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ИЗДАВАЧ:

Економски факултет
Универзитета у Бањој Луци
БиХ, РС, 78000 Бања Лука
Мајке Југовића 4
E-mail: info@ef.unibl.org

ЗА ИЗДАВАЧА:

Проф. др Миленко Крајишник,
декан Економског факултета
Универзитета у Бањој Луци

ГЛАВНИ УРЕДНИК:

Проф. др Драган Глигорић

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УРЕЂИВАЧКОГ ОДБОРА:

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ЛЕКТОРИ:

Др Милица Богдановић
Мр Татјана Марић

ПРЕЛОМ ТЕКСТА:

Милан Дамјановић, дипл. инж. ел.

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CRISIS MANAGEMENT OF HUNGARIAN TOURIST ATTRACTIONS BEFORE AND DURING THE CORONAVIRUS CRISIS

1 Krisztina Keller, Institute of Sustainable Development, Corvinus University of Budapest, Budapest, Hungary
2 Nikoletta Kaszás, University Center for Circular Economy, University of Pannonia, Nagykanizsa, Hungary
3 Szabolcs Mátyás, Faculty of Law Enforcement, Ludovika University of Public Service, Budapest, Hungary,
*Corresponding author's e-mail: krisztina.keller@uni-corvinus.hu
1 ORCID ID: 0000-0002-4408-7940
2 ORCID ID: 0000-0001-5147-2022
3 ORCID ID: 0000-0001-9529-7596

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ABSTRACT

The aim of the study is to examine how the crisis management of tourist attraction sites evolved before and during the coronavirus epidemic. Eighty-seven in-depth interviews were conducted with managers responsible for crisis management of attraction sites, examining the stages of preparation and response regarding the perception of the crisis, setting up a crisis plan and crisis team, defining priorities and measures during the coronavirus pandemic, and the lessons learned. Results have demonstrated that most had neither a crisis management plan nor experience gained from previous crises. Most of the enterprises set up a business management team consisting of managers, which then defined the retention of the workforce as a primary priority, while the steps that were taken mainly related to working from home and the use of public wage subsidies, as well as a rethinking of communication.

1. INTRODUCTION

The COVID-19 pandemic represented an unprecedented "super-shock" for the tourism sector (Wassler & Fan, 2021). According to the World Travel and Tourism Council (WTTC), 62 million jobs in tourism were lost globally in 2020 due to the pandemic. Small and medium-sized enterprises, which make up 80% of the sector, were particularly hard hit by an 18.5% drop in jobs (WTTC, 2021). More than 592 million people became ill from COVID-19 and nearly 6.5 million died worldwide following its onset at the beginning of August 2022

(worldometers.info, 2022). The economic and social impacts of the pandemic are wide-ranging (Irimiás, Csordás, Kiss, & Michalkó, 2021; Kovács, 2020), with the tourism sector particularly affected by it due to travel restrictions and social isolation (Lenzen et al., 2020; Nicola et al., 2020).

The importance of tourism and the impact of COVID-19 on the Hungarian economy is indisputable. Hungarian tourism had seen dynamic growth until 2019, with foreign and domestic tourism spending increasing by 21% in the year preceding the epidemic. The value of investment in tourism-specific sectors increased by 18%, and the output of the industry contributed 10% to domestic GDP, including spillover effects. However, following a successful year in 2019, the tourism sector was hit hardest in 2020 by the restrictions resulting from the COVID-19 epidemic (Hungarian Central Statistics Office [Központi Statisztikai Hivatal], 2019), causing a marked decline in almost all segments of tourism and hospitality. Guest nights in commercial accommodation fell by more than half compared to 2019. The number of outbound trips by Hungarians visiting Hungary fell by about half, and the number of inbound trips from other countries was also lower than in the preceding year (Központi Statisztikai Hivatal, 2021). In 2021, the economic impact of the restrictions due to the epidemic was much smaller than in 2020, but in February 2022, the Russian-Ukrainian war created a new threat (Központi Statisztikai Hivatal, 2022). The war affected tourism in many ways like the rise in oil prices, soaring inflation, and economic difficulties, and because of this, tourists didn't travel (Pan, Wu, & Morrison, 2024).

The impact of the coronavirus outbreak on tourism has already been analysed from many angles. COVID-19, which existed for almost two years, is clearly different from previous health risks that affected tourism (Kökény, Kenesei, Marton, Birkner, & Michalkó, 2022). The impact of COVID-19 was more global and industry-wide than previous health risks, requiring drastic action in social and business policies, as well as in individual lifestyles (Park, Kim, & Kim, 2022). The COVID-19 pandemic impacted not only at individual and community levels but also at national and international levels, as the social, health, economic, and political consequences were unavoidable, albeit indirectly (Németh & Tokodi, 2022). The economic losses in the tourism sector were eight times larger than the impact of the 2008 financial crisis (UNWTO, 2020). According to Sánchez-Cañizares, Cabeza-Ramírez, Muñoz-Fernández, & Fuentes-García (2021), health-related crises and risks have a particularly large impact on tourism demand and the business performance of service providers because travel plays a significant role in the spread of the epidemic. Zhang, Song, Wen, & Liu (2021) highlighted the transformative and innovative opportunity created by a pandemic

of unprecedented impact like as brand-new services (Kökény, Jászberényi, Syahrivar, & Kökény, 2024).

Research is likely to shift away from the previous critical agenda (e.g. over-tourism) and enter a new phase of tourism support with a focus on rapid crisis recovery. The dominant management focus that the tourism academy has adopted in recent years will not change (Wassler & Fan, 2021). Many scientific articles deal with the COVID-19 pandemic. For example, research conducted by Zhong, Sun, Law, & Li (2021) discovered long-term effects concerning the future. The questionnaire survey conducted by Kukanja, Planinc, & Sikošek (2020) examined the crisis management practices of companies based on different company size (micro, small, and medium).

There have been many attempts to research the crisis management of sectors that suffered great losses during the pandemic, particularly accommodation (Hao, Xiao, & Chon, 2020; Jiang & Wen, 2020; Lai & Wong, 2020; Le & Phi, 2021) and hospitality services (Giousmpasoglou, Marinakou, & Zopiatis, 2021; Guzzo, Wang, Madera, & Abbott, 2021; Hu, Yan, Casey, & Wu, 2021), but attraction sites were much less in focus despite suffering serious losses as well (Wang, Tian, Filimonau, Ning, & Yang, 2022). Itani and Hollebeek (2021) examined how attractions adapted to social distancing induced by COVID-19 and the expected impact of this on consumers' intentions to purchase virtual reality (VR-based vs. in-person) site visits, both during and after the pandemic. Yang, Ruan, Huang, Lan, & Wang (2021) examine the impact of the COVID-19 pandemic on tourists' real-time on-site emotional experience, and their results are significantly lower than before the outbreak of COVID-19. This suggests that tourism destinations should not only focus on attracting tourists, but also pay attention to restoring the tourism experience in the boom phase of tourism.

Based on these considerations, we identify a relevant need to answer the following research question: How did the crisis management of Hungarian tourist attraction operators evolve before and during the coronavirus epidemic?

The study reviews the impact of epidemics on tourism in general, then in Hungary in particular. After presenting the possibilities of crisis management in tourism, the primary research aims to assess the differences in crisis management among Hungarian tourist attraction site operators. Following a description of the methodology and sample selection criteria used to answer the research questions, the results of in-depth interviews with the staff members responsible for crisis management at the attractions under study are presented, examining the stages of preparation, response, and recovery with regard to the perception of the crisis, setting up a crisis plan and a crisis team, defining priorities and measures

during the coronavirus pandemic, and any lessons learned. Besides its academic contribution this study also provides recommendations for the managers of attraction sites.

2. THEORETICAL BACKGROUND

2.1. The impact of epidemics on tourism

Potential sources of crises in tourism include terrorism, economic, political, technological, and socio-cultural threats, as well as health crises, regardless of whether the pathogens in question affect humans or animals (Mazilu, Marinescu, Bălă, & Dragomir, 2019; Mátyás, 2017). Although the level of health risk has decreased in most destinations due to today's modern health care, the threat still puts constant pressure on tourism businesses because they have to be on constant alert (Buhalis & Costa, 2006).

There are few theories that identify health crises as a separate category among the types of crises; however, one such example comes from Chedli and Kchaich (2016), who, in addition to economic, financial, political, and social crises, also refer to situations that threaten public health and significantly increase mortality as officially state-declared health crises.

Epidemics have long caused social and economic changes. Sometimes they have minimal impact, but at other times the transformations can be unexpected, changing contemporary paradigms (Hall, Scott, & Gössling, 2020).

An epidemic is "the occurrence of a given communicable disease in a given area or community at a significantly higher than expected frequency or above a specified threshold level over a specified period of time, or at least two related cases, the relation of which is supported by epidemiological evidence" (National Centre for Public Health, 1998, p. 3). According to the World Health Organization (WHO), animal cases do not initially pose a threat to humans in pandemics, but this can change, and the virus may then sporadically be detected in humans. Later, limited spread can be observed before larger outbreaks develop and then eventually the virus spreads to other countries. After the peak of the epidemic, the number of cases starts to decrease and then falls back to normal seasonal influenza levels. This is the moment in which to review and share lessons with other countries and to assess the performance of the health care system (WHO, 2020).

Infectious diseases have always been present throughout human history, with some pathogens appearing at different times; that is, some epidemics have

broken out in multiple waves (Jamal & Budke, 2020). During the 20th century, developed countries reduced some severe epidemics with the help of vaccines, clean drinking water, and sewage networks (Petrosillo, 2019), but in the 21st century the threat posed by the spread of viruses has increased again (Gössling, Scott, & Hall, 2020).

Many articles have dealt with the way in which diseases affect tourism. SARS (severe acute respiratory syndrome) can be considered one short crisis that had effects that were regional but severe (McKercher & Chon, 2004; Zeng, Carter, & De Lacy, 2005; Wang, 2009), and more serious than avian flu (McAleer, Huang, Kuo, Chen, & Chang, 2010). Other diseases like swine flu (Page, Yeoman, Munro, Connell, & Walker, 2006) (H1N1) (Lee, Song, Bendle, Kim, & Han, 2012; Page, Song, & Wu, 2012), foot and mouth disease (Blake, Sinclair, & Sugiyarto, 2003; Irvine & Anderson, 2006), malaria, yellow fever, dengue, and ebola (Novelli, Burgess, Jones, & Ritchie, 2018; Rosselló, Santana-Gallego, & Awan, 2017) have also attracted the interest of researchers.

The emergence of infectious diseases is one of the consequences of global tourism. In addition to urbanisation and globalisation, tourism also increases the rapid spread of viruses (Hilsenrath, 2020). We travel more frequently and further than before, but increasing mobility includes not only travel for tourism but also migration (Petrosillo, 2019). Other causes of epidemics include population growth, urbanisation leading to overcrowding, mass production of food, famine and war (Gössling, Scott, & Hall, 2020).

