity, autocorrelation, and cross-sectional correlation. One of the most important assumptions is the mutual independence of predictor variables. If there is a strong correlation between two independent variables, this can cause a significant problem in the estimated values, and this phenomenon is called multicollinearity. The Variance Inflation Factor test (VIF) can be used to identify the presence of multicollinearity between independent variables. The VIF value greater than 10 indicates the existence of strong multicollinearity. Another important assumption is homoskedasticity. More specifically, homoskedasticity indicates that there is no correlation between random effects and independent variables, while heteroskedasticity occurs when a random error correlates with one of the independent variables. If a random error that is heteroskedastic is treated as homoskedastic, the estimated coefficients obtained by regression will be consistent but will not be effective and the standard error of these estimated values will be biased (Baltagi, 2008). When it comes to testing this assumption, there are many tests, the most commonly used being the Breusch-Pagan test and the modified Wald test for groupwise heteroscedasticity. The next test is

related to the examination of autocorrelation. A situation in which the random error of one observation depends on the random error of another observation is called autocorrelation or serial correlation. Autocorrelation can be found most frequently in time series data when observations in a certain time period depend on observations in previous time periods. The presence of autocorrelation results in the inefficiency of the estimated values (Chiulli, 2018). The most frequently used test for the examination of autocorrelation is Wooldridge serial correlation test for panel data. The last test refers to the examination of cross-sectional dependence. Cross-sectional dependence denotes the existence of the correlation of the residuals across entities which causes biased results. One of the commonly used tests to account for the cross-sectional dependence is Pesaran's test.

4. Empirical data and analysis

To determine the link between entrepreneurial dynamics and the indicators of the business condition indicators, data obtained from the Doing Business database published by the World Bank and the Eurostat database were used. The Doing business database provides objective measures of business regulations and their enforcement across economies (Doing Business, 2022). Data were obtained for the period from 2010 to 2019. As a proxy of entrepreneurial dynamics, the birth rate (BirthRate) of the company was used, while as indicators of business conditions, enforcing contracts costs (EnforcingContracts), total tax and contribution rate (TotalTax), registering property costs (RegisteringProperty) and minimum amount of capital needed for starting a business (StartingCapital) were used. The enterprise birth rate represents the number of births as a percentage of the population of active enterprises. The enforcing contracts indicator indicates the quality of court proceedings, assessing whether each economy has implemented a range of suitable practices that endorse quality and efficiency in the court system (World Bank, 2022). The total rate of taxes and contributions indicates the size of the company's tax liabilities in a specific economy. Registering property costs indicate the cost required by the enterprise to register the asset expressed as a percentage of the value of the asset, while the minimum amount of capital represents the amount of capital needed for starting a business expressed as a percentage of income per capita. Descriptive statistics of the variables are presented in Table 1 in Appendix. The results of descriptive statistics indicate that there is significant variability of the StartingCapital variable observed both in one country and in the panel.

In order to evaluate the determinants that affect the entrepreneurial, regression analysis is performed on panel data, and the following model is estimated:

$$BirthRate_{it} = \beta_0 + \beta_1 EnforcingContracts_{it} + \beta_2 TotalTax_{it} + \beta_3 RegisteringProperty_{it} + \beta_4 StartingCapital_{it} + \varepsilon_{it} \quad (2)$$

wherein

$\beta_0, \beta_1, \dots, \beta_4$ – intercept and slope coefficients

ε_{it} – disturbance term, $i = 1, \dots, 27, t = 1, \dots, 10$.

In order to assess the adequate model specification, the Hausman test specification was applied, and the results of the Hausman test are in favor of the model with fixed effects (Table 2 in Appendix). To examine the validity of the model, assumptions related to multicollinearity, heteroskedasticity, autocorrelation, and serial correlation were further analyzed. The values of all variance inflation factor values are less than 10 (Table 3 in Appendix) which indicates that there is no multicollinearity of explanatory variables. The results of the Wald test for the Groupwise heteroscedasticity in the fixed effect regression model indicate that the model suffers from heteroscedasticity (Table 4 in Appendix). The results of the Pesaran’s test of cross-sectional independence indicate the existence of cross-sectional dependence (Table 5 in the Appendix). The results of Wooldridge’s test for autocorrelation in panel data indicate the existence of autocorrelation (Table 6 in Appendix).

Taking into account the conducted tests, the fixed effect regression with the Driscoll-Kraay standard errors was performed (Table 2). Driscoll and Kraay (1998) offer “a nonparametric covariance matrix estimator which produces heteroscedasticity consistent standard errors that are robust to very general forms of spatial and temporal dependence” (Hoechle, 2007: 2). Although the estimation procedure is initially based on a large T assumption, Driscoll and Kraay (1998) prove that even for very short time dimensions the estimator is consistent. In addition, it has been shown that for models in which the cross-sectional dimension is relatively larger than the time dimension this approach is more appropriate than alternative approaches (Zhang and Lin, 2012; Knight, 2014).

Table 2: Regression with Driscoll-Kraay standard errors

BirthRate	Coefficient	Std. Err.	t	P> t	95% Conf. Interval	
EnforcingContracts	.0164169	.0325704	0.50	0.626	-.0572623	.0900962
TotalTax	-.0392726	.0124833	-3.15	0.012	-.0675119	-.0110334
RegisteringProperty	-.3264175	.1199226	-2.72	0.024	-.5977013	-.0551336
StartingCapital	.0173934	.0056477	3.08	0.013	.0046174	.0301694
_cons	12.8924	.5392985	23.91	0.000	11.67242	14.11238

Source: Authors’ calculation

Research results indicate an influence of various formal indicators on the dynamics of new enterprises in EU countries. The enterprise birth rate is negatively affected by the total tax burden, as well as the cost of property registration, while the amount of initial capital required to open a business has a positive impact. The effect of enforcing contracts cost has no significant influence on the dependent variable. Therefore, the research hypothesis is confirmed in the part where it was proposed that two of four formal institutional determinants have a negative influence on the dependent variable. On the other hand, the hypothesis is not supported when it comes to the influence of stating capital on the new business dynamism which was positive, and the effect of enforcing contract cost was not confirmed to be significant.

5. Results and discussion

Based on the conducted regression analysis, the main determinants of the companies' birth rates were identified. They can represent a good starting point for creating guidelines for policymakers. In addition, to verify the obtained results, after the discussion and implications, a robustness analysis was performed.

5.1. Discussion and implications

The study findings present central determinants of the entrepreneurship ecosystem in the EU. Firstly, the results concerning the effect of the total tax burden imposed on the newly formed enterprises are in the line with the previous research of Chowdhury et al. (2019) that identified the effect of commercial tax in the inverted U-shape on the quantity of entrepreneurship. Also, the entrepreneurship rate in developing is rather resilient to commercial tax changes than in developed countries. On the other hand, Chowdhury et al. (2015) found that the total tax rate has a trifold influence on entrepreneurship. Start-up firms face the negative effect of tax rates increase, self-employment is under the positive influence of tax rates, while for nascent entrepreneurship the influence is not confirmed. Undoubtedly, determining tax rates affects business operations by collecting a part of revenue and thus decreasing the profit margin as compensation for high-risk investments by the entrepreneur. The literature does not confirm the direct effect of tax reduction on business dynamism, but the indirect effect of tax reduction especially in tax levied on profit is proven to promote entrepreneurship and generates business value (Sedlacek, et al., 2019). Therefore, the tax systems should provide incentives for newly established businesses in order to motivate entrepreneurs and thus boost the rate of new firms' establishment. In this situation, the government and its positive attitudes toward entrepreneurship and the economic growth that it produces comes to the fore. Secondly, registering property cost as a determining factor with a

negative sign of the effect is a signal for policy-makers that in order to achieve an increase of established firms they should ensure an entrepreneurial ecosystem free of unnecessary bureaucracy and procedures. Similarly, Levie and Autio (2008) revealed that the regulatory environment assessed as not consuming when it comes to time and money positively influences entrepreneurial activity. It implies that if the country has strict business regulations, it will have a negative effect on investments and capital creation (Canton et al., 2017). Public administration influences business from the very beginning to the end of the lifecycle. Specifically, in the research of Sendra-Pons et al. (2022) countries with the rule of law and simple procedures for business creation have higher rates of entrepreneurship. Thirdly, in this paper, it was discovered the positive effect of capital required at the very beginning of the business establishment procedure on the enterprise birth rate. However, it is not unexpected to have this outcome because higher levels of capital mean that fewer have an opportunity to form their business and will do so only if are sure of its success (Silva et al., 2022). Even though this result is opposite to expectations made while defining the research model, it is not without the support in the literature. The study of Dilli et al. (2018) indicates that depending on the level of the geographical grouping, some countries face a positive influence of demanded starting capital on the firm birth rate (i.e., Nordic and Mediterranean countries). The results of the same study also indicate that the positive effect of capital requirements and other financial constraints is present in low-tech enterprises' birth rates, while high-tech firms' birth rates are increased if the financial constraints are not so restrictive. Therefore, if the countries are devoted to an increase in high-tech enterprises number the financial requirements should be lessened. Lastly, no influence of enforcing contract costs was noted in this study. On the other hand, research conducted by Dilli et al. (2018) found its negative influence on the business birth rates while the study of Fuentelsaz et al. (2019) showed a positive influence of all formal institutional factors among such as enforcing contract cost on the total entrepreneurial activity. According to Chowdhury et al. (2019), bankruptcy law is an important factor for entrepreneurs in developing countries because protects their interests when needed. Sendra-Pons et al. (2022) stipulate that rule of law brings higher entrepreneurial activity rates but the absence of it hinders entrepreneurship in the country. Nevertheless, the current study did not confirm any of the previously identified effects thus indicating that the enterprise birth rate depends more on the costs of starting a business rather than ending it. What is more, only indecisive future entrepreneurs could potentially base their decision-making process of starting a business on the facts such as enforcing contract cost, time of court procedures, and similar (Chowdhury et al., 2019).

5.2. Robustness analysis

Since the issue of endogeneity is particularly relevant in the context of panel data regression models in order to perform a robustness check the procedure proposed

by Chowdhury et al. (2015) was performed. The robustness procedure is based on the estimation of the regression model with the lagged independent variables. The results are presented in Table 3.

Table 3: Dynamic regression results

BirthRate	Coefficient	Std. Err.	t	P> t	95% Conf. Interval	
L.EnforcingContracts	-0.0362445	0.0617323	-0.59	0.573	-.1785994	.1061105
L.TotalTax	-0.0007383	.0167433	-0.04	0.966	-.0393485	.0378719
L.RegisteringProperty	0.1578213	.1424026	1.11	0.300	-.1705597	.4862022
L.StartingCapital	.02628	.0027084	9.70	0.000	.0200343	.0325257
_cons	10.30355	1.061165	9.71	0.000	7.856495	12.7506

Source: Authors' calculation

The obtained results partially support the results of the fixed-effects model with the Driscoll-Kraay standard errors and prove that the amount of capital required to start a business is indeed an important determinant of business birth rates, confirming the positive sign of this variable.

6. Conclusions

It is more than obvious that there are significant differences between EU countries in terms of business environment conditions. These deviations are preventing EU countries' convergence when it comes to entrepreneurship. Therefore, there is a need for policy changes in order to improve the conditions for establishing a new company. With this in mind, the authors conducted the analysis and partially confirmed the research hypothesis that formal institutional factors negatively influence enterprise birth rates in EU countries. The paper contributes to the literature in the field of entrepreneurship by confirming the direction of influence of two determinants, and pointing out that the influence of tax cost and registering property cost is assessed as negative. Additionally, the conducted research offered the new results that shed the light on the positive influence of starting capital requested for business establishment, and on the factor of enforcing contract cost that is found to be without the influence on the enterprise birth rate. From the methodological point of view, the study merged two databases and showed that Doing business indicators as a measure of the business environment can be regressed not only to the total entrepreneurial activity but also to the business performance indicators such as enterprise birth rate. Future research should encompass other indicators of the business ecosystem such as market size, characteristics of the financial market, security, stability and etc. in order to assess

both the influence of the business environment and the potential for increasing entrepreneurial activity. Given the obtained positive effect of starting capital on the dependent variable, and since the EU is formed of diverse entities and there is a need to analyze it separately so this opinion could be perceived as a paper limitation and an opportunity for further analysis. In addition, another limitation of the conducted research can be observed in the small sample size, specifically in the short time dimension, and future research can be focused on the inclusion of more time periods. Also, by including years after 2019, it is possible to analyze the impact of the coronavirus pandemic on the birth rate of new companies. Nevertheless, the paper offers valuable insights for policymakers who should undertake activities to diminish the effects of tax and administration costs and to stimulate entrepreneurship and economic growth in the country, while the rule of law is of secondary importance for future entrepreneurial activity.

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Determinante poduzetničke dinamike: slučaj Europske unije

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Sažetak

Budući da ekonomska teorija identificira nova poduzeća kao jedan od osnovnih pokretača gospodarskog rasta, ona u prvi plan stavlja potrebu razumijevanja postojeće dinamike poduzetništva. Stoga je identifikacija temeljnih odrednica poduzetništva središnje pitanje kako s teorijskog tako i s praktičnog stajališta u suvremenoj literaturi. Bolje razumijevanje čimbenika koji utječu na dinamiku poduzetništva osnovni je preduvjet za kreiranje učinkovitih politika usmjerenih na poticanje stvaranja novih poduzeća, a posljedično i otvaranja novih radnih mjesta. Stoga se ovaj rad bavi nekoliko važnih pitanja. S teorijskog stajališta ispituje se uloga poduzetničkih odrednica u stvaranju novog posla. S praktičnog stajališta analiziraju se osnovni formalni institucionalni čimbenici koji utječu na natalitet novih poduzeća. Analiza je provedena na uzorku zemalja Europske unije za razdoblje od 2010. do 2019. godine korištenjem podataka iz Doing Business baze podataka Svjetske banke, kao i podataka o poslovnoj dinamici iz baze podataka Eurostata. Provedena je regresijska analiza panel podataka primjenom Driscoll-Kraayeve procedure procjene sa standardnim pogreškama, a rezultati pokazuju da na dinamiku osnivanja novih poduzeća negativno utječu ukupno porezno opterećenje, kao i trošak uknjižbe vlasništva, dok iznos početnog kapitala potreban za otvaranje poduzeća ima pozitivan učinak. Rezultati istraživanja mogu poslužiti kao osnova za fino ugađanje politika koje će olakšati i potaknuti stvaranje novih poduzeća.

Ključne riječi: stopa osnivanja poduzeća, formalni institucionalni faktori, Doing Business, zemlje EU, panel analiza

JEL klasifikacija: M13, G30, M21, O52, C33

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Appendices

Table 1: Descriptive statistics of variables for the countries and for the panel

Country	Descriptive statistics	BirthRate	Enforcing-Contracts	TotalTax	Registering-Property	Starting-Capital
Austria	Mean	7.12444	20.48889	51.63333	4.57778	34.00000
	STD	0.54058	0.10541	0.41231	0.04410	19.98725
	CV	0.07588	0.00514	0.00799	0.00963	0.58786
Belgium	Mean	6.35333	17.80000	57.66667	12.70000	18.16667
	STD	0.53066	0.15000	1.06536	0.00000	1.01735
	CV	0.08352	0.00843	0.01847	0.00000	0.05600
Bulgaria	Mean	11.87111	18.60000	27.61111	2.93333	2.30000
	STD	0.61825	0.00000	1.11181	0.07071	6.90000
	CV	0.05208	0.00000	0.04027	0.02411	3.00000
Croatia	Mean	8.85571	14.23333	20.44444	4.88889	13.27778
	STD	0.86927	1.45000	1.02848	0.33333	0.42361
	CV	0.09816	0.10187	0.05031	0.06818	0.03190
Cyprus	Mean	6.60000	16.40000	22.31111	10.10000	0.00000
	STD	2.33920	0.00000	1.17733	0.94207	0.00000
	CV	0.35442	0.00000	0.05277	0.09327	
Czech Republic	Mean	9.27111	33.80000	46.00000	3.55556	16.81111
	STD	1.08913	0.00000	0.41533	0.52705	15.95450
	CV	0.11748	0.00000	0.00903	0.14823	0.94905
Denmark	Mean	11.10222	23.30000	25.57778	0.60000	21.54444
	STD	0.54710	0.00000	1.40159	0.00000	8.37065
	CV	0.04928	0.00000	0.05480	0.00000	0.38853
Estonia	Mean	11.30778	20.81111	51.80000	0.48889	20.47778
	STD	0.71880	1.77302	6.29047	0.03333	3.58845
	CV	0.06357	0.08520	0.12144	0.06818	0.17524
Finland	Mean	8.23889	15.55556	40.28889	4.00000	7.02222
	STD	1.30550	1.27878	2.97802	0.00000	0.43237
	CV	0.15846	0.08221	0.07392	0.00000	0.06157
France	Mean	10.39000	17.40000	67.37778	6.36667	0.00000
	STD	1.05648	0.00000	2.90507	0.52915	0.00000
	CV	0.10168	0.00000	0.04312	0.08311	
Germany	Mean	12.51778	8.86667	29.21111	2.93333	10.50000
	STD	1.05008	0.40000	2.24246	0.63246	2.82179
	CV	0.08389	0.04511	0.07677	0.21561	0.26874

Country	Descriptive statistics	BirthRate	Enforcing-Contracts	TotalTax	Registering-Property	Starting-Capital
Greece	Mean	4.68250	22.40000	47.78889	7.85556	10.10000
	STD	0.31320	0.00000	2.94595	3.80300	12.00187
	CV	0.06689	0.00000	0.06165	0.48412	1.18830
Hungary	Mean	10.65222	15.00000	50.04444	5.66667	26.65556
	STD	1.46756	0.00000	3.52601	2.00000	20.19964
	CV	0.13777	0.00000	0.07046	0.35294	0.75780
Italy	Mean	7.09667	27.51111	64.00000	4.44444	5.46667
	STD	0.32315	3.14819	6.28967	0.05270	5.18748
	CV	0.04554	0.11443	0.09828	0.01186	0.94893
Latvia	Mean	15.68000	23.10000	36.16667	2.00000	3.34444
	STD	2.24647	0.00000	0.95656	0.00000	6.65002
	CV	0.14327	0.00000	0.02645	0.00000	1.98838
Lithuania	Mean	21.47667	23.60000	43.11111	0.80000	23.13333
	STD	2.57984	0.00000	0.82529	0.00000	11.34383
	CV	0.12012	0.00000	0.01914	0.00000	0.49037
Luxembourg	Mean	6.95500	24.00000	28.86667	0.30000	25.90000
	STD	0.24419	0.00000	0.20616	0.00000	0.84705
	CV	0.03511	0.00000	0.00714	0.00000	0.03270
Ireland	Mean	9.45444	9.70000	20.30000	10.12222	21.02222
	STD	0.36070	0.00000	0.35355	0.04410	1.77467
	CV	0.03815	0.00000	0.01742	0.00436	0.08442
Malta	Mean	9.34444	21.50000	42.12857	8.94286	1.45556
	STD	4.25810	0.00000	1.17716	4.32892	0.16667
	CV	0.45568	0.00000	0.02794	0.48406	0.11450
Netherlands	Mean	10.07889	24.01111	39.70000	6.10000	22.40000
	STD	0.51319	0.22048	0.82916	0.00000	26.57725
	CV	0.05092	0.00918	0.02089	0.00000	1.18648
Poland	Mean	12.51000	19.22222	40.51111	0.36667	12.76667
	STD	0.66675	0.21082	0.65849	0.07071	1.64317
	CV	0.05330	0.01097	0.01625	0.19285	0.12871
Portugal	Mean	14.38444	16.75556	41.60000	7.32222	7.51111
	STD	1.64718	0.42164	1.14018	0.04410	14.90515
	CV	0.11451	0.02516	0.02741	0.00602	1.98441
Romania	Mean	11.52111	25.80000	42.74444	1.52222	0.72222
	STD	2.05742	0.00000	1.80562	0.13017	0.13944
	CV	0.17858	0.00000	0.04224	0.08551	0.19308

Country	Descriptive statistics	BirthRate	Enforcing-Contracts	TotalTax	Registering-Property	Starting-Capital
Slovak Republic	Mean	13.02222	29.45556	49.27778	0.00000	20.02222
	STD	2.93390	3.35898	0.77746	0.00000	2.17473
	CV	0.22530	0.11404	0.01578		0.10862
Slovenia	Mean	10.77111	12.70000	32.28889	2.21111	42.88889
	STD	0.97413	0.00000	1.66692	0.03333	1.81414
	CV	0.09044	0.00000	0.05163	0.01508	0.04230
Spain	Mean	10.73500	33.64444	33.28889	2.71111	1.94444
	STD	1.01116	4.22880	3.03622	0.03333	2.91895
	CV	0.09419	0.12569	0.09121	0.01230	1.50118
Sweden	Mean	7.10778	30.93333	50.96667	4.01111	14.54444
	STD	0.53478	0.40000	1.86011	0.57325	5.35750
	CV	0.07524	0.01293	0.03650	0.14291	0.36835
Panel	Mean	10.54084	20.96679	40.71381	4.31604	13.75000
	STD	3.61031	6.61623	12.49751	3.52972	14.03069
	CV	0.34251	0.31556	0.30696	0.81781	1.02041

Source: Authors' calculation

Table 2: The Hausman test results

	Chi-Square Statistic	Probability
Ho: difference in coefficients not systematic	42.30	0.0000

Source: Authors' calculation

Table 3: Variance inflation factor values

Variable	VIF
EnforcingContracts	1.17
StartingCapital	1.10
RegisteringProperty	1.09
TotalTax	1.05

Source: Authors' calculation

Table 4: Results of the modified Wald test

Chi Square	Probability
3711.43	0.0000

Source: Authors' calculation

Table 5: Pesaran's test of cross-sectional independence

Value	Probability
4.456	0.0000

Source: Authors' calculation

Table 6: Wooldridge test for autocorrelation in panel data

Value	Probability
534.548	0.000

Source: Authors' calculation

The flypaper effect phenomenon of intergovernmental transfers during the Covid-19: Evidence from Indonesia*

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Abstract

This study aims to confirm the flypaper effect phenomenon and the impact of the Covid-19 pandemic on local own-source revenue (LOR), general allocation fund (GAF), and local government financing on local government expenditure in Indonesia. The research used a quantitative method, while the sample was data on regional government budget (RGB) realization in 335 local governments in 2019 – 2020. The data were analyzed using Moderating Regression Analysis. The study found that there was a flypaper effect phenomenon that encouraged the local governments to use GAF, instead of LOR for their local expenditure. The GAF and local government expenditures were higher during the Covid-19 period. To overcome the flypaper effect phenomenon, the central government is advised to improve the GAF policy by setting priorities for its use. Local governments must encourage micro, small, and medium enterprises to help support LOR. This study proves there exists the phenomenon of the flypaper effect in developing countries that implement the presidential system (republic) and provide substantial empirical evidence on government spending policies during crisis and non-crisis (Covid-19).

Key words: flypaper effect, general allocation fund, local government expenditure, local government financing, local own-source revenue

JEL classification: H30, H53, H70, H74

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1. Introduction

The current decentralization movement in Indonesia includes the adoption of regional autonomy. The adoption of Law No. 32 on Local Government (Republic Indonesia Law, 2004a) and Law No. 33 on Central and Local Fiscal Balance harmonized with regional autonomy (Republic Indonesia Law, 2004b). Local own-source revenue (LOR), which is used to support regular and development expenses, is the primary financial source for the local government. Besides LOR, Local governments also get support from the central government in the form of a Balance Fund. Balance funds consist of specific allocation funds (SAF), general allocation funds (GAF), and revenue-sharing funds (Republic Indonesia Law, 2004b). The distribution of the balance fund is intended to help local authorities finance and eliminate vertical fiscal disparities (the financial gap between the central and local governments) and horizontal fiscal disparities (the financial gap among local governments).

The issue today is that local governments rely too heavily on Balance Fund allocation to pay for ongoing expenses and development without fully utilizing its potential. The GAF allocation, established by the Central Government, is not based on the local income potential. The GAF formula is allocated based on the fiscal gap and the basic allocation on the generalization in each local government that the local government with a larger fiscal gap earns a higher GAF. The GAF concept has high flexibility even without terms and conditions, and greater allocation, the local government will always expect a greater GAF from the Central Government. It is because the fund is more focused on the income distribution between local governments (horizontal); rather than the potential capacity of local income, and not to maximize efforts to explore the local tax base. This phenomenon is generally referred to as the flypaper effect. A study on flypaper effects in Japan used a Bayesian approach and found that the phenomenon was especially common in the financing for sanitation, education, police, and disaster management (Kakamu et al., 2014). Given the transfer from the central government, the local authorities become more dependent on these practices rather than efforts to increase local revenue (Dick-Sago and Tingum, 2021).

The flypaper effect is to explain the tendency of government fiscal policy, especially in local government, that the transfers or grants from the central government are used more primarily than the local government expenditures fund compared to LOR (Dick-Sago and Tingum, 2021). An empirical study in Ghana shows that central government transfers dominate the local government expenditures fund more than local revenue (Dick-Sago and Tingum, 2021). This phenomenon also occurs in Italy regarding the funding of specific local government expenditures, such as spending in the health sector (Levaggi and Zanola, 2000). Likewise, local governments in other countries were more likely to use transfers from the central government rather than their local own revenues (Levaggi and Zanola, 2000). However, the research results

conducted in Indonesia are different, where the LOR influenced local government expenditures much stronger than the balance fund effect. It proves that there was no flypaper effect in Indonesia (Iskandar, 2012), and also (Delgado and Mayor, 2011) study in Spain revealed that there was no flypaper effect phenomenon. The dominant contribution of central government transfers compared to LOR for funding local government expenditures in the long term will impair good governance. The results of previous studies showed that dependence on central government transfers had a negative impact on development (Barenstein and de Mello, 2001).

Covid-19 caused budget constraints on the local government fiscal. In May 2020, there was an increase in local government expenditure in line with the efforts to overcome the impact of Covid-19. The local government strove to overcome Covid-19 by refocusing and reallocating the budget. Decreasing fiscal availability during Covid-19 reduced the local government's revenue sources, which were dominated by transfer revenues, accounting for 56% share of the local government budget in the 2020 FY (Bank Indonesia, 2020). Meanwhile, the allocation of transfer funds allocated by the central government has also decreased in line with the rationalization of government expenditure. Covid-19 pressures the local governments to adjust their local budget (Ulya, 2020) 2020 via transfer income LOR adjustment based on the calculation of potential tax revenue, and fees for services they provided. Options for LOR optimization as a source of local government revenue in a pandemic were limited, which was in line with the implementation of relaxation of tax penalties in several local governments. Spatially, the local government's dependence on transfer funds is indicated in the ratio of financial independence which is below 36% in almost all provinces except North Sulawesi (Bank Indonesia, 2020). The Covid-19 pandemic has a devastating effect on economic conditions that affect the local income. It is an extraordinary condition, which is a different condition from what has been done by previous researchers, which raises the question of whether LOR, GAF, and local government financing affect regional expenditures before and during the Covid-19 pandemic. To evaluate this relationship, the authors suggest the key hypothesis that (1) Local own revenue (LOR), general allocation fund, and local government financing (LGF) have a positive effect on local government expenditure (LGE); (2) Covid-19 has a negative effect on LGE; (3) LOR, GAF, and LGF during the Covid-19 pandemic have an effect on LGE. a positive effect on local government expenditure (LGE); (2) Covid-19 has a negative effect on LGE; (3) LOR, GAF, and LGF during the Covid-19 pandemic have an effect on LGE.

It is necessary to overview the regional financial condition during the Covid-19 pandemic, especially LOR, general allocation fund, and local government financing that can be used as a funding source for local government expenditures. During the Covid-19 pandemic, the implementation of a social distancing policy and the issue of increasing the number of Covid-19 cases made it more difficult for the local government efforts to encourage the local economy. Meanwhile, in the future, it is

expected that economic activities contribute to local income. Therefore, this study fills the gaps in previous research that studied the flypaper effect under normal conditions with different concepts (Kakamu et al., 2014). The rest of this essay is organized as follows: Following the introduction, Section 2 explores pertinent literature, examines relevant theories, and develops hypotheses, while Section 3 elaborates on the research method. The analysis of empirical data is covered in Section 4, Results and Discussion are covered in Section 5, and the study is summarized and ended in Section 6.

2. Literature review

The underlying theory of this research is the flypaper effect theory and fiscal federalism. Central government transfers make local government officials tend to be more dependent on general allocation fund (GAF); rather than relying on their efforts to increase local own-source revenue (LOR). In the theory of the flypaper effect on local government, Niskanen (1976) suggested that the flypaper affects the incentives of local bureaucrats, based on the power of their position in public decision-making to enhance local spending. It leads to the bureaucrats' behavior that freely spend intergovernmental transfers rather than focusing on increasing local revenue because they have more information about income sources.

The flypaper effect is a stimulus condition of local government expenditures that occur due to the addition of the value/amount of transfer from the central government (unconditional grants) larger than the other fund as a component in local own-source revenues (Iskandar, 2012). This condition is revealed in most studies that unconditional grants have a more stimulative impact on local government expenditures than local revenue (Dahlby and Ferede, 2016). Meanwhile, unconditional grants have a "price effect" and "income effect" because they allow the recipient government to reduce local tax revenues, lowering the costs of public fund, while still providing the same level of service (Dahlby and Ferede, 2016). It occurs because the local government improves the services quality to the people without increasing the tax rate. The flypaper effect can be shown by the coefficients of transfers (unconditional grants) in their effect on local government expenditure compared to LOR. The flypaper effect can be recognized if the transfer coefficient value (unconditional grants) is greater than the coefficient value of LOR (Cárdenas and Sharma, 2011; Iskandar, 2012; Sagbas and Saruc, 2004).