In pandemic-affected destinations, the number of visitors and workers decreases significantly (Zissis & Christos, 2008). In the case of a health crisis, travel is reduced in household spending due to insecurity (Petcu & David-Sobolevschi, 2020). Research by Senbeto and Hon (2020) shows that while pandemics cause anxiety for all potential travellers, women are more sensitive to such situations.

2.2. Crisis management in tourism

The success of a destination is largely determined by its ability to create safe conditions for tourists (Ghaderi, Paud, & Wang, 2014). Scientific studies on tourism crises can be divided into two main categories: risk perception at the individual level (demand side) and crisis management at the collective level (supply side) (Qiu, Park, Li, & Song, 2020). The process of crisis management can be divided into three parts: pre-crisis preparation and prevention, management of a crisis situation, and post-crisis measures (Mazilu, Marinescu, Bălă, & Dragomir, 2019). In order to mitigate the negative effects of a potential crisis, effective preparation is needed by both the destination management and the tourism service providers:

budgets for emergency management, a communication strategy, and staff training (Mazilu, Marinescu, Bălă, & Dragomir 2019). According to Martens, Feldesz, & Merten (2016), this phase also involves learning from previous crises. Attention must be paid to unusual signals from inside and outside the organisation that indicate a crisis. By recognising them on time, the harmful effects of the crisis can be reduced or even eliminated (Paraskevas & Altinay, 2013). However, statistical methods cannot measure perfectly the effects of unexpected events. Therefore, statistical forecasts must be adjusted with expert opinions (Sanders & Ritzman, 2001).

The degree of risk perceived is influenced by the information conveyed through the media, the characteristics of a given tourist's personality, and their experiences during their previous trips. Furthermore, the opinions of friends and acquaintances play an important role in the travel decision process (Burns, Lester, & Bibbings, 2010). According to Song-Agócs and Michalkó's research (2022), following the Covid-19 pandemic, the Visiting Friends and Relatives (VFR) tourism segment is among first to be reactivated (Song-Agócs & Michalkó, 2022). Cui, Liu, Chang, Duan, & Li (2016) conducted research on what the risks for tourists are during a trip, what they fear most, and which influences them most. Visitors are concerned with human risks and psycho-social risks, and they pay most attention to food safety and weather risks. However, they are later more concerned about costs, quality of service, and the risk of natural disasters and accidents.

The COVID-19 pandemic significantly disrupted the events industry, leading to widespread festival cancellations and necessitating adaptation. Based on the study of the Veszprém–Balaton 2023 European Capital of Culture region, the four pillars of PwC's Risk Management Model (detect, protect, react, restore) were used and analysed (Lőrincz, Formádi, & Ernszt, 2023). The biggest challenges for event organisers during the pandemic were uncertainty and unpredictability, with increased financial, human, and mental risks and burdens. However, the positive benefits of the period and the future developmental directions of sustainable festivals were also highlighted (e.g. small-scale, family-friendly events).

In case of an emergency, it is essential to set up an operational unit at the destination that also supervises the communication centre. The intensity of communication must be increased, and preparations should be made to ensure that all stakeholders are informed in a continuous and credible manner (COMCEC, 2017). If the media presents a negative image of areas affected by the epidemic, travellers will associate that area with a dangerous image in the long term, and this perception can only be changed at great cost by the destination management

organisation at a later stage (Novelli, Burgess, Jones, & Ritchie, 2018). One of the lessons learned from the H1N1 outbreak was that it is not enough to focus on facts and emphasise expertise when communicating, as fake news also appeared constantly in the media (Lee & Basnyat, 2012). The WTTC highlights that "dominating" social media is essential, as it is the main source of news for a great many people. The body dealing with the crisis must have credible communication on all platforms (World Travel & Tourism Council, 2018).

The tourism businesses concerned should also move to crisis management-based operational management. It is of great importance that they communicate with their guests in a continuous and transparent way and facilitate destination-level communication (Martens, Feldesz, & Merten, 2016). The role of governments is essential in mitigating the effects of the crisis. They must focus on the distribution of resources, strengthening communication between stakeholders and providing financial assistance (Ritchie & Jiang, 2019). Incidentally, communication is key in any action taken. If the public are aware of what needs to be introduced, restricted or banned and why, there will be fewer people who will oppose or take action against these measures (Németh & Tokodi, 2022).

Once the crisis is resolved, recovery can be slow (Novelli, Burgess, Jones, & Ritchie, 2018). The image of the destination needs to be stabilised, which can only be achieved through a coordinated marketing campaign (Avraham, 2016; Péter, Németh, Katona, Göllény-Kovács, & Tollár, 2019). The rebranding of destination image is a necessary step in the market recovery (Zhang, Song, Wen, & Liu, 2021).

Coordinated cooperation between the private and public sectors is needed, with government support in the form of subsidies and tax incentives. In the longer term, the focus should be on rebuilding the destination, identifying renewed market needs and opportunities, and opening up untapped opportunities and market niches that have emerged in the aftermath of the crisis. It is also necessary to build on the lessons learned during the crisis and ensure that local tourism professionals are equipped with the requisite knowledge to better respond to a new crisis (COMCEC, 2017).

The crisis may even be helpful in encouraging destination management and service providers to improve in order to be better prepared to face future challenges (Buhalis & Costa, 2006). McKercher and Chon (2004) pointed out that effective protection also requires international cooperation and networking.

Current research focuses on the COVID-19 pandemic and its effects on tourism, more specifically on tourism attraction sites. However, tourism was affected by

more than one type of crisis at this time. Shortly after COVID-19, the tourism industry was hit hard by the Russia-Ukraine war (2022), which radically changed European tourism. Millions of Russian and Ukrainian tourists stayed at home, causing a serious demand crisis in some countries (e.g. Italy, Cyprus, and even Hungary). Rising energy prices also negatively impacted tourism in European countries. In addition, the refugee crisis deterred many tourists from vacationing in southern Italy or Spain (Muradzada & Aliyex, 2023).

3. DATA AND METHODS

The research question is the following: How did the crisis management of the operators of tourist attractions evolve before and during the coronavirus epidemic?

The research sub-questions are:

Q1: What was the last event that led tourism operators to perceive a crisis situation before the coronavirus outbreak? What measures were taken at that time to avoid further crises? What lessons were learned after the crisis?

Q2: What were the main risks to the operation of domestic tourist attractions before the outbreak of the coronavirus?

Q3: What level of crisis readiness was there at the surveyed enterprises before the outbreak of the coronavirus pandemic? Had emergency planning been carried out?

Q4: What colleagues were commissioned to solve problems related to the coronavirus epidemic at domestic tourist attraction operators? What positions did the crisis team consist of?

Q5: What priorities were set by operators of domestic attractions during the coronavirus outbreak?

Q6: What specific crisis management measures were taken in the organisations surveyed?

Our primary research, conducted in March-May 2021, is based on structured interviews with managers of organisations operating in the tourism sector in Hungary. Within the framework of our qualitative research, we interviewed 87 business managers from different areas of the country either in person or online. The organisations included in our study were selected using a snowball method following expert recommendation. The essence of the snowball method is that we initially visit a few members of the target population, and after that we recruit more and more people through the participants interviewed.

In addition, since Hungary's attractions are significant both in terms of natural and manufactured, we involved service providers from both dimensions. Based on Michalkó (2016), who grouped the sights in his study and formulated different attraction types according to the field of activity, our goal was to include all attraction types listed in Table 1 and Table 2. Finally, 25 natural and 62 manufactured attractions were selected (Tables 1 and 2).

Table 1. Number of interviews with managers of natural attraction sites

Type of natural attraction	Number of interviews (pcs)
Flora and fauna	7
Waters	6
Volcanism	3
Astronomical phenomena	3
Climatic and weather phenomena	2
Topography	2
Scenic beauty	1
Soil conditions	1
In total	25

Source: Author's research, 2021

Table 2. Number of interviews with managers of built tourist attraction sites

Type of built attraction	Number of interviews (pcs)
Gastronomy	8
Medical treatment	8
Cultural traditions	6
Historical buildings	5
Living spaces resulting from the social work sharing	5
Special collections	5
Stations in the lives of famous people	4
Worlds of production and work	4
Unique works of architecture	4
Shadow site	3
Services and sites for physical activity	3
Sites of historical events	2
Specific forms and spaces of human coexistence	2
Spiritual sphere	1
"The best of all"	1
Public artworks	1
In total	62

Source: Author's research, 2021

4. RESULTS

The majority of the interviewees in our empirical research of Hungarian attractions service providers were managers (45), but a large number of top managers (35) were also represented. In addition, five owners and one mayor took part in the research, while the position of one interviewee was not known.

The majority of interviewees (30) have been working in the same company or organisation for 10-20 years. The period the interviewees are in a given position shows a similar picture, but most of them have been working in their current position for 1-3 years (30 people), and the frequency of interviewees who have been in a position for 10-20 years (20 people) is also high.

Of the businesses and organisations included in the sample, most (25) can be considered "young", as they were founded between 2010 and 2020. A similar number of enterprises (21) were created between 2000 and 2009. In addition, a significant proportion of the sample is made up of businesses and organisations founded before 1969 (19), with a brewery, a porcelain factory and a castle having the longest history.

The majority of the organisations represented by the interviewees were small enterprises (31) in terms of the number of employees in 2019, but a large number (20) of medium-sized enterprises were also present (Table 3).

Table 3. Frequency of the average statistical headcount of the sampled organisations in 2019

Organisation size	Average statistical number of employees (persons)
Micro-enterprise (1-9 employees)	19
Small business (10-49 employees)	31
Medium enterprise (50-249 employees)	20
Large enterprise (250 employees)	10

Source: Author's research, 2021

One of the consequences of the economic downturn caused by the pandemic was the lay-off of workers. In 2020, the sample included three more micro enterprises, two small enterprises and one large enterprise less than before.

Many organisations made serious efforts to retain staff: "Of course we have been affected by the crisis, but we treat everyone like family, so we have tried to keep everyone, and we have succeeded, so the number of employees has not changed."

Nevertheless, 38 interviewees reported a decrease in the number of employees, 17 companies had a decrease of 1 to 5 employees, 9 had a decrease of 6 to 10 employees, while 12 organisations had more than 10 employees in 2020 less than in previous year. On average, the surveyed organisations laid off between 10-25% of their employees because of the epidemic situation. At the same time, there were some companies (3) that shed more than 50-60% of their workers as a result of the pandemic, with 2 cases having only 13-14% of their 2020 statistical headcount compared to 2019.

The number of employees increased for 9 organisations and stagnated for 29. Typically, the attractions that were able to increase the number of employees were those that were part of an industrial company (automotive, brewing), that also had agricultural activities (wineries) or that allowed outdoor activities during the period under review (ski resorts, arboretums).

Another possible impact of the pandemic was a drop in visitor numbers. Table 4 shows that in 2020, compared to a year earlier, attractions with lower visitor numbers increased in popularity, while attractions with more than 100,000 visitors decreased in traffic. In 2020, only four of the attractions surveyed (three spas and one cathedral) attracted more than 500,000 visitors.

Almost all of the businesses represented by the interviewees are active in several areas. In addition to tourism, 53 are involved in education, 48 in nature conservation and 39 in heritage protection. In addition, gastronomy (8), sport and recreation (5), accommodation services (5), event organisation (6), agriculture (2) and industrial production (4) were among the activities reported.

The majority of the organisations in the sample are privately (32) or publicly (22) owned, 16 are owned by municipalities, 4 by churches, 2 by foundations and the same number for university-run institutions. One of the attractions surveyed is owned by an association, while 8 organisations have mixed ownership.

The operation of institutions shows a similar picture, but the number of institutions run by for-profit enterprises is higher (40). Of the institutions represented by the interviewees, 19 are run by municipalities, 18 by the state, 3 by churches, 1 by a university, 2 by foundations, and 3 by mixed management.

Of the institutions represented at interview, 36 are part of a network, typically cultural, academic or nature conservation. The surveyed attractions are mainly part of networks operating in Hungary, while 6 enterprises operate in an international system and have international connections.

Interviewees were asked to name one case each in which slow and rapid change had taken place in their organisation prior to the coronavirus outbreak, and to formulate the lessons learned in relation to the speed of change.

The slow changes were mostly related to changes in the pricing and sales system, the organisational structure, and the support and tendering systems. For wineries, slow change is almost the only characteristic of the nature of their business: "For example, if I want to plant Cadarca somewhere, it will be wine in 5 years."

Rapid changes are typically caused by a sudden event, such as a rule change due to an accident (building a new slide) or a change of location. This could be the replacement of a supplier or maintenance company or organisational improvements to improve the quality of products or services. Interviewees also included the dismissal or recruitment of staff.

Almost half of the organisations considered that there had been no major change in their operations, attributing that to the right structure of the organisation or brand, continuous monitoring of the market, and their ability to solve problems.

The key lessons learned from interviewees include that a company needs to be adaptable, flexible, and innovative. It must be alerted to change and find solutions to problems. "It is worthwhile developing a plan for as many possible situations as possible, as early as possible, so that when you have to act, you can react as quickly as possible to changing circumstances." It is also important to monitor and respond to changes in guest needs and to focus on marketing.

We considered it important to learn about the last crisis in the businesses represented by the interviewees before the coronavirus outbreak, to examine the measures taken then, and to learn lessons to avoid further crises. Almost half of the organisations surveyed reported that they had not experienced any previous crisis. The events that were identified as crises, the actions taken, and lessons learned by the other interviewees are summarised in Table 4.

Table 4. Events experienced as the last crisis before the outbreak of the coronavirus, actions taken and lessons learned

Events	Actions	Lessons
Natural disasters (hailstorms, climate change, forest fires)	• taking out insurance • improving farming	• concentration of plantations is necessary • measures to improve the ecological status of grassland habitats

Economic crisis (2008)	• loan rescheduling • competition among suppliers • cost cutting to achieve • branding • strengthen reliability in communication, new communication strategy, stronger communication	• it is worth taking out a fixed-rate loan based on the Hungarian Forint • "Stretch until the ceiling is reached, i.e., invest in something with high equity and little external funding or where the funding is subsidised and not a repayable loan (e.g., EU tenders)." • it is not necessary to respond to the economic crisis by raising prices, as this is when solvent demand falls • financial stability, building up reserves
Investment crisis	• a reduction or delay in the amount of aid • extended closure due to investments	• better and more effective communication with the contractor
Changes in leisure habits and supply side	"Our main target segment is families, for whom there are now more and more free family festivals, venues and programmes. With parking fees, admission tickets and a restaurant on the Skanzen [open air museum] grounds, the average family can spend more than 10,000 forints on a visit. It's hard to compete with, say, a free family festival in the Városliget [city park]..."	

Source: Author's research, 2021

Our research focused on the three main risks that interviewees anticipated for their business operations prior to the outbreak of the coronavirus (Table 5).

Table 5. Three main risks faced by the businesses represented by the interviewees prior to the coronavirus outbreak

	Highest risk	Second highest risk	Third highest risk
Markets	16 (demand), 2 (supply)	11 (demand), 9 (supply)	5 (demand), 6 (supply)
Weather	12	4	1
Labour shortages	15	13	5
Financial	9	12	8
Technical	9	5	3
Economic	6	3	8
Security	2	3	-
Health	4	2	-
Organisational	1	2	2
Legal	-	1	4
Political	1	1	1

Source: Author's research, 2021

For the sampled businesses, the biggest risks are clearly the lack, retention and finding of suitably qualified staff, and market risks (fall in demand), yet only 26 organisations provided a written risk analysis. Natural and gastronomic attractions (e.g., wineries) highlighted weather as a primary risk to be taken into account when developing their strategy. According to respondents, the second most important risk is also related to the market and labour shortages, and financial risks were also highlighted. The latter mainly refers to the lack of financial stability, while the market risks are more strongly linked to the demand side (the ability of the attraction to meet consumer expectations, i.e. is the supply sufficiently diverse? And does it meet modern technological conditions?) and the perceived threat from the supply side, i.e. from competitors. The third biggest risk identified by businesses is in market, financial and economic conditions (the possibility of obtaining subsidies, tenders, current economic trends). Before the pandemic, only 6 enterprises identified a health risk and these organisations addressed this threat mainly by promoting the health of their employees and visitors.

A contingency plan would have been of significant help to businesses during a pandemic, so we also asked whether the sampled organisations had a contingency plan in place before the outbreak of the coronavirus, and whether they had any contingency planning in place. The vast majority of organisations did not have a contingency plan in place prior to the outbreak of the coronavirus epidemic. Some did not have a crisis plan due to their specific situation (agricultural organisation, small organisation) or did not feel the need to have one, but after the outbreak of the coronavirus they considered appropriate to have one. "We did not have a contingency plan before the outbreak, but we had one in place for the second wave."

Only 10 respondents reported having a comprehensive crisis plan in place, many of them as a result of an earlier crisis: "We learned in 2008." Several organisations had plans in place in case of an event: "We have contingency planning in place if a big storm comes and we have to evacuate the area and people, or if there is an accident."

There were some organisations without a crisis plan, but whose business plans, strategies and marketing plans included sections on emergency management. "The business plan always takes into account the potential impact of emergencies."

One respondent explained the lack of a crisis plan as a result of resilience: "There is no plan, but we are constantly training ourselves to react quickly to any change/crisis."

Companies with a contingency plan mostly anticipated uncertain economic situations (e.g. learning from the 2008 crisis), natural emergencies (e.g. storms) or dealing with accidents. It can be said that emergency planning was mostly carried out by organisations that had also carried out a risk analysis.

In addition, 58 respondents felt that their organisation adapts more easily to change and is more responsive than 5 years ago. For 17, there has been no change, while 3 have been slower.

Part of crisis management envisages when a crisis occurs, staff are assigned to solve problems. In the case of the coronavirus outbreak, 13 organisations (mainly built attractions) did not have a designated crisis manager or team, while the others had the following in charge of crisis management:

- an operational team consisting of: general managers, senior managers, marketing managers, technical managers, financial, communication and HR staff; in the case of municipal operations, the mayor, the notary, and the head of the finance department (40): 'task force team, whose task was to define the operational processes that changed during the crisis, to develop new operational standards and communicate them.'
- for smaller organisations, everyone was involved in crisis management (12);
- one staff member per division/department (6);
- specific colleague (4);
- specific department (3);
- owner (2).

Our research also included an examination of the priorities that organisations set during the coronavirus outbreak. It can be said that the most important objective was to retain the workforce (65 mentions) and related aspects (e.g. maintaining wage levels, health and safety of workers, 12 mentions). "Not having to make anybody redundant, because the team that has been built up over time is very valuable."

In many organisations employees have special skills, which is why retaining them was a priority: "We have specialists here and if we get rid of them because of the coronavirus epidemic, we may not be able to rehire them once the epidemic is over."

However, it is important to highlight that for several respondents it was also important to maintain a sense of belonging and team spirit. Several respondents noted the need to keep the team together even at the cost of reducing wages. "The community was very cohesive because in the second wave, all of the workers

gave up a certain percentage of their wages so that no one would have to be laid off."

In addition, priority was given to creating the conditions for financial (37 mentions) and technical operations (35 mentions). "Perhaps the most important thing is to maintain operations, which without financial stability and manpower will be unfeasible in the future." There were also some other aspects to which the operators of attractions had to pay attention, such as maintaining constant communication, a constant presence for guests (12 mentions), restructuring work (9 mentions), implementing the planned improvements (for online sales) (1 mention).

A number of specific crisis management measures were taken in the organisations examined. Most frequently mentioned were the use of public wage subsidies (38 mentions) and working from home (52 mentions). In addition, several companies highlighted crisis communication (40 mentions), not only offering their services but also sending messages to visitors: "We used social media to communicate, recalling historical examples that are similar to the current crisis situation. Our aim was to highlight the importance of hope and solidarity." Two other measures worth mentioning are the creation of an online webshop (13 mentions) and the reorganisation of work (19 mentions).

The interviewees' views on the question of having enough reserves to "stay alive" varied widely. There were 32 responses to this question, with 12 organisations reporting only 1-3 months of reserves, and 8 organisations reporting 4-6 months. Only 9 companies in the sample had sufficient reserves for at least one year. This suggests that few organisations paid attention to building up reserves in the period before the crisis.

The final question in the interview was how the organisations surveyed prepared for reopening (Table 6).

Responses to the question of preparing for the reopening ranged widely. Most respondents planned to expand the range and strengthen marketing, while maintenance and technological development were also important tasks to prepare for the future. "We have tried to use the time to improve the institution technically, preparing for future hybrid events." The outbreak highlighted some of the changes that are necessary: "The situation created by the coronavirus outbreak highlighted some of the things we need to think about, such as the expansion and reconfiguration of the indoor facilities. We think that after the epidemic, guests will not like small spaces where many people are crowded together, so we need to make changes in this area."

Table 6. Frequency of re-opening activities

Expanding the offer	36
Strengthening marketing	21
Maintenance	12
Technological development	10
Purchase/relocation of hygiene equipment	9
Recruitment of staff	9
Specific planning (preparation of camps, events, opening hours)	8
Renovation	7
Training	5
Gardening	3
Building relationships with service providers	2
Strengthening online sales	2
Developing a pricing strategy	2
Restructuring the organisation	2
Looking for a support scheme	2
Cleaning up	2
Minimising costs	1
Finding a new target group	1
Monitoring provisions	1
Stocking up on supplies	1

Source: Author's research, 2021

This approach was also adopted by many businesses which actively spent the "down" time preparing to offer their guests a unique and memorable experience when they reopened. In addition, several highlighted that they had started recruiting staff in May so that they could concentrate fully on their guests when they reopened. Another common point was that the organisations were engaged in intensive online marketing activities during the pandemic, which they were keen to maintain in the future. A key element of this will be uniqueness: "There will be plenty of hunters and few seals, everyone will be hunting for the adventurous travellers." Broadening the target audience was also part of future plans, "We have not taken anyone under 12 so far for the safety reasons, but now we are trying to come up with something for that, which would be good for younger children."