The large and regular transfers to local governments increase their income and make them biased toward these transfers, less focused on their own local revenues (Dick-Sago and Tingum, 2021; Niskanen, 1976; Pöschl and Weingast, 2013). When local governments are focused more on central government transfers than their LOR, they will automatically reduce their autonomy. It is because they will

be more dependent on the central government and they ignore the people in their regions who should be a priority for them to serve. As such, the local government spending does not reflect the needs and priorities of the region (Sirenko et al., 2018). On the other hand, if local governments depend on LOR, they will be more autonomous than central government transfers. They will have freedom to regulate their government and fund their routine and development expenditures from their local revenues. Thus, they cannot be controlled and used as agents of the central government to achieve their political goals. Local governments will focus on the role of regional development and serving local communities. It fulfills the principle of allocation efficiency as suggested by (Oates, 1999). (Cárdenas and Sharma, 2011; Iskandar, 2012; Sagbas and Saruc, 2004).

2.1. Local government expenditures

Local expenditures in Indonesia refer to general treasury accounts that do not need to be received back by the region and other expenditures in accordance with the provisions of the legislation. They are recognized as a deduction from equity, which is a regional obligation in one fiscal year (Republic of Indonesia, 2021). It can be assumed that in the process of making spending policies, policymakers are very concerned about the ability of income and the level of expenditure or according to the ability of their respective local government income (Moller and Messina, 2012).

Oates (1999) stated that there are several studies proving that local government spending is much more responsive to an increase in transfer receipts from the central government than an increase in local own revenue. The growth of GDP is one of the indicators to determine the improvement of people's welfare. Several studies found that LOR has an impact on the growth of GDP that can positively become a proxy of the positive growth of local government expenditure since it is a component of the GDP. In several countries, the relationship between tax revenues and GDP growth leads to the conclusion that tax revenues significantly affect the growth of GDP, such as in Ghana (Egbunike et al., 2018), Kosovo (Gashi et al., 2019), and Nigeria (Joseph and Omodero, 2020).

2.2. Local own-source revenue (LOR)

Local own revenue is a part of the local revenue as the right of the local government originating from the regional business itself to obtain funding sources for development activities. The local government regulates the local revenue in accordance with the provisions of local regulations. In accordance with the Minister of Home Affairs Regulation of the Republic Indonesia No. 27 (2021), the components of LOR are local tax revenue, local levies, separated local assets management results (revenue earned from regional company profits), and other legitimate local own revenue.

LOR is sourced from a local government effort to obtain funding sources for development activities. With the right policy, economic activities will run smoothly and encourage the growth of LOR, which is then used for expenditure allocation. Thus, the greater the LOR the government receives, the more increased the impact on the allocation of local government expenditures (Kakamu et al., 2014). Based on the explanation above, the following hypothesis is formulated:

H_{1a}: Local own revenue (LOR) has a positive effect on local government expenditure.

2.3. General allocation fund (GAF)

The fiscal balance transfers from the central government to regions is one of the sources of local income allocated by the central government through the state budget. The fiscal balance transfers from the central government to the local government (*dana perimbangan*) are divided into three funding sources that have their respective categories. A revenue sharing fund (*dana bagi hasil*) is a transfer allocated to local governments based on the performance of central tax revenues collected by the local government as a form of profit sharing the local government. Meanwhile, special allocation funds (*dana alokasi khusus*-SAF) are transfers allocated by the central government to fund specific needs including operational expenditure in the non-physical special allocation fund and capital expenditure in the physical special allocation fund. Furthermore, the general allocation fund (*dana alokasi umum*-GAF) is a transfer allocated from the central government as an unconditional character called a block grant. It means that GAF does not have specific provisions, such as the special allocation fund or the revenue sharing fund. Thus, the local government has more discretion in its use. The fund GAF is also an equalization grant to fulfill the fiscal gap between local governments. It is appropriate with the formula of the former GAF, one of which is the fiscal gap that aims to fill the gap between local governments' fiscal capacity and fiscal needs. Furthermore, as a source of funding from flexible transfers, the local government will maximize the use of the GAF to finance its expenditures. The GAF is a fund derived from the state budget, which is allocated with the aim of equalizing financial capacity among regions to finance their expenditure needs in the implementation of decentralization (Iskandar, 2012).

A general allocation fund is a transfer fund allocated by the central government to local governments, as a flexible/unconditional transfer. The central government provides flexibility in its utilization to local governments according to development priorities that have been established by local governments to encourage regional spending. General allocation fund has a positive effect on local government expenditure (Barenstein and de Mello, 2001; Dahlby and Ferede, 2016; Dick-Sagoe and Tingum, 2021; Kakamu et al., 2014; Levaggi and Zanola, 2000; Lewis and

Smoke, 2017; Liu and Zhao, 2011). Based on the elucidation above, the following hypothesis is formulated:

H_{1b}: General allocation fund (GAF) has a positive effect on local government expenditure.

2.4. Local government financing (LGF)

Local government financing is a financial transaction to cover a budget deficit or to take advantage of a surplus. Deficits or surpluses occur when there is a difference between regional budget revenues and regional expenditures. Funding is provided to budget for every expenditure that will be received back and/ or revenue that needs to be repaid both in the current fiscal year and the following fiscal year. In its budgeting, LGF is divided into 2 parts, namely LGF receipts and LGF expenditures (Law of the Republic of Indonesia No. 1, 2022). The main objective of LGF in the local government's financial budgeting is to cover the budget deficit resulting from spending plans that are larger than planned revenues and or utilizing the available budget surplus. LGF receipts are all regional revenues that enter the regional general treasury account (RKUD), which can, among other things, come from receipt of bonds and loans, transfers from or disbursement of reserve funds and also proceeds from the sale of separated regional assets. LGF receipts are recognized as receipts when received in the regional general cash account. LGF expenditures consist of repaying the principal of the loan, equity participation by local governments, as well as loans to other entities.

Local government financing is one of the alternative sources of funding to cover the regional budget deficit (local government budget). They can use it as a funding source for expenditures aimed at accelerating local economic growth and services improvement. There is a positive effect of local government financing on its expenditure proxied by the impact of SiLPA (financing surplus) on local government expenditure (Al Khoiri, 2015; Kosim, 2017). Based on the elucidation above, the following hypothesis is proposed:

H_{1c}: Local government financing has a positive effect on local government expenditure.

Government policy aims to prevent the spread of Covid-19 and manage its impacts as well as to optimize the local economic activities. The local governments adjust their 2020 local budget through transfer to local government and village fund revenues, LOR by taking into account the potential for regional taxes and fees for each local government, rationalization of employees spending and goods/services spending at least 50% by budget reduction, rationalization of capital expenditure at least 50% (Ulya, 2020). The spending rationalization policy could have an impact on decreasing the realization of local government expenditure. Based on the elaboration above, the following hypothesis is proposed:

H₂: Covid-19 has a negative effect on local government expenditure.

The Covid-19 pandemic has caused the budget to constrain local government finances. With the policy of local spending rationalization by prioritizing to overcome the Covid-19 pandemic effect in Indonesia, the government has cut the budget for ministries as well as budget transfers to local government. It causes local governments to lack funding sources for their expenditures. In addition, to encourage the industries economic sustainability, especially small and medium enterprises, local governments made policies for local tax relaxation. Several sources of funding that can be used by local governments to fund their expenditures include LOR as original income of the local government and GAF as unconditional grants or transfers that are not earmarked for a specific purpose, and local government financing. Besides funding from these three funding sources, the local government faced the Covid-19 pandemic that impacts the growth of local revenues or the amount transferred to the GAF government. Based on the explanation above, the following hypothesis is formulated:

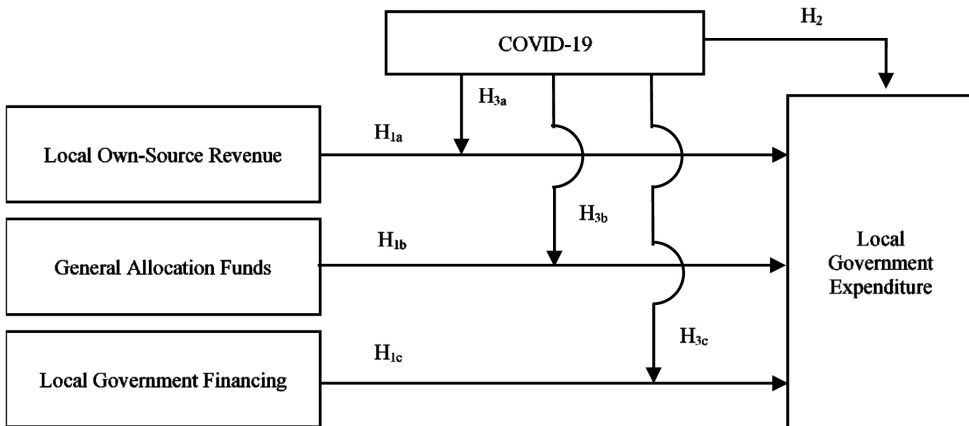
H_{3a}: LOR during the Covid-19 pandemic has a negative effect on local government expenditure.

H_{3b}: General allocation fund during the Covid-19 pandemic has a positive effect on local government expenditure.

H_{3c}: Local government financing during the Covid-19 pandemic has a positive effect on local government expenditure.

Based on the explanation above, we propose a theoretical framework of the research that describes the impact of the Covid-19 pandemic on the LOR, GAF, and local government financing variables as follows:

Figure 1: Research theoretical framework



Source: Authors' elaboration

3. Methodology

This study used a quantitative method with a causal design that tested the influence between variables. The dependent variable was local government expenditure, while the independent variable consisted of local own revenue (LOR), general allocation fund (GAF), local government financing, and Covid-19 as an independent and moderating variable. The indicators used to measure the research variables are described in Table 1 below.

Table 1: Variable operation

Variable	Indicator	Reference
Local government expenditure (LGE)	$LGE = DE + IE$ Note: LGE: local government expenditure DE: direct expenditure IE: indirect expenditure	Law of the Republic of Indonesia No. 1 (2022)
Local own revenue (LOR)	$LOR = \text{local taxes} + \text{local levies} + \text{separated results of local wealth management} + \text{other legitimate LOR}$	
General allocation fund (GAF)	$GAF = \text{base allocation} + \text{fiscal gap basic allocation: regional civil servant salary}$ fiscal gap: $\text{fiscal needs} - \text{fiscal capacity}$	
Local government financing (LGF)	$LGF = \text{local financing revenue} - \text{local financing expenditure}$	
Covid-19	Dummy 1 = Covid-19 Dummy 0 = non Covid-19	(Ulya, 2020)
Flypaper effect (observed phenomenon)	1) Insignificant effect of the independent variable 2) The value of the coefficient of the independent variable If the GAF coefficient > LOR coefficient, then a flypaper effect occurs, or it also can be used if $b_1 > b_2$, meaning >1 , then a flypaper effect occurs.	(Dick-Sagoe and Tingum, 2021; Iskandar, 2012; Tresch, 2002)

Source: Authors' elaboration

The population of this study was derived from data on the realization of the 2019 and 2020 regional revenue and expenditure budget (RGB) of all local governments consisting of district, city, and provincial governments with a total of 531 local governments. The research samples were taken using purposive sampling, selected based on certain criteria. Data on the realization of RGB in 335 local governments consisted of 259 district governments, 57 city governments, and 19 provincial governments.

Furthermore, the data were then analyzed using Moderating Regression Analysis (MRA). The panel data regression equation model was used to test the hypothesis of the effect of LOR, general allocation fund, regional financing on regional expenditures as follows:

$$LGE_{it} = \alpha_{it} + \beta_1 PAD_{it} + \beta_2 DAU_{it} + \beta_3 LGF_{it} + \beta_4 COV_{it} + \beta_5 COV * PAD_{it} + \beta_6 COV * DAU_{it} + \beta_5 COV * LGV_{it} + \varepsilon_{it} \tag{1}$$

4. Empirical data and analysis

The minimum value of the pre-pandemic spending variable was IDR 136 billion, and the minimum value during the pandemic was IDR 149 billion. Meanwhile, the maximum value of the pre-pandemic spending variable was IDR 11.9 trillion, and the maximum value during the pandemic was IDR 10 trillion. The mean of the spending variables pre-pandemic and during the pandemic was IDR 708 billion and IDR 683 billion, respectively.

Table 2: Data description

Pre-Covid-19 pandemic (non Covid-19)				
	Local gov. expenditure	GAF	LOR	Local gov. financing
	(in bn)	(in bn)	(in bn)	(in bn)
Mean	708	466	224	121
Median	448	385	62	33
Maximum	11,900	2,330	10,100	4,590
Minimum	136	136	0.666	-103
Std. Dev.	1,050	265	804	374
Observations	335 samples	335 samples	335 samples	335 samples
During Covid-19 pandemic				
	Local gov. expenditure	GAF	LOR	Local gov. financing
Mean	683	432	216	105
Median	448	356	66.2	37.8
Maximum	10,000	2,210	8,930	4,350
Minimum	149	0.048	0.939	-9,890
Std. Dev.	904	248	749	689
Observations	335 samples	335 samples	335 samples	335 samples

Source: Authors' calculation

Based on the comparison of LOR conditions pre and during the pandemic presented in Table 2, the minimum value of LOR increased, while the maximum value of LOR decreased, indicating the range between the maximum value and the minimum value of LOR was narrowing.

The range between the minimum and maximum values of general allocation fund (GAF) during the pandemic tends to widen, which is indicated by the lower value of the minimum GAF during the pandemic when the maximum value of the GAF does not experience a large enough decline or is more likely to be constant. The negative value of financing in Table 2 indicates that the financing expenditure made by the local government is greater than the financing earned. During the pandemic, the minimum value of financing becomes smaller, indicating that during the period the local government carried out a mechanism for financing local expenditures greater than revenue as the funding sources.

Based on panel data model testing, the right model is used to test this hypothesis using a fixed effect model by providing “cross section-weight”, with the following model results:

Table 3: Results of the moderating regression analysis

Variables	Local government expenditure				
	Prediction	Coefficient	t-Statistic	Prob.	Result
Local own revenue (LOR)	$\beta+$	-0.039986	-1.8110	0.0711*	Rejected
General allocation fund (GAF)	$\beta+$	0.043376	2.1344	0.0335**	Accepted
Local government financing (PD)	$\beta+$	-0.113367	-10.4378	0.0000***	Rejected
Covid-19	$\beta-$	-9.90E+09	-4.6225	0.0000***	Accepted
Covid-19* LOR	$\beta+/-$	-0.286497	-27.2207	0.0000***	Accepted
Covid-19* GAF	$\beta+/-$	0.075308	9.4082	0.0000***	Accepted
Covid-19* PD	$\beta+/-$	0.148172	10.9255	0.0000***	Accepted
R-squared	0.9994				
Adjusted R-squared	0.9989				
F-statistic	1734.23***				
Observations	355 samples				

Note: ***significant α 1%, **significant α 5%, *significant α 10%

Source: Authors' calculation

Based on f-Statistic value of 1734.23 with a probability result of 0.000, it can be concluded that this research has a good model. The adjusted R-squared value of 0.9989 shows that the variation of the independent variable is 99%, while the difference of 1% is explained by other variables. It means that local government is determined by LOR, general allocation fund, and local government financing of 99.89% both during the Covid-19 pandemic and before the pandemic.

Based on the results of hypothesis testing, both LOR and financing have a negative effect on local government expenditure. The Covid-19 pandemic was also able to reduce local government expenditure in various cities in Indonesia. On the other hand, general allocation fund have a positive effect on local government expenditure. The Covid-19 is able to reduce the effect of LOR on local government expenditure, but enhance the effect of GAF and local government financing on local government expenditure. It means that GAF and local government financing are able to increase the local government expenditure during the Covid-19 pandemic. Further differences in LOR, GAF, local government financing, and local government expenditures before and during the Covid-19 are explained in Table 4 below.

Table 4: Paired samples test

Variable	Mean		Sig. (2-tailed)
	Pre-Covid-19 pandemic (in millions)	During Covid-19 pandemic (in millions)	
Locally generated revenue	223	216	0.158
General allocation fund	466	432	0.000***
Local government financing	121	105	0.626
Local government expenditure	708	683	0.065*
Observations	355 samples		

Note: ***significant α 1%, **significant α 5%, *significant α 10%

Source: Authors' calculation

Based on the results of the Paired Sample Test with data before the pandemic (non Covid-19) and during the Covid-19 period, it revealed that LOR, GAF, local government financing, and local government expenditures were smaller during the Covid-19 pandemic than before the period. General allocation fund and local government expenditures differ significantly before and during the pandemic.

5. Results and Discussion

Transfer of general allocation fund (GAF) has a significantly positive effect on local government expenditure (LGE), while local own-source revenue (LOR) has a significantly negative impact on local government expenditure. In the short term, an increase in the general allocation fund will increase LGE, while the opposite effect is shown in LOR. This is shown by the value of the GAF coefficient which is greater than the LOR coefficient both before and during the pandemic (see table 3), this result means that there is a flypaper effect on local government expenditure in 335 Regional Governments in Indonesia. The pre-pandemic GAF coefficient value was 0.043, meaning that every 100% increase in the flypaper effect on GAF will increase regional spending by 4.3%. During the pandemic, the flypaper effect will increase regional spending by 7.5%. This empirical evidence shows that the flypaper effect on GAF has a positive effect on regional spending, and its value has increased during the pandemic. These results prove that there is a flypaper effects phenomenon. This condition occurred both before and during the Covid-19 pandemic. Such a phenomenon was also confirmed in several researcher findings that found the flypaper effect in local government expenditure, such as in Ghana (Dick-Sagoe and Tingum, 2021), Italy, in which there was flypaper effects to fund on specific local government expenditure, i.e., in the health sector (Levaggi and Zanola, 2000). Furthermore, flypaper effect was also found in a study conducted in Japan where the phenomenon was found in the financing for sanitation, education, police, and disaster management sector (Kakamu et al., 2014). In China, the flypaper effect was revealed where the provincial government also prioritized the use of government transfer fund, and was reluctant to develop its regions (Wu and Wang, 2013). The flypaper effect also occurred in the Netherlands (Allers and Vermeulen, 2014), Mexico (Cárdenas and Sharma, 2011; Sour, 2013), Brazil (Mattos et al., 2011), Italy (Gennari and Messina, 2014), Turkey (Sagbas and Saruc, 2004), and Ukraine (Sirenko et al., 2018). However, the results are contrary to the research results of Kang and Setyawan (2012), which revealed that there was no flypaper effect in Indonesia, also Delgado and Mayor (2011) in Spain. The results of this study are also different from previous researchers who tested the flypaper effect in Indonesia (Iskandar, 2012). The contrary results could be due to the narrower scope of the research area, which only tested local governments in West Java Province (Iskandar, 2012).

The flypaper effect refers to a strong empirical asymmetry between the magnitude of the reaction to spending on an increase in GAF or LOR. Such asymmetry found in the literature is associated with the sign of variation in transfer or subtraction versus addition (Moller and Messina, 2012). When transfers decrease, the budget deficit for spending will be compensated by an increase in LOR, or even suppress the spending by reduction from the LOR side. On the other hand, the flypaper effect phenomenon can also be caused by the consequences of increasing taxation

to raise LOR if taxpayers are more sensitive to a decrease, rather than an increase in welfare. If they do not have an increase in current income and efforts to increase income in the future, it seems that the local government is more likely to choose to increase the budget from GAF instead of LOR (Moller and Messina, 2012). Tosun and Abizadeh (2005) and Dahlby and Ferede (2016) studied the flypapers effects in the provinces in Argentina and 28 cities in America. It was found that there were flypapers effects in the areas with the majority with high tax rates. According to the research results of (Dahlby and Ferede, 2016), the flypaper effect can occur because the local government suppresses tax revenues while maintaining tax rates services to the people without additional tax rates. The existence of empirical evidence of the flypaper effect in Indonesia supports Sirenko et al. (2018), where local governments in Indonesia are more focused on central government transfers, rather than their LOR. The condition will automatically undermine the autonomy of local governments because they will be more responsible to the central government. They will ignore the people in their responsibility supposed to be the priority for their service.

LOR has a significantly negative effect on local government expenditure. The results of this test do not support the hypothesis and are inconsistent with previous studies which state that LOR had a positive effect on local government expenditure (Kakamu et al., 2014). It indicates that there is a reduction in expenditure funding from the LOR side while local government expenditures have increased. One of the factors is the condition of the local government budget at the beginning of the year when there was delayed disbursement of LOR while other funding, such as the GAF was more stable. Thus, GAF was used for local government expenditures. Another factor is from the government policy, especially from the economic aspect, rather than increasing revenue from the regional taxation (LOR), the government prefers to relax taxation. It aims to encourage regional economic growth and fund transfers (GAF) the central government provides for regional development. Local government financing used by local governments as shown in table 5 has no effect on increasing regional spending. However, regional financing has had a positive effect on regional spending during the COVID-19 pandemic.

In-depth analysis on funding for local government expenditure, especially during the Covid-19 pandemic, it was found that the funding originating from the local government (LOR) had a negative coefficient, while local government financing had a positive coefficient. Funding on expenditure is also challenging in other countries, such as in USA in providing transfers to regions in the education sector during the financial crisis and COVID-19 pandemic (Al-samarrai and Lewis, 2021). There might be a deceleration or weakening of income indication due to the Covid-19 pandemic in the country. Then, to find out the relationship between LOR, which has a negative coefficient, and local government financing with a positive coefficient, there is an assumption test of the effect of LOR on local government financing as shown in Table 5.

Table 5: Results of the effect of LOR on local government financing test

Variable	Local government financing		
	Coefficient	t-Statistic	Prob.
LOR	-0.177436	-11.31168	0.0000***
Covid-19	-11,8 bn	-79.93324	0.0000***
Covid-19* LOR	-0.023558	-10.65838	0.0000***
R-squared	0.999545		
Adjusted R-squared	0.999082		
F-statistic	2161.93***		

Note: ***significant α 1%, **significant α 5%, *significant α 10%

Source: Authors' calculation

It is understood that local government must prepare policies to achieve fiscal sustainability. Thus, it could be assumed that during the Covid-19 pandemic, local governments would prioritize to utilize the available local government financing mechanism when LOR generation is difficult. Table 5 shows a significantly negative relationship between LOR and local government financing. When there is a decrease in LOR, local government financing increases, indicating that the local government during the Covid-19 pandemic fund the spending using the local government financing mechanism. Efforts to improve local government fiscal capability during the Covid-19 pandemic in terms of regional financing can be performed by optimum use of the financing surplus which was one of the government's financings mechanisms to fill the fiscal gap.

Local government financing as shown in Table 5 only occurs during the Covid-19 pandemic. However, GAF is funded by the local government both before and during the Covid-19 pandemic. From the observation results presented in Table 1, it can be seen that GAF is still the best option for local governments to fund their expenditures because it has minimal risk and is not specific transfer (unconditional grants). During the Covid-19 pandemic, the GAF coefficient increased, indicating that local governments were more likely to use GAF during the pandemic.

Based on the results of the Paired Sample Test, LOR, GAF, local government financing, and local government expenditure before and during the pandemic in Table 5, it is proven that the pandemic reduced GAF and regional expenditures. This result is in agreement with the current condition that the central government issued an adjustment policy on the fiscal balance transfers from the central government to local government to overcome the Covid-19 pandemic. Local government expenditure dropped because the components that make up the regional spending decreased during the pandemic. The fund transferred from the central government consist of DAK, GAF, revenue sharing fund, and other transfer. This empirical

evidence is relevant to the study results of Al-samarrai and Lewis (2021) revealing that during the Covid-19 pandemic, it is important to maintain economic stability in the short term to prevent development problems in the long term. This condition is following the central government's policy which prioritized solving health problems. However, the next step that needs to be taken into consideration is how to improve the trend of the local government dependence in expenditure funding on the GAF as indicated by the flypaper effect. It is because the high contribution of LOR has a negative correlation with the development of the government (Barenstein and de Mello, 2001).

The low absorption of local revenue and regional dependence on fiscal transfers indicates that any changes in economic conditions will have an impact on LOR. This relationship infers that regions with sound economic conditions are indicated with high LOR. Thus, there is a positive relationship between economic growth and LOR, in line with economic growth, such as conditions that occur in several regions in China where there are regions with better regional income, which have better sources of income. Higher power to increase regional development which then has an impact on the regional economy even though there is no direct relationship between local income and economic growth (Wu and Wang, 2013). In addition, economic growth as measured by GDP per capita has a significant effect on tax revenues in OECD countries (Tosun and Abizadeh, 2005).

6. Conclusions

The results of this study indicate that there is a flypaper effect phenomenon in local government expenditure in Indonesia. Local governments prioritize funding their expenditure from the general allocation fund (GAF) both before and during the Covid-19 pandemic; rather than depending on their locally generated revenues (LOR). The Covid-19 has been proven to decrease LOR, GAF, financing and local governance expenditure, but the most significant ones are GAF and local governance expenditure. It is interesting that there is a positive coefficient on local governance financing, while LOR has a negative coefficient during the Covid-19 pandemic, indicating that local expenditure funding is mostly funded from the financing side, instead of LOR. The low economic growth in Indonesia during the Covid-19 pandemic in 2020 reflected that the LOR component was affected, which in turn had an effect on the decline in local government expenditure.

The implication of this empirical evidence is the central government can make improvements to the GAF policy by setting priorities for its use. The government should make special arrangements regarding the provisions that regulate the priority of the use of the GAF. When the central government wishes to narrow the horizontal disparity gap between regions, the policy on the use of the GAF

should naturally be prioritized to encourage economic development focusing on micro-enterprises. Although the local government acts only as a coach for micro-enterprises, it can play a maximum role if the GAF can be used to support the achievement of fostering business planning and operation, up to the opening of marketing forums. For instance, the establishment of agropolitan area development program as an agriculture-based economic development in the agribusiness area, designed and implemented by synergizing the various existing potentials to encourage the agribusiness development as competitive, people-based, sustainable and decentralized, and driven by the community and facilitated by the government. Furthermore, it is expected that the local government concerns to these micro-enterprises can encourage business development and support LOR.

This study has some constraints since it cannot use the entire financial report data to obtain more complete results. Transfer fund distributed by the central government to local governments only test the GAF, so that further research should consider other transfer fund variables other than GAF as a comparison with local revenue to analyze the flypaper effect. In addition, there is the potential to conduct further research incorporating the theory that the majority of the flypaper effect is found in areas with high tax rates. Thus, it is possible to map local governments with flypaper effect conditions.

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Fenomen efekta muholovke međuvladinih transfera tijekom Covid-19: dokazi iz Indonezije

Lela Nurlaela Wati¹, Heri Ispriyahadi², Dhika Habibi Zakaria³

Sažetak

Ova studija ima za cilj potvrditi fenomen efekta muholovke i utjecaj pandemije Covid-19 na lokalne prihode iz vlastitih izvora (LOR), fond opće raspodjele (GAF) i financiranje lokalne samouprave na rashode lokalne samouprave u Indoneziji. U istraživanju se primjenjuje kvantitativna metoda, a za uzorak su korišteni podaci o realizaciji regionalnog proračuna (RGB) u 335 jedinica lokalne samouprave u razdoblju 2019. – 2020. Podaci su analizirani moderirajućom regresijskom analizom. Studija je otkrila da je postojao fenomen efekta muholovke koji je potaknuo lokalne vlasti da koriste GAF umjesto LOR za svoje lokalne izdatke. GAF i rashodi lokalne samouprave bili su veći tijekom razdoblja Covid-19. Kako bi se prevladao fenomen efekta muholovke, središnjoj vladi se savjetuje da poboljša politiku GAF postavljanjem prioriteta za njezinu upotrebu. Lokalne vlasti moraju poticati mikro, mala i srednja poduzeća da pomognu podržati LOR. Ova studija dokazuje da postoji fenomen efekta muholovke u zemljama u razvoju koje provode predsjednički sustav (republika) i pruža značajne empirijske dokaze o politici državne potrošnje tijekom krize i bez krize (Covid-19).

ključne riječi: efekt muholovke, fond općih izdvajanja, rashodi lokalne samouprave, financiranje lokalne samouprave, vlastiti prihodi lokalne samouprave

JEL klasifikacija: H30, H53, H70, H74

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The impact of ICT capital growth on economic growth: the case of Egypt*

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Abstract

Capital investments in information and communication technology (ICT) have been a major contributor to the growth of several developed countries. In an attempt to boost their economies, some emerging and developing countries have been following a similar path, in which they heavily invest in the sector of ICT. However, due to other factors, ICT capital growth may not always produce the desired economic outcome. The purpose of this study is to estimate the impact of capital growth in ICT on economic growth in one developing country, Egypt, which has been heavily investing in the sector of ICT. The study analyses time series data covering the period from 1999 to 2019 using an error correction model. The findings demonstrate that there is no long-term positive association between ICT capital growth and economic growth in Egypt. While the development of ICT provides the potential for Egypt to achieve sustained economic growth, the significance and size of these impacts are currently negligible. The study concludes that in order to benefit from capital investments in ICT, policymakers should enact high-quality investment policies and improve the overall quality of the surrounding environment, such as the regulatory and institutional environments, in addition to controlling inflation and government consumption.

Key words: economic growth, ICT, capital growth, digital economy

JEL classification: O47, O33, E22, O14

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1. Introduction

ICT refers to the collection of tools required for the treatment of information, most notably computers and software, as well as other technical provisions necessary for the management and storage of information in technological formats that enable information to be distributed, exchanged, searched for, and retrieved (Antonelli, 2003; Gollac et al., 2000). According to the OECD, the ICT sector is divided into three sub-sectors: information technology, telecommunications, and electronics. Today, digital technology permeates all sectors of the global economy, playing a critical role in many countries economic growth. The digital economy and ICT contribute directly to GDP growth in developed economies and have made a direct and significant contribution to job creation and productivity over the last decades (Pilat, 2004; Spiezia, 2013; Sawng et al., 2021). However, the debate over which countries are more likely to benefit from ICT investments continues. Some studies stress the importance of infrastructure and expertise in transforming ICT investments into real economic growth, thus leading them to believe that developed nations are more likely to benefit from these investments, while other studies oppose this. According to the World Bank report on digitization in the MENA region (Cusolito et al., 2022), despite the low adoption of digital technologies in many countries across the region, digitalizing the economy has the potential to increase GDP per capita by about 46% over the next 30 years. This study focuses on the most populous country in the MENA region, Egypt, which came first in the MENA region in the number of deals in startups in the ICT sector and second in the volume of foreign investments in startups in the ICT sector in 2020. According to the Egyptian Ministry of Communications and Information Technology (MCIT), the ICT sector in Egypt grew by 16.1% in 2022 and around 15.2% in 2020, which is considered the country's fastest-growing sector in 2022. Egypt has been heavily investing in the ICT sector; total investments in this sector in 2021 have reached \$3 billion. It is hoped that these high levels of investment are going to directly impact the country's level of economic growth. As part of its ICT 2030 strategy, the Egyptian government is carrying out many investments, infrastructure modernization training, and capacity-building initiatives, in addition to digital reforms in the sectors of health, education, and government services. According to the strategy, these efforts are made to increase the ICT sector's contribution to the growth of the Egyptian economy. This paper investigates whether or not there is a short-term or long-term impact on economic growth due to the growth of the ICT capital in Egypt. Finding a positive association between the growth in the ICT capital in Egypt and its growth in GDP would serve as supporting evidence that Egypt has been on the right track over the past 20 years and that the efforts, initiations, and strategies drafted in this regard are advantageous. Recently, research on investigating the link between ICT investment and economic growth has been growing, yet studies on cases from the MENA region are scarce. In addition, fewer studies have

investigated the impact of capital accumulation in ICT on economic growth, and fewer have linked growth in ICT capital to GDP growth. This study investigates the impact of growth in the capital of ICT on economic growth in Egypt. Derived from the neoclassical model, the study utilizes a production function that takes the fundamental engines of growth in the economy into account and finds both the short-term and long-term impacts on economic growth. The study is sectioned into six sections. The following section is a literature review, followed by a section presenting the research methodology, an empirical data and analysis section, results and discussion section, and a final section for conclusions.

2. Literature review

Rapid global advancements in ICT over the last three decades have captivated the attention of several scholars from both developed and developing countries who study the dynamics and economic impacts of these advancements, particularly the effects on economic growth and development. While theoretical work has demonstrated a positive impact of technological development on economic growth, various empirical studies have generated mixed outcomes. Outstanding theories, such as Schumpeterian theories (Schumpeter, 1934) and neoclassical growth theory (Solow, 1956), are some basic theoretical foundations for supporting an argument that there should be a positive relationship between ICT and economic growth. The first stream of empirical research examined the effect of ICT diffusion on the economic growth both of developed and developing nations. The second stream examined ICT dissemination and its impact on economic growth using worldwide comparisons. The classification of research methods in this literature consists of four categories: regression analysis (REG), growth accounting analysis (GA), mixed (REG&GA), and other types of analysis (Vu et al., 2020).

Earlier scholars such as Qiang et al. (2004) identified three channels through which ICT can influence economic growth: mainly capital deepening and total factor productivity growth through reorganisation and ICT usage. Oliner and Sichel (2000) evaluated the impact of information technology on the economic recovery in U.S. labour productivity in the second half of the 1990s and found that two-thirds of the acceleration in productivity growth between the first and second halves of the 1990s is attributable to an increase in the utilisation of information technology capital and faster efficiency gains in the production of computers. Another earlier study done by Brynjolfsson and Hitt (2000) found evidence that over a longer time horizon (between 3 and 7 years), computerization (investments in ICT and organisational reforms) contributes more to productivity increases than its short-term impact. In their view, organisational reform takes time, hence computerization's full influence is long-term.

In recent studies, linkages between ICT investment and growth have been studied from different dimensions. Bahrini and Qafas (2019) assessed the impact of ICT on the economic growth of selected developing countries in the Middle East and North Africa (MENA) and Sub-Saharan Africa (SSA) regions over the period 2007–2016 using a panel generalised method of moments (GMM) growth model. The econometric model results revealed that, aside from fixed telephones, other information and communication technologies such as mobile phones, Internet usage, and broadband adoption have been the key drivers of economic growth in MENA and SSA emerging nations between 2007 and 2016. Aghaei and Rezagholizadeh (2020) used dynamic and static panel data approaches inside a growth model framework and applied them to the economies of Organization of Islamic Cooperation (OIC) countries from 1990 to 2014. The findings indicated that investments in ICT have a significant impact on economic growth in the countries studied. Hong (2017) bolsters the long-term effect of ICT investment by demonstrating the short- and long-term causal linkages between R&D investment and economic growth. The study proposes a virtuous cycle for public and private ICT R&D spending, implying a greater long-term impact. Another study on Sub-Saharan African countries done by Awad and Albaity (2022) using data from 2004 to 2020 found a causal mediation role of openness, education, and domestic investment, through which ICT indirectly increases per capita growth. Soomro et al. (2022) studied the BRICS countries from 2000 to 2018 to investigate the dynamic relationship between FDI, ICT, trade openness, and economic growth. The results show that ICT has a positive impact on the economic growth of a few countries. Similarly, Sinha and Sengupta (2022) studied Asia-Pacific developing countries over the period of 2001–2017 and found that ICT has a positive and significant impact on economic growth and that ICT expansion positively impacts FDI inflows. Belloumi and Touati (2022) studied a sample of 15 Arab countries over the period 1995–2019 and found that ICT and FDI have positive effects on economic growth in the long run and that ICT has a positive impact on FDI inflows. To explore the relationship between ICT diffusion and economic growth in Tunisia, Dahmani et al. (2022) studied data from 1997 to 2017. The study finds that the effect of ICT is heterogeneous depending on the sector of activity; sectors such as financial services and hotels have a positive and significant impact on the value added, while others such as trade and some manufacturing industries have a negative impact. Using a GMM estimator for 46 African countries between 2000 and 2019, Nchake and Shuaibu (2022) found that an increase in investment in ICT infrastructure increases inclusive growth by an average of 0.4% to 0.7%. Using a cointegration analysis, Sawng et al. (2021) used an error correction model and found a positive association between ICT investment and economic growth in South Korea. Similar findings were observed by Kim (2015) while studying data from the United States of America. Another study, Mim and Jeguirim (2021), looked at the impact of ICT on growth in 14 MENA countries and found that Internet use has a non-linear positive impact on economic growth; however,

investment and human capital were found to be the primary transmission channels of this impact.

Due to the unavailability of data, several studies used different variables to represent ICT stock. For instance, Erdil et al. (2010) found a positive association between ICT (represented by mobile phone subscribers and internet users) and economic growth for underdeveloped and developing countries, analysing a dataset for the time period from 1995 to 2006. Another study by Sepehrdoust and Ghorbanseresht (2019) used an ICT index and linked it to economic growth in the petroleum exporting countries (OPEC) for the period from 2002 until 2015 using a panel GMM model. Aissaoui (2017) used ICT investment as a percentage of GDP and linked it to economic growth to explain the economic growth gap between the MENA region and the OECD. Similarly, Yousefi (2015) used ICT as a percentage of GDP for 70 developed and developing countries and found a positive association between it and growth in GDP per capita. Niebel (2014) used ICT capital services and found a positive association between them and economic growth. Findings revealed no statistical difference between this impact in developing, emerging, or developed countries. In contrast, Sedika and Emamb (2019) used ICT capital services and found that the impact was different depending on the region. Rahman et al. (2021) used exports and imports as proxies for investment to analyse data for Pakistan and found no association between ICT and economic growth. Using a similar methodology and variables to analyse data from Rwanda, Roger et al. (2021) found a similar finding.

The methodology used in this paper was similarly used by Kooshki and Ismail (2011), who studied data between 1990 and 2008 in newly industrialised countries and found a positive association between investing in ICT and economic growth; however, the author found that the impact occurs within considerable lags between the time of investment and the time when growth happens. Earlier, a similar methodology was used by Vu (2005), who found a positive impact of ICT on economic growth for 50 countries representing 90% of the international market in ICT. The study found that an economy can attain a greater growth rate for a given level of increase in labour and capital inputs by having a higher level of ICT capital stock per capita.

However, few studies have investigated the impact of growth in ICT capital and GDP growth. A positive association was found by Hanclova et al. (2014), who studied the EU-7 and EU-14 countries using data covering the time periods between 1994–2000 and 2001–2008. Earlier,

As seen from the literature, few studies have directly investigated the link between ICT capital growth and economic growth, and country-specific cases from the MENA region were found to be scarce. Therefore, this paper contributes to the literature by investigating this link in one of the most dynamic economies in the MENA region, the Egyptian economy.

3. Methodology

The goal of this study is to investigate the impact of growth in ICT capital on the GDP growth rate of Egypt. According to the neoclassical production function, labour and capital are the basic two determinants of national output, and a stable rate of economic growth is produced when the three economic forces of labour, capital, and technology are in balance. The Solow-Swan Growth Model is the simplest and most often used variation of the neoclassical growth model. The theory contends that different levels of labour and capital that are essential to the production process lead to short-term economic equilibrium. According to the theory, technological advancement has a significant impact on how the economy runs as a whole. The theory, however, emphasises its assertion that transitory, or short-term, equilibrium is distinct from long-term equilibrium and does not necessitate any of the three factors. Hence, variable levels of labour and capital result in a short-term economic equilibrium. Accordingly, an economy's capital accumulation and human capital utilization interaction is what determine economic growth. The theory contends that technology boosts labour productivity, raising overall output through improved labor productivity.

The neoclassical growth model's production function is used to measure an economy's equilibrium and rate of economic growth, and its general form has the following structure:

$$Y = AF(K, L) \tag{1}$$

where: Y is income or GDP, K is Capital, L is labor, and A is the level of technology.

Using time-series and an error correction model (ECM), the study uses two main control variables, growth in fixed capital formation and growth in the employment rate to estimate the following equation:

$$\begin{aligned} (GDP \text{ growth rate})_t = & n_0 + n_1(Employment \text{ growth rate})_t + \\ & + n_2(Fixed \text{ capital formation growth rate})_t + \\ & + n_3(ICT \text{ capital growth rate}) + \varepsilon_t \end{aligned} \tag{2}$$

The normally distributed error term is represented by ε at time t . Growth in the employment rate is expected to have a positive effect on growth as well as growth in capital formation and growth in the share of ICT to total capital. The parameters n_i are the elasticities of production to factors of production. Several studies in the literature have used similar control variables to predict growth in GDP; see Youssef and M'henni (2004), El-Baz (2016), Colecchia and Schreyer (2002) and Bacchini et al. (2014).

There are three main limitations to this study. Firstly, data on ICT capital is not available, so it was estimated. Secondly, data on ICT investment in Egypt is only

available for a period of 21 years. Thirdly, data on the ICT depreciation rate is not available for Egypt.

Growth rate in ICT capital was calculated using data on ICT investment collected from the International Telecommunications Union DataHub. In terms of depreciation rates, ICT capital stocks differ from non-ICT capital stocks (Jorgenson et al., 2000; Jorgenson, 2001). Many authors (Schreyer, 2000; Youssef and M'henni, 2004; Lee et al., 2005; Chabossou, 2018) proposed a depreciation rate of 12.5% for ICT capital. This study follows the same assumption. To calculate ICT capital stock, the study used the following formula:

$$K_{t+1} = (1 - \delta)K_t + I_{t+1} \quad (3)$$

where K_{t+1} is capital stock at time $t+1$, δ is the rate of depreciation, K_t is capital at time t and I_{t+1} is investment at time $t+1$.

To start with an initial value of ICT capital, the study uses the following equation:

$$K_t = K_0 / (\delta + i) \quad (4)$$

where i is the average growth rate of investment over the sample period, see El-Baz (2016).

4. Empirical data and analysis

Egypt's information and communications technology (ICT) sector is thriving, with a growth rate exceeding Egypt's GDP overall growth rate of 15.2 percent in the fiscal year 2019/2020. Its GDP contribution increased from 3.5 percent in fiscal year 2018/2019 to 4.4 percent in the 2019/2020 fiscal year. Total sector investments increased by 35% in 2019/2020, reaching \$3.5 billion. The Egyptian government is pursuing a series of investments, capacity building and training programs, digital government services reforms, and infrastructure enhancements as part of its ICT 2030 agenda. The strategy calls for the development of new projects to optimize the ICT sector's contribution to Egyptian economic growth, with an emphasis on capacity building, electronics design and manufacture, and technology parks. The strategy also includes a plan for digitalizing fundamental government functions in the areas of education, healthcare, and government services.

Egypt's Ministry of Communications and Information Technology (MCIT) has introduced a National Internet Plan with the goal of expanding high-speed broadband coverage throughout the country. MCIT is also developing Egypt's national strategy for e-commerce promotion. Between 2014 and 2017, mobile

broadband customers increased from 38% to 62%, while Internet access increased from 29% to 41%. The government announced a plan in June 2020 to upgrade internet infrastructure by raising the average internet speed. In April 2021, internet speed has increased to 39.6 Mbps, up from 6.5 Mbps in January 2019.

The government is currently focused on transitioning to a digital economy and driving the country's digital transformation, both of which provide prospects for ICT firms. The government's continuing digital transformation provides a variety of opportunities for enterprises with proven technologies and competitive pricing.

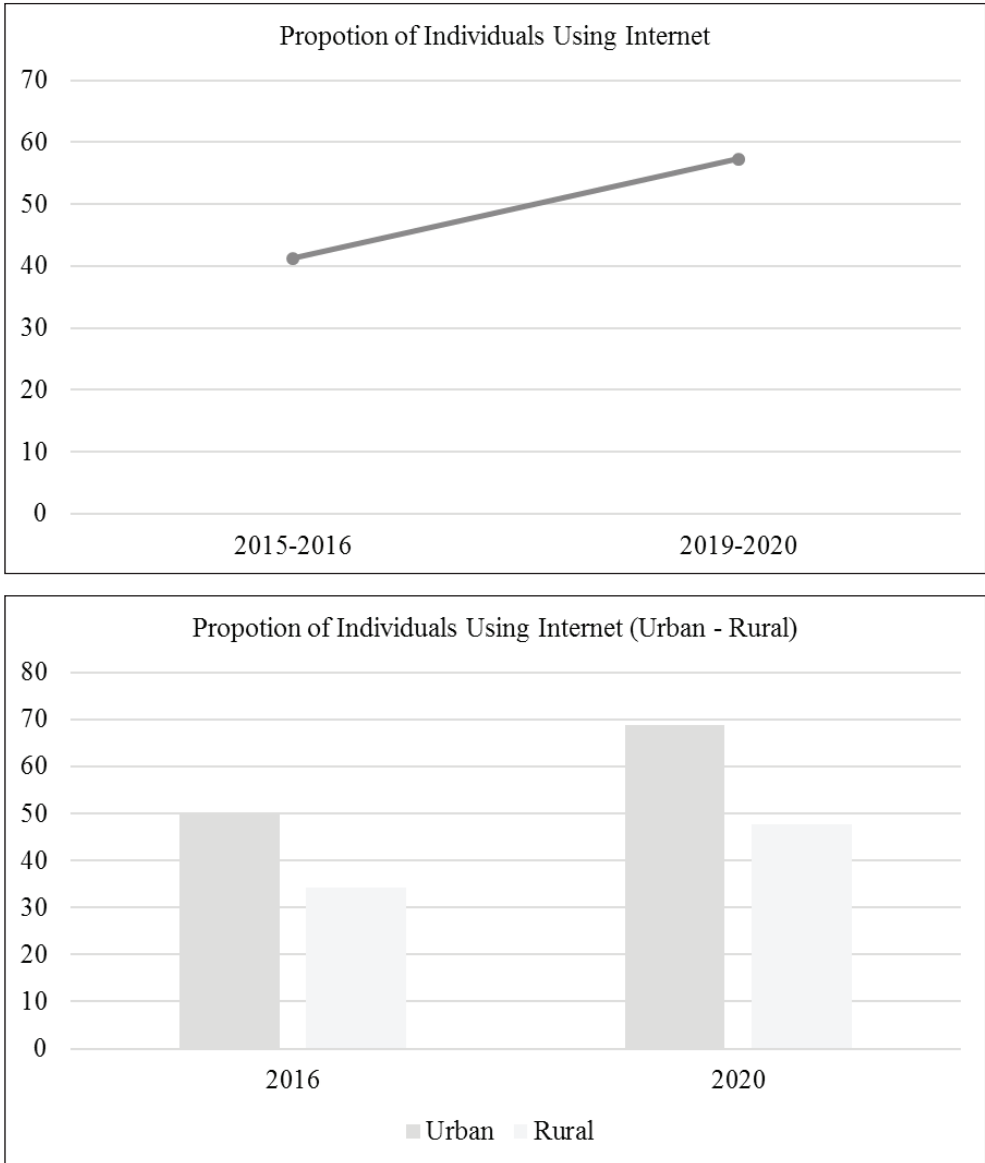
An expenditure of approximately 1 billion Egyptian pounds (\$63 million) to modernize mobile networks on Egypt's important roadways and localities. In addition, \$1.17 billion in new frequencies were awarded to mobile network carriers. To oversee cell phone services and protect users, the National Center for ICT Services Quality Control and Monitoring was established.

Decent Life (Haya Karima) is a presidential programme designed to improve the effectiveness of local communications infrastructure. This initiative is built on three main pillars: connecting villages with fiber optic cables for improved internet speed and stability, which will cover one million homes; developing 906 post offices with ATMs; and improving telecommunications services by establishing cell phone stations in those villages.

Egypt's digital transformation plan has been accelerated in part due to the Covid-19 epidemic. The number of peak hours for internet usage has increased from 7 to 15 per day, with a 99 percent increase in load. Cell phone internet usage has climbed by 35%, and international calls have increased by 19%. Zoom (3,465 percent), Telegram (1,100 percent), and YouTube have all seen significant increases in usage (115 percent). The National Telecommunications Regulatory Authority (NTRA) introduced its Mobile Number Portability (MNP) service in June 2020, allowing mobile phone subscribers to keep their phone numbers while transferring network service providers. This improves efficiencies and competitiveness.

Increased localization through increased local content is part of Vision 2030. As a result, various global corporations supply raw materials and collaborate with local organizations to establish an assembly line in Egypt. This increases the possibility of winning government tenders and adds value to the proposals through localization.

Figure 1: Key ICT Indicators in Egypt Between 2016 and 2020

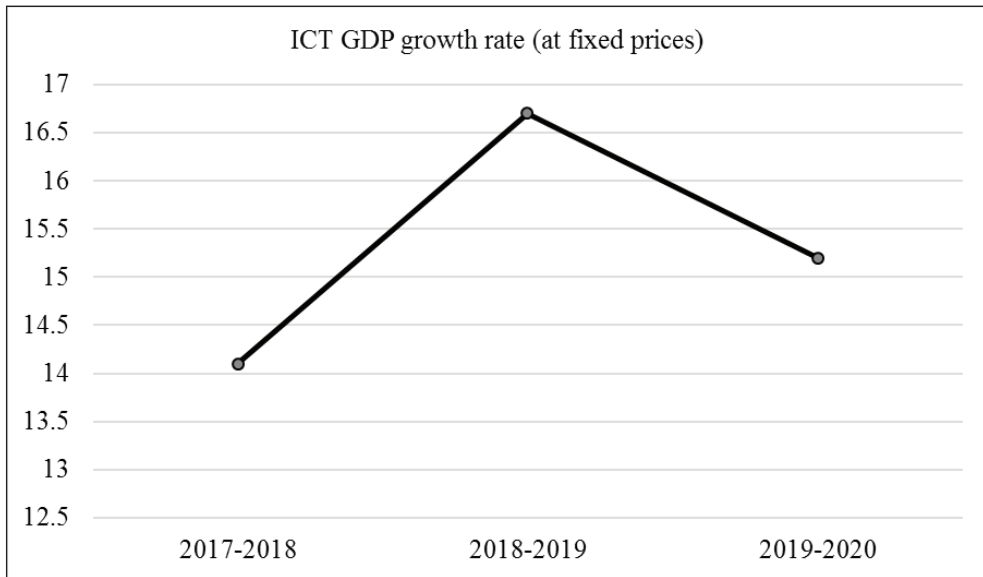


Source: MCIT, Annual Report 2020

Overall, the number of individuals using the internet in Egypt has been continuously rising. Within the 2015–2020 period, the country witnessed a 16% increase in the number of individuals using the internet. The rise is significant in both rural (13.6% increase) and urban areas (19% increase).

Numerous efforts have been made over the last few years to maintain a competitive environment for ICT companies and to bring an increasing amount of value to the economy. The Egyptian ICT sector generated 14% of GDP in 2017. In 2016, the outsourcing industry generated over \$1.7 billion in exports and approximately \$1.87 billion in 2017. The ICT sector had a considerable inflow of targeted investments, both domestic and foreign, resulting in a total growth of almost 16%. In 2016, the number of newly founded enterprises in the ICT sector surpassed 1,000. Additionally, investments began to flow into the electronic design sector to capitalize on the promise of the promising new sector. These flows are the result of policies and planning aimed at increasing the efficiency of the telecommunications infrastructure, strengthening the export sector's ability to export, and fostering a competitive environment that fosters work and innovation. This will ultimately increase sector productivity and benefit the local economy through added value, job generation, and cost savings.

Figure 2: ICT Economic Indicator Between 2016 and 2020 for Egypt



*The decrease in ICT GDP growth rate in 2019/2020 was led by COVID-19

Source: MCIT, Annual Report 2021

Economic growth continues to fluctuate today, even though it has improved in recent years. However, the digital economy has the potential to accelerate Egypt's economic growth and contribute to the country's ambitious sustainable development agenda by 2030.

The study covers annual data from 1999 to 2019 for Egypt. Table 1 summarizes definitions and data sources of all variables and Table 2 presents summary statistics.

Table 1: Variables Definitions and Data Sources

Variable	Definition	Source
GDP growth rate	Annual % change in Gross domestic product.	World Bank (2022a)
Employment growth rate	Annual % change in total employment to population ratio, 15 years and over.	World Bank (2022b)
Fixed capital formation growth rate	Annual % change in gross fixed capital formation.	World Bank (2022c)
ICT capital growth rate	Annual % change in ICT capital to total public/private/public-private capital.	International Telecommunications Union ITU

Source: Author's elaboration

Table 2: Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
GDP growth rate	4.470419	1.66261	1.764572	7.156283
Fixed capital formation growth rate	7.031688	9.356517	-10.2991	24.1446
Employment growth rate	-.5529982	2.58048	-.4665309	3.969745
ICT capital growth rate	2.10446	2.426425	-47.15337	51.91903

Source: Author's calculation

4.1. Unit Root Test

The study establishes the order of integration of the time series using the conventional augmented Dickey-Fuller (ADF) tests on the specified variables. The basic ADF tests for the null hypothesis of series non-stationarity, that is, the existence of a unit root in the series under consideration. The unit root test, which is derived from the standard Augmented Dickey-Fuller test, yielded the results shown in Table 3. At a 5% level of significance, the critical values of individual variables are less than the statistical ADF values. The null hypothesis that all series contain a unit root was accepted. This indicates that all variables were not stationary at the same level. Taking the first difference, all variables became stationary, I (1), as the critical values of all variables were higher than the ADF's statistical values at the 5% level. A co-integration test was performed to test the long-term economic relationship.

Table 3: Augmented Dickey – Fuller Unit Root Test Results with Trend and Intercept

Variable	Level Test statistic	First difference Test statistic
GDP growth rate	-1.891	-4.131***
Fixed capital formation growth rate	-3.030	-6.112***
Employment growth rate	-3.243	-6.205***
ICT capital growth rate	-3.176	-4.638***

*** $p \leq .01$; ** $p \leq .05$; * $p \leq .10$

Note: 5% critical value = - 3.600

Source: Author’s calculation

4.2. Johansen Co-Integration and ECM

The study employs the Johansen co-integration test to examine the number of long-term cointegrating equations that exist between integrated variables. This test enables the identification of long-term relationships in integrated time series and the extraction of all cointegration vectors in a multivariate context. The results of the co-integration trace test are shown in Table 4.

Table 4: Johansen Co-integration Test Results

Hypothesis	Trace	
	Trace statistic	5% critical value
Null	55.9603	47.21
1	29.8651	29.68
2*	13.1028*	15.41*
3	5.1556	3.76

*The maximum number of co-integrating equations.

Source: Author’s calculation

The trace test statistics indicated the existence of a maximum rank of two cointegrating equations between the variables. The statistics of the trace were lower than the critical value. As a result, the variables of this study were found cointegrated at the 5% level and an error correction model was applied. Table 5 shows the results of OLS estimation of the long-term relationship between GDP growth and the explanatory variables as well as the short-term results of the Error Correcting Model (ECM).

Table 5: Short and Long Terms Results

OLS Model Results (Long-term)			ECM Results (Short-Term)		
GDP growth rate	Coeff.	Prob.	GDPgrowth	Coeff.	Prob.
Fixed capital formation growth rate	.10057	0.005***	ΔL1 GDP growth rate	.06284	0.719
Employment growth rate	.16552	0.163	ΔL2 GDP growth rate	.22146	0.091*
ICT capital growth rate	.01022	0.451	ΔL3 GDP growth rate	.19559	0.255
CONSTANT	3.7849	0.000***	Δ Fixed capital formation growth rate	.06735	0.005***
			Δ Employment growth rate	.22462	0.004***
			Δ ICT capital growth rate	.000153	0.852
			ECM-1	-.80034	0.003***
			CONSTANT	.00579	0.973
$R^2 = 0.5948$ F-Statistic = 7.83			$R^2 = 0.8635$ F-Statistic = 8.13		

*** $p < .01$; ** $p < .05$; * $p < .1$

Source: Author's calculation

In the long term, the coefficient of determination for the OLS model ($R^2 = 0.5948$) and Fisher test p value (.0000) indicated that the exogenous variables in the model account for about 60% of the variability observed in GDP growth rate. Results show that only growth in fixed capital formation in Egypt had a significant impact on the level of GDP growth. For the short term, the lagged error correction term was included along with a number of lagged optimised variables. These results are derived by applying the ordinary least squares approach to an error correction model of the short-term dynamics represented by the variables in first difference. The coefficient of determination ($R^2 = .8635$) and Fisher test p value (.000) indicate that the model is statistically significant. Using residual robustness tests (Jarque-Bera test and White tests), the error term was found to be normally distributed and homoscedastic. The error correction term parameter is negative and significant at the 5% level, indicating the existence of an error correction mechanism over the long run. The coefficient of the error term is .8003465, which denotes the rate of absorption of an imbalance. Thus, 50% of a shock would be absorbed after about 6 months and entirely absorbed after about one year ($.2^n = .5$). As a result, the error correction model is sufficient. In both, the short and long runs, the model indicates that the coefficient of the ICT capital stock variable is positive and statistically insignificant. This finding is consistent with Morrison (1997) and Berndt and

Morrison (1995) who found that ICT capital has no impact on productivity compared to non-ICT capital, and consistent with O'Mahony and Vecchi (2003) who found no impact of ICT on growth. Similarly, Yousefi (2011) found that the effect of ICT differs across different income groups of countries. The impact was found to be significant in higher income groups and became insignificant in lower income groups. The impact of the growth in fixed capital growth on GDP growth was observed in both the short and long runs. However, the impact of the growth in the employment rate was only observed in the short run. A 10% increase in the growth of fixed capital and the growth of employment rates increases GDP growth by 6% and 22%, respectively.

5. Results and discussion

Several studies have shown that increased access to information and communication technologies results in increased employment opportunities, knowledge transfer, economic efficiency, and growth. The economic literature shows that the dispute over the relationship between ICT and growth is tilting in favour of a positive relationship; however, there is still a discussion about the magnitude of the effects and the conditions under which these effects can be observed. Efforts exerted in the field of ICT by the government of Egypt over the past 20 years have been in the hope that growth and development will cause economic growth. While many studies have found a positive association between ICT capital or ICT investment and economic growth, the results of this study found no association between growth in ICT capital and GDP growth in the short or long term in Egypt. However, both control variables were found significant, as expected. While a few studies have used a similar methodology, some were done on cross-sectional data from different countries or with different variables to represent ICT capital stock due to data scarcity, none were done on a specific MENA country. This is the first paper to address one specific country case from the MENA region using this methodology. While we did not find any supporting evidence that growth in ICT capital causes any change in the level of the GDP growth rate, several explanations can be derived. Firstly, the level of annual accumulation in the ICT capital over the past 20 years may have been inadequate to cause any immediate or late changes in the annual GDP growth rate. Secondly, a shift in thinking about the quality of these investments may be needed. Quality is critically important in many aspects: the quality of ICT investment policies, the quality of maintaining and handling the investment, the quality of workers in the field, and the overall quality of the country's environment, such as the quality of regulations and institutions, the level of inflation, the level of unemployment, market needs evaluations and government consumption. Thirdly, less focus on the channels through which investments in ICT flow back to the economy, such as the financial sector, may cancel out the impact of ICT capital growth on economic growth.

6. Conclusion

A growing body of literature is emerging to estimate the impact of ICT capital on economic growth. This study employs a production function and uses an error-correction model of time series data from Egypt between 1999 and 2019 and concludes that ICT capital growth is not impactful or sufficient to cause a resulting change in the GDP growth rate. Due to the absence of data, ICT capital was calculated using an assumed depreciation rate.