5. DISCUSSIONS

Health risks can endanger the safety and security of tourists (Jonas, Mansfeld, Paz, & Potasman, 2011), and worldwide pandemics like COVID-19 pose a significant threat in particular. Several articles, mainly related to accommodations

and restaurants, have dealt with the crisis management of the pandemic, but to the best of our knowledge, no research has been conducted to examine the readiness and reaction of tourist attraction sites to the crisis. This area can be said to be critical since the main motivations for trips are usually attractions. In addition, while many restrictions were introduced for accommodation and catering establishments worldwide during the pandemic, fewer mandatory restrictions were imposed on attractions, so several factors could be decided at their discretion (opening hours, number of visitors, mask-wearing rules, etc.). To fill that knowledge gap and to provide academic and managerial implications, the present study has aimed to explore the crisis management measures of managers of tourist attraction sites before and during the coronavirus pandemic.

The previous crisis management experiences the attraction site operators concerned have had and the lessons they have learned from them are decisive in crisis management (Q1). Dealing with the crisis was made more difficult by the fact that half of the interviewees reported that they had no experience in dealing with crises, while the others mainly reported experience of natural damage, the economic crisis (2008-2009), and changes in the consumer habits of tourists. The main consequence of previous crises was that it is worth creating a crisis management plan, which prepares the organisation for different scenarios and when a crisis occurs, it must be handled in a flexible and innovative way and as rapidly as possible, in addition to continuously monitoring the expectations of tourists.

Part of the crisis management plan to be prepared is the management of risks, for which we asked the interviewed managers to identify the three main risks prior to the coronavirus outbreak (Q2). For the respondents, the biggest risks were changing markets, labour shortages, and financial risks, but technical, economic risks and the weather were also mentioned in several cases. Service providers listed a wide range of risks, suggesting that although nearly half of those surveyed had not experienced a crisis before the outbreak of COVID-19. They had a rational view of their economic role and understood the threats to their day-to-day operations. However, it can also be concluded that before COVID-19, service providers were generally not concerned with health risks.

Preparedness of a tourism enterprise for a crisis is helped by the existence of a crisis management plan, the existence of which was also examined (Q3). Only 10 respondents reported the existence of one; several had prepared one as a consequence of the effects of a previous crisis. Some businesses had a chapter on emergency planning in their business plans. Crisis management plans can be of different types. Depending on the type of crisis, it is advisable to prepare

a passive, negative, defensive, or proactive strategy (Mikusová & Horváthová, 2019). The plan should prepare the organisation for a possible crisis by drawing on experience and recommendations, for example by preparing appropriate scenarios, setting up appropriate organisational structures, and offering specific training.

The COVID-19 outbreak caught service providers unprepared. They could not imagine what consequences it would have. Many had not prepared a crisis plan, because of the size of their business. This was a mistake, as it is often micro-enterprises that provide the livelihoods of entire families as the only source of income.

The reaction phase meant taking immediate and in some cases short-term, decisions which were impossible to prepare for in advance in the case of COVID-19. Even though measures taken in China in January-February 2020 were followed by businesses, it was not foreseeable what measures would be taken at the European, national, and local government level, nor could anyone have expected the complete closure of some service units.

In the case of crises, it is important to set up a crisis management team immediately, and part of our research investigated which positions made up the members of such a team (Q4). Only 13 investigated organisations failed to create a crisis management team, the others mainly delegated the top management (general managers) and senior managers (marketing, technical, financial, communication, and HR managers) to this.

The priorities determined during crisis management (Q5) determine the necessary steps (Q6), so the examination of these was also part of our research. The job of the crisis team was to manage the situation as best as possible in the event of an outbreak. Using the appropriate scenarios, in cooperation with the competent authorities, they ensured that the spread of the virus was prevented in the tourism service provider (e.g. medical examinations, clearing infected areas, possibly quarantine). In other words, we can say that the job of the crisis team is primarily to maintain contact with national organisations and local stakeholders, follow mandatory regulations, and adapt them to their organisation.

It is also important to inform employees and maintain employee morale. At the same time, the proper functioning of the business has to be ensured - if regulations allow it. Cooperation, such as liaison between the individual tourism service providers and tourism stakeholders, also has to be maintained (cf. Jamal & Budke, 2020).

Many organisations made the greatest effort to retain their workforce. Despite this, the number of employees decreased with most service providers. Most frequently mentioned crisis management measures were working from home and the use of public wage subsidies. Crisis management plans include a communication strategy that considers resources and identifies spokespersons in the event of a crisis (Mazilu, Marinescu, Bălă, & Dragomir, 2019).

Communication also underwent significant change. The messages of businesses were formulated along the lines of hope and solidarity. Additional measures included the creation of online webshops and the reorganisation of work.

6. CONCLUSIONS

Tourism is a fragile industry that is often and severely affected by crises. Businesses must therefore become resilient, as they have no prior cognisance of the timing, type and severity of crises. In the crisis management literature, current models tend to suggest the same approach, often ignoring the fact that the duration, scale, and impact of crises can vary greatly (Speakman & Sharpley, 2012).

Crises can be examined in a broader context as many crises negatively affect tourism. Yet the sector never before experienced a crisis as large as COVID-19. Before this national economic crises, natural disasters were limited to one destination, or slowly evolving demand changes made the activities of service providers difficult. Of these, we only examined the COVID-19 crisis in detail, but even with its passing, many new crises have arisen (e.g. problems caused by the Russia-Ukraine war).

The academic literature has extensively studied the effects of natural and environmental disasters and even viruses (such as SARS and Ebola) on the tourism industry. However, the impact of the management of the COVID-19 health crisis on the attraction site sector is unprecedented. Although we can glean lessons from the past, COVID-19 is significantly larger in size and scope than previous epidemics (Zheng, Luo, & Ritchie, 2021). It is unique in that we have not faced a similar type of global pandemic since the 1918–1919 Spanish Flu epidemic (Pan, Shu, Kitterlin-Lynch, & Beckman, 2021). Closed borders, bans on public gatherings, closed attraction sites, and mobility restrictions across countries dramatically affected both domestic and international travel.

The restoration phase aims to restore the image of the tourism service provider once the immediate threat has passed and encourage travellers to travel and visit the service again. The recovery phase aims to restore the image of the tourism

service provider once the crises has ended, emphasise the end of the emergency, and stress safety. The consequences of the examined crisis are expected to lead to a reorientation of attraction site service providers. As a result, changes in the preparation for and handling of crises are expected in the future. To this end, our research shows that the main areas for improvement are cooperation with other organisations, the provision of resources in case of emergencies, and the preparation of contingency plans. The search for new ways and solutions is essential and, based on the guest feedback collected on an ongoing or annual basis, most of the organisations surveyed suggest holding regular meetings to discuss the introduction of new products and services.

The COVID-19 crisis for Hungarian tourism operators was twofold: It was both a health crisis and an economic crisis, so any action taken had to take into account the relationship between the planned action or the action taken and the epidemiological and economic crisis. At the same time, a third aspect had to be kept under constant review: the long-term objectives of the undertaking. Short-term measures taken may mean that businesses that survived the crisis would not be able to recover after the crisis, for example because they did not have the right number of skilled staff. On the labour side, the disenchantment with tourism was also a major challenge. Many workers moved to other industries since the spring of 2020 and do not want to return to a sector that showed such vulnerability.

While some crises are beyond the control of management, organisations are often judged on their emergency response and reaction to such crises (Remondino, Penco, & Profumo, 2019). As the majority of operators lack knowledge and experience in crisis management, the Tourism Destination Management Organisations are encouraged to organise training and exchange of experience for tourism operators in the regions. According to the interviewees, the high level of employee engagement, the preservation of organisational identity and the availability of leadership competences to deal with crisis situations in the organisations surveyed are a strong basis for resilient organisations.

To avoid disincentives, crisis management should be seen as a process, i.e. constantly monitoring the signs. This requires building industry relationships, analysing trends and thinking in scenarios. A good way to monitor the noise would be to ask customers at the beginning of the service provision whether they are worried or unsure about anything. Building on this, service providers could focus and communicate better.

Furthermore, with the increasing flow of information and the improvement of people's safety awareness, health risks have become a significant concern for tourists, and risk perceptions would affect their travel decisions (Page, 2009). An

up-to-date market segmentation is needed (risk-averse people cannot be relied upon, a target group may be excluded due to restrictions), therefore segmentation needs to be reinterpreted in the dimensions "solvent" and "decision competent".

The majority of tourism service providers surveyed recognised the need for crisis management planning, and a recovery plan should also be considered. This should include an assessment of the damage to machinery and equipment caused by the outage, and measures, services and recertification to regain visitor confidence.

An effective promotion of the recovery is essential (new certification or a new product would make things easier, but it is also necessary to communicate when the attractions are open regarding who can enter, updating the information). The key players in the recovery cooperation are the local partners, especially the Tourinform office and the accommodation providers, who the operators of the attractions should inform about opening hours and the conditions of entry. Staff management also has an important role to play and motivation, training, and quality assurance are essential in this situation.

From our perspective, this study has made important contributions to the literature on crisis management of attraction sites, but we have to recognise some limitations.

One of the limitations of the research is the relatively small number and heterogeneous composition of the businesses surveyed. Therefore, even though it is possible to make generalisations for the sector as a whole, especially when using other sources, these findings are not necessarily true for every tourism business. The other limitation of the research is the constantly changing circumstances and sometimes random, trial-and-error reactions to them. Another limiting factor was that only Hungarian attraction sites were examined.

As a continuation of the qualitative research, it is necessary to extend the research to more attraction sites and countries and a longitudinal study would be worthwhile to see how managers' opinions change after a few years.

Conflict of interests

The authors declare there is no conflict of interest.

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КРИЗНИ МЕНАЏМЕНТ МАЂАРСКИХ ТУРИСТИЧКИХ АТРАКЦИЈА ПРИЈЕ И ТОКОМ КРИЗЕ ИЗАЗВАНЕ ВИРУСОМ КОРОНА

1 Кристина Келер, Институт за одрживи развој, Универзитет Корвин у Будимпешти, Будимпешта, Мађарска
2 Николета Косаш, Универзитетски центар за циркуларну економију, Панонски универзитет, Нагканижа, Мађарска
3 Сабољч Матјаш, Правни факултет, Универзитет јавних служби Лудовика, Будимпешта, Мађарска

САЖЕТАК

Циљ студије јесте да се испита како се кризни менаџмент на туристичким атракцијама развијао прије и током епидемије изазване вирусом корона. Обављено је 87 дубинских интервјуа са менаџерима надлежним за кризни менаџмент на туристичким атракцијама, при чему су испитане: фаза припреме и реаговања у вези са перцепцијом кризе, успостављање кризног плана и кризног тима, дефинисање приоритета и мјера током пандемије изазване вирусом корона, као и поуке. Резултати су показали да већина није имала ни план управљања кризом, нити искуство стечено у претходним кризама. Већина предузећа је формирала тим за управљање пословањем који чине менаџери, који су потом као приоритет одредили задржавање радне снаге. Кораци који су предузети углавном су се односили на рад од куће и коришћење јавних субвенција за плате, као и на преиспитивање комуникације.