The Egyptian government is undergoing real changes and structural reforms in order to maximize the contribution of the ICT sector to economic growth. Based on findings of this study, the government is recommended to keep on the track of reforms, reconsidering both the volume and the quality of investments in ICT. Future research is needed to further investigate the influence of ICT capital accumulation on growth using longer time periods, better indicators of human capital, and adding total factor productivity to the model. In addition, more research is needed on the policy dimension. This includes applying the same methodology to investigate the impact of government interventions. Finally, databases for ICT capital and ICT depreciation rates for several MENA countries are missing; therefore, this study advises the Egyptian government and international organisations to help provide an updated and open source that comprehensively covers ICT capital data and its subcategories for this region.

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Utjecaj rasta ICT kapitala na gospodarski rast: slučaj Egipta

*Hoda Mansour*¹

Sažetak

Kapitalna ulaganja u informacijsku i komunikacijsku tehnologiju (ICT) daju veliki doprinos rastu nekoliko razvijenih zemalja. U pokušaju da potaknu svoja gospodarstva, neke zemlje u nastajanju i razvoju slijede sličan put, u kojem ulažu velika sredstva u sektor IKT-a. Međutim, zbog drugih čimbenika, rast IKT kapitala možda neće uvijek proizvesti željeni ekonomski ishod. Svrha ove studije je procijeniti utjecaj rasta kapitala u ICT-u na gospodarski rast u jednoj zemlji u razvoju, Egiptu, koja značajno ulaže u sektor ICT-a. Studija analizira vremenske serije podataka koji pokrivaju razdoblje od 1999. do 2019. pomoću modela ispravljanja pogrešaka. Nalazi pokazuju da ne postoji dugoročna pozitivna povezanost između rasta ICT kapitala i gospodarskog rasta u Egiptu. Iako razvoj ICT-a Egiptu pruža potencijal za postizanje održivog gospodarskog rasta, značaj i veličina tih utjecaja trenutačno su zanemarivi. Studija zaključuje da bi, kako bi imali koristi od kapitalnih ulaganja u ICT, kreatori politika trebali donijeti visokokvalitetne investicijske politike i poboljšati ukupnu kvalitetu okolnog okruženja, kao što su regulatorna i institucionalna okruženja, uz kontrolu inflacije i državne potrošnje.

Ključne riječi: *gospodarski rast, ICT, rast kapitala, digitalna ekonomija*

JEL klasifikacija: *O47, O33, E22, O14*

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Role of personality traits in shaping entrepreneurial intention: Comparative study of South Korea and Vietnam*

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Abstract

This paper investigates the role of personality traits in nurturing entrepreneurial intention in South Korea and Vietnam. We developed a research model to examine the integrated influence of both positive entrepreneurial characteristics and dark triad on entrepreneurial intention in South Korea and Vietnam. Primary data was collected from 550 students in South Korea and 700 students in Vietnam using the convenient sampling method in a self-administered questionnaire survey. We used structural equation modelling (SEM) to analyse structural relationships between positive entrepreneurial attributes, dark triads, and entrepreneurial intention in two samples. T-tests were also performed to explore any differences in students' entrepreneurial intention in South Korea and Vietnam regarding their family background and gender. Findings showed that positive entrepreneurial attributes and dark triads influence entrepreneurial intention differently in the two countries. While the dark triad mainly influenced Vietnamese students' intention to startup, Korean students received more impact from the positive entrepreneurial characteristics such as risk tolerance, locus of control, and entrepreneurial alertness. Surprisingly, both gender and family tradition do not affect students' entrepreneurial intention. Based on our findings, we

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suggested that policymakers and higher education institutions in both South Korea and Vietnam promote students' entrepreneurial intentions in the future.

Key words: *entrepreneurial intention, personality traits, dark triad, South Korea, Vietnam*

JEL classification: *M13, L26, O57*

1. Introduction

Entrepreneurship is an important field that needs to be studied (Shane and Venkataraman, 2000). Scholars have taken several approaches to investigate factors influencing entrepreneurial intention. One domain is the behavioural approach, which is based on Ajzen's theory of planned behaviour (Krueger et al., 2000; Tausif et al., 2021; Vodă and Florea, 2019), or Shapero's entrepreneurial event model (Krueger et al., 2000; Peterman and Kennedy, 2003). Other studies using the trait approach focus mainly on the Big five (Murugesan and Jayavelu, 2017; Şahin et al., 2019) or positive characteristics of the entrepreneur (Vodă and Florea, 2019). Besides, the dark triad, originally viewed as negative attributes within society, also plays a vital role in entrepreneurship. Research has investigated the effect of the dark triad on entrepreneurial intention (Hmieleski and Lerner, 2016; Mathieu and St-Jean, 2013; Tucker et al., 2016). However, most studies have typically dismissed the co-presence of dark triad traits and positive entrepreneurial characteristics in predicting entrepreneurial intention. Thus, it is worth examining how positive entrepreneurial attributes and dark triad traits jointly contribute to entrepreneurial intention. The purpose of this paper is to examine how personality traits might influence the entrepreneurial intention of people in two Asian countries: South Korea and Vietnam.

The development of startup is different from country to country. In South Korea, startups have played a key role since the late 1970s, mainly in Seoul. Statistics revealed that the number of companies fell by 72,000 due to the financial crisis in 1998. Following a series of systemic economic changes to address the financial crisis, the number of companies increased by 137,000 in 1999 and 79,000 in 2000. Recently, South Korea has around 2 million startups (Hemmert et al., 2019) and this figure is still increasing. In Vietnam, the startup ecosystem was born in 2004. Since then, the startup community have grown dramatically. However, the number of startups is still very low, less than 4% comparing to 12.4% of other factor-driven economies. There are about 3,800 startups in Vietnam running until 2022 (Statista, 2022).

South Korea and Vietnam are Asian nations with different levels of economic growth but share some similarities. According to the GEM study, the fear of failure for the startup is a big concern for both South Korea (32.8%) and Vietnam (46.6%) in 2018. Moreover, less than 10% of youth engage in a startup in South Korea,

while this number in Vietnam is 20%. In 2019, total early-stage entrepreneurial activity (TEA) was 14.94% for South Korea and 23.3% for Vietnam. However, the GEM study did not explain which factors drive entrepreneurial intention in the two countries. In this regard, there is a call for comparing entrepreneurial intention between South Korea and Vietnam, focusing on the influence of personality traits. Therefore, we raise some hypotheses in this study to test the role of personality traits in shaping the entrepreneurial intention of South Korean and Vietnamese people. Firstly, we formulate four hypotheses to examine the influence of positive personality attributes such as need for achievement, locus of control, entrepreneurial alertness on entrepreneurial intention. In addition, we develop three hypotheses to test how the dark triad qualities such as psychopathy, narcissism, and Machiavellianism impact the entrepreneurial intention. The two remaining hypotheses are raised to check if gender and family business background influence the entrepreneurial intention.

The rest of this paper is organized as follows. Section 2 briefly reviews the theoretical background of entrepreneurship and develops hypotheses. Section 3 presents the research model, measurement instruments, and sampling method. Section 4 describes the research findings. Finally, in Section 5, we conclude the practical implications, limitations of this study, and suggestions for future work.

2. Literature review

2.1. Entrepreneurship

Entrepreneurship was described as discovering, evaluating, and exploiting an opportunity (Shane and Venkataraman, 2000). Kuratko and Audretsch (2009) viewed entrepreneurship as a dynamic process of vision, change, and creation, including the passion for creating and implementing new ideas and solutions. Entrepreneurship requires the initiation, participation, and success of entrepreneurial endeavours rooted in environments (Shepherd et al., 2019).

Entrepreneurial intention represents the state of mind initiated by individuals towards self-employment over conventional wage-based employment (Gerba, 2012). It can be defined as one's belief that he/she intends to set up a new business and the action plan to do in the future (Thompson, 2009) or an individual's affirmation of the intention to become a business owner (Pruett, 2012). Entrepreneurial intention reflects a person's ambition or strategy for his/her profession to be an entrepreneur. People with entrepreneurial aspirations plan to take risks, raise the money needed and set up their projects (Karabulut, 2016). Therefore, entrepreneurial intention is a vital sign of entrepreneurial foundation (Ndofirepi, 2020).

2.2. Entrepreneurial attributes and entrepreneurial intention

2.2.1. Need for achievement

The need for achievement (ACH) is viewed as the level to which one sets objects and strives for those objects (McClelland, 1987). He found that people with higher ACH score can be successful in small business. Comparing the US and Ireland, de Janasz et al. (2007) showed that achievement motivation was significantly and positively correlated to entrepreneurial intention for US participants. In addition, Gerba (2012) showed a significant relationship between the need for achievement and entrepreneurial intention in Ethiopian students. Recently, the need for achievement was verified as an essential factor that accounted for a significant amount of variance in entrepreneurial intentions (Ndofirepi, 2020). Based on the above discussions, we formulate the following hypothesis:

H1: Need for achievement (ACH) positively influences entrepreneurial intention (EI).

2.2.2. Locus of control

Locus of control (LOC) is an individual's belief regarding the causes of his or her experiences and the factors to which that person attributes success or failure. It includes internal control (within the person) and external control (outside the person, relying on powerful others, external conditions, chance or luck). Locus of control seems to be an excellent measure to distinguish a successful entrepreneur from an unsuccessful one (Thomas and Mueller, 2000). Notably, Diaz (2003) believed that people who have an internal locus of control are expected to determine their career paths. In that sense, people with strong internal LOC have been proved to express higher entrepreneurial intention (Kristiansen and Indarti, 2004). Besides, Karabulut (2016) proved that the locus of control positively affects entrepreneurial intention. Therefore, we hypothesize:

H2: Locus of control (LOC) positively influences entrepreneurial intention (EI).

2.2.3. Entrepreneurial alertness

Entrepreneurial alertness (ALT) is an attitude of receptiveness to changes that have so far escaped notice. Alertness, as the role of *antenna*, enables individuals to detect market shifts and opportunities (Kirzner, 1997). They can discover and exploit unnoticed opportunities to benefit the market by their alertness (Kirzner, 2009). Furthermore, Tang et al. (2012) claimed that entrepreneurial alertness related to opportunity finding and creation. Alertness can boost individual perceived

capability, leading to a new business initiative (Lin et al., 2017). Hu et al. (2018) have empirically confirmed that entrepreneurial alertness has a significant relationship with entrepreneurial intention, particularly in scanning and predicting opportunities. Thus, we hypothesize as follows:

H3: Entrepreneurial alertness (ALT) positively influences entrepreneurial intention (EI).

2.2.4. Risk tolerance

According to Ahmed (1985), risk-taking relates to dealing with uncertainties and the degree of readiness to bear them. Risk-taking is one of the critical characteristics of the entrepreneur that fosters his/her intention of starting a business (Lüthje and Franke, 2003). Several studies have confirmed that discovered that risk-taking propensity stands out as a source of generating entrepreneurial intention (Gürol and Atsan, 2006; Lüthje and Franke, 2003). Concerning risk aversion, de Janasz et al. (2007) pointed out that risk tolerance (TOL) influences entrepreneurial intention among the Irish negatively. Similarly, Fairlie and Holleran (2012) confirmed that entrepreneurial intention is negatively affected by risk aversion. Based on these discussions, we expect that:

H4: Risk tolerance (TOL) positively influences entrepreneurial intention (EI).

2.3. Dark triad and entrepreneurial intention

Psychopathy, Narcissism, and Machiavellianism are the dark triad of personalities described by Paulhus and Williams (2002). Dark triad qualities are believed to affect daily decision-making and the process of becoming an entrepreneur.

2.3.1. Narcissism

Narcissism is a multidimensional, multifaceted, and multi-contextual concept. It consists of entitlement, grandiosity, and attempts to influence others (Jonason et al., 2012). Narcissists often feel confident in themselves, have fantasies of control, success, and admiration, and prefer to look for others' praise and respect (Forsyth et al., 2012).

Entrepreneurs and narcissists share some traits in the Big Five-factor model. According to O'Boyle et al. (2015), narcissism was positively associated with extraversion, openness, and conscientiousness. Narcissism might influence entrepreneurial intention in some ways. On the one hand, narcissism is an inherent characteristic of entrepreneurs. According to Mathieu and St-Jean (2013), narcissistic individuals seem to be overconfident in their skills and knowledge, and they are willing to take a risk and intent to start up a business. On the other hand, narcissism was found to

have a significant positive relationship with entrepreneurial intentions in the study of Hmieleski and Lerner (2016).

On the contrary, Wu et al. (2019) found that individuals with a higher level of narcissism have lower entrepreneurial intentions in the Chinese context. However, we believe that narcissism is necessary for startups. Thus, we hypothesize that:

H5: Narcissism (NAR) positively influences entrepreneurial intention (EI).

2.3.2. Machiavellianism

Machiavellianism is characterized as a self-interested, deceptive, strategic, and manipulative personality trait. People with high Machiavellianism seem to be achievement-oriented, self-disciplined, and deliberate in their actions (O'Boyle et al., 2015). In addition, they will use distinct methods to achieve goals, try to control others and maximize their interests (Do and Dadvari, 2017). According to Tucker et al. (2016), Machiavellianism can help individuals go through the entire entrepreneurial process. Therefore, we hypothesize that:

H6: Machiavellianism (MACH) positively influences entrepreneurial intention (EI).

2.3.3. Psychopathy

Hare and Neumann (2009) defined psychopathy as a cluster of interpersonal, affective, lifestyle, and antisocial traits and behaviours. It is associated with guiltlessness, dishonesty, cynicism, and insensitivity (Crysel et al., 2013). Psychopaths seem to lack normal levels of emotional arousal but excel in highly stressful and uncertain situations (Hmieleski and Lerner, 2016). Studies investigate the effect of psychopathy on entrepreneurial intention, but the results are not consistent. On the one hand, Akhtar et al. (2013) found that only primary psychopathy was significantly and negatively related to social entrepreneurship. On the other hand, Hmieleski and Lerner (2016) argued that psychopathy would positively associate with their intentions to start a new business. From the above arguments, we expect that:

H7: Psychopathy (PSY) positively influences entrepreneurial intention (EI).

2.4. Gender, family business background and entrepreneurial intention

Many studies found that entrepreneurial intention varies significantly with gender (Gerba, 2012; Karhunen and Ledyeva, 2010; Marlow, 2002). Concerning the impact of gender on entrepreneurial intention of women entering self-employment

in the UK, Marlow (2002) suggested that women will experience challenges within self-employment than man. Karhunen and Ledyeva (2010) discovered that entrepreneurship is more appropriate for men than women in career choice. This finding was strengthened by Gerba (2012), suggesting that females are less active in launching a venture. On the other hand, some studies concluded that gender has no significant effect on entrepreneurial intention (Kristiansen and Indarti, 2004; Murugesan and Jayavelu, 2017; Pruett et al., 2009). However, under the context of Asian countries, the following hypothesis is offered:

H8: There is a difference in entrepreneurial intention (EI) between male and female students.

Family business background refers to those people whose parents or relatives are involved in self-employment. Carr and Sequeira (2007) believed that a business family would affect the family member's attitude and intentions towards entrepreneurial action. Pruett et al. (2009) indicated that students from business family are more likely to start their businesses because their family members can serve as role models. Those students who experienced family business also show a strong entrepreneurial desire (Karhunen and Ledyeva, 2010). The positive correlation between the history of the entrepreneurial family and the interest in entrepreneurial intent was also verified by Mungai and Velamuri (2011). Gerba (2012), on the other hand, revealed that students with an entrepreneurial family do not have more entrepreneurial intent than students with a non-entrepreneurial family. However, we believe that individuals growing up in an entrepreneurial family can learn from self-employed parents and plan to start their business. As a result, we suggest:

H9: There is a difference in entrepreneurial intention (EI) between students from business families and those from non-business families.

3. Methodology

3.1. Measurements and research model

The entrepreneurial intention was set as the dependent variable in this study. To measure the likelihood of starting a business within a short time, five items adapted from Lin et al. (2017) were used. The items were measured on a five-point Likert scale ranging from 5 (strongly agree) to 1 (strongly disagree).

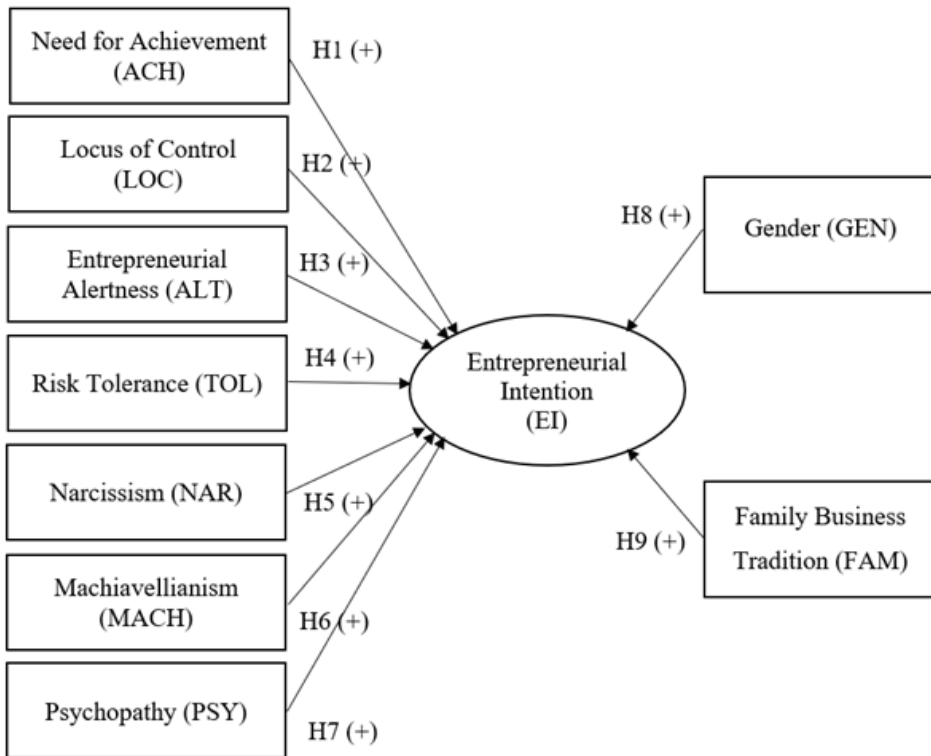
The independent variables include the positive entrepreneurial traits and the dark triad. Need for achievement consists of 7 items that were combined from the works of Kristiansen and Indarti (2004) and Karimi et al. (2017). 4 items to measure locus of control were adapted from Karimi et al. (2017). A shorter version of Tang et al. (2012)'s scale, including three dimensions: opportunities

scanning, association and evaluation, was used to measure entrepreneurial alertness. In addition, we measured risk tolerance with the instrument developed by Karimi et al. (2017). Dark triad constructs were based on Jones and Paulhus (2014) short scales in which respondents were asked to rate their response to each of the 21 items generated for narcissism (6 items), Machiavellianism (9 items) and psychopathy (6 items). All items are Likert-scale type ranging from 1 strongly disagree to 5 strongly agree.

In addition, two control variables are included. Two variables that have been shown to affect intention to start a business include gender (1 for male, 0 for female) and family business tradition (1 if at least one family member has started their own business, otherwise 0).

The research model is presented as follows.

Figure 1: Research model



Source: Author's elaboration

4. Empirical data and analysis

4.1. Sampling and data collection

We selected a pool of items for survey instruments from existing literature. The questionnaire consists of 43 items on a 5-point Likert scale. The convenient and snowball sampling strategy was utilized. The survey was implemented both online and offline. In South Korea, the authors got supports from the Vietnamese Student Association (VSAK) to approach potential respondents from four universities in Seoul and Busan. In Vietnam, printed questionnaires were delivered to six universities located in Hanoi (the North), Danang (the Central) and Ho Chi Minh City (the South). The respondents were students enrolling in bachelor programs who are from 18 to 24 years old. After four months, eliminating uncompleted questionnaires, 550 and 700 usable responses from South Korea and Vietnam were used for testing the hypotheses. Table 1 summarises the distribution of respondents according to demographic characteristics, including gender, year of studies and family background. It shows that 52.5% and 76.9% of the respondents were females in South Korea and Vietnam, respectively. Concerning the school year of respondents, 32.2% of Korean respondents were fourth-year students, while only 8.4% of Vietnamese respondents were in the fourth year. Moreover, the two samples showed a significant difference in family tradition, with 32.5% of Korean students' families running their own business, while this figure in Vietnam is 57.9%.

Table 1: Sample demographic characteristics

Characteristics	South Korea (n ₁ = 550)		Vietnam (n ₂ = 700)	
	Frequency	Percent (%)	Frequency	Percent (%)
Gender				
Female	289	52.5	538	76.9
Male	261	47.5	162	23.1
University year enrolment				
First year	61	11.1	258	36.9
Second year	87	15.8	233	33.3
Third year	132	24.0	141	20.1
Fourth year	177	32.2	59	8.4
Above fourth year	22	4.0	9	1.3
Family business tradition				
Yes	179	32.5	405	57.9
No	371	67.5	295	42.1

Source: Author's calculation

4.2. Preliminary analysis

Initially, we executed the Cronbach’s alpha test and confirmatory factor analysis (CFA) to evaluate the measurement instruments’ reliability, validity, and convergence. Forty-three items of the eight constructs were put into CFA. Then, we applied the composite reliability index (CR) and average variance extracted index (AVE) to compute the convergent validity.

After running the reliability test and CFA, for the Korean sample, we removed five items, including Ach6, Ach7, Nar2, Nar3, Mach9. For the Vietnamese sample, we removed seven items, which were Ach1, Ach2, LoC1, Nar1, Nar2, Mach9, Psy6. The detailed results of this preliminary test were described in Table 2.

Table 2: Reliability, validity, and convergence of model constructs

Construct	Cronbach alpha C.R (AVE)		Item	Loading	
	South Korea	Vietnam		South Korea	Vietnam
Need for achievement (ACH)	0.781 0.792 (0.421)	0.785 0.770 (0.405)	Ach1	0.739	
			Ach2	0.694	
			Ach3	0.671	0.564
			Ach4	0.508	0.637
			Ach5	0.606	0.553
			Ach6		0.638
			Ach7		0.767
Locus of control (LOC)	0.866 0.875 (0.641)	0.689 0.709 (0.451)	LoC1	0.797	
			LoC2	0.905	0.658
			LoC3	0.844	0.681
			LoC4	0.631	0.675
Entrepreneurial alertness (ALT)	0.786 0.820 (0.624)	0.703 0.715 (0.463)	Alt1	0.432	0.531
			Alt2	0.903	0.804
			Alt3	0.932	0.678
Risk tolerance (TOL)	0.798 0.802 (0.577)	0.812 0.815 (0.595)	Tol1	0.664	0.744
			Tol2	0.750	0.815
			Tol3	0.854	0.752
Narcissism (NAR)	0.787 0.763 (0.417)	0.745 0.723 (0.410)	Nar1	0.648	
			Nar3		0.718
			Nar4	0.544	0.681
			Nar5	0.782	0.573
			Nar6	0.584	0.578

Construct	Cronbach alpha C.R (AVE)		Item	Loading	
	South Korea	Vietnam		South Korea	Vietnam
Machiavellianism (MACH)	0.858 0.884 (0.495)	0.869 0.878 (0.481)	Mach1	0.464	0.483
			Mach2	0.608	0.539
			Mach3	0.644	0.619
			Mach4	0.706	0.756
			Mach5	0.814	0.824
			Mach6	0.667	0.766
			Mach7	0.827	0.738
			Mach8	0.819	0.747
Psychopathy (PSY)	0.819 0.810 (0.421)	0.777 0.771 (0.415)	Psy1	0.589	0.687
			Psy2	0.678	0.612
			Psy3	0.664	0.591
			Psy4	0.817	0.659
			Psy5	0.552	0.667
			Psy6	0.553	
Entrepreneurial Intention (EI)	0.918 0.924 (0.710)	0.866 0.869 (0.572)	EI1	0.874	0.727
			EI2	0.894	0.847
			EI3	0.860	0.782
			EI4	0.876	0.739
			EI5	0.694	0.677
Model fit indices	South Korea	Vietnam	Suggested value		
Chi-square/df	2.330	2.912	< 3		
p-value	0.000	0.000	< 0.05		
GFI	0.858	0.847	> 0.8		
CFI	0.915	0.879	> 0.8		
RMSEA	0.049	0.052	< 0.07		

Source: Author's calculation

For Korean and Vietnamese data, Table 2 showed that the average variance extracted (AVE) of several constructs, such as the need for achievement (ACH), locus of control (LOC), entrepreneurial alertness (ALT), narcissism (NAR), Machiavellianism (MACH) and psychopathy (PSY) was less than 0.5 but higher than 0.4 (Fornell and Larcker, 1981). However, the composite reliability of these constructs was higher than 0.6. So, the convergent validity of these constructs was still adequate (Fornell and Larcker, 1981).

The model fit indices in CFA for both South Korea and Vietnam samples met the requirements with Chi-square/df is smaller than 3, p-value lower than 0.05, and other indices such as GFI and CFI were lower than 0.9 but higher than 0.8. According to Doll et al. (1994), the GFI and CFI indices higher than 0.8 were still accepted. Therefore, the validity of model constructs was adequate.

4.3. SEM analysis

We run SEM analysis for two subsamples (i.e., South Korea and Vietnam) to test the hypotheses in the entrepreneurial intention model. The SEM analysis results were presented in Table 3.

Table 3: The SEM analysis results

Relationship	South Korea (n ₁ = 550)				Vietnam (n ₂ = 700)			
	Unstandardized Coefficients	S.E	C.R.	p	Unstandardized Coefficients	S.E	C.R.	p
ACH → EI	-0.120	0.088	-1.367	0.171	0.056	0.073	0.759	0.448
LOC → EI	0.631	0.081	7.778	***	0.301	0.108	2.780	0.005
ALT → EI	0.126	0.040	3.146	0.002	0.191	0.052	3.650	***
TOL → EI	0.364	0.074	4.892	***	0.002	0.055	0.027	0.978
NAR → EI	0.393	0.113	3.477	***	0.145	0.089	1.622	0.105
MACH → EI	0.070	0.048	1.468	0.142	0.173	0.051	3.405	***
PSY → EI	-0.058	0.100	-0.581	0.561	0.378	0.141	2.675	0.007
GEN → EI	0.045	0.059	0.757	0.449	0.024	0.043	0.551	0.582
FAM → EI	-0.105	0.063	-1.663	0.096	0.022	0.036	0.603	0.547
Model fit indices	Chi-square/df = 2.939 (p = 0.000), GFI = 0.826, CFI = 0.861, RMSEA = 0.059				Chi-square/df = 2.844 (p = 0.000), GFI = 0.847, CFI = 0.873, RMSEA = 0.051			

Note: S.E = Standard Error; C.R = Composite Reliability; ***: p < 0.001

ACH: Need for achievement; LOC: Locus of control; ALT: Opportunity alertness; TOL: Risk tolerance; NAR: Narcissism; MACH: Machiavellianism; PSY: Psychopathy; EI: Entrepreneurial intention

Source: Author’s calculation

As given in Table 3, among four factors of positive entrepreneurial attributes, three factors were proved to influence entrepreneurial intention positively except for the need for achievement (ACH). Two factors in the dark triad did not significantly relate to entrepreneurial intention, which was Machiavellianism (MACH) and psychopathy (PSY), since p-values were greater than 0.05. Thus, hypotheses H1a,

H6a, and H7a were not supported in this research. The remaining hypotheses were statistically accepted for the Korean sample.

For the Vietnamese sample, as may be observed, there was not enough evidence to confirm the positive influence of the need for achievement (ACH) and risk tolerance (TOL) on entrepreneurial intention. So H1b and H4b were rejected. On the other hand, the rest two factors of entrepreneurial attributes, which are the locus of control (LOC) and opportunity alertness (ALT), positively affected students' entrepreneurial intention. Thus, hypotheses H2b and H3b were supported. Besides, among the dark triad, both Machiavellianism (MACH) and psychopathy (PSY) had a positive influence on entrepreneurial intention; only narcissism (NAR) did not statistically affect entrepreneurial intention. Thus, hypothesis H5b was rejected, but H6b and H7b were accepted.

Moreover, for Korean and Vietnamese samples, gender and family business background have p-values greater than 0.05. So, hypotheses H8a, H9a, H8b, and H9b were rejected. Table 4 summarized the hypotheses test results for both countries.

Table 4: Summary of hypothesis test results

Relationship	South Korea		Vietnam	
	Hypothesis	Result	Hypothesis	Result
ACH → EI	H1a	Rejected	H1b	Rejected
LOC → EI	H2a	<i>Supported</i>	H2b	<i>Supported</i>
ALT → EI	H3a	<i>Supported</i>	H3b	<i>Supported</i>
TOL → EI	H4a	<i>Supported</i>	H4b	Rejected
NAR → EI	H5a	<i>Supported</i>	H5b	Rejected
MACH → EI	H6a	Rejected	H6b	<i>Supported</i>
PSY → EI	H7a	Rejected	H7b	<i>Supported</i>
GEN → EI	H8a	Rejected	H8b	Rejected
FAM → EI	H9a	Rejected	H9b	Rejected

Note: ACH: Need for achievement; LOC: Locus of control; ALT: Opportunity alertness; TOL: Risk tolerance; NAR: Narcissism; MACH: Machiavellianism; PSY: Psychopathy; EI: Entrepreneurial intention

Source: Author's calculation

4.4. Test of country differences

To examine differences between South Korea ($n_1 = 550$) and Vietnam ($n_2 = 700$) samples, we employed the independent sample t-tests. As described in Table 5, it is shown the notable differences in terms of the mean values of all eight variables between students of the two countries because the p-values of all factors were smaller than 0.05. Compared to the Korean sample, the Vietnamese sample reported higher mean scores for all variables, except for the need for achievement ($M_{KOR} = 4.038$, $M_{VIE} = 3.954$).