Кључне ријечи: *туризам, туристичка атракција, КОВИД 19, кризни менаџмент, перцепција ризика.*

THE IMPACT OF FINANCIAL DEVELOPMENT ON RENEWABLE ENERGY CONSUMPTION IN KENYA

1 Mercy. T. Musakwa, Department of Economics, University of South Africa, UNISA, Pretoria, South Africa
2 Nomfundo Vacu, Department of Economics, University of South Africa, UNISA, Pretoria, South Africa
3 Nicholas M. Odhiambo, Department of Economics, University of South Africa, UNISA, Pretoria, South Africa
*Corresponding author's e-mail: tsile.musa@gmail.com
1 ORCID ID: 0000-0001-6280-140X
2 ORCID ID: 0000-0003-4518-7764
3 ORCID ID: 0000-0003-4988-0259

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ABSTRACT

Purpose: Increasing awareness of global warming consequences, together with the call for all countries to take responsibility for reducing their carbon footprint by moving to cleaner energy use motivated this study to examine the impact of financial sector development on renewable energy for Kenya. The study aims to answer the question, 'Can financial sector development help Kenya to increase renewable energy consumption?' The study used annual data from 1990 to 2020 to examine the nature of the relationship between the two variables. Methodology: The study employed autoregressive distributed lag (ARDL) approach. Results: The study found financial development to have a positive impact on renewable energy consumption in the short and long run. Conclusions: The results point to the significant role that the financial sector plays in availing resources for cleaner energy projects. Recommendations: Policymakers in Kenya should harness the country's financial sector potential to meet the Sustainable Development Goals aligned to cleaner energy consumption.

1. INTRODUCTION

The role of the financial sector in economic development has attracted the attention of many researchers. The sector plays an important role in financial intermediation from both bank-based and market-based financial development.

It acts as an intermediator between surplus units - those who want to save and deficit units - those who want to borrow (Mohr & Associates, 2015). From this background, the more efficiently the financial system can avail funds to investors and encourage savings, the higher the investment and hence economic growth are. Thus, savings are an important ingredient to economic growth, although external sources of funding like foreign direct investment are now used to augment domestic savings. Concerns about global warming are also encapsulated in the Sustainable Development Goals (SDGs). This has resulted in a wave of businesses, governments, and households investing in renewable energy.

The relationship between financial development and energy consumption depends on the proxy used to measure financial development and energy consumption and the country studied. For example, findings from a study by Saygin & Iskenderoğlu (2022) confirm that in emerging countries stock market variables and some of the banking variables have no influence on energy consumption when total final renewable energy consumption is used. Only private credit by deposit money banks to GDP (%) has a positive effect. On the other hand, when renewable energy consumption in terajoule is used as a proxy for energy consumption, only stock market capitalisation to GDP (%) leads to an increase in energy consumption, the rest of the variables have no effect. A similar finding is also confirmed in Chang (2015).

The Kenya Blueprint - Vision 2030 aims to transform the economy into a newly industrialised middle-income country (Government of the Republic of Kenya, 2007). The vision is based on three pillars, namely, economic, social and political. The economic pillar in Vision 2030 aims to facilitate economic development targeting an average growth rate of 10%. (Government of the Republic of Kenya, 2007). The social pillar aims to build a cohesive and just society where social equity is a priority as well as clean environment, and the political pillar aims to build a political system anchored on a democratic system that protects the rights and freedom of every individual. The economic pillar supports steady economic growth that is commensurate with other support functions from the economy. Rapid economic growth is also associated with high demand for energy consumption. For Kenya, given the social pillar thrust, renewable energy is preferable. The big question is how to achieve an increase in renewable energy consumption among competing government obligations.

Several studies have been done exploring the impact of various macroeconomic variables on economic growth, such as remittances, financial development, and urbanisation. This is based on the developmental goals and visions that regard economic growth as a springboard for other developmental goals, including the

source of finance. In recent times, there has been a rising interest in the link between finance and energy consumption. The main aim of this study, therefore, is to relook at the impact of finance on renewable energy demand in Kenya. This study is important in informing policy on the role the financial sector can play in boosting not only energy consumption capacity, but also the quality of energy used, as the country focuses on clean energy.

Studies that have focused on the impact of financial development on energy consumption have found inconclusive results. However, the scale has been tilted to a positive impact of finance on energy consumption (see: Prempeh, 2023; Ibrahim, Bukonla & Jamiu, 2021; Chiu and Lee, 2020, Gaies et al., 2019; Chang, 2015; Islam et al., 2013). The inconclusive results in the extant literature make the generalisation of the link between finance and energy demand across domains inappropriate, especially now that loud calls are being made to reduce carbon emissions and foster responsible development. This study will depart from other studies by using the financial development index from the IMF to investigate the nexus between finance and renewable energy consumption in Kenya. The use of the financial index centres on the argument for the best financial development measure between bank-based and financial-based measures. The financial development index is a composite measure of bank-based financial indices and market-based financial indices. This provides a comprehensive measure of financial development that captures the two aspects. Further, the study uses renewable energy consumption as a measure of energy consumption in Kenya. It is hoped that the results will give an unbiased result on the nexus between finance and renewable energy consumption. The ARDL approach has been used in this study to analyse the impact of finance on renewable energy consumption owing to the several advantages that it has over other estimation techniques.

Kenya was selected as a study country because it has made strides in financial liberation and has also taken steps to expand renewable energy consumption. In addition, given that the country is a signatory to the Sustainable Development Goals (SDGs), where environmental sustainability is one of the key deliverables, this study provides insight into the role the financial sector can play in the drive.

The rest of the paper is organised as follows: Section 2 discusses the literature review, and Section 3 outlines estimation techniques. Section 4 dwells on data analysis and discussion of results, while section 5 concludes the study.

2. LITERATURE REVIEW

2.1 Financial development and energy consumption dynamics in Kenya

Financial development

The Kenyan financial system is fairly developed in comparison to other SSA countries (UNESCO, 1997). Kenya has experienced growth in commercial and non-commercial institutions and has witnessed an expansion in the services offered.

Several factors in the 1980s and 1990s ushered in the urgent need for financial reforms. Some of the factors that weakened the financial sector resulting in a less important role in economic development were loss of control of the money supply by the central bank, non-compliance by the financial institution to regulatory requirements, lack of authority by the central bank to carry out monetary policy, accommodation of the government that was experiencing chronic fiscal deficits and lack of a level playing field in the financial sector. These were some of the factors that lead to financial reforms and financial liberalisation (UNESCO, 1997). The reforms were important to strengthen the financial system, provide a strong legal and regulatory framework, build capacity within the central bank to implement monetary policy and carry out bank oversight (UNESCO, 1997). It is against these structural and institutional deficiencies that financial sector reforms were implemented in the mid-1980s. The reforms aimed to promote an efficient, market-oriented financial system, improve financial intermediation, avail suitable monetary policy instruments, relax control over interest rates, and strengthen the framework for the supervision of financial institutions. There was a revamp of the legal and regulatory framework to support the new reforms. Reforms in the legal and regulatory framework included amendments to the Capital Bank of Kenya Act, the Capital Market Authority Act, and the Banking Act. The revised Banking Act of 1991 strengthened the ability of the central bank to oversight on commercial banks and imposition of penalties in cases of non-compliance. In the capital markets, the amendment of the Capital Markets Authority Act saw the creation of a broad-based Board of Capital Markets, which reflected the composition of the actors in the market (UNESCO, 1997). There was also the removal of Capital Markets Committees' role in regulating shares, the removal of double taxation, and the abolition of stamp duties on retail share transactions. Institutional reforms included the removal of fragmentation of financial institutions by requesting non-bank institutions to move to commercial bank space or merge with other commercial banks (UNESCO, 1997). The entry into the financial sector was made strict and a higher minimum requirement to

open a commercial bank. The trends in the financial sector captured by Financial Institution Index, Financial Market Index, and Financial Development Index are presented in Figure 1.

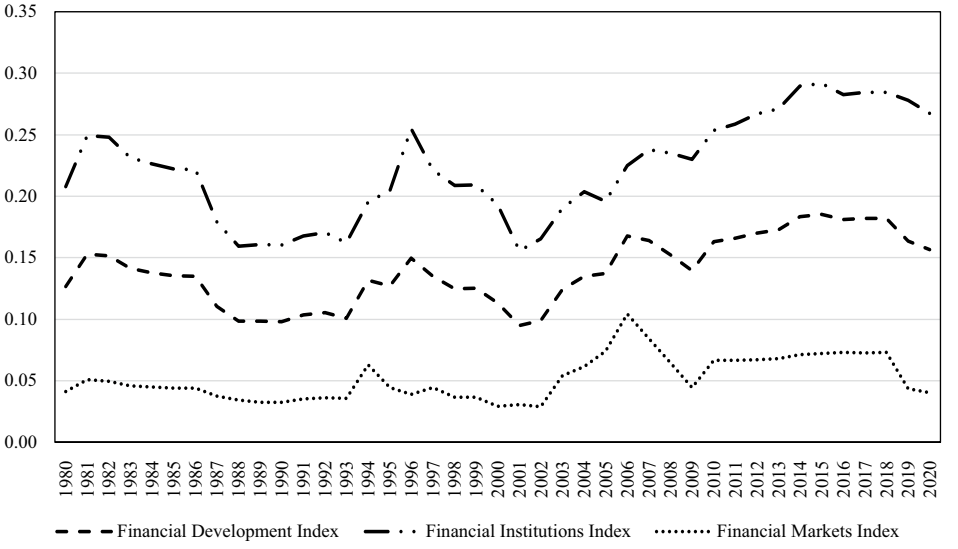


Figure 1: Trends in financial development 1980 -2020
Source: IMF, 2023.

Figure 1 reports the trends in financial development in Kenya during the study period (IMF, 2023). The Financial Development Index mimics the trends in the Financial Institution Index (bank-based measure) and the Financial Market Index (market-based measure) during the study period (IMF, 2023).

It is not surprising that the Financial Development Index mimics the movements in the Financial Institution and Financial Market indices since it is made up of a summation of the two indices. Although the three variables trended together, the Financial Market Index remained low and never broke the 0.12 mark (IMF, 2023). This points to the smaller role that the market-based financial sector has in financial development in Kenya. This is the opposite from the bank-based measures, where the indices remain above the financial development index (IMF, 2023).