Table 5: Results of independent t-tests

Construct	Mean (SD)			t-value
	Total (n = 1,250)	South Korea ($n_1 = 550$)	Vietnam ($n_2 = 700$)	
Need for achievement (ACH)	3.991 (0.523)	4.038 (0.537)	3.954 (0.509)	2.828**
Locus of control (LOC)	3.230 (0.826)	2.878 (0.908)	3.506 (0.631)	-13.788***
Opportunity alertness (ALT)	2.986 (0.887)	2.578 (0.950)	3.307 (0.680)	-15.190***
Risk tolerance (TOL)	2.707 (0.787)	2.512 (0.811)	2.861 (0.733)	-7.868***
Narcissism (NAR)	3.044 (0.754)	2.661 (0.760)	3.344 (0.597)	-17.289***
Machiavellianism (MACH)	3.189 (0.668)	2.893 (0.657)	3.422 (0.579)	-15.111***
Psychopathy (PSY)	3.045 (0.803)	2.562 (0.715)	3.425 (0.651)	-22.001***
Entrepreneurial intention (EI)	2.994 (1.028)	2.362 (1.018)	3.490 (0.718)	-22.023***

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Source: Author’s calculation

We also controlled for gender and family traditions in the entrepreneurial model of the two countries. Thus, we ran the independent t-test analysis for the two samples with gender and family tradition as the group variable, respectively. Table 6 shows the t-test result that compares positive personality traits and entrepreneurial intention between male and female groups in each country.

Table 6: Independent-samples t-test with gender as a grouping variable

	South Korea					Vietnam				
	Female (n=289)		Male (n=261)		t	Female (n=538)		Male (n=162)		t
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
ACH	4.024	0.538	4.0546	0.535	-0.662	3.950	0.487	3.964	0.578	-0.265
LOC	2.785	0.895	2.9818	0.913	-2.540*	3.482	0.610	3.586	0.693	-1.847
ALT	2.447	0.899	2.7229	0.984	-3.411**	3.252	0.664	3.487	0.702	-3.890***
TOL	2.519	0.828	2.5045	0.794	0.210	2.822	0.722	2.987	0.756	-2.518*
NAR	2.595	0.724	2.7347	0.794	-2.144*	3.313	0.584	3.449	0.627	-2.549*
MACH	2.928	0.610	2.8539	0.705	1.321	3.373	0.546	3.588	0.652	-3.809***
PSY	2.486	0.705	2.6475	0.718	-2.653**	3.376	0.646	3.588	0.645	-3.674***
EI	2.265	1.021	2.470	1.004	-2.273	3.439	0.684	3.660	0.800	-3.188

Note: *p < 0.05; **p < 0.01; ***p < 0.001

ACH: Need for achievement; LOC: Locus of control; ALT: Opportunity alertness; TOL: Risk tolerance; NAR: Narcissism; MACH: Machiavellianism; PSY: Psychopathy; EI: Entrepreneurial intention

Source: Author's calculation

As shown in Table 6, Korean female and male students are different in terms of locus of control ($t = -2.540, p < 0.05$) and while for Vietnam, there is no difference between males and females in terms of locus of control ($t = -1.847, p > 0.05$). Consequently, these results indicate that the two countries are different in terms of personality traits when gender is put in the model as a grouping variable.

Regarding the effect of family tradition, we also ran the t-test analysis. Table 7 below demonstrated the details.

Table 7: Independent-samples t-test with Family tradition as a grouping variable

	South Korea					Vietnam				
	Business family (n=371)		Non-business family (n=179)		t	Business family (n=295)		Non-business family (n=405)		t
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
ACH	4.053	0.543	4.007	0.524	0.960	3.930	0.509	3.970	0.509	-1.026
LOC	2.917	0.942	2.798	0.831	1.495	3.456	0.624	3.542	0.635	-1.779
ALT	2.594	0.976	2.543	0.894	0.590	3.216	0.681	3.372	0.672	-3.010**
TOL	2.534	0.829	2.465	0.772	0.935	2.836	0.723	2.879	0.740	-0.763
NAR	2.659	0.794	2.664	0.688	-0.077	3.279	0.598	3.392	0.592	-2.467*
MACH	2.832	0.675	3.018	0.602	-3.120**	3.402	0.562	3.437	0.592	-0.791
PSY	2.570	0.758	2.547	0.619	0.347	3.343	0.637	3.484	0.656	-2.845**
EI	2.412	1.037	2.259	0.970	1.656	3.397	0.712	3.558	0.716	-2.938

Note: *p < 0.05; **p < 0.01; ***p < 0.001

ACH: Need for achievement; LOC: Locus of control; ALT: Opportunity alertness; TOL: Risk tolerance; NAR: Narcissism; MACH: Machiavellianism; PSY: Psychopathy; EI: Entrepreneurial intention

Source: Authors calculations

Table 7 revealed that when we put family tradition as a grouping variable, not much difference was found in Korean and Vietnamese samples. For the Korean sample, students from families that run a business have different Machiavellianism from those of non-business tradition families (t = -3.120, p < 0.05). For the Vietnamese sample, the difference between two groups of students with business tradition and non-business tradition was found in three traits, including entrepreneurial alertness (t = -3.010, p < 0.01), narcissism (t = -2.467, p < 0.05) and psychopathy (t = -2.845, p < 0.01).

5. Results and discussion

Firstly, the impact of motivational entrepreneurial traits on students' entrepreneurial intentions (EI) between South Korea and Vietnam is different. For the Korean sample, three out of four factors of positive traits were confirmed to have a significant impact on EI. Only need for achievement (ACH) did not influence the EI of Korean students. The Vietnamese sample reported different results with two factors that were need for achievement (ACH) and risk tolerance (TOL) did not affect EI. This finding is quite different from previous studies (Gürol and Atsan, 2006; Hansemark, 1998) that confirmed the positive influence of need for achievement on entrepreneurial intention. However, this finding is in line with the work of Kristiansen and Indarti (2004), which insisted that the need for achievement had no significant effect on the entrepreneurial intention of students in Indonesia and Norway. It might be explained that previous studies have been conducted in Western countries so that the cultural background will be different from South Korea and Vietnam. Moreover, the insignificant relationship between risk tolerance and entrepreneurial intention in the Vietnamese sample is contributed to the reality that many young people are not willing to take the risk to start their business. The percentage of adults in Vietnam having a fear of business failure reducing from 56.7% in 2013 to 45.6% in 2015 has slightly increased to 46.6% in 2017, ranking 10th out of 54 economies, much higher than the average rate of 36.6% in factor-driven economies (GEM Vietnam 2017-2018 Report, 2018).

Secondly, among the four factors of positive entrepreneurial attributes, locus of control ($\beta_{\text{KOR}} = 0.631$; $\beta_{\text{VN}} = 0.301$) had the strongest impact on entrepreneurial intention in both two samples. While in some previous studies of (Altinay et al., 2012; Kristiansen and Indarti, 2004), locus of control had no significant influence on entrepreneurial, in this study, locus of control played the most important role in shaping EI in both South Korea and Vietnam. Notably, for the Korean sample, risk tolerance ($\beta_{\text{KOR}} = 0.364$, $p = 0.000$) and opportunity alertness ($\beta_{\text{KOR}} = 0.126$, $p = 0.002$) took the second and third positions in the impact on EI. On the contrary, for the Vietnamese sample, opportunity alertness ($\beta_{\text{VN}} = 0.191$, $p = 0.000$) was the second factor of entrepreneurial attributes that affected EI. This finding is in line with the GEM 2018 Report South Korea data, saying that more than 45% (45.7%) of Korean respondents reply they identify great entrepreneurial opportunities within six months (GEM South Korea 2018 Report, 2018). For the Korean sample, risk tolerance ($\beta_{\text{KOR}} = 0.364$, $p = 0.000$) and opportunity alertness ($\beta_{\text{KOR}} = 0.126$, $p = 0.002$) took the second and third positions in the impact on EI. On the contrary, for the Vietnamese sample, opportunity alertness ($\beta_{\text{VN}} = 0.191$, $p = 0.000$) was the second factor of motivational entrepreneurial traits that affected EI.

Thirdly, based on the dark triad's impact on Korean students, only narcissism ($\beta_{\text{KOR}} = 0.393$, $p = 0.000$) is positively associated with EI. The other two traits,

Machiavellianism ($\beta_{\text{KOR}} = 0.070$, $p = 0.142 > 0.05$) and psychopathy ($\beta_{\text{KOR}} = -0.058$, $p = 0.561 > 0.05$), did not have any impact on EI. For the case of Vietnamese students, the opposite results were recognized. Narcissism ($\beta_{\text{VN}} = 0.145$, $p = 0.105 > 0.05$) was not proved to have impact on EI of Vietnamese students. However, the other two factors Machievallianism ($\beta_{\text{VN}} = 0.173$, $p = 0.000$) and psychopathy ($\beta_{\text{VN}} = 0.378$, $p = 0.007$) had significant impact on EI. More interestingly, psychopathy is the strongest factor in the dark triad that affected the EI of Vietnamese students.

Fourthly, in general, Vietnamese students were more influenced by the dark triad in shaping their EI than Korean students. On the other hand, Korean students were more influenced by motivational entrepreneurial traits when they formed their EI. This finding might be explained by the fact that Korean and Vietnamese young people have different entrepreneurship motivations. Korean young people are motivated to start up by self-actualization needs, while Vietnamese are more motivated by a career and income. Moreover, this finding is consistent with the 2018 GEM Report for South Korea and Vietnam. Regarding the GEM South Korea APS data analysis, Korean entrepreneurs are more likely to be motivated by the improvement-driven opportunity (IDO). In the 2018 Survey, the proportion of total entrepreneurial activity (TEA) with IDO motives represents an average of 67.1% of entrepreneurs in South Korea (GEM South Korea 2018 Report, 2018). In contrast, the piece of TEA with necessity-drive motivation has reduced over the last five years. In the meantime, as stated in the 2017/2018 GEM Report in Vietnam, Vietnamese take the chances principally to raise their income (49.4%) rather than being more independent (23.5%). Vietnam's motivation index reached 4.6 points, ranking ninth of 54 countries (GEM Vietnam 2017/2018 Report, 2018). For the above arguments, it is undeniable that Vietnamese young people are more motivated by the dark triad than Korean students.

Fifthly, gender and family tradition did not control the EI model of Korean and Vietnamese samples as the p-values of these two variables were higher than 0.05. Regarding the impact of gender on entrepreneurial intention, this study had an opposite finding with some previous studies (Hmieleski and Lerner, 2016; Marlow, 2002) but in line with other researches (Kristiansen and Indarti, 2004; Vodă and Florea, 2019). Interestingly, the impact of family business tradition on entrepreneurial intention was confirmed in several studies to be either negative or positive (Pruett et al., 2009).

Sixthly, regarding the mean scores of factors in the EI model of two samples, Korean students were proved to have a higher ACH than Vietnamese students, but this factor did not influence their EI. The other three factors of motivational entrepreneurial traits, including risk tolerance ($\beta_{\text{VN}} = 2.681 > \beta_{\text{KOR}} = 2.512$), locus of control ($\beta_{\text{VN}} = 3.506 > \beta_{\text{KOR}} = 2.878$), and opportunity alertness ($\beta_{\text{VN}} = 3.307 > \beta_{\text{KOR}} = 2.578$), have slight to moderate difference between the Vietnamese and Korean samples. The biggest difference in mean score can be observed in the

opportunity alertness. It is concluded that Vietnamese students are much more alert to business opportunities than their Korean counterparts.

5.1. Theoretical implications

Studies have shown that successful entrepreneurs are not only born but made. Thus, entrepreneurship education plays a critical role in changing the mindset and traits of young people so that they will be more knowledgeable and more confident in the startup. So far, the entrepreneurship courses have been focusing too much on formulating a business plan, which may eventually harm attitude towards entrepreneurship. Thus, it is necessary to develop a more extensive entrepreneurship education program with more integration of outdoor activities to link the business plan with the real business world and get the students more exposure to the business and improve their traits and confidence in a startup. Contents specifically designed to increase the entrepreneurial attitude orientation of students should be included.

Furthermore, the core entrepreneurship education program should also have some extracurricular activities like company problem-solving sessions through site visits to real companies to recognize their current and potential drawbacks of the company that needs to be solved. The effectiveness of the entrepreneurship education program will only be improved if students are immersed in the business world or simulation cases to practice their problem-solving skills and other business manager's skills.

5.2. Practical implications

In Asian countries like South Korea and Vietnam, family and referential groups play an essential role in the decision-making process of students. Family members and friends should give useful advice to the entrepreneurs rather than putting more pressure on their decision to startup. Especially for families who have a business tradition, parents need to create conditions for their children to be exposed to the family's business so that they have experience in the business, and their entrepreneurial attitude orientation will be enhanced.

Besides, friends and other referential persons (coach, instructors) also play a critical role in nourishing the high entrepreneurial environment. When studying at universities, students should join different clubs. Since then, the environment of collective activities, learning, and interaction among students will have an impact on their attitude and entrepreneurial intention. If the third and fourth-year students in university clubs can participate in supporting the dissemination of knowledge and startup experience for the first and second-year students, the new students will be more motivated and more confident to start a business.

Moreover, according to the GEM 2018 Report, South Korea ranked 14th among 54 countries in terms of the National Environment Context Index (NECI) score, with a score of 5.49 above the international average. Besides, the 2018 NES results in South Korea also prove that the government has created very favourable conditions for entrepreneurs. Government policies in South Korea were considered relatively friendly towards new and growing firms, with an overall score of 6.14 points. The priority of the national government was supposed to be the most satisfactory criterion, with 6.48 points. Policies and procurements and the priority of local governments were also considered to be above average with 6.18 and 5.75 points, respectively. Despite this good fact, Korean young people expect the government to have more effective policies to enhance the favourable ecosystem for entrepreneurship. For Vietnam, the NECI score for most items was less than 4.0 points, except for internal market dynamics and physical infrastructure. It means that there is much room for the government to improve the entrepreneurship ecosystem.

6. Conclusion

Entrepreneurial intention is aroused by a combination of factors relating to individuals, such as personality traits, attitudes, and perceptions. Nowadays, the influence of the environment on these dimensions is beyond doubt. With further caution on the effects of personality characteristics on entrepreneurial intention, the present study explores the relationship among entrepreneurial intention antecedents. The findings indicate that social context gaps may contribute to differences in the relationship between the two countries' entrepreneurial intentions. This research also suggests that an active environment should improve schooling for entrepreneurship and social support to encourage entrepreneurship in both countries. Therefore, we need the state, research institutions, charitable groups, civic organizations, and families to have a collective hand.

This research has some limitations. First, a bias in the sample distribution in family tradition for the Vietnamese sample remains. On the other hand, the Vietnamese sample includes respondents from three main Vietnam cities, while the Korean sample includes only students from universities located in Seoul and Busan. The unintended differences in sample characteristics might create minor changes in the research results. This research focuses mainly on the role of personality traits on entrepreneurial intention. We did not include other factors such as culture and macro-environment. Future work should also investigate the impact of personality traits on entrepreneurial intention in relationships with other cultural and sociological factors.

This study is also limited due to the small sample size. Hence, this study should be replicated with a modified questionnaire and a broader sample to confirm research findings. In addition, in-depth interviews with respondents should also supplement

the empirical findings. This paves the way for further research to utilize qualitative data to verify the quantitative data so that more findings and suggestions may be discussed further.

In sum, this study nonetheless opens up some exciting avenues concerning the interaction between not only personality traits but also cultural and sociological factors, as well as the comparison of the entrepreneurial intention model across two countries. Future research will have much room for growth to deepen the paths of the entrepreneurial intention model with more involvement of other factors in the entrepreneurship ecosystem.

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Uloga osobina ličnosti u oblikovanju poduzetničke namjere: Komparativna studija Južne Koreje i Vijetnama

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Sažetak

Ovaj rad istražuje ulogu osobina ličnosti u njegovanju poduzetničkih namjera u Južnoj Koreji i Vijetnamu. Razvili smo znanstveni model za ispitivanje integriranog utjecaja pozitivnih poduzetničkih karakteristika kao i utjecaj mračne trijade na poduzetničke namjere u Južnoj Koreji i Vijetnamu. Primarni podaci dobiveni anketiranjem 550 studenata u Južnoj Koreji i 700 studenata u Vijetnamu prikupljeni su korištenjem prikladne metode uzorkovanja u anketi koju su sami proveli. Koristili smo modeliranje strukturalnim jednadžbama (SEM) za analizu strukturalnih odnosa između pozitivnih poduzetničkih atributa, tamnih trijada i poduzetničke namjere u dva uzorka. Također su provedeni T-testovi kako bi se istražile razlike u poduzetničkim namjerama studenata u Južnoj Koreji i Vijetnamu s obzirom na njihovo obiteljsko porijeklo i spol. Rezultati su pokazali da pozitivne poduzetničke osobine i mračne trijade različito utječu na poduzetničke namjere u dvije zemlje. Dok je mračna trijada uglavnom utjecala na namjeru vijetnamskih studenata da se pokrenu, korejski studenti dobili su veći utjecaj od pozitivnih poduzetničkih karakteristika kao što su tolerancija na rizik, lokus kontrole i poduzetničke budnosti. Iznenađujuće, spol i obiteljska tradicija ne utječu na poduzetničke namjere studenata. Na temelju naših otkrića, predložili smo da kreatori politika i visokoškolske ustanove u Južnoj Koreji i Vijetnamu promiču poduzetničke namjere studenata u budućnosti.

Ključne riječi: poduzetničke namjere, osobine ličnosti, mračna trijada, Južna Koreja, Vijetnam

JEL klasifikacija: M13, L26, O57

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Emerging equity market reaction to pandemic prevention policy: Evidence from regression discontinuity design*

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Abstract

The purpose of this study is both to release the effects of the current pandemic on emerging equity markets and to examine the efficacy of the prevention policy to lessen the plausible negative effects. In this context, Turkey, as an emerging market, is examined by adopting the Regression Discontinuity Design which is a robust non-experimental approach for evaluating the causal effects of interventions. The results of the research reveal that the COVID-19 pandemic is effective in Bourse Istanbul after a certain period when it first appeared in the world. And therewithal, the efficiency of preventing policy taken in the country statistically decreased the negative impact of the pandemic.

Key words: COVID-19, pandemic, emerging equity markets, Turkey, regression discontinuity

JEL classification: G10, G18

1. Introduction

The coronavirus crisis, namely COVID-19, broke out in the city of Wuhan, China, in December 2019. Since the influenza pandemic of 1918, COVID-19 was unique considering its astounding global spread, which is due to exponentially growing cases resulting from a delayed response in terms of general awareness. China officially informed World Health Organization (WHO) about the unknown illness on 31st of December 2019. WHO declared COVID-19 as a global emergency on the

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30th of January 2020, which was later declared a pandemic on the 11th of March 2020. On the 19th of January 2022, 328,826,023 confirmed cases with 5,557,754 deaths in total were reported to WHO.

Governments took emergency measures like lockdowns, restrictions on travel, and quarantining to ensure social distancing. Such measures increased social distancing in addition to putting people in difficult situations as most people's incomes considerably decreased, and general economic activity slowed down. Unfortunately, today's world has to deal with the social and moral costs in addition to the financial and economic consequences of the pandemic. Stock markets have faced a few shock waves starting in February 2020, and the uncertainty stemming from COVID-19 has continued to prevail. While COVID-19 has a larger impact on some industries, it has negatively affected global domestic demand and has created enormous economic destruction through the disruption to operations and finance unprecedentedly. On the 16th of March 2020 and 12th of March 2020, there were 12.93% and 9.99% declines in DJIA, respectively, which was the third and the sixth largest daily drops for it (World Economic Forum, 2020). Bloomberg announced that: *Through 1 p.m. on March 18 the S&P 500 index was off 27% for the year to date, Germany's DAX was down 38%, and Japan's Nikkei was off 29%* (Coy, 2020). The first quarter of 2020 was the worst quarter since 1987 for FTSE100 as it dropped by 24.80% (Partington, 2020). Global output collapsed in the first two quarters of 2020 with decreases of more than one-fifth in some advanced and emerging market economies, including Great Britain, Spain, and India. Even though there are some efforts to re-balance the output and other financial indicators, the recovery process slowed down during the summer (OECD, 2020).

The primary goal of this study is to assess how China's official announcement of the pandemic's presence and the preventive measures that have been made public by governments to combat it have affected the economy of the nation. Numerous studies in the existing literature have concentrated on these research issues for this goal (Baker et al., 2020a; Okorie and Lin, 2020; Zhang et al., 2020; Akhtaruzzaman et al., 2020; Zaremba et al., 2020; Haroon and Rizvi, 2020; Harjoto and Rossi, 2021). In this study, the effects of the precautionary measures decided upon for the announced pandemic in Turkey with the official announcement of the pandemic by China on the nation's economy will be measured for the first time using a method (Regression Discontinuity Design) that is statistically more appropriate for the case in question. Therefore, this study will contribute to the methodologically relevant literature by demonstrating the usability of this method in the COVID-19 pandemic or similar cases.

This study used both BIST100 Index return values in the log-return form and Turkey's 5-Year Credit Default Swap (CDS) values starting from the 3rd of September 2019. On the 31st of December 2019, China reported the cases of unknown illness to WHO, hence the agents in the financial markets were informed

about it by then. In addition, on the evening of the 10th of March 2020, the first case of COVID-19 in Turkey was announced by the Ministry of Health of Turkey. After this incidence, the government's first economic stimulus announced was a \$15.4 billion economic stability package on the 18th of March 2020. Benefiting from these two cut-offs, Regression Discontinuity Design (RDD) is applied in our study to calculate the causal effect of the announcements by comparing the groups treated and untreated. The timing of the report and the first economic stimulus package in Turkey were unexpected, hence its exogeneity was ensured.

This study aims to measure the impact of the COVID-19 pandemic on the Turkish economy with two cases. The first is the event of China officially announcing the COVID-19 pandemic to the world, and the second is the announcement of precautionary policies for the COVID-19 pandemic in Turkey. In this regard, the research has two main questions. These are (i) Does China's pandemic announcement have an impact on the country's economy? and (ii) Do countries' pandemic preparedness packages have an impact on their economies? These two research questions will be tested within the scope of this research specific to the Turkish economy. The hypothesis proposed for the first research question is that China's pandemic announcement has an impact on the economies of the countries. The main reason for this was that the global effects of the COVID-19 case were expected to harm the economies of the countries in the short and long term. In particular, it was clear that problems would arise in trade supply chain management due to the quarantine practices implemented by China following the outbreak of the pandemic. The hypothesis proposed for the second research question is that the precautionary policies developed by the countries against the pandemic have a positive effect on the economies of the countries. The main reason for this is to reduce the risk and uncertainty caused by the pandemic.

By adopting the RDD approach, the current study can make some important contributions to not only the literature but also our understanding of emerging equity markets' reaction to governments' prevention policies against the great coronavirus pandemic of 2020. According to our results, the announcement China made did not have a significant impact on the log return of BIST100. Hence, there was a lagged reaction by financial markets, which resulted in becoming an inefficient market. The first economic stimulus package did not have a significant impact on the log return of BIST100 when we use our full dataset. We found that this package had an increasing effect on the log return of BIST100 when the dataset is narrowed down to start on the 31st of December 2019. The remainder of the paper is as follows: Section 2 briefly reviews the previous studies. Data and empirical methodology are explained in Section 3 whereas results are demonstrated in Section 4 and, finally in Section 5, the conclusion is presented.

2. Literature review

Existing literature about pandemics is limited as pandemics at the global scale are rarely witnessed. Even though these occurrences are unfortunate, they provide academia with the opportunity to investigate the tail risks and reaction dynamics in financial markets, which, accordingly, has led to increased interest in the relation of the economic and financial impacts of COVID-19.

Baker et al. (2020a) examined the response of the U.S. stock market to COVID-19 and other viral epidemics, such as the Spanish Flu, and discovered that COVID-19 caused remarkable market volatility compared to previous infectious diseases, which had only moderate effects on the U.S. stock market. In this study, neither quasi-experimental nor experimental methods are employed. He attributed this outcome to government constraints on business activity and voluntary social separation in the service-based economy of the United States. Okorie and Lin (2020) explored the contagion effect of the COVID-19 pandemic on the financial markets, and they discovered a substantial fractal contagion impact on market volatility and market return that dissipates over the medium and long term for both the stock markets' return and volatility. This study utilized the Detrended Moving Cross-Correlation Analysis (DMCA) and Detrended Cross-Correlation Analysis (DCCA) methods before and after the treatment date. Zhang et al. (2020) examined the volatility of stock markets in the nations with the greatest number of confirmed cases between January and February of 2020. He demonstrated that volatility increased considerably in February owing to COVID-19. In this research, authors conducted volatility analysis, correlation analysis, and minimum spanning tree algorithm in their research setting. Akhtaruzzaman et al. (2020) explored whether financial contagion occurs among listed enterprises in China and the G7 nations and found that conditional correlations for market returns increased significantly over the COVID-19 period. In addition, they discovered that the financial contagion follows a similar pattern to the viral spread. In this paper, volatility is modeled through the DCC-GARCH framework.

Harjoto and Rossi (2021) worked on market reaction to WHO's announcement comparing developed and developing countries as an event study. They used daily stock index data and adopted Carhart and GARCH (1,1) models. Findings indicated that the COVID-19 pandemic had a significantly greater negative impact on the equity markets in developing countries. In their study, Haroon and Rizvi (2020) looked at the connection between stock market volatility and news reports about the coronavirus. They discovered that this sort of news spreads fear among individuals, which is linked to rising equity market volatility. They demonstrated that the most severely impacted industries had increased volatility. In this study, the E-GARCH model is used to model volatility. When examining the influence of governmental interventions on the impact of COVID-19 on stock market volatility, Zaremba

et al. (2020) showed that these actions had a limited impact in terms of both magnitude and breadth by using panel data regression. The impact of worldwide pandemic economic uncertainty on broad commodity price indices was examined by Bakas and Triantafyllou (2020). They found that volatility in the oil market greatly decreased after the pandemic uncertainty shock, however, volatility in the gold market marginally rose by using VAR (Vector Autoregressive) framework. Albulescu (2020a) demonstrated that the number of new infection cases and the mortality ratio observed both globally and domestically had a favorable effect on the turbulence of the American financial markets by using regression analysis. The influence of new COVID-19 case announcements and the death ratio on the financial markets volatility index (VIX) was explored by Albulescu (2020b) by using regression analysis, who found that the death ratio had a favorable impact on VIX and that the death ratio outside of China had a higher impact. The new cases reported in China and outside China had a mixed impact on financial volatility.

Al-Awadhi et al. (2020) evaluated the impact of COVID-19 on stock market outcomes, focusing on the Chinese stock market in the framework of regression analysis, and found that total share prices in China declined, owing to the anticipated negative economic effects of COVID-19. Goldberg and Reed (2020) provided preliminary evidence on the public health and short-run economic effects of the COVID-19 crisis in emerging markets and developing economies. Ashraf (2020a) analyzed the influence of government actions on stock market performance by conducting a regression analysis. Using data from 77 nations, he demonstrated that the government's social distancing efforts had a direct negative influence on stock market returns owing to their negative effect on economic activity and an indirect beneficial effect due to the decline in COVID-19 verified cases. Stock markets had a negative response to the COVID-19 epidemic, according to Ashraf (2020b), however, this reaction is only relevant to the rise in confirmed cases, not to the increase in fatalities. In this paper, the author conducted a regression analysis. Ali et al. (2020) analyzed the worldwide response of financial markets by using the E-GARCH model to COVID-19 in terms of declines and volatility as the epicenter of the Coronavirus spread from China to Europe and the United States. They discovered that the market in China was stabilized due to the prompt steps taken by the government when the epicenter shifted out of China. As the core of the epidemic shifted to the United States, even the returns on more secure commodities, such as gold, became negative, although volatility was low for these commodities. Using U.S. data, Alfaro et al. (2020) determined that the stock market value decreased in reaction to pandemic diseases such as COVID-19 and SARS. In addition, they emphasize that the unanticipated changes in the course of COVID-19 infections had an impact on U.S. market returns. They employed exponential and logistic growth models which are used to model infection and mortality in biology and epidemiology. Ozili and Arun (2020) discovered that the preventative measures taken in response to COVID-19 had a significant negative impact on the amount of

economic activity and the closing, opening, minimum, and maximum stock prices of key stock market indexes by conducting a panel data regression. Jana et al. (2022) attempted to explore the impact of COVID-19 on the US equity market by embracing machine learning and the Johansen co-integration test together with a detrended cross-correlation analysis (DCCA). They used data about the COVID-19 news and the US equity market sectors' daily data over the period January 1, 2020–March 20, 2020. They found out that, at an early stage of the pandemic, global fears had a significant effect on most sectorial equity indices and COVID-19 increased the performance of a couple of sectors such as telecommunication and teleworking.