Energy consumption developments

The National Energy Policy guides energy-related matters in Kenya, and this is a successor policy from the energy sector concessional Paper No 4 of 2004 (Ministry of Energy, 2018). The National Energy Policy was a culmination of

major changes in policy driven by the Vision 2030 blueprint. The discovery of oil and coal also added to the benefits of a policy that ensures there is a legal, institutional and regulatory framework (Ministry of Energy, 2018). The policy makers in Kenya also recognise several challenges associated with availing clean energy to Kenyans and meeting the targets set in Vision 2030 (Ministry of Energy, 2018). The main objectives of the energy policy are to use energy to accelerate economic development; promote energy efficiency and conservation; promote capacity building in the sector through research, training and development; promote diversification of energy supply sources to build capacity; promote indigenous primary sources of energy; improve access to affordable, competitive and reliable energy services (Ministry of Energy, 2018). Some of the challenges highlighted include reliable quality supply, high capital outlay, high cost of energy, and low levels of industrialisation and competitiveness, among other challenges. The thrust of the policy rests on enhancing power generation capacity and diversification of the energy mix (Ministry of Energy, 2018). The National Energy Policy comprehensively covers all energy sources on how the country can harness them with minimum negative effects on the environment and at affordable prices, such that the poor categories of the population are able to afford them. The responsibility for protecting the environment and developing a sustainable system through the safety of dams, hydraulic engineering, public investment, and energy policy. The country's government is responsible for country planning and the development of gas and electricity infrastructure, and aligning the energy sector regulatory, policy and legal framework with the constitution. Apart from the National Energy Policy, the energy sector is governed by the Energy Act No 12 of 2006, the Geothermal Resources Act No 12 of 1982 and the Feed in Tariff Policy of 2008 (Ministry of Energy, 2018). There are several stakeholder institutions responsible for energy, for example, the Ministry of Energy and Petroleum, Energy Tribunal, Kenya Power and Lighting Company Limited, Rural Electrification Authority, Kenya Electricity Transmission Company Limited, and Independent Power Producers, among other supporting instruments (Ministry of Energy, 2018).

Kenya has made progress in the electrification of both rural and urban areas, with 71.44% of the population having access to electricity in 2020 (Our World in Data (2023). This contrasts with 10.9% in 1990, according to Our World in Data (2023). The same development was reported on the proportion of the population with access to clean fuel for cooking. Steady growth was experienced from 1990 to 2020, recording an average of 31.59% (Our World in Data, 2023). Kenya consumes 7.86 billion kWh of electricity per year, which gives a per capita of 148kWh in 2020 (Our World in Data, 2023). Renewable energy consumption

grew steadily from 1990 to 2009 when consumption took a downward turn until 2020 (World Bank, 2023). The decline in renewable energy consumption over the years is concerning, given the drive to clean energy sources. Thus, making this study is pertinent to establish the role the financial sector can play in increasing renewable energy consumption.

2.2 Empirical Literature Review

A few studies have been conducted on the impact of financial development on energy consumption with conflicting results. This includes studies such as Sadorsky (2010), who studied the impact of financial development on energy consumption in 22 emerging economies. This was tested by applying the generalised method of estimates on panel data covering the period from 1990 to 2006. The findings showed that when stock market variables are used as a proxy, financial development has a positive impact on energy consumption. Using the Generalised methods of moments (GMM) model and banking sector development as a proxy for financial development, Brunnschweiler (2010) confirmed similar results for non-OECD developing and transition economies for the period from 1980 to 2006. Çoban and Topcu (2013) conducted a similar study for the European Union (EU) member countries over the period from 1990 to 2011. The study used banking sector development and stock market development as proxies for financial development. Using the system-GMM model, the findings confirmed that financial development has no significant effect on energy consumption in the EU. However, when the members of the EU are categorised into old and new members the findings suggest strong evidence of the positive effect of financial development on energy consumption for new members, while the effect of financial development on energy consumption in old members depends on the measure of financial development used. When banking variables are used, financial development is found to have an impact that displays an inverted U-shaped pattern.

For Malaysia, Islam et al. (2013) employed the autoregressive distributed lag (ARDL) approach to cointegration on time series data covering the period from 1971 to 2009. The findings confirmed that financial development has a positive impact on energy consumption. Corresponding results were confirmed by Komal and Abbas (2015) in the case of Pakistan. Al-mulali and Lee (2013) investigated the impact of financial development on energy consumption for the Gulf Cooperation Council using data from 1980 to 2009. The study used ordinary least squares, and a long-run positive impact was confirmed. Using the panel cointegration test, Furuoka (2015) examined the impact of financial development

and energy consumption in a panel of Asian countries. The findings confirmed that financial development has a positive impact on energy consumption. It was also found that energy consumption is a driving factor for financial development in Asia.

Using the fixed-effects linear regression model, Chang (2015) examined the impact of financial development on energy consumption in 53 countries. The study used panel data covering the period from 1999 to 2008. It was found that in the case of non-high-income countries, financial development leads to an increase in energy consumption when private and domestic credit is used as financial development indicators, while it leads to a decline when the value of traded stocks and stock market turnover is used in advanced economies. The findings also confirmed a positive effect of the value of traded stocks and stock market turnover in high-income countries of emerging markets and developing economies. A similar finding was confirmed by Ibrahim, Bukonla & Jamiu (2021) for Nigeria, using the ARDL Bounds cointegration approach on time series data covering the period from 1971 to 2014.

Kakar (2016) conducted a similar study in Pakistan and Malaysia over the period from 1980 to 2010. Using the Johansen cointegration test and vector error correction model, the study found that financial deepening improves energy use in both countries in the long run. No significant relationship was found in the short run. Anton and Nucu (2020) reported similar results for 28 European Union member countries over the period from 1990 to 2015. Eren, Taspinar and Gokmenoglu (2019) studied the impact of financial development and economic growth on renewable energy consumption in the case of India. The study employed annual time series data from 1971 to 2015. Employing dynamic ordinary least squares (DOLs) estimation, the study found financial development and economic growth to have a positive impact on energy consumption. For MENA countries, Gaies et al. (2019) also studied the impact of financial development on energy consumption using the dynamic panel GMM model on panel data covering the period from 1996 to 2014. The results confirmed that financial development has a positive impact on energy consumption. It was also confirmed that a non-linear and inverted U-shaped relationship exists between financial development and energy demand for the MENA region.

Razmi et al. (2020) examined the impact of stock market value on renewable energy consumption using ARDL in a time series covering the period from 1990 to 2014 for Iran. The study employed two measures for renewable energy consumption, that is, the consumption of hydro, solar, wind, and nuclear energies as well as that of combustible renewables and waste energies. The findings

confirmed a positive significant relationship between stock markets and energy consumption in the long run, while there is no significant relationship in the short run. Mukhtarov et al. (2020) used the VECM techniques on a time series of data covering the period from 1993 to 2014 for Kazakhstan. The findings confirmed a positive impact of financial development on energy consumption. Using the Panel smooth transition regression model, Chiu and Lee (2020) reported similar findings for 79 OECD and non-OECD countries. The findings confirmed that the banking sector development has a larger impact on energy consumption. Ciftci *et al.* (2020) found similar results for emerging markets using the Toda-Yamamoto method on time series data covering the period from 1971 to 2014. Ma and Fu (2020) carried out a similar study for 120 selected developing and developed countries. The study employed a generalised method of moments on panel data, covering the period from 1991 to 2014. The findings confirmed that financial development leads to an increase in energy consumption.

Prempeh (2023) examined the impact of financial development on renewable energy consumption in Ghana. The study applied the ARDL bounds testing approach, Gregory, Bayer-Hank, FMOLS, CCR, DOLS and VECM on time series data covering the period from 1990 to 2019. The findings confirmed a positive impact of financial development on energy consumption. Habiba and Xinbang (2023) investigated the impact of financial development on renewable energy using data from seven emerging (E7) countries. Employing the Method of Moments Quantile Regression (MMQR) the study found overall financial development, financial market-related development and financial institution-related development to have a positive impact on renewable energy. However, the effect was found to be greater with financial market-related development. In the same spirit, Sun, Zhang and Gao (2023) analysed the impact of financial development on renewable energy for 103 economies using data from the period 1991-2014. Using the dynamic panel model, the study found financial development to have a positive impact on renewable energy consumption. Financial development was found to promote renewable energy consumption more in developed economies. A summary of the empirical studies is given in Table 1.

Table 1. Literature review on the impact of financial development on energy consumption

Author and date	Country	Estimation techniques	Financial development indicators	Conclusion [The impact of financial development on energy consumption]
Sadorsky (2010)	22 Emerging countries	GMM estimation techniques	Stock market variables Banking variables Foreign direct investment	The positive effect when stock market variables are used
Brunnschweiler (2010)	Non-OECD developing and transition economies	GMM	Banking Sector variables	Positive effect
Çoban and Topcu (2013)	27 European countries	GMM	Stock market variables Banking sector variables	Positive effect for new EU member An inverted U-shaped pattern confirmed for old members when banking variables are used
Islam et al (2013)	Malaysia	ARDL bounds testing approach	Banking sector variables	Positive effect
Komal & Abbas (2015)	Pakistan	system GMM estimation technique	Banking sector variables	Positive effect
Furuoka(2015)	Asian countries	Panel cointegration test	Banking sector variables	Positive effect
Kakar (2016)	Pakistan and Malaysia	Johansen cointegration and error correction techniques	Banking Sector variables	Positive effects in the long run
Anton and Nucu (2020)	28 countries in the European Union (EU)	Fixed effects regression model	- Bank-based financial sector variables -Stock market development variables	Positive effect
Gaies et al (2019)	MENA countries	Dynamic panel GMM model	Banking Sector variables	Positive effect
Razmi et al (2020)	Iran	ARDL model	Stock market variables	Positive effect

Author and date	Country	Estimation techniques	Financial development indicators	Conclusion [The impact of financial development on energy consumption]
Chang (2015)	53 high- and non-high-income countries	Fixed-effects linear regression model; 1999 -2008	Banking Sector variables Stock market variables	Positive effect in all groups when banking sector variables are used. Negative effect in advanced economies when stock market development is used. Positive effect in emerging and developing countries when stock market development is used.
Mukhtarov et al (2020)	Kazakhstan	Johansen cointegration and error correction techniques 1993 to 2014	Banking Sector variables	Positive effect
Chiu and Lee(2020)	34 OECD countries 45 non-OECD countries	PSTR model with fixed effects; 1984 - 2015	Banking Sector variables Stock market variables	Positive effect
Durusu-Ciftci, Soytas & Nazlioglu (2020)	Emerging markets	Toda-Yamamoto method; 1971 - 2014	Banking Sector variables	Positive effect
Ibrahim, Bukonla & Jamiu (2021)	Nigeria	ARDL Bounds cointegration approach; 1971 - 2014.	Banking Sector variables	Positive effect
Prempeh (2023)	Ghana	ARDL bounds testing, Bayer-Hank, Gregory and Hansen cointegration, VECM, FMOLS, CCR and DOLS tests; 1990 - 2019.	Financial development index	Positive effect

Source: Authors' compilation

3. MATERIAL AND METHODS

This study used the ARDL approach to estimate the link between finance and renewable energy consumption. The technique was used owing to the numerous advantages that it has over other modern time-series techniques.

Variables

The key variables used in this study include financial development measured by an index from the IMF financial database and renewable energy (REW) measured as a percentage of final energy consumption. Other variables included in our model as control variables include economic growth, urbanisation and trade. The definitions of these variables and our data sources are presented in Table 2.

Table 2. Variable description and source

Variable		Definitions of variable (Measurement)	Source
Renewable energy consumption	REW	Renewable energy consumption as a share of total final energy consumption	WDI
Financial development	FDI	Financial development Index	IMF
Economic growth	ECOG	Rate of change of GDP	WDI
Urbanisation	URB	Population living in urban areas as a proportion of the population	WDI
Trade	TOP	Exports +Exports/GDP	WDI

WDI = World Bank Development Indicators of the World Bank.
IMF = International Monetary Fund Database
Source: Authors' compilation

Model Specification

The general model used in this study can be presented as follows:

$$REW = \pi_0 + \pi_1 FDIX + \pi_2 ECOG + \pi_3 URB + \pi_4 TOP + \varepsilon_t \quad \text{..... (1)}$$

Where:

REW = Energy consumption measured by renewable energy

FD = Financial sector development

ECOG - Economic growth

URB = Urbanisation

TOP - Trade openness

The ARDL-bounds model specification is given in Equation 2.

$$\Delta REW_t = \pi_0 + \sum_{i=1}^{n} \pi_{1i} \Delta REW_{t-i} + \sum_{i=0}^{n} \pi_{2i} \Delta FD_{t-i} + \sum_{i=0}^{n} \pi_{3i} \Delta URB_{t-i} + \sum_{i=0}^{n} \pi_{4i} \Delta TOP_{t-i} + \vartheta_1 REW_{t-1} + \vartheta_2 FDIX_{t-1} + \vartheta_3 URB_{t-1} + \vartheta_4 TOP_{t-1} + \eta_{1t} \quad \text{.....(2)}$$

Where:

π_0 = Constant

π_{i1}-π_{4i} = Short-run coefficients

ϑ_1-ϑ_4= Long-run coefficients

η_{1t} = Error term.

Error Correction Model Specification

In the ARDL approach, cointegration is tested on the variables in Equation 1 in order to establish whether a cointegration relationship exists between REW and its regressors. By using this approach, estimation involves a test of cointegration. Upon confirmation of cointegration, the ECM model can be specified as follows:

$$\Delta REC_t = \pi_0 + \sum_{i=1}^{n} \pi_{1i} \Delta REW_{mt-i} + \sum_{i=0}^{n} \pi_{2i} \Delta FDIX_{t-i} + \sum_{i=0}^{n} \pi_{3i} \Delta ECOG_{t-i} + \sum_{i=0}^{n} \pi_{4i} \Delta URB_{t-i} + \sum_{i=0}^{n} \pi_{5i} \Delta TOP_{t-i} + \rho_1 ECM_{t-1} + \mu_{1t} \quad \text{.....(3)}$$

Where *ECM* is the error correction term; ρ_1 is the coefficient of the *ECM*. The coefficient of the error correction term is expected to be negative and less than one (1).

4. RESULTS AND DISCUSSIONS

Unit Root Test

The results of the unit root test based on the Dickey-Fuller Generalised Least Squares (DF-GLS) test and the Phillips-Perron (PP) test are reported in Table 3.

Table 3. Unit Root Test Results

Panel 1: Dickey-Fuller Generalised Least Squares (DF-GLS)				
Variable	**Stationarity of all Variables in Levels**		**Stationarity of all Variables in First Difference**	
	Without Trend	With Trend	Without Trend	With Trend
REW	0.1481	-1.3157	-4.3998***	-5.1551***
FD	-1.2448	-1.1169	-5.3159***	-5.4109***
ECOG	-3.6226***	-3.9050***	-	-
URB	-2.0316**	-3.6358**	-	-
TOP	-0.9146	-2.5032	-5.6435***	-5.8772***
Panel 2: Phillips-Perron (PP)				
Variable	**Stationarity of all Variables in Levels**		**Stationarity of all Variables in First Difference**	
	Without Trend	With Trend	Without Trend	With Trend
REW	0.4394	-0.5870	-4.8712***	-8.2515***
FD	-1.2602	0.7441	-5.2236***	-5.2170***
ECOG	-3.5423**	-3.9047**	-	-
URB	-1.7948	-2.0209	-5.7055***	-6,7541***
TOP	-0.8289	-2.4979	-5.6626***	-6.1858***

Note: *, ** and *** denote stationarity at 10%, 5% and 1% significance levels respectively.

Source: Authors' compilation

All the variables included in the model are either I(0) or I(1), according to the results reported in Table 4. This implies that we can now proceed to use the ARDL to examine the cointegration relationship between renewable energy and its regressor. The results of cointegration are reported in Table 4.

Table 4. Cointegration Results

Dependent variable	**Function**		**F-statistic**		**Cointegration Status**	
REW	F(REW|FD, ECOG, URB, TOP)		4.720***		Cointegrated	
Pesaran *et al*. (2001),	**1%**		**5%**		**10%**	
Table CI(iii), Case	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
III, p.300.	3.74	5.06	2.86	4.01	2.45	3.52

Note: *** denotes statistical significance at the 1% level.

Source: Authors' compilation

The results reported in Table 4 confirmed the presence of cointegration in the model. This implies that our model should be estimated in short- and long-run timeframes.

The optimal lag length used in this study was selected based on the Akaike Information Criteria (AIC), which gave the most parsimonious model. The model lag selection was (1, 1, 2, 0, 1,) for renewable energy (REW), financial development (FD), economic growth (ECOG), urbanisation (URB) and trade openness (TOP), respectively. Results from the estimation are presented in Table 5.

Table 5. Short run and Long run results

Regressors	Coefficient	T-ratio
Panel A – Long run Results		
C	23.528***	4.680
FD	0.7100*	1.8640
ECOG	0.2979*	2.0973
URB	-0.8233	-1.1274
TOP	0.0604	0.3619
Panel B – Short-Run Coefficients		
DFD	0.1378**	2.3607
DECOG	-0.1014	-0.6079
DECOG1	0.5385***	3.1443
DURB	-0.2638**	-1.9841
DTOP	0.1060**	2.2245
ECM (-1)	-0.3204***	-3.2984
R-squared – 0.7021 S.E of Regression – 1.2320 Akaike Info Criterion – -51.0674 R-Bar Squared – 0.6252 F-Stat (10, 28) – 4.7488[0.001] Schwarz Bayesian Criterion – -57.9039 DW-statistic – 1.9726		

Note: ***, ** and * denote stationarity at 1%, 5% and 10% levels of significance, respectively.

Source: Authors' compilation

The results presented in Table 5 confirmed that finance has a positive effect on renewable energy consumption in Kenya in the short and long run. This is confirmed by a significant coefficient for financial development at 10% in the long run and 5% in the short run. These results suggest the reliance of Kenyans on renewable energy financing from the financial sector. This finding is consistent with previous studies, such as Prempeh, 2023; Gaies et al., 2019; Chang, 2015; Islam et al., 2013, among others.

Other results show that economic growth has a positive impact on renewable energy in the long run only. This confirms the importance of growth as a source of income to households and firms, thereby creating the financial ability to

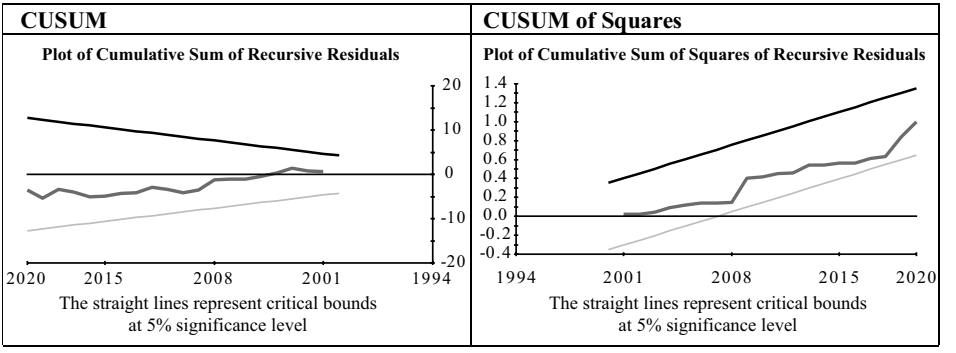
consume cleaner energy. The impact of urbanisation on renewable energy was, however, found to have a negative impact, but in the short run only. The study found trade openness to have no significant impact on renewable energy demand, irrespective of the time considered. The model is a good fit with an explanatory power of 70%. The error correction (ECM) rate of adjustment whenever there is a disequilibrium in the economy was found to be -0.320 with a negative sign as expected and significant at 1%. It takes slightly over three years for the economy to get back to equilibrium after a disequilibrium in the economy, according to the findings of this study. Diagnostic results are reported in Table 6 and Figure 2.

Table 6. Diagnostic Results

LM Test Statistic	Results
Serial Correlation	0.021 [0.883]
Normality	0.481 [0.786]
Functional Form	1.114 [0.291]
Heteroscedasticity	1.224 [0.269]

Source: Authors' compilation

The results reported in Table 6 confirm that the model is free from serial correlation. It also shows that the model has passed other diagnostic tests, such as functional form, normality test and heteroscedasticity. Figure 2 also confirms that the model is stable at 5% level of significance.



Note: 5% level of significance

Figure 2. Stability Tests
Source: Authors' compilation

5. CONCLUSIONS

This study examined the impact of financial sector development on renewable energy consumption for Kenya during the period between 1990 and 2020. The motivation behind this study was to find out whether financial development has played any significant role in Kenya's journey to successful cleaner energy use. Financial development was measured by the financial index computed by the IMF, which incorporates both bank-based and market-based indices. To fully specify the model, growth, trade openness and urbanisation were added to the model as control variables. Employing the ARDL approach, the study found financial development to spur renewable energy consumption in Kenya, irrespective of the time considered. The findings of this study confirm the important role that financial development can play in fast-tracking the country's journey to clean energy use and in the reduction of its carbon footprint. It is recommended that Kenya should continue to educate its population on clean energy sources and to buttress green financial development. Furthermore, it is important for the government to increase financial inclusion to broaden financial access for projects aligned with renewable energy.

Conflict of Interests

The authors declare there is no conflict of interest.

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УТИЦАЈ ФИНАНСИЈСКОГ РАЗВОЈА НА ПОТРОШЊУ ОБНОВЉИВЕ ЕНЕРГИЈЕ У КЕНИЈИ

1 Мерси, Т. Мусаква, Економски факултет, Универзитет у Јужној Африци, УНИСА, Преторија, Јужноафричка Република
2 Номфундо Вакју, Економски факултет, Универзитет у Јужној Африци, УНИСА, Преторија, Јужноафричка Република
3 Николас. М. Одијамбо, Економски факултет, Универзитет у Јужној Африци, УНИСА, Преторија, Јужноафричка Република

САЖЕТАК

Сврха: Повећање свијести о посљедицама глобалног загревања, заједно са позивом свим земљама да преузму одговорност за смањење свог угљичног загађења преласком на чистију употребу енергије, мотивисали су ову студију да испита утицај развоја финансијског сектора на обновљиве изворе енергије за Кенију. Студија има за циљ да одговори на питање: „Може ли развој финансијског сектора помоћи Кенији да повећа потрошњу обновљиве енергије?“ Студија је користила годишње податке од 1990. до 2020. да би испитала природу односа између ове двије варијабле. Методологија: Студија је користила приступ ауторегресивног дистрибуираног кашњења (АРДЛ). Резултати: Студија је показала да финансијски развој има позитиван утицај на потрошњу обновљиве енергије у кратком и дугом року. Закључци: Резултати указују на значајну улогу коју финансијски сектор има у искоришћавању ресурса за пројекте чистије енергије. Препоруке: Према томе, креатори политике у Кенији треба да искористе потенцијал финансијског сектора земље како би испунили циљеве одрживог развоја који су усклађени са чистијом потрошњом енергије.