Celik and Aktan (2020) discovered that the Turkish financial markets reacted significantly to the outbreak in the near term, and they predict the markets to fluctuate and stay unstable in the short run by using descriptive evaluation. Goodell (2020) emphasized in his descriptive study that the COVID-19 crisis taught investors, policymakers, and the general public that natural catastrophes may cause tremendous economic devastation in any region of the world. The G-Cubed Multi-Country Model, a global intertemporal general equilibrium model with heterogeneous agents, is used in this research. McKibbin and Fernando (2020) calculated the cost of the COVID-19 pandemic under many alternative scenarios and showed that, even though costs might be very high, they can be mitigated via global cooperative efforts, particularly in the poorest nations. The G-Cubed Multi-Country Model, a global intertemporal general equilibrium model with heterogeneous agents, is used in this research. Ramelli and Wagner (2020) showed that the response of investors to the pandemic and its rapid spread heightens their worries about business debt and cash reserves by using regression analysis. Corbet et al. (2020) examined the impact of the term *corona* on the return and volatility of equities during the COVID-19 pandemic in the framework of the GARCH model. After the announcement of the pandemic, they discovered that firms with the term *corona* in their names saw big increases in hourly volatility, large spikes in trading volumes, and high negative hourly returns. Schell et al. (2020) analyzed stock market responses to World Health Organization PHEIC (Public Health Emergencies of International Concern) notifications by using the Event Study framework and found no regular trends. In addition, they discovered that of all the disorders included in their analysis, only Covid-19 had a negative influence on stock markets that lasted at least 30 days. Using data from the six nations most impacted by COVID-19, Cepoi (2020) evaluated the stock market's response to coronavirus-related news by using panel quantile regression. He discovered that stock markets exhibited asymmetric dependence on COVID-19-related news with the media coverage causing a decline in returns for the middle and higher quantiles while not influencing the lower quantiles.

Mirza et al. (2020) evaluated the price reaction, performance, and volatility timing of European investment funds during the Covid-19 pandemic outbreak and discovered

that while the majority of investment funds exhibited stressed performance, social entrepreneurship funds were more resilient and exhibited volatility-timing in the framework of Event Study framework. Sharif et al. (2020) investigated the relationship between the spread of COVID-19, the oil price volatility shock, the stock market, geopolitical risk, and economic policy uncertainty in the United States by using a wavelet-based approach. They demonstrated that the COVID-19 outbreak had a higher effect on geopolitical risk and economic uncertainty in the United States than on the stock market. Additionally, they discovered that the pandemic had an effect on gasoline prices, which may be explained by travel limitations. Baker et al. (2020b) evaluated the uncertainty that has persisted since the commencement of the COVID-19 epidemic using a variety of metrics, including indicators of stock market volatility. By way of illustration, they determined that more than half of the predicted production decline is due to COVID-induced uncertainty in the framework GARCH model. Ma et al. (2020) demonstrated a negative stock market reaction and a lasting negative impact on real GDP growth for a panel of 210 countries, with the effect being felt more in nations with a less aggressive first-year response in government expenditure by using panel data regression.

3. Methodology

We utilized a method, Regression Discontinuity Design (RDD), classified under the framework of quasi-experimental design. Several methods are available in this branch of research methods, including Regression Discontinuity, Difference-in-differences, Synthetic Control, Event Studies, Matching Methods, and Interrupted Time Series. The differences among these methods are their underlying assumptions. The primary purpose of selecting Regression Discontinuity Design (RDD) in the present study is that their underlying assumptions fit well into the current research structure. In addition, this is the first attempt to adopt this method to a pandemic event.

Taking advantage of these cut-offs, Regression Discontinuity Design (RDD) (*please see Imbens & Lemieux, (2007) for a broad discussion*) is implemented to calculate the causal effects of the announcements and CDS on BIST100 Index values by comparing the groups treated and untreated. The main notion underlying the RD design is that treatment assignment is determined, entirely or partially, by the value of a predictor (the covariate) being on either side of a predetermined threshold. This predictor may be connected with the potential outcomes, however, it is expected that this association is smooth. Therefore, any discontinuity in the conditional distribution of the outcome as a function of this covariate at the cutoff value is viewed as evidence of a causal influence of the treatment (Imbens and Lemieux, 2007). The first essential identifying assumption that ensures validity is that assignment is random at the cutoff. Near the cutoff, there should not be any systematic differences between the pre-treatment characteristics of the treatment

and control groups. The only systematic difference between them will be whether or not they heard the announcement. In this study, treatment is assigned based on date, and values on or after the cutoff dates are considered treated. Due to the actualization of events, it is evident that the date is not manipulated. Second, the timing of announcements should not be contingent on any aspect that influences BIST100 levels. The timing of China's report and the first economic stimulus plan was unexpected, ensuring the report's objectivity. The final defining premise of RDD is that the relationship between the assignment variable and the outcome must be continuous. Thus, we can go as close as feasible to the discontinuity from both sides, and only the discontinuous portion will be cut off. The relationship between the date and BIST100 values is continuous, hence the assumption is sustained. Sharp and Fuzzy Regression Discontinuity Designs are two main alternatives of RDD in applications. We follow Sharp RDD in the current study.

We set up the estimation model as follows (Angrist and Pischke, 2008). Sharp RD is utilized when the treatment status is a discontinuous and deterministic function of a covariate, x_i . Consider, for instance, that;

$$p_i = \begin{cases} 1 & \text{if } x_i \geq x_0 \\ 0 & \text{if } x_i < x_0 \end{cases} \quad (1)$$

In this set up, x_0 is predetermined cutoff level. This assignment process is a deterministic function of x_i , as once x_i is known, p_i can be determined. It is a discontinuous function because the treatment remains unchanged until $x_i = x_0$, regardless of how close x_i is to x_0 . The most important difference between RDD and the similar quasi-experimental design is that observations just before and after cutoff level is considered which may results a jump at cutoff.

Specifying the estimation, linear regression is set up as it is the standard procedure in Sharp RDD. As it is structured in Angrist and Pischke (2008), linear regression is formed as follows:

$$E[Y_{0i}|x_i] = \alpha + \beta x_i \quad (2)$$

$$Y_{1i} = Y_{0i} + p \quad (3)$$

In this set up, equation (2) represents expected outcomes before and after cutoff. Equation (3) demonstrates constant effect model in which the announcement effect presents. Hence, we run the following regression that reflects the equation (2) and (3) as follows.

$$y_i = \alpha + \beta x_i + p t_i + \varepsilon_i \quad (4)$$

In this equation, y_i represents the dependent variable. We have two thresholds for two different regression sets. The timing of China's report and the first economic stimulus plan are considered as treatments which are depicted by t_i also known as running variable in the context of RDD.

4. Empirical data and results

4.1. Empirical data

Daily financial data is used in this analysis consisting of BIST100 Index values and 5-year Credit Default Swaps (CDS) of the country which both are the main variables in the regressions. Moreover, *China* and *Package* were used as dummy variables as independent variables and cutoffs respectively for two different regression sets and regression discontinuity design. In the second regression set, one lagged value of Turkey's 5-year CDS, as CDS (-1) was used. The dataset of this study includes data starting from the 3rd of September 2019 to 21st of October 2020, making a total of 286 data points. In the first group of regressions for which we used the China announcement as the cut-off, the values before 31st of December 2019 are labeled as *untreated*, while the values on and after the announcement date are labeled as *treated*. Similarly, in the second group of regressions for which we used the Turkey's first economic stimulus package date as the cut-off, the values before 18th of March 2020 are labeled as *untreated*, while the values on and after the cut-off are labeled as *treated*.

Table 1 shows the summary statistics on BIST100 Index and Turkey CDS values for the period it's considered. Mean BIST100 and CDS values are 1078.81 and 428.31, respectively.

Table 1: Summary Statistics I

	Mean	Std. Dev.	Min.	Max.	Observation
BIST100	1078.81	88.80	842.46	1235.56	286
CDS	428.31	118.76	234.75	651.91	286

Source: Author's calculation

Other independent variables used are *China*, which is a dummy variable that takes value of 0 before the China's announcement and 1 otherwise, and *Package* which is a dummy variable that takes value of 0 before the first case announcement in Turkey, and 1 otherwise. Table 2 below shows the summary statistics on these dummy variables for the period examined.

Table 2: Summary Statistics II

	Mean	Std. Dev.	Min.	Max.	Observation
China	0.71	0.46	0	1	286
Package	0.52	0.50	0	1	286

Source: Author's calculation

We used two different cut-offs for two different regression sets in this study. The first cut-off is the 31st of December 2019, when China reported the cases of unknown illness to WHO, hence the agents in the financial markets were informed about it by then. The government's first economic stimulus was a \$15.4 billion economic stability package on 18th of March 2020 (Celik and Aktan, 2020). Hence, the second cutoff is 18th of March 2020.

4.2. Empirical analysis

According to the results, the impact of the CDS on the log return of BIST100 is significant at 10%, even though the coefficient is very small. When we use one-lagged CDS in the analysis, the coefficient does not change while it is still significant at 10%, almost at 5% (as the p-value is 0.053), which can be seen on Panel B of Table 3 below. Hence, CDS and CDS with a lag have positive impacts on the log-return of BIST100 separately.

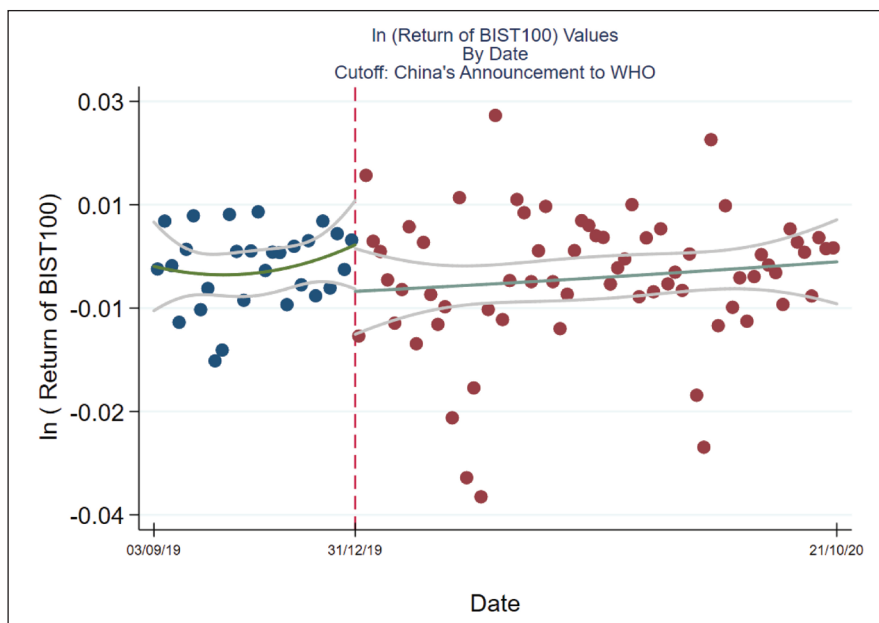
Table 3: Regression Results I

OLS	A) CDS		B) CDS (One Lag)	
	China Announ.	CDS	China Announ.	CDS (One Lag)
ln(Return of BIST100)	-0.00375	0.00002*	-0.00376	0.00002*
P-value	[0.113]	[0.061]	[0.109]	[0.053]

Source: Author's calculation

When we consider the impact of the announcement made by China on the log-return of BIST100, we do not have any significant coefficient. However, as p-values are quite close to 0.10 for both regressions using CDS and one-lagged CDS as independent variables; they are almost significant at 10%. When China made the official announcement of the unknown illness to WHO on 31st of December 2019; there was no immediate impact on the financial markets in Turkey. In fact, financial markets reacted because of the transmission of COVID-19 virus to other countries after a 20-day delay (Celik and Aktan, 2020). As we can see a lagged reaction here, efficiency of the financial markets in Turkey could be re-considered.

Figure 1: Ln (BIST100 Returns) By Date – Cutoff 31.12.2019



Source: Author's elaboration

Figure 1 above shows the values of ln (BIST100 returns) by date, in which the cutoff date is 31st of December 2019. Here, we do not observe a significant jump considering the interaction of confidence intervals on both sides of the cutoff. This figure is consistent with our regression findings of this study.

In the second part, analyses were done by using Turkey's 5-year CDS values and the dummy variable showing the first economic stimulus package after the first COVID-19 case in Turkey as independent variables. This exposure is determined by date as the data points before the cutoff date (18.03.2020) took the value of 0 and 1 otherwise. The dependent variable is log-return of BIST100 values. Regressions are made by using CDS values and one-lagged CDS values separately. Both results are shown in Table 4.

Table 4: Regression Results II

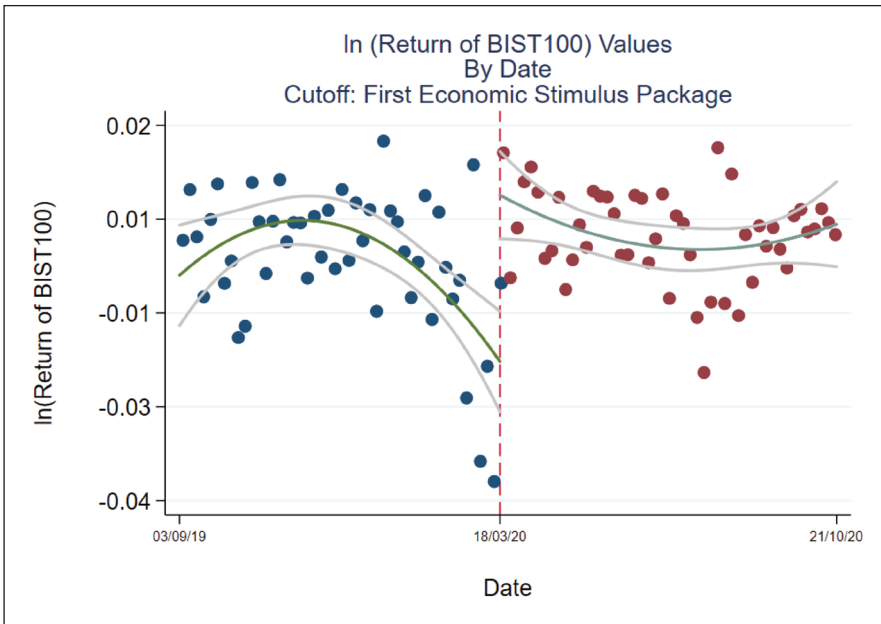
OLS	A) CDS		B) CDS (One Lag)	
	Package	CDS	Package	CDS (One Lag)
ln(Return of BIST100)	0.00521	0.00000	0.00474	0.00000
P-value	[0.204]	[0.574]	[0.256]	[0.671]

Source: Author's calculation

Results show that the impact of the CDS on the log return of BIST100 is insignificant. When we use one-lagged CDS in the regression, the coefficient decreases slightly, but it is not significant as before, seen on Panel B of Table 4. Hence, CDS and CDS with a lag do not have any significant impacts on the log return of BIST100.

When the effect of the first economic stimulus package on the log return of BIST100 is evaluated, we do not have any significant coefficient and we cannot make any deductions about a significant impact for the regressions using CDS and CDS with a lag separately. However, we have a relatively big dataset here. Observing the impact of the package would be possible if regression analyses are made with a narrower dataset.

Figure 2: Ln (BIST100 Returns) By Date – Cutoff 18.03.2020



Source: Author's elaboration

Figure 2 above shows the values of Ln (BIST100 returns) by date, in which the cutoff date is 18th of March 2020. Here, we observe a significant jump considering the place and pattern of lines and confidence intervals on both sides of the cutoff. As we observe a positive jump here, making the regression analysis showing the causal impact of the package on the log-return of BIST100 values with a narrower data window would be useful.

In the third part, analyses done by using Turkey’s 5 Year CDS values and the dummy variable showing the first economic stimulus package after the first COVID-19 case in Turkey as independent variables like in the second part. However, this time the dataset is narrowed down to start with 31st of December 2019. Again, the dummy variable’s value is determined by date as the data points before the cutoff date (18.03.2020) took the value of 0 and 1 otherwise. The dependent variable is log-return of BIST100 values. Regressions are made by using CDS values and one-lagged CDS values separately. Both results are shown in Table 5 below.

Table 5: Regression Results III

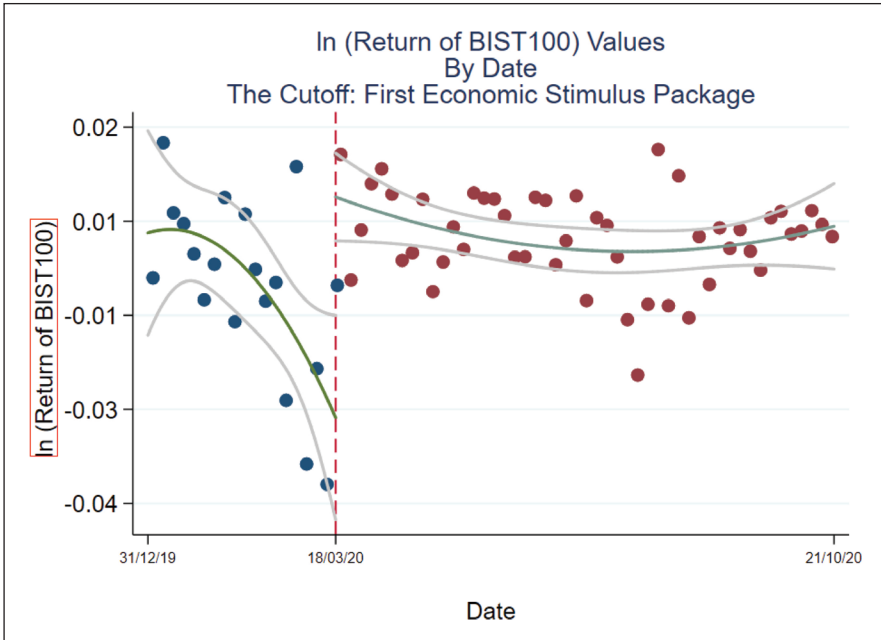
OLS [Dataset 31.12.2019 - 21.10.2020]	A) CDS		B) CDS (One Lag)	
	Package	CDS	Package	CDS (One Lag)
ln(Return of BIST100)	0.01321**	-0.00002	0.01376**	-0.00003
P-value	[0.021]	[0.244]	[0.022]	[0.231]

Source: Author’s calculation

Results indicate that the impact of the CDS on the log return of BIST100 is not significant and the coefficient is very small. When we use one-lagged CDS in the regression; the coefficient does not change much and it is still not significant, which can be seen on Panel B of Table 5. In sum, both CDS and CDS with one lag do not have any significant impact on the log return of BIST100.

When we evaluate the effect of the first economic stimulus package after the first COVID-19 case in Turkey on the log-return of BIST100, we observe that the economic stimulus package has a positive impact of 13% approximately on the log-return of BIST100. As the p-value for this coefficient is 0.02, this result is significant at 5%. When we run the same regression with the independent variable of CDS with a lag instead of CDS, regression results show that the package has a positive effect of 14% approximately on the log return of BIST100. As the p-value is 0.02, this impact is significant at 5%, too. Hence, both regression results confirm that the economic stimulus package had an increasing impact on the log return of BIST100. This result was expected as the objective in the implementation of this package was to accelerate the financial and economic markets, and the results we get are parallel with this objective.

Figure 3: Ln (BIST100 Returns) By Date - Cutoff 18.03.2020 – Narrow Dataset



Source: Author's elaboration

Figure 3 above shows the values of \ln (BIST100 returns) by date, in which the cutoff date is 18th of March 2020 with a dataset starting on 31st of December 2019. Here, we observe a significant jump considering the place and pattern of lines and confidence intervals on both sides of the cutoff. This result follows the regression results in Table 5 as we found that the first economic stimulus package implemented created a positive impact on the log-return of BIST100.

5. Results and Discussion

In this study, there are two research questions examined which are (i) Does China's pandemic announcement have an impact on the economies of the countries? and (ii) Do countries' pandemic measure packages have an impact on their economies? The hypothesis developed for the first research question was rejected for Turkey's data. In other words, the view that China's pandemic announcement has an impact on the Turkish economy is not supported by data. The main reason for this result can be interpreted as the fact that the negative impact of the pandemic on the economies in both the public and private sectors in Turkey is not perceived sufficiently. Another reason is that the research method used in this study is aimed at revealing the effect of the case just before and after

the incident. In other words, the method used in this study is aimed at testing the presence of a short-term effect.

The hypothesis developed for the second research question could not be rejected for Turkey's data. In other words, the precautionary policies that Turkey announced against the pandemic had a positive impact on the country's economy. The main reason for this is that the precautionary policies announced in Turkey were announced approximately two months after the pandemic. The fact that the level of perception against the pandemic has increased in Turkey in the last two months and the positive atmosphere created by the precautionary packages has caused the market to be felt immediately.

The results obtained in this study reveal important results when compared with similar studies in the relevant literature. The first of these is whether the statistical method used can measure the short- or long-term effect. If the method used measures a long-term data range before and after the event occurs, the results may be biased. This makes it difficult to measure the effect that is intended to be measured as it moves away from the event. This is particularly difficult because the impact of other news may also be included in the measurement. From this point of view, this research shows that the research method used will give more accurate results when used under the influence of pandemics and similar cases. Another important result of this study is that the impact of pandemics and similar cases on the economies of different countries may not be instantaneous. As of the analysis period for the Turkish economy examined in this study, the level of perception of the pandemic may differ in other countries. As a result, while the pandemic is expected to harm the economies of the countries, differences in the market efficiency levels of the relevant countries suggest that the negative effect may have a delayed reflection on the markets. The results obtained in this study reveal that researchers should consider the issue of market efficiency in studies that measure the levels of negative cases.

6. Conclusion

We attempted to measure the effects of the current pandemic on emerging equity markets and to examine the efficacy of the preventing policies to reduce the plausible negative effects. With these objects in mind, we used both the log-return of BIST100 values and Turkey's 5-year CDS values from the 3rd of September 2019 to the 21st of October 2020. By considering the cutoff dates of China's announcement to WHO about unknown illness and the first economic stimulus package in Turkey, Regression Discontinuity Design (RDD) approach was implemented to compare the *treated* and *untreated* groups.

Our RDD estimates show that the announcement China made on the 31st of December 2019 did not have a significant effect on the log return of BIST100. This

may be a result of the lagged reaction of financial markets, which may stem from being an inefficient market. While the first economic stimulus package did not have a significant impact on the log return of BIST100 when we use our full dataset, we were able to observe that this package had an increasing effect on the log return of BIST100, when the dataset is narrowed down to start with 31st of December 2019. Results are consistent with some previous studies such as Jana et.al (2022) and Harjoto and Rossi (2021) that equity market(s) in many sectors recovered rapidly.

This study extends the literature which investigates market reactions to equity market shocks and provides insight into how an emerging equity market reacts government's stimulus amid the COVID-19 pandemic of 2020 and an opportunity for policymakers to take necessary measures as early as possible to avoid economic downturns and market crashes. As pandemics are rare but inevitable incidences, observing their effects on every aspect of community life is a rare opportunity for academia for their research. By observing the effects of the measurements taken on every aspect of community life, the world could be more prepared for such incidences that might reoccur in the future.

Finally, we should emphasize that the scope of this study is restricted to Turkey's equity market, therefore, it would be useful to expand the market coverage in further research.

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Reakcija tržišta dionica u nastajanju na politiku prevencije pandemije na primjeru diskontinuiteta regresije

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Sažetak

Svrha ove studije je otkriti istovremeno učinke trenutne pandemije na tržišta dionica u nastajanju i ispitati učinkovitost politike prevencije za smanjenje mogućih negativnih učinaka. U tom kontekstu, ispituje se Turska, kao tržište u nastajanju, primjenom dizajna diskontinuiteta regresije (RDD) koji predstavlja robusan ne-eksperimentalni pristup za procjenu uzročnih učinaka intervencija. Rezultati istraživanja otkrivaju da COVID-19 pandemija, nakon određenog razdoblja kada se prvi put pojavila u svijetu, utjecala na Istambulsku burzu. A pritom, politika prevencije, koja se vodi u zemlji, statistički je učinkovito smanjila negativan utjecaj pandemije.

Cljučne riječi: COVID-19, pandemija, tržišta kapitala u nastajanju, Turska, regresijski diskontinuitet

JEL klasifikacija: G10, G18

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Factors influencing dividend payout policy: Evidence from listed non-financial firms of the Zagreb Stock Exchange*

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Abstract

This paper aims to assess the impact of financial factors on the dividend payout ratio, and the purpose is to research factors affecting dividend payout in less developed markets and compare them with the results of previous studies. We use the global research platform Screener.co, and the financial statements available on Zagreb Stock Exchange to collect the data. Our sample consists of companies listed on the Zagreb Stock Exchange that paid dividends at least once in the last three years. In the model applied, we covered five years (dividends paid from 2017 to 2021, based on financial fundamentals preceding dividends from 2016 to 2020) using hierarchical linear regression analysis that consists of four explanatory variables: return on equity, return on assets, financial leverage, and free cash flow to revenue. First, the research found high fluctuations in the dividend payout ratio and return on equity variability. Secondly, we found no statistically significant causality between the dividend payout ratio and explanatory variables. The results suggest that other long-term non-financial factors, such as the investors' expectations, history of paying dividends, and large cash reserves backed by high retained earnings, may have a decisive impact on the dividend payout ratio rather than recent financial factors.

Key words: dividend policy, dividend payout, financial analysis, Zagreb Stock Exchange

JEL classification: G32, G35, O16

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1. Introduction

One of the key financial objectives is to maximize the firm's value. The firm value depends on investment, financing, and dividend choices. The firm's value is maximized when the company's assets are financed at the lowest expense. This rule applies to all components of the capital structure, including the owner's capital. The cost of the equity is not explicit, but it is reflected in the required return that compensates the investor for the risk taken and is materialized both by dividends and capital gain.

The academic community so far has no unique position on factors that determine the dividend policy. The reason for this is the multitude of variables that may impact dividend policy. It is subject to numerous internal and external factors. Hence, the explanation of the dividend preference phenomenon may reach even the sphere of behavioral science. The central question is whether, by paying dividends, the shareholders are rewarded for the invested capital or perhaps deprived of higher earnings in the future (Black, 1976).

Furthermore, some corporate actions, such as stock repurchases, may further veil the factors that influence dividend policy. Until 1980, repurchases were relatively rare (Brealey et al., 2014). The dividend payouts still prevail, although in some parts of the world, as an alternative to the dividend payouts, repurchases are just as frequent. For example, companies make repurchases due to the accumulation of excess cash or when they want to change the capital structure in favor of indebtedness (Brealey et al., 2014).

We propose the following research hypothesis:

H1: Dividend payout ratio has statistically significant dependence on key financial performance variables: 1) return on equity (ROE), 2) return on assets (ROA), 3) financial leverage measured as the ratio of assets to equity (F.L.), and 4) surplus of free cash flow (FCF) over revenues.

The ratio behind the hypothesis is the idea that companies with strong recent financial fundamentals are in a better position to pay dividends. This argument has more foundation on less developed markets and is consistent with the bird-in-the-hand theory, which concludes that risk-averse investors prefer dividend payouts to retained earnings that will be reinvested. Less developed markets may be less efficient, and new positive information may not be effectively embedded in stock prices. Thus, investors would prefer dividends over future capital gains. On the other side, companies with high profitability are incentivized to reinvest earnings in expectation of future growth.

The paper is structured as follows. The following section provides an extensive review of the literature and empirical studies dealing with determining dividends

by internal and external factors. In the third section, the research model is specified. The fourth section contains empirical data and analysis, while in the fifth section, we present and discuss the results of the empirical analysis supported by explanations. Finally, the last section brings conclusions.

2. Literature review

The literature review covers a theoretical framework, an empirical studies review, a review of some buyback practices, and some external impacts on dividend policy, such as different institutional frameworks (emerging markets) and different ownership structures (state-owned enterprises).

A rich theoretical framework tries to explain the determinism of dividend policy. Various authors tried to explain why companies pay dividends, whether this may affect the company's value, and what determines dividend policy. The pioneering study of Miller and Modigliani (1961) marked the beginning of a greater interest in the topic of dividends that continues to this day. They developed a model in which they claimed that the company's value in perfect market conditions, without the influence of taxes, transaction costs, or asymmetric information, does not depend on the dividend policy. On the contrary, Gordon (1963) pointed out the shortcomings of the previous theory. They developed the so-called The-bird-in-the-hand theory, which considers the time value of money and shows that dividend payouts increase the company value because risk-averse investors prefer dividend payouts to retained earnings that will be reinvested. The theory of tax differentiation is opposed to the theory of the irrelevance of dividends. This theory was developed by Litzenberger and Ramaswamy (1982). It explains the influence of taxes on investors' preferences. According to the theory, taxes which are generally higher on dividends than on capital gains, favor the orientation of investors towards retained earnings and companies towards repurchases. Signaling Theory (Bhattacharya 1979, John and Williams, 1985; Miller and Rock, 1985) suggests that information about the size of dividends can affect the share price, especially in conditions of greater information asymmetry. The reaction to dividend changes also depends on the ownership structure. It will not cause the same reaction whether it consists of insiders or institutional shareholders (Bajaj et al., 2002). In this respect, insider ownership could serve as a performance bond against false signaling (Born, 1988). Clientele effect theory recognizes that shareholders can be categorized into classes regarding payout preference in opposition to capital gains. For example, retail investors who often use dividends for necessities may have different preferences over dividends compared to institutional investors (Brav et al., 2005). According to Jensen and Meckling (2019), who are the originators of the Free cash flow theory as a variation of the Agency theory, managers will invest excess free cash flow resources in negative net present value investments, hence paying dividends is

one of the ways to reduce overinvestment and agency costs. This theory has been endorsed by DeAngelo et al. (2004). They argue that 25 companies with stable dividends in the USA would have otherwise kept USD 1.6 trillion of retained cash and probably used it for non-efficient investments.

Overall, empirical studies consider the impact of various factors on dividend policy, such as profitability, indebtedness, liquidity, company size, investment opportunities, company growth, clientele effects, ownership concentration, asymmetric information, etc. Lintner is one of the first authors who researched the dividend policy. Lintner's model of dividend policy on how a company creates a dividend policy with fluctuating earnings or the importance of their stability to company managers marked the beginning of greater interest in the topic of dividend payouts (Lintner, 1956). Baker and Powell (2000) showed that the most significant determinants of a firm's dividend policy are the level of current and expected earnings and the pattern or continuity of past dividends. Fama and French (2001) investigated the influence of profitability, investment opportunities, and company size on the probability of dividend payouts. They concluded that larger and more profitable firms have a higher probability of paying dividends, while the opposite is true for firms with larger investments. Their research also confirms the theory of tax differentiation. Consistent with the research by Fama and French (2001) that referred to U.S. companies, the research by Eije and Megginson (2006) showed a decline in the number of companies that pay dividends in the E.U., while total real dividends paid and dividends payments as a fraction of total profit increase significantly. Their conclusions are consistent with the study by Raaballe and Hedensted (2006), who determined that firms that pay dividends are characterized by higher ROE and low volatility, high retained earnings, and large firm size, while the market-to-book value and ownership structure do not play a role in whether the firm pays a dividend or not. Likewise, Denis and Osobov (2007) conclude in their study that larger and more profitable firms and those with higher retained earnings are more likely to pay dividends.

DeAngelo et al. (2006) showed that with the growth of retained earnings to total equity, the probability of paying dividends also increases, which is consistent with a life cycle theory of dividends. Therefore, companies in the mature stage have higher retained earnings and higher profitability but lack investment opportunities. In the research conducted by Gill et al. (2010), they found that for companies in the manufacturing industry in the USA, the ratio of dividend payments is a function of profit margin, taxes, and the ratio of market to book value of the company. A study conducted in Sweden by Hellström and Inagambaev (2012) showed that variables such as free cash flow, growth, financial leverage, profit, risk, and size affect the dividends, but not equally for large and medium caps. Dividend payout ratios of large caps are more sensitive to growth rate changes than medium caps; medium caps are more severely affected by leverage than large caps, whereas medium caps

are more sensitive to size changes than large caps. In consistence with previous findings Franc-Dbrowska and Mađra-Sawicka (2020) claimed that free cash flow, company growth, liquidity, profitability ratio and a size increase the likelihood of dividend payouts.

Research has shown that share buybacks have become significantly more frequent since the early 1980s, mostly in mature and more profitable companies. However, buybacks did not replace the payment of dividends. Unlike regular dividend payouts, which are more persistent, repurchases are more arbitrary and not binding in the long term (Brealey et al., 2014). It is also confirmed by the study of Fama and French (2001). They discovered a significant decrease in the number of companies that pay dividends, but not at the expense of share buybacks because share buybacks occur in companies that pay out dividends.

A survey conducted by Brav et al. (2005) showed that in the case of increased financing needs of profitable projects, companies would be more reluctant to reduce dividends than to reduce buybacks which means buybacks are more sensitive to M&A strategies. Furthermore, they found that the buyback is more flexible than the dividend payout because the dividends are paid out of permanent cash flow, while the buybacks can eliminate short-term excess liquidity. It is also consistent with research by Servaes and Tufano (2006), who show that the most common reasons for buybacks are the return of excess capital to shareholders, an increase in leverage in asset financing, undervaluation of shares, tax treatment, etc. Furthermore, the signaling power is larger in the case of dividend payments than in buybacks, but at the expense of less flexibility. They also found differences in the forms of dividends distribution, so they state that dividend payouts prevail globally, and extraordinary dividends are more frequent than the buyback of shares in Asia, Australia and New Zealand, Germany, and Latin America. In contrast, the buyback of shares in North America is almost as significant as the dividend payouts.

Moreover, in their study Raaballe and Hedensted (2008) claim that, from a tax perspective, shareholders of companies that bought back shares fared better than shareholders of dividend-paying companies due to a higher tax rate on dividends compared to capital gains. They also stated that companies with more generous dividend payments are also those with more frequent share buybacks. Finally, they concluded that companies that buy back are larger, with a higher ROE and a more concentrated ownership structure.

The research mentioned above mainly dealt with internal factors' impact on the dividend policy. However, the influence of the mentioned internal factors will not be the same in the existence of different external factors (such as the legal or institutional framework, the level of capital market development, etc.). Therefore, the dividend policy will differ whether it is an emerging market or developed country, when it comes to different institutional and regulatory frameworks, or

state-owned or private companies, whether it is a booming or a crisis period (Floyd et al., 2015), etc.

By comparing dividends in 33 countries, La Porta (2000) concludes that better protection of the shareholders' rights, for example, the minority shareholders' protection, corresponds to higher dividend payments. Aivazian et al. (2003) showed that the dividend policy in Emerging market countries, compared to the U.S., is sensitive to the same variables, but the intensity of this sensitivity differs by country. Curiously, the study results show that companies in the Emerging market paid higher dividends than U.S. counterparts, despite financial constraints. Amidu and Abor (2006) investigated the relationship between determinants of dividend payout ratios from the context of a developing country. They concluded that there is a significant positive relationship between dividend payout and profitability, cash flow, and taxes and a negative association between dividend payout and risk, institutional shareholding, growth, and market-to-book value. Research by Cristea and Cristea (2017) related to companies in the Bucharest Stock Exchange as an example of the Emerging market showed a positive relationship between profitability and dividend policy and a negative relationship between the variables of financial leverage, company size, growth, and dividend payout. Another research conducted at the Istanbul Stock Exchange by Kisava and John (2017) shows that the dividend policy is directly explainable by the profitability, liquidity of the company, the amount of debt, and the ratio of market to book value. In Indonesia, Fajaria and Isnalita (2018) show that the company's profitability and growth positively affect the dividend size, while liquidity and high indebtedness have a negative effect. Contrary to them, in the same market, Pattiruhu and Paais (2020) claim that the variables such as Current Ratio, ROE, and company size did not have a positive and significant effect on dividend policy while Debt-to-Equity Ratio and ROA have a positive and significant impact.

State-owned enterprises account for many countries' gross domestic product, employment, and assets (Putniņš, 2015). Agency costs tend to be higher than for companies in the private sector (Estrin and Perotin, 1991), and dividend policies may differ depending on the government's budgetary needs. The OECD Guidelines on Corporate Governance of State-Owned Enterprises, considered a global benchmark, recommend setting profitability targets, optimal capital structure objectives, and dividend policy (OECD, 2015). Best practice shows that in setting the dividend policy, State-owned enterprises identify the cost of capital and determine the optimal capital structure (OECD, 2014). The state's objective is to ensure that dividend yield is sustainable and predictable, considering the capital enterprise's future capital requirements and financial position (Ministry of Enterprise and Innovation, 2021). States also use dividend policy to achieve an optimal capital structure for companies they own (OECD, 2014). There are also examples of extraordinary dividend payouts resulting from excessive capitalization

and cash surplus (OECD, 2014). When determining the dividend policy, one needs to consider the company's need to cover any remaining losses from previous years, investment plans, the company's indebtedness, return on capital and the company's liquidity (OECD, 2014). There are also examples where in order to set dividend levels, capital reserve level, debt/equity ratio, previous dividend levels, future investment needs, but also payouts ratios in private sector peers are considered (OECD, 2014).

Good Corporate Governance has a significant positive influence on the decision to pay dividends and on the average dividend payout level (Yarram, 2015). The composition of the board in favour of independent directors and the intensity of equity incentives increase dividend payout as well (Driver et al., 2020). Furthermore, the board's characteristics affect dividend policy. A study conducted by Dissanayake and Dissabandara (2021) revealed that women on boards, the board size, and CEO duality have a significant positive relationship for the likelihood to pay dividends whereas Audit Committee size, board independence, and frequency of board meetings negatively affect the dividend decision. On the contrary, Widyasti and Putri (2021) stated that corporate governance, represented by the number of Audit Committee members does not affect dividend policy.

Dividend policy determination has remained a puzzle until today. Moreover, there is a growing interest in the field. According to the analysis made by Pinto et al. (2019), out of a total of 768 articles published in the past 47 years obtained from the Scopus database, 80% were published from 2005 onwards whereas the highest number of publications come from US and UK.

3. Conception of analysis

The main goal of this paper is to determine the causal relationship between the dividend payout ratio as a dependent variable and four explanatory variables as independent variables. The sample consists of 28 listed companies on Zagreb Stock Exchange. We propose the following research hypothesis:

H1: Dividend payout ratio has statistically significant dependence on key financial performance variables: 1) return on equity (ROE), 2) return on assets (ROA), 3) financial leverage measured as the ratio of assets to equity (F.L.), and 4) surplus of free cash flow (FCF) over revenues.

The empirical analysis is based on a hierarchical linear regression analysis. The expected causal relationship is represented in the following econometric model:

$$DPR_{i,t+1} = \beta_0 + \beta_1 ROE_{it} + \beta_2 ROA_{it} + \beta_3 FL_{it} + \beta_4 FCF/Rev_{it} + \beta_5 \ln(Rev)_{it} + u_{it} \quad (1)$$

The model investigates the relationship between the dividend payout ratio (DPR) as a dependent variable and four explanatory variables as independent variables. DPR is calculated as the ratio of dividend payout shown in the cash flow statement for period $t+1$ to net income presented in the income statement for period t . We focus our research on the dependency of the dividend payout on profitability factors. The main factors widely used in practice as true represents of corporate profitability are the return on equity (ROE), return on assets (ROA), and the ratio of free cash flow to revenue. ROE stands for return on average equity. It is calculated as a ratio of net profit or net loss in period t to average equity (beginning and end of respective year). ROA stands for return on average assets. ROA is calculated as the ratio of earnings before interest and taxes (EBIT) to average assets. FL marks financial leverage and is calculated as the ratio of assets and equity for the respective year. We have included this ratio as the main liaison between ROE and ROA. Finally, the FCF/Rev represents the respective year's free cash flow ratio to revenue. This ratio is important as it represents the financial capacity to payout dividends. In addition, it should be expected that more profitable companies will generate higher free cash flow. The controlling variable is the size of the company (logarithm of the revenue, $\ln(\text{Rev})$). β_0 is constant, while β_1 , β_2 , β_3 , and β_4 are parameters of independent variables. u_{it} represents an error term.

We have covered five years period ($T=5$) and applied variables on 28 non-financial companies listed on Zagreb Stock Exchange (ZSE). Thus, we have a total of 140 observations for each variable.

4. Empirical data and analysis

The data for the analysis comes from two primary sources. The first is the global equity research platform Screener.co, and the other is a database of financial statements publicly available on the Zagreb Stock Exchange. The analysis covers 28 non-financial companies listed on Zagreb Stock Exchange. The main criteria for inclusion in the analysis have been at least one dividend payout in the last three years presented in the cash flow statement in 2019 – 2021. Therefore, the dividend payout has been extracted from the financial section of the cash flow statement. The decision on dividend payment is based on the decisions of the General Assembly. Commonly, the dividends of companies listed on ZSE are paid-out in the year following the closing of the financial statements for the previous financial year. Therefore, the dividends paid in 2021 and shown in the financial section of the cash flow statement for 2021 are generally related to financial performance for 2020, i.e., on the net result shown in the income statement for 2020.

Consequently, the dividends presented in the cash flow statement for 2020 are related to on net result shown in the income statement for 2019 and so forth. The

analysis covers five years. The first observation starts from dividends paid out in 2017 and is related to the net result shown in the income statement for 2016. The most recent observation relates dividends paid out in 2021 to the net result shown in the income statement for 2020.

Descriptive statistics for all study variables are reported in Table 1.

Table 1: Summary of descriptive statistics of all variables

Descriptive statistics ($N = 140$)				
Variable	Minimum	Maximum	Mean	SD
Y – DPR	-738.8%	267.0%	35.4%	82.0%
X1 – ROE	-292.1%	2,571.5%	23.2%	218.7%
X2 – ROA	-21.0%	15.5%	4.5%	4.8%
X3 – Financial Leverage	-19.1	28.0	2.1	3.2
X4 – FCF to Rev	-172.9%	36.2%	-1.7%	25.2%
Ln (Rev)	17.5	23.8	20.5	1.5

Source: Authors' calculation

Bivariate correlations (Pearson's r) between study variables are reported in Table 2.

Table 2: Bivariate correlations for study variables

Bivariate correlations for study variables ($N = 2140$)						
	1.	2.	3.	4.	5.	6.
1. DPR	-	-0.02	0.13	-0.05	0.12	-0.09
2. ROE		-	-0.02	.42***	0.03	-0.02
3. ROA			-	0.13	0.33***	0.11
4. Financial Leverage				-	-0.01	0.04
5. FCF-to-Rev					-	0.16
6. Ln (Rev)						-

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed).

Source: Authors' calculation

Results of hierarchical linear regression analyses (Table 3) showed that FCF/Rev positively predicted DPR in the second step of regression analyses ($\beta = 0.39$, $p < 0.05$) in the 2018 year. In addition, ln (Rev) as a criterion significantly predicted DPR ($\beta = 0.44$, $p < 0.05$) in the 2016 year, while other variables (ROE, ROA, and Financial Leverage) are not significant predictors of DPR.

Table 3: Hierarchical linear regression analysis: prediction of DPR based on ROE, ROA, Financial Leverage, and FCF-to-Rev for the period time 2016 – 2020

Hierarchical linear regression analysis ($N = 28$)										
Criterion: DPR										
	2016		2017		2018		2019		2020	
	β	t	β	t	β	t	β	t	β	t
Step 1										
Ln (Rev)	0.44*	2.45*	0.15	0.76	-0.14	-0.73	-0.19	-0.97	-0.25	-1.32
R^2	0.19*		0.02		0.02		0.04		0.06	
Step 2										
Ln (Rev)	0.33	1.71	0.11	0.56	-0.28	-1.36	-0.27	-1.31	-0.28	-1.31
ROE	0.36	0.68	2.36	1.37	-0.18	-0.23	0.46	0.83	0.05	0.10
ROA	-0.02	-0.05	-0.82	-1.61	0.24	1.16	-0.04	-0.10	0.17	0.42
Financial Leverage	0.09	0.38	-1.51	-1.05	-0.01	-0.01	0.19	0.50	-0.17	-0.42
FCF-to-Rev	0.11	0.55	0.33	1.68	0.39*	2.06*	0.21	0.86	0.05	0.21
ΔR^2	0.14		0.19		0.23		0.14		0.06	
Total R^2	0.33		0.21		0.25		0.18		0.13	

Note: Standardized regression coefficients (β) and R^2 (squared multiple R) are from regression models, including four predictors of criterion (DPR). $\Delta R^2 = R$ change for the predictors entered in a separate step after controlling Ln (Rev).

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed)

Source: Authors' calculation

5. Results and discussion

Table 1 the dividend payout ratio measured as the ratio of dividend to net income, ranges from negative -739% to 267%. The financial source for the dividend payouts may come from net income earned from the recent year or retained earnings (net income earned in periods preceding the recent year). The two primary reasons may explain this divergence. First, even when a company shows a net loss in the income statement but has significant cash reserves, it may decide to pay dividends from retained earnings from previous years. In that case, DPR has a negative sign. Secondly, in certain circumstances, as in the case of large cash reserves and the absence of lucrative investment opportunities, a company may decide to pay dividends that several times surpass the most current annual net income.

As shown in Table 2, the criterion variable (DPR) is not significantly related to any predictor or control variable at the bivariate level. In addition, Table 3 shows

that the other variables (ROE, ROA, and Financial Leverage) are not significant predictors of DPR, while the FCF/Rev ratio positively predicted DPR in the second step of regression analyses ($\beta = 0.39, p < 0.05$) but only in 2018. This result suggests that dividend policy, particularly the DPR of the listed companies, is not necessarily affected by the most recent financial results reflected by the profitability measured with ROE and ROA, nor with the financial leverage. Instead, the DPR decision is more likely influenced by other long-term and non-financial factors, such as the history of dividend payments or dividend expectations. Moreover, these non-financial factors may outweigh current profitability (ROE and ROA) as a primary determinant of dividend payouts.

The practical implications of these results suggest that investors chasing dividend-paying firms will be more likely to rely on the history and expectation of dividend payments as more critical than the recent profitability. Furthermore, results come from the Zagreb Stock Exchange, characterized by relatively small size, turnover, low efficiency, and orientation of companies toward banking debt as a dominant source of financing (Šestanović, 2014; 2018). Therefore, there is expected high diversity in DPRs on small stock exchanges with a relatively small number of dividend-oriented companies. As a result, even passive investors investing in the stock indices of such exchanges may face the high variability of the DPR.

Bivariate correlations for study variables, ROE is moderately positively correlated with Financial Leverage ($r = 0.42, p < 0.001$). It is expected as the decomposition of ROE is shown by multiplying the net profit margin, total assets turnover, and financial leverage. The FCF-to-Rev is also moderately positively correlated with Financial Leverage ($r = 0.33, p < 0.001$). Capital expenditures are commonly financed with operating cash flow and cash from financing (debt or equity). The company may increase its financial leverage to exploit investment opportunities. The correlation of the FCF-to-Rev and financial leverage suggests that the company undertakes additional debt only when the free cash flow is large enough to ensure future debt repayments.

Most previous studies researched dividend policy on the developed stock exchange and, to a much lesser degree, in less developed stock exchanges. This study contributes to the existing empirical studies of less developed markets. In addition, it investigates and brings conclusions on dividend payment decisions that may have implications for other less stable markets. Therefore, further research may focus on the dividend policies of firms in less developed markets.

6. Conclusion

Previous empirical research gives different importance to factors that influence dividend policy. Apart from internal factors, various external and non-financial factors may impact dividend policy. The hypothesis that the dividend payout ratio

has a statistically significant dependence on four explanatory variables is rejected. Results suggest that dividend payout ratios are not statistically influenced by the recent financial profitability (ROE and ROA) nor the financial leverage and free cash flow to revenue. Several conclusions may bring light to these results. First, other non-financial factors may have a decisive influence on dividend payment. These factors include the investors' expectations, history of paying dividends, and large cash reserves backed by high retained earnings. Secondly, countries' institutional and regulatory frameworks and capital development levels vary. As a result, developing markets are generally less efficient in the information-price embedment. Thus, we may expect investors' behavior to follow the proposition of the bird-in-the-hand theory, i.e., to prefer dividends over future capital gains in the tax-neutral treatment of the dividends over the capital gains. Thirdly, while it is expected that financial leverage has no significant effect on the dividend payout ratio, the impact of profitability ratios (ROE, ROA, free cash flow to revenue) on dividend payment may be more appealing. While more profitable firms generally have more financial capacity for dividend payments, they also have more incentives to reinvest earnings or suspend dividends while investing in new opportunities. This study was confined to the 28 companies listed on the Zagreb Stock Exchange that paid out dividends at least once in the previous three years. The obstacle for the larger sample is that the Croatian capital market is relatively small and limited in broader usage of the new stock issue as a source of financing. Hence, due to inherent limitations, the results are not necessarily applicable to more developed or larger economies with more efficient markets and wider financing choices. Future research can study different variables as dividend payment determinant factors. The determinants of the dividend payout ratios in non-listed companies may also be further explored to reveal the eventual difference in the dividend-paying decisions compared to listed companies. Further research may also focus on a publicly listed state-owned enterprise as a subsegment of the listed companies. These companies are influenced by market conditions and government decisions regarding capital structure and dividend policies.

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Čimbenici politike isplate dividendi: dokazi temeljem uvrštenih nefinancijskih društava na Zagrebačkoj burzi

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Sažetak

Cilj rada je ocjena utjecaja financijskih čimbenika na omjer isplate dividendi. Svrha je istražiti čimbenike koji utječu na isplatu dividendi na manje razvijenim tržištima i usporediti ih s rezultatima prijašnjih studija. Uzorak obuhvaća kompanije uvrštene na Zagrebačku burzu koje su isplatili dividendu barem jednom u posljednje tri godine. Model obuhvaća razdoblje od pet godina (dividende isplaćene u razdoblju od 2017. do 2021. godine na temelju fundamentalnih financijskih pokazatelja od 2016. do 2020. godine ostvareni prije isplate dividendi). Za podatke je korišten servis Sreener.co, globalna istraživačka platforma, kao i raspoloživi financijski izvještaji objavljeni na Zagrebačkoj burzi. U radu je korišten hijerarhijski linearni regresijski model s četiri eksplanatorne varijable: prinos na vlastiti kapital, prinos na imovinu, financijska poluga i omjer slobodnih novčanih tokova i prihoda. Rezultati su pokazali visoku fluktuaciju omjera isplate dividendi, kao i varijabilnost prinosa na vlastiti kapital. Nadalje, nismo utvrdili statistički značajnu kauzalnost između eksplanatornih varijabli i omjera isplate dividendi. Rezultati sugeriraju da drugi, dugoročni, nefinancijski čimbenici kao što su očekivanja investitora, povijest isplata dividendi i velike rezerve novca praćene visokim zadržanim dobitima mogu imati jači utjecaj na omjer isplate dividendi negoli prethodno nedavno ostvareni financijski čimbenici.

Ključne riječi: politika dividendi, isplata dividendi, financijska analiza, Zagrebačka burza

JEL klasifikacija: G32, G35, O16

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The impact of working capital management on SME profitability – evidence from Kosovo*

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Abstract

The study attempts to show the impact of working capital management on the profitability of ninety-eight Kosovo-based SMEs, primarily in the manufacturing and construction sectors. The data were obtained from the financial statements of these companies for the years 2010 through 2020, and the assumptions were verified using the Ordinary least square (OLS) method. To express SMEs profitability, return on assets (ROA) is taken as a dependent variable, while to express working capital management, independent variables are taken: the inventory turnover period (INTP), receivables collection period (TRCP), trade payable period (TPP), and cash conversion cycle (CCC). In addition, are taken four control variables (size of companies, current ratio, sustainable growth, and leverage), which are not a variable of interest in the study but could influence the outcomes. The results reveal that SMEs increase profitability by decreasing the cash INTP and increasing TRCP, TPP, and CCC. By analyzing the effect of working capital management on profitability in the context of SMEs in Kosovo, this research contributes new knowledge to the existing literature.

Key words: profitability, working capital management, SMEs, financial statements, Kosovo

JEL classification: G30, G31, G32

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1. Introduction

Profit maximization is the main goal of each company and thus, the increase of shareholders' wealth. Therefore, the factors that affect profitability have been the main concern of managers and of various researchers. The leading component that directly affects the company's profitability is working capital management and liquidity. While working capital management is about managing current assets and current liabilities, on the other hand, the company's ability to pay these current liabilities has expressed its liquidity. For these reasons, working capital management has become a crucial and delicate issue for businesses of any nature, especially in maintaining the optimal levels of key components of assets and current liabilities, respectively, via inventory management, cash, receivables, and payables.

In the modern operating environment of companies, available resources are limited, so working capital management is believed to have a key role in achieving a high level of profitability via the use of these resources. That means that the company's liquidity largely determines its profitability, while liquidity and profitability are not the same, but are the essential objectives of a company. Attentive managing of working capital is very important, especially for manufacturing companies, because current assets (eg. inventory and receivables) represent a major part of their assets (Arunkunar and Ramanan, 2013) or cash, prepaid expenses, short-term investments, inventory, and receivables (Ponsian et al., 2014).

As stated by Gitman and Zutter (2016), working capital management is an important element that reflects in increased sales and in achieving better results to have an optimal level of liquidity and profitability. In this regard, there is an urgent need to optimize working capital management, requiring companies to focus more on reasonable and fair use and control of their resources, ie to have comprehensive management of their short-term assets and liabilities.

The basic principles of working capital management are minimizing used capital and improving efficiency in the use of short-term assets such as cash, inventories, receivables, and payables (Lamichhane, 2019). The more carefully the working capital is managed, the lower the risk of the optimal possession of the size of cash, inventory, receivables, and payables, which are very necessary for the proper functioning of various business activities. Working capital optimization minimizes the demand for working capital financing and maximizes the income and wealth of the company. Effective working capital management intends to ensure that a company has good cash access to the funds needed for daily operating expenses, while at the same time ensuring to finance of company assets most productively.

Kosovo's economy, especially the private sector, faces many factors that can hinder the speed of return of resources used by companies. As a result, proper

management of these resources is required, while working capital is the most important resource.

While in most developed countries, the manufacturing and construction sectors are the main drivers of sustainable development, in Kosovo's economy, the sectors mentioned below are the main drivers for sustainable development and the main contributors to the country's GDP. In Kosovo in 2020, 40,056 different companies were active with a total of 191,021 employees. In this number of companies, according to Statistical Agency of Kosovo, manufacturing companies participated with 14.5% of the total number of companies, with 17.7% of employees and 12.9% of the total turnover, while construction companies participated with 9.59% of the total number of companies, with 11.4% of employees and 10.6% of total turnover. The above statistics show that manufacturing and construction companies with 24.09% of the total company structure and 23.5% of the total turnover despite not being given enough attention and support. Since these companies are the main carriers of economic development in all developed and developing countries, our work is focused on analyzing working capital management and its impact on profitability. The analysis results are also expected to show an attractive situation for potential investors in the SME sector in manufacturing and construction.

The main purpose of this paper is to evaluate the impact of working capital management on the profitability of SMEs operating in Kosovo, comparing the achieved results of working capital management and the levels of the performance indicator expressed through return on assets (ROA). With this in mind, we propose the following research hypotheses:

H₁ – Inventory turnover period and the company profitability have a significant relationship between them.

H₂ – The relationship between the trade receivable collection period and the company's profitability will be significant.

H₃ – The trade payable period and the company's profitability have a significant relationship between them.

H₄ – The cash conversion cycle and the company's profitability have a significant relationship between them.

The structure of the paper is as follows: After introducing the subject matter of this research in the first section, the second section discusses the impacts of working capital management on Kosovo SMEs' profitability and provides a literature review that summarizes the relevant research. The third section describes the research methodology of data collecting and analysis. The fourth section focuses on empirical data and provides an in-depth analysis of the impact of working capital

management on the profitability of SMEs operating in Kosovo. The fifth section explains the results and their economic significance, discussing the process of evaluating the hypotheses formulated at the beginning of the research. The sixth section, Conclusion, summarizes the research objectives, elaborates on the research results and contributions to the scientific field, provides practical implications, and gives recommendations for further research.

2. Literature review

Working capital management is essential for organizations to be able to routinely borrow money from current liabilities while investing substantial sums in current assets. Working capital management gives businesses control over the decision-making process involved in determining the best amounts of, primarily, cash, receivables, inventories, and payables (or even any account that can be treated as an asset or short-term liability). By keeping control of these amounts, businesses can shorten the time it takes to execute their operational tasks and increase profitability.

Several empirical research on this topic supports one or the other theory of capital structure. Researchers are trying to identify key capital structure determinants, but we often find empirical evidence that contradicts each other, even for basic facts (Khaki and Akin, 2020). Most of these empirical studies have been conducted to provide support for the desired perspective based on the theory used to define and manage working capital. Despite the theories used and the extensive empirical literature available on the subject, there is a consensus on the tendency of firms to have an optimal capital structure, but not on the key determinants that influence corporate financing behavior.

Most studies on working capital management have focused on companies operating in the US. These researchers recently expanded the search to test US capital structure theories in developed countries that have similar structures and characteristics to generate a consensus on the factors influencing corporate financing behavior. Ryan and Zingales (1995) through their study, make the first attempts in this direction, to conclude that the same group of determinants of corporate financing, was important for both the US and other G-7 countries. Even researchers Ryan and Zingales (1995), and Ozkan (2001), focused their research primarily on studying these determinants in companies in the US or even in developed countries that have institutional similarities to the US. In the beginning, the focus has been on large companies, because the company size is an important factor in setting perceptions of working capital management (Nobanee and Abraham, 2015), but due to the small and non-representative sample, subsequent studies have focused on SMEs because they have represented a much larger number of companies, and

in most countries, these have dominated the total number of companies in different sectors. In most developing countries, SMEs have their main source of economic growth. Kosovo is also considered a developing country, so the focus of our study is SMEs and working capital management and its relationship with profitability and sustainable growth.

Several studies have concentrated on analyzing the relationship between working capital management and profitability, both theoretically, and empirically. Empirical research has rapid development, especially in recent years as evidenced in the literature on this issue (Prasad et al., 2019; Naumoski, 2019; Vukovic and Jakšić 2019; Chalmers et al., 2020; Sensini, 2020), etc. Within these studies, various constructions for working capital management have been used. The most specific components of the WCM structure encountered in most studies are the inventory turnover period, trade receivables period, trade payable period, and cash conversion cycle (Prša, 2020; Ramos et al., 2020; Sensini and Vazquez, 2021; Hossain, 2021; Al-Momani et al., 2021; Panda et al., 2021; Mazanec, 2022).

In this study, the company's inventory level is expressed as the ratio of the inventory value multiplied by the number of days in the previous year to the cost of sales. The company needs to track the amount of inventory and not create underloads and overloads with inventory, even though researchers declare pro et contra. According to researchers Eroglu and Hofer (2011), Ching et al. (2011), and Mathuva (2013), inventory underloads lead to reduced productivity, efficiency, and productivity, although maintaining a smaller amount of inventory is related to an aggressive inventory management policy. According to researchers, small amounts of inventory, followed by an aggressive policy can increase productivity as it causes reducing storage costs (Nazir and Afza, 2009; Tauringana and Afrifa, 2013). On the contrary, inventory overload is related to a traditional inventory management policy, which seems that the more inventory we have the less the risk of not meeting the demand of buyers and that it has a positive impact on profitability. Researchers Corsten and Gruen (2004), Kieschnick et al. (2013), Aktas et al. (2015) also favor maintaining a larger inventory even though inventory overload increases its maintenance and financing, and interest costs and higher credit risk. In their study, they found the positive impact of inventory on profitability.

The role and impact of accounts receivable on the profitability of the company have been analyzed in various studies (Banos-Caballero et al., 2014; Abuhommous, 2017; Altaf and Shah, 2018; Dary and James, 2019). The nature of this impact depends on whether the company pursues a traditional or aggressive policy in applying accounts receivable when selling (Garcia-Teruel and Martinez-Solano, 2007; Afza and Nazir, 2009; Tauringana and Afrifa, 2013). The company's traditional policy can increase accounts receivable and thus reduce cash flow as well as profitability because there are times when those accounts receivable often lead to bad debt. An

aggressive policy pursued by the company for accounts receivable, can increase cash flow and thus, profitability.

The third important factor for working capital management is accounts payable. Various researchers, in their research, came to different conclusions, concluding that accounts payable have positive but also negative effects on the profitability of the company. They argue the positive effect of accounts payable on profitability with transaction costs, which means that by reducing these costs, companies increase their operational efficiency and consequently their profitability (Sharma and Kumar, 2011; Bhatia and Srivastava, 2016). By delaying the payment of payables, respectively by increasing the days of accounts payable, companies reduce transaction costs and thus increase profitability. Also, other authors find that late payment of accounts payable offers a cheap alternative source of short-term financing to the company (Yazdanfar and Manhman, 2016). Some other researchers declare the opposite by finding that delayed payables may attract interest on overdue debts (Tryfonidis, 2006; Garcia Jeruel and Martinez-Solano, 2007; Cuiñat, 2007; Giannetti et al., 2011).

The Cash conversion cycle (CCC), which is a comprehensive indicator of working capital management, is the fourth crucial component. In other words, the CCC is the result of the addition of TRCP and INTP and the deduction of TPP. Depending on the traditional or aggressive application policy to the constituent components of the CCC, the same will apply to the CCC. An aggressive CCC policy means a shorter period for collecting accounts receivable and maintaining inventory as well as a longer period for paying accounts payable. Applying an aggressive policy is interpreted by researchers as a negative relationship between CCC and profitability (Sharma and Kumar, 2011; Enqvist et al., 2014; Bhatia and Srivastava, 2016). The opposite would be a traditional CCC policy. The long CCC period allows the company to increase sales, eliminate stock out and improve customer relations (Baños-Caballero et al., 2014).

3. Research methodology

The study is descriptive research using secondary sources of data from audited financial statements of mainly manufacturing and construction companies in Kosovo for the period 2010 – 2020 published by the Kosovo Financial Reporting Council. The sample was made by 98 companies in Kosovo, culminating in 1,078 firm-year observations. Company data were used to enable the researcher to conduct an in-depth study of the sample taken for the selected period to study the WCM influence of these companies on profitability.

In this study, the dependent variable of SMEs profitability is Return on Assets (ROA). The use of ROA enables researchers to calculate returns and expenses

related to financial and non-financial assets (Brammah et al., 2021). Based on several studies, working capital management (WCM), contain inventory turnover period (INTP), receivable account collection period (TRCP), payable account payment period (TPP), and the cash conversion cycle (CCC), which are the independent variable (Prša 2020; Sensini and Vazquez, 2021; Hossain, 2021; Al-Momani et al., 2021; Panda et al., 2021; Mazanec, 2022). Also based on the analyzed literature (Sharma and Kumar, 2011; Bhatia and Srivastava, 2016; Altaf and Shah, 2018), to influence the profitability of the company we included control variables (the size of the company, sustainable growth, current ratio, and the financial leverage). These variables were summarized and analyzed in different components using the multiple regression equation, assisted by SPSS to test the relationship between them. Ordinary Least Squares (OLS) regression model is used:

$$ROA_{it} = \beta_0 + \beta_1 INTP_{it} + \beta_2 L_TA_{it} + \beta_3 SGr_{it} + \beta_4 CR_{it} + \beta_5 LEV_{it} + \varepsilon_{it} \quad (1)$$

$$ROA_{it} = \beta_0 + \beta_1 TRCP_{it} + \beta_2 L_TA_{it} + \beta_3 SGr_{it} + \beta_4 CR_{it} + \beta_5 LEV_{it} + \varepsilon_{it} \quad (2)$$

$$ROA_{it} = \beta_0 + \beta_1 TPP_{it} + \beta_2 L_TA_{it} + \beta_3 SGr_{it} + \beta_4 CR_{it} + \beta_5 LEV_{it} + \varepsilon_{it} \quad (3)$$

$$ROA_{it} = \beta_0 + \beta_1 CCC_{it} + \beta_2 L_TA_{it} + \beta_3 SGr_{it} + \beta_4 CR_{it} + \beta_5 LEV_{it} + \varepsilon_{it} \quad (4)$$

$$ROA_{it} = \beta_0 + \beta_1 INTP_{it} + \beta_1 TRCP_{it} + \beta_1 TPP_{it} + \beta_1 CCC_{it} + \beta_2 L_TA_{it} + \beta_3 SGr_{it} + \beta_4 CR_{it} + \beta_5 LEV_{it} + \varepsilon_{it} \quad (5)$$

Table 1 details the approved definitions and basis for the dependent, independent, and control variables.

Table 1: Measurements of Dependent and Independent Variables

Acronym		Measurement	Source
Dependent variable			
ROA	Return on assets	Net profit after taxes / Total assets	Prša 2020; Ramos et al., 2020; Wijaya and Atahau, 2021; Sensini and Vazquez, 2021; Hossain, 2021;
Independent variable			
INTP	Inventory turnover period	Inventories multiplied by the number of days in the year/ Cost of sales	Prša 2020; Ramos et al., 2020; Sensini and Vazquez, 2021; Hossain, 2021; Al-Momani et al., 2021; Panda et al., 2021; Mazanec, 2022;
TRCP	Trade receivables period	(Receivables multiplied by the number of days in the year / Total sales value	Prša 2020; Ramos et al., 2020; Sensini and Vazquez, 2021; Hossain, 2021; Al-Momani et al., 2021; Panda et al., 2021; Mazanec, 2022;
TPP	Trade payable period	(Payables multiplied by the number of days in the year / COGS	Prša 2020; Ramos et al., 2020; Sensini and Vazquez, 2021; Hossain, 2021; Al-Momani et al., 2021; Panda et al., 2021; Mazanec, 2022;
CCC	Cash Conversion Cycle	TRP + INVP – PPP	Prša 2020; Ramos et al., 2020; Sensini and Vazquez, 2021; Hossain, 2021; Al-Momani et al., 2021; Panda et al., 2021;
Control variable			
L_TA	Firm size	Natural logarithm of total assets	Prša 2020; Wijaya and Atahau, 2021; Hossain, 2021; Al-Momani et al., 2021;
CR	Current ratio	Current assets/Current liabilities	Hossain, 2021; Braimah, 2021; Mazanec, 2022; Yousaf and Bris, 2021;
SGR	Sustainable Growth	Return on equity subtracting the rate of earnings retention	Nastiti et al., 2019; Wijaya and Atahau, 2021;
LEV	Leverage	Total debt divided by Total Assets	Wijaya and Atahau, 2021; Sensini and Vazquez, 2021; Al-Momani et al., 2021; Braimah et al., 2021;

Source: Author's elaboration

4. Empirical data and analysis

This section focuses on the interpretation of data on the impact of working capital management on the profitability of SMEs operating in Kosovo, including descriptive statistics, Pearson's correlation analysis as well as regression analysis through the least squares method, therefore, the discussion of the results of the process of evaluating the hypotheses formulated at the beginning of the research.

Table 2 reports the descriptive statistics, minimum, maximum, mean, and standard deviation. In total, 1,078 observations from 98 firms during an 11-year period were used in this study.

Table 2: Descriptive Statistics

Variables	N	Mean	Std. Deviation	Minimum	Maximum
ROA	1,078	0.090	0.171	(0.438)	1.672
TRCP	1,078	121.841	125.147	3.897	668.675
TPP	1,078	102.975	90.923	4.414	779.528
INTP	1,078	149.406	150.218	2.316	838.894
CCC	1,078	168.272	188.905	0.223	891.435
L_TA	1,078	9.766	1.159	6.928	12.240
SGr	1,078	(1.174)	13.193	(261.186)	0.250
CR	1,078	1.280	1.391	0.092	14.619
LEV	1,078	0.486	0.254	0.018	0.993
Valid N (listwise)	1,078				

Source: Author's calculation

In Table 2 we present descriptive statistics for dependent, independent, and control variables. The mean for the dependent variables (ROA) during the study period is 0.09. The mean for TRCP is 121.84 days, which means that to accumulate accounts receivable, SMEs need 121.84 days. The mean of TPP is 102.97 days which means that SMEs need an average of 102.97 days to repay their loan suppliers. The mean for INTP is 149.41 days. Overall, the mean for CCC of SMEs sampled is 168.27 days. As the inventory turnover period, the collection (payment) period of receivables (payables) is longer than 100 days due to installment sales by construction companies, which also affects the length of the period of payment of payables. The firm size mean (L_TA) is 9.77. The mean for the Current ratio (CR) is 1.28 suggesting that the current assets of SMEs on average can cover their current liabilities 1.28 times. During the period, SMEs in Kosovo have a mean for leverage is 0.49 (49.0%), while the mean of sustainable growth is negative (- 1.17).

Table 3: The Pearson Correlation analyses of the study variables

Variables	ROA	INTP	TRCP	TPP	CCC	L_TA	SGR	CR	LEV
ROA	Pearson Corr.: 1								
	Sig. (2-tailed)								
INTP	Pearson Corr.: -0.180**	1							
	Sig. (2-tailed)								
TRCP	Pearson Corr.: -0.108*	0.239**	1						
	Sig. (2-tailed)	0.023	0.001						
TPP	Pearson Corr.: -0.013	0.463**	0.314**	1					
	Sig. (2-tailed)	0.788	0.001	0.001					
CCC	Pearson Corr.: -0.209**	0.731**	0.701**	0.095*	1				
	Sig. (2-tailed)	0.001	0.001	0.046					
L_TA	Pearson Corr.: -0.125**	-0.270**	0.047	-0.167**	-0.103*	1			
	Sig. (2-tailed)	0.008	0.001	0.324	0.031				
SGR	Pearson Corr.: -0.513**	0.024	-0.013	-0.089	0.053	0.030	1		
	Sig. (2-tailed)	0.001	0.622	0.778	0.062	0.270			
CR	Pearson Corr.: -0.120*	0.198**	0.316**	-0.190**	0.458**	-0.009	0.046	1	
	Sig. (2-tailed)	0.012	0.001	0.001	0.001	0.001	0.332		
LEV	Pearson Corr.: 0.006	-0.099*	-0.043	0.157**	-0.183**	-0.021	-0.158**	-0.288**	1
	Sig. (2-tailed)	0.899	0.037	0.366	0.001	0.001	0.001	0.001	
	N	1,078	1,078	1,078	1,078	1,078	1,078	1,078	1,078

Source: Author's calculation

The Pearson correlation measures the strength of the linear relationship between two variables. For the sake of result clarification, Pearson’s correlation coefficient is used to find the degree of the linear relationship between two continuous variables. Table 3 contains the results of the correlation analysis, which is based on the relationship between the dependent and independent variables. This point demonstrates that all explanatory variables are correlated. In other words, this is an attempt to prevent difficulties associated with multicollinearity. Return on assets has a negative correlation with INTP at significant level of 99.9% ($r = -0.180$, $p = 0.001$). Like INTP, TRCP has a negative correlation with ROA at the significant level of 97.7%, TRCP ($r = -0.108$, $p = 0.023$). TPP has a negative correlation but not significant with ROA at the level of 21.2% ($r = -0.013$, $p = 0.788$), while CCC at significant level of 99.9% ($r = -0.209$, $p = 0.001$). In analyzing the independent variables and the relationships between them, we can conclude that the independent variables have a positive relationship with each other. What is worth emphasizing, is the estimated coefficients between the Independent variables are all less than 0.75, indicating, the absence of potential multicollinearity (Gujarati, 2004), and for that, problems of multicollinearity between variables are not observed. Also, the article examined multicollinearity using the VIF, and the results suggested that the VIF value is less than five and that the reciprocal of the VIF is greater than 0.20. These numbers revealed the absence of multicollinearity. These findings are summarized in Table 4.

Table 4: Variance inflation factor

Variables	VIF	1/VIF
INTP	1.350	0.741
TRCP	1.691	0.591
TPP	1.527	0,655
L_TA	1.104	0.906
SGR	1.435	0.697
CR	1.142	0.876
LEV	1.034	0.967

Note: ROA is a dependent variable; CCC – is an excluded variable

Source: Author’s calculation

After conducting the preliminary analysis, the study evaluates the panel data model for determining the effect of independent variables on banks’ liquidity risk.

Table 5 presents the estimated statistics of equations 1, 2, 3, and 4 that report the relationship between working capital management and the profitability of Kosovo SMEs.

Table 5: Regression Results on the Effect of WCM on profitability (ROA) OLS model, using 1,078 observations, Dependent variable: ROA

Variable	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Const	0.418	0.001 ^a	0.306	0.001 ^a	0.343	0.001 ^a	0.353	0.001 ^a	0.408	0.001 ^a
INTP	-0.001	0.001 ^a							0.000	0.001 ^a
TRCP			0.000	0.052 ^c					-0.000	0.258
TPP					0.001	0.028 ^a			0.000	0.470
CCC							0.000	0.001 ^a		
L_TA	-0.025	0.001 ^a	-0.016	0.007 ^a	-0.019	0.002 ^a	-0.020	0.003 ^a	-0.024	0.001 ^a
SGR	-0.007	0.001 ^a	-0.007	0.001 ^a	-0.007	0.001 ^a	-0.007	0.001 ^a	-0.007	0.001 ^a
CR	-0.012	0.057 ^b	-0.013	0.020 ^b	-0.019	0.001 ^a	-0.005	0.343	-0.009	0.142
LEV	-0.086	0.009 ^a	-0.076	0.009 ^a	-0.073	0.012 ^b	-0.086	0.005 ^a	-0.087	0.002 ^a
R-square	0.335		0.303		0.305		0.328		0.337	
Adjust. R-square	0.327		0.295		0.297		0.320		0.327	
F – value	43.75		31.43		36.44		37.59		31.41	
p-value (F)	0.000 ^a		0.000 ^a		0.000 ^a		0.000 ^a		0.001 ^a	

^{a, b} and ^c – denote statistical significance at 1%, 5%, and 10%, respectively

Source: Author's computations from 2010 – 2020 companies' data

Table 5 presents the results of the regression analysis for ROA. The coefficient of determination R-square measures the proportion of variability in the dependent variable that is explained by independent variables. The model shows that the R-square for each model is 0.335, 0.303, 0.305, and 0.328 respectively, which indicates around 32% of the relationship between the variance of profitability and the variance of independent variables (INTP, TRCP, TPP, and CCC). In this case, there will be another factor (control variables) that can contribute to the effect of the profitability of Kosovo SMEs.

5. Results and discussion

A wide range of research findings have been provided by the literature on the effect of working capital management on SME profitability. Based on the above models, we can comment on the results of the impact of working capital management on SME's profitability. Thus, model 1 in Table 5 examines the relationship between the Inventory turnover period (INTP) and Return on Assets (ROA). Results show that Model 1 explains 33.5% of the variation in ROA. During the analysis of these relationships, we found that there is a negative and significant relationship between INTP and ROA with a coefficient of 0.001 and p-value = 0.001. This also leads

us to the conclusion that the H_1 hypothesis according to which *Inventory turnover period (INTP) and the company profitability have a significant relationship between them* is accepted and it is concluded that INTP is statistically significant at a level of 1%, but due to the small beta coefficient, is economically insignificant. This result is consistent with Sharma and Kumar (2011), Enqvist et al. (2014) Bhatia and Srivastava (2016). In addition, the overall model with an F value of 43.75 is statistically significant, and the adjusted R^2 implies that this model explains 32.70% of the change in the company's profitability.

Model 2, examines the relationship between the Trade receivables period (TRCP) and Return on Assets (ROA) and the results show that this model explains 30.3% of the variation in ROA. The TRCP coefficient is 0.001 and it has a value of $p = 0.052$; this relationship has a statistical significance at a 10% level. In this model, we try to test the second hypothesis according to which *the relationship between the commercial receivables collection period (TRCP) and the company profit (ROA) will be significant*. Based on this, we conclude that TRCP is statistically significant, but because of coefficient of 0.001, that there is no economic significance. It means that, the higher of TRCP, the better the profitability of these companies. This result is the opposite of many studies (Gul et al., 2013; Tran, 2015; Le et al., 2017; Altaf and Shah, 2018), etc. In addition, the overall model is statistically significant, with an F value of 31.43. The adjusted R square of 0.295 means that this model explains 29.5% of the ROA companies' variation.

Model 3 examines the relationship between Trade payable period (TPP) and Return on Assets, and the results show that model 3 explains 30.5% of the variation in ROA. The model presented in the table tests the third hypothesis according to which *the trade payable period (TPP) and the company's profitability (ROA) have a significant relationship between them*. Regression results show that the TPP coefficient is positive at 0.001 and is significantly different from zero (p -value = 0.028). Based on this, it can be concluded that the third hypothesis is accepted and it is concluded that TPP is statistically significant at a significance level of 5%. This suggests that the longer a company extends its supplier-billing period, the more opportunities it has to increase its working capital; from there, the profitability increases. In other words, to increase profits, companies need to extend the payment time of the goods within their allowances so that they are not penalized for overdue payments. In addition, the overall model is statistically significant, with an F value of 36.44 ($p > 0.05$). The adjusted R square model is 0.297, which means that 29.7% of the company variation in ROA is explained by this model. This result is the same as studies by Gul et al. (2013), Enquist (2014), Yunos (2015), Panda et al. (2020). However, it differs from the findings by Tran (2015); Le et al. (2016), Ho et al. (2017).

Model 4 examines the truthfulness of the fourth hypothesis that *the cash conversion cycle (CCC) and the company profitability (ROA) have a significant relationship between them*. The regression results show that the CCC coefficient is 0.00 with a

positive p-value of 1%. Results show that Model 4 explains 32.8% of the variation in ROA. This is in contrast to the research results of when who found a statistically positive relationship between CCC and profitability, but we cannot say that it has a pronounced economic significance.

Model 5 is a model where all the variables are included for finding out the most significant variables affecting the ROA. The model shows that INTP, L_TA, SGR, and LEV are very significant and TRCP, TPP, and CR are not significant. In this model, CCC is excluded from the model due to collinearity, INTP and TPP (even not significantly) are positively related to ROA, and TRCP, L_TA, SGR, CR, and LEV are negatively related to ROA. The adjusted square R of the model is 32.7%, with an F value of 31.41, which is very significant ($p < 0.01$).

The regression models for ROA as a proxy of firm profitability are influenced by the control variables. There is a significant positive relationship between L_TA and ROA in all models; this indicates that firms can increase ROA by decreasing the size of the company. In addition, there is also a significant negative relationship between SR and LEV with ROA. Between CR and ROA there is a (significant in models 1, 2, and 3) negative relationship, this indicates that a higher current ratio of firms negatively affects ROA.

The paper is important for a number of reasons. First, the findings can help business owners and SME managers create and put into practice working capital management plans. This could be crucial for increasing profitability and, consequently, for the survival and growth of SMEs, which does a lengthy process of inventory conversion, receivables collection, and payables payment characterize. Even if the findings of this inquiry are typical of developing nations, their growth will create ideal conditions for new investments in the sectors studied.

The current research creates a lot of space for future studies based on the financial statements of SMEs operating in Kosovo. Working capital management practices of SMEs in Kosovo can be integrated with their financing practices. Integrating research results and working capital management best practices with the SME financing structure can help maximize firm value. Therefore, this issue should be explored in the future to create an overview of the prospects of survival and development of SMEs in Kosovo.

6. Conclusion

The paper's main objective is to evaluate the impact of working capital management policies on ninety-eight Kosovo SMEs' profitability for the period 2010-2020. The sample companies were selected mostly from manufacturing and construction SMEs, including retail ones. To achieve the objectives of the study, we used an

OLS regression model. Tests carried out on the estimates suggested that the model is reliable in explaining the effect of working capital management on profitability.

From a methodological point of view, we used the individual WCM determinants (INTP, TRCP, TPP, and CCC) as independent variables, while ROA, as a proxy of profitability, represented the dependent variable. In addition, to influence the profitability of the company, we included control variables (the size of the company, sustainable growth, current ratio, and financial leverage). We used panel data that were calculated through the small squares method, according to which we assessed the impact of individual determinants on the profitability of SMEs. The results provide some interesting insights.

In particular, even though SMEs in Kosovo operate with trade receivables in the short term, issuing a longer period of trade receivables (TRCP) does not affect profitability. However, the empirical findings should be interpreted according to the type of SME that was sampled for analysis. Many SMEs have little room for maneuvering in trade policy because they have a diverse clientele that also dictates the period of accounts receivable.

Based on previous research, the results of variables such as INVP and TPP, showed a negative relationship with return on assets, concluding that investing in inventories and extending the payables payment period increases costs that they are unable to compensate.

Because the CCC in model 5 has shown high collinearity, we consider the impact of this variable on WCM to be negligible.

Without questioning the significance of this paper for science, the main limitation of the study is the unavailability of secondary financial data for SMEs operating in Kosovo. Financial data for each SME had to be extracted separately from the Kosovo Financial Reporting Council website, as this agency has not been able to compile a modern website that would allow researchers much easier access to these signs. Therefore, we suggest that in the future study, the researcher should include the other sectors of Kosovo SMEs, increasing the sample size and use the dynamic model. Finally, future studies can add financial and non-financial variables expected to moderate the effect of working capital management on profitability, as may corporate governance.

By examining the relationship between effective working capital management and profitability, the study makes a contribution by taking into account sustainable growth. Additionally, the findings have practical implications for managers, investors, bankers and other stakeholders searching for the best way to increase business profitability through effective and efficient working capital management. Additionally, managers and financial institutions can utilize the study's findings to help them decide whether to finance working capital needs or invest in current assets.

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Utjecaj upravljanja obrtnim kapitalom na profitabilnost malih i srednjih poduzeća na primjeru Kosova

Ardi Ahmeti¹, Yllka Ahmeti², Skender Ahmeti³

Sažetak

Studija pokušava pokazati utjecaj upravljanja obrtnim kapitalom na profitabilnost devedeset osam malih i srednjih poduzeća sa sjedištem na Kosovu, prvenstveno u sektoru proizvodnje i građevinarstva. Podaci su dobiveni iz financijskih izvještaja ovih tvrtki za razdoblje od 2010. do 2020. godine, a pretpostavke su provjerene metodom običnog najmanjeg kvadrata (OLS). Za izražavanje profitabilnosti malih i srednjih poduzeća, povrat na imovinu (ROA) uzima se kao zavisna varijabla, dok se za izražavanje upravljanja radnim kapitalom uzimaju nezavisne varijable: razdoblje obrta zaliha (INTP), razdoblje naplate potraživanja (TRCP), razdoblje plaćanja prema dobavljačima (TPP) i ciklus konverzije gotovine (CCC). Osim toga, uzete su četiri kontrolne varijable (veličina poduzeća, tekući omjer, održivi rast i financijska poluga), koje nisu varijabla od interesa za studiju, ali bi mogle utjecati na ishode. Rezultati otkrivaju da mala i srednja poduzeća povećavaju profitabilnost smanjenjem gotovinskog INTP-a i povećanjem TRCP-a, TPP-a i CCC-a. Analizirajući učinak upravljanja obrtnim kapitalom na profitabilnost u kontekstu SMS-ova na Kosovu, ovo istraživanje pridonosi novim saznanjima postojećoj literaturi.

Ključne riječi: profitabilnost, upravljanje obrtnim kapitalom, MSP, financijski izvještaji, Kosovo

JEL klasifikacija: G30, G31, G32

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d. Introduction – defines the problem and the subject matter of the research referring to recent bibliography and findings. However, these can more specifically be dealt with in the second section *Literature review*. The last part of the introduction is reserved for setting the hypothesis of the research that

will be later on analyzed at the beginning of the conclusions. Finally, Introduction ends up by giving clues of the organization of the text.

- e. Literature review** – precedes a research section providing readers with a cutting-edge context of the referential literature dealing with crucial points of current knowledge based on the relevant results of the current research. Literature review should be a synthesis of previous research, justifying the theoretical and empirical contributions of the respective paper, a not a simple listing of previous scientific contributions.
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Kostelich, E. (1995) "Symphony in Chaos", *New Scientists*, Vol. 146, No. 1972, pp. 36–39.

Fox, S. (1994) “Empowerment as a Catalyst for Change: An Example from the Food Industry”, *Supply Chain Management*, Vol. 2, No. 3, pp. 29–33.

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Di Noia, C. et al. (1999) “Should Banking Supervision and Monetary Policy Tasks be Given to Different Agencies?”, *International Finance*, Vol. 2, No. 3, pp. 285–361.

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Quah, D. T. (1993a) “Empirical Cross-section Dynamics in Economic Growth”, *European Economic Review*, Vol. 37, No. 2-3, pp. 426–434.

----- (1993b) “Galton’s Fallacy and Tests of the Convergence Hypothesis”, *Scandinavian Journal of Economics*, 95, Vol. 95, No. 4, pp. 427–443.

----- (1994) “Exploiting cross Section Variation for Unit Root Inference in Dynamic Data”, *Economics Letters*, Vol. 44, No. 1-2, pp. 9–19.

----- (1996a) “Empirics for Economic Growth and Convergence”, *European Economic Review*, Vol. 40, No. 6, pp. 951–958.

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Važna napomena: Ukoliko tablica, grafikon ili slika sadržavaju posebne znakove te su rađeni u posebnom programu dostavljaju se u posebnom dokumentu s točno navedenim i označenim položajem na kojem dolaze u tekstu.

Članak mora zadovoljavati sve tehničke propozicije navedene u ovim uputama.

Stil i organizacija teksta

Autori se obvezno moraju pridržavati znanstvene metodologije prezentacije građe u pisanju tekstova koja je uobičajena u znanstvenim publikacijama (“Harvard style”). To zahtijeva sljedeći pristup:

(1) Naslov i organizacija prezentacije građe:

Naslov je najvažniji sažetak rada koji mora održavati sadržaj i svrhu rada. Ne smije biti “opisan” niti sadržavati riječi poput “analiza” ili “metoda”, i sl. Građu se raspoređuje u dijelove kao što su:

- *Sažetak (Abstract)* – ispod naslova
- *Gljučne riječi*
- *JEL klasifikacija*.

Iza toga slijedi glavni dio rada podijeljen u odlomke:

- *Uvod*
- *Pregled literature*
- *Metodologija/metoda/model/koncepcija analize* (treće poglavlje)
- *Empirijski podaci (dokumentacijska podloga) i analiza* (četvrto poglavlje)
- *Rezultati i diskusija* (peto poglavlje)
- *Zaključci* (šesto poglavlje).

(2) Sadržaj pojedinih dijelova prezentirane građe:

a. Sažetak – ispisuje se u 100-250 riječi, a obvezno treba sadržavati:

- utvrđeni cilj istraživanja,
- metodu/model/koncepciju analize,
- glavni rezultat istraživanja (analize),
- temeljni zaključak istraživanja.

Sažetak se ne smije pisati u odlomcima!

b. Ključne riječi – moraju odražavati suštinu sadržaja rada, a navodi se do pet takvih riječi.

c. JEL klasifikacija – autor svoju temu mora razvrstati sukladno kodu časopisa The Journal of Economic Literature (JEL).

d. Uvod – sadrži definiranje problema i predmeta istraživanja s pozivom na recentnu literaturu odnosno rezultate istraživanja. Taj se dio može istaknuti i u posebnoj, tj. 2., poglavlju kao *Literature review*. Pri kraju uvodnog dijela treba utvrditi radnu pretpostavku (hipotezu) istraživanja o kojoj se treba očitovati (kasnije) na početku poglavlja *Zaključak*. *Uvod* treba završiti s naznakom organizacije teksta.

e. Pregled literature – prethodi istraživačkom dijelu, a pruža čitateljima pregled referentne literature s ključnim točkama dosadašnjih spoznaja

temeljenih na relevantnim rezultatima aktualnih istraživanja. Pregled literature ne smije biti taksativno navođenje prethodnog znanstvenog doprinosa, već autori trebaju izvršiti sintezu dosadašnjih istraživanja kako bi dokazali opravdanost teorijskog i empirijskog doprinosa vlastitog rada.

- f. Metodologija/Metoda/Model/Koncepcija** – obično se prezentira u trećem poglavlju; metoda/model/koncepcija analize mora biti transparentno istaknuta radi eventualnog ponavljanja testiranja rezultata od strane zainteresiranih istraživača (to je jedno od temeljnih pravila znanstvene metodologije).
- g. Empirijski podaci i analiza** – sadržavaju dokumentacijsku podlogu i rezultate empirijske analize. Potrebno je opisati i prikazati uzorak podataka korišten u analizi te prezentirati i objasniti statistička te ekonometrijska obilježja dobivenih rezultata uz tumačenje njihova ekonomskog sadržaja.
- h. Rezultati i rasprava** – autor objašnjava rezultate, osobito njihovo ekonomsko značenje i poruke. U ovom dijelu očekuje se argumentacija znanstvenog doprinosa, povezivanje rezultata rada s rezultatima te zaključcima dosadašnjih empirijskih istraživanja te preporuke za promjene javnih i drugih politika.
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 - smjernice za buduća istraživanja;
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(3) Literatura – navesti samo one naslove (izvore) koji su korišteni u tekstu!

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----- (1994) "Exploiting cross Section Variation for Unit Root Inference in Dynamic Data", *Economics Letters*, Vol. 44, No. 1-2, pp. 9–19.

----- (1996a) "Empirics for Economic Growth and Convergence", *European Economic Review*, Vol. 40, No. 6, pp. 951–958.

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