Кључне ријечи: *Кенија, финансијски развој, обновљива енергија, потрошња енергије, ауторегресивно дистрибуирано кашњење*

ASSESSING THE IMPACT OF RISK MANAGEMENT COMPONENTS ON CONSTRUCTION PROJECT PERFORMANCE IN MOROGORO MUNICIPAL COUNCIL, TANZANIA

1 Aurelia Ngirwa Kamuzora, Department of Economics, Mzumbe University, Morogoro, Tanzania
*Corresponding author's e-mail: ankamuzora@mzumbe.ac.tz
1 ORCID ID: 0000-0003-0095-5889

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ABSTRACT

This study examines the impact of risk management components on the performance of construction projects in Morogoro Municipal Council, Tanzania. Data from 162 employees of contractors reveal that 33% hold postgraduate degrees, while 67% have qualifications below this level. Additionally, 42% have over five years of project management experience, and only 20% are proficient in risk management. Logistic regression analysis explored the relationships between Project Risk Identification, Project Risk Analysis, Project Risk Control, and construction project performance. The correlation matrix shows strong positive correlations between these risk management components and project performance, suggesting that effective risk management practices lead to better project outcomes. The model summary indicates a strong positive correlation ($R = 0.862$) between the predictors and the dependent variable, with an R-Square value of 0.749, meaning that approximately 75% of the variability in project performance is explained by the model. Logistic regression coefficients highlight the significant impact of Project Risk Identification ($\beta = 0.303$), Project Risk Analysis ($\beta = 0.398$), and Project Risk Control ($\beta = 0.560$). In conclusion, this study emphasises the importance of comprehensive risk management practices in enhancing construction project performance in Morogoro Municipal Council. These findings provide valuable insights for practitioners and policymakers in construction project management.

1. INTRODUCTION

Risk identification is the initial and perhaps most critical step in the risk management process, though, despite its importance, some studies have reported its role being ignored (Kutsch & Hall, 2010). It involves the systematic recognition of potential risks that could adversely affect the project (Flanagan & Norman, 1993). Once identified, these risks must be analysed to understand their potential impact and likelihood to affect the outcome of project performance levels (Zwikael & Ahn, 2011). This analysis provides a basis for prioritising risks and developing strategies to manage them effectively (Hillson & Simon, 2007). After identifying the risks the next step is to find the means to control them (Baker, Ponniah & Smith, 1999). Risk controlling as a final phase, involves implementing measures to mitigate identified risks, monitoring their effectiveness, and making necessary adjustments to ensure project objectives are met (Kerzner, 2017). Effective risk control strategies are vital for maintaining project timelines, budgets, and quality standards, thus contributing to overall project success (PMI, 2017).

Research conducted at the Technion - Israel Institute of Technology in Haifa, Israel has shown that comprehensive risk management practices significantly improve project performance by reducing uncertainties and enhancing decision-making processes (Raz, Shenhar & Dvir, 2002). The same research by Raz, Shenhar, and Dvir (2002) investigates the relationship between risk management, project success, and technological uncertainty. The study found out that effective risk management significantly enhances project success, particularly in environments with high technological uncertainty such as Tanzania where almost the major contractors in the construction sector are foreign companies and a few are locals. Key components such as risk identification, analysis, and control identified by the study are critical for mitigating risks and improving project outcomes of construction projects in Tanzania. The findings of Raz, Shenhar and Dvir (2002) underscore the importance of a structured risk management approach to handle uncertainties and achieve project objectives.

Despite the established importance of risk management, there remains a need for further empirical studies to quantify its impact on project success, particularly in the construction sector (Smith & Merritt, 2006). Smith and Merritt (2006) conducted a comprehensive study on managing risk in construction projects, emphasising the importance of systematic risk management practices. The research highlights that effective risk identification, assessment, and control are essential for mitigating potential issues and ensuring project success. The study provides a framework for integrating risk management into project planning and

execution, demonstrating that projects with robust risk management strategies are more likely to be completed on time, within budget, and to the required quality standards. This study was conducted in the United Kingdom, focusing on various construction projects across the region.

Several studies conducted in Tanzania have explored the impact of risk management on project success. For instance, Kaliba, Muya and Mumba (2009) examined cost escalation and schedule delays in road construction projects, identifying risk factors such as poor project planning and inadequate risk assessment as primary contributors. They emphasised the need for systematic risk management practices to mitigate these issues. Another study by Lema and Mavhungu (2020) focused on construction projects in Dar es Salaam, highlighting that effective risk identification and control significantly improve project outcomes. Both studies underscore the critical role of robust risk management in enhancing project performance in Tanzania. This study aims to fill this gap by examining the contribution of risk identification, analysis, and control to the successful implementation of construction projects, specifically:

- To analyse the contribution of the three components of risk management (Project risk identification. Project risk analysis, Project risk control) to the project performance.

The significance of this study, titled "Contribution of Risk Identification, Analysis, and Control to Successful Project Implementation", lies in its potential to enhance project management practices, particularly in the construction industry. Effective risk management is crucial for minimising uncertainties and achieving project objectives (Kerzner, 2017). By systematically identifying, analysing, and controlling risks, project managers can significantly improve project performance, leading to timely completion, cost efficiency, and quality outcomes (Chapman & Ward, 2003).

This study provides empirical evidence on the impact of risk management practices on project success, highlighting the importance of a structured approach to risk management. Such an approach ensures that potential issues are anticipated and mitigated before they escalate, thereby reducing the likelihood of project failures (Raz, Shenhar & Dvir, 2002). The findings can inform policymakers, project managers, and stakeholders about the critical role of risk management in achieving successful project implementation.

Moreover, the study contributes to the existing body of knowledge by filling gaps in empirical research on risk management's quantifiable benefits, particularly in the construction sector (Smith & Merritt, 2006). This can lead to the development

of improved risk management frameworks and methodologies that can be applied in various project environments, thereby enhancing overall project management practices and outcomes.

2. LITERATURE REVIEW AND ANALYTICAL FRAMEWORK

The management of risks is a pivotal aspect of successful project implementation, particularly within the construction industry. Comprehensive risk management involves systematic processes of risk identification, analysis, and control, all of which significantly contribute to project success (Kerzner, 2017).

Risk identification is the first step in the risk management process and is critical for the early detection of potential project risks. According to Hillson and Simon (2007), effective risk identification involves recognising both internal and external factors that could adversely impact project objectives. Techniques such as brainstorming, checklists, and expert interviews are commonly employed to identify risks (Aven, 2016). The early identification of risks provides a foundation for subsequent risk analysis and control activities, ensuring that all potential issues are addressed proactively (Flanagan & Norman, 1993). Risk identification is the foundational step in risk management, involving the systematic detection of potential risks that could impact project success (Hillson & Simon, 2007). This process includes recognising internal and external factors that may threaten project objectives (Chapman & Ward, 2003). Effective risk identification ensures that all possible risks are considered early in the project lifecycle, providing a basis for subsequent analysis and control (Aven, 2016).

Following identification, risk analysis quantifies and prioritises identified risks based on their potential impact and likelihood (Kerzner, 2017). Once risks have been identified, they must be analysed to determine their potential impact and likelihood. This step involves both qualitative and quantitative assessments to prioritise risks and develop appropriate mitigation strategies (Chapman & Ward, 2003). Kerzner (2017) emphasises the importance of risk analysis in understanding the severity of risks and their potential effects on project outcomes. Tools such as risk matrices, probability-impact diagrams, and Monte Carlo simulations are widely used in risk analysis (Smith & Merritt, 2006). Effective risk analysis enables project managers to allocate resources efficiently and focus on the most critical risks. This step involves qualitative and quantitative assessments to evaluate the severity and probability of risks, allowing project managers to focus on the most critical threats (Flanagan & Norman, 1993). Techniques such as SWOT analysis, Monte Carlo simulation, and risk matrices are commonly used for thorough risk evaluation (Smith & Merritt, 2006).

After analysis, risk control mechanisms for a specific project follows. Risk control involves implementing strategies to mitigate identified risks and monitor their impact throughout the project lifecycle. This process includes developing risk response plans, continuous monitoring, and adjusting control measures as necessary to manage risks effectively (PMI, 2017). Raz, Shenhar & Dvir (2002) highlight that successful risk control is essential for maintaining project timelines, costs, and quality standards. Effective risk control measures contribute to reducing uncertainties and ensuring that projects are completed on time, within budget, and to the desired quality levels.

The integration of risk identification, analysis, and control is crucial for the successful implementation of projects. Risk control encompasses the strategies and actions taken to mitigate identified risks, ensuring they do not adversely affect project performance (PMI, 2017). This step involves implementing risk response plans, continuous monitoring, and adjusting control measures as necessary to manage risks effectively (Raz, Shenhar & Dvir, 2002). Effective risk control is crucial for maintaining project timelines, costs, and quality standards (Hopkinson, 2011). Research has shown that robust risk management practices lead to improved project performance by minimising uncertainties and enhancing decision-making processes (Lema & Mavhungu, 2020). Projects that adopt comprehensive risk management strategies are more likely to achieve their objectives and deliver desired outcomes (Smith and Merritt, 2006). The risk management components are presented in Figure 1.

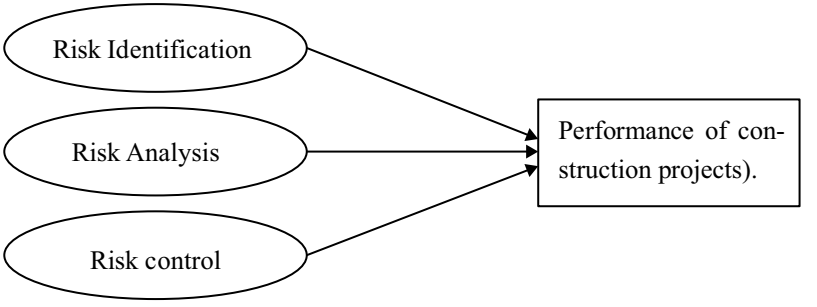

Figure 1: Conceptual framework
Source: author's construct

Figure 1 illustrates an analytical framework that underscores the relationship between risk management components - risk identification, risk analysis, and risk control - and successful project implementation. This framework highlights the interconnectedness of these elements and their collective impact on project outcomes.

The three components of risk management presented in Figure 1 show the interrelationship among the components and how they influence the project success. The integration of risk identification, analysis, and control directly contributes to the successful implementation of projects (Lema & Mavhungu, 2020). By proactively managing risks, project managers can reduce uncertainties, make informed decisions, and enhance the likelihood of achieving project objectives (Ahmed et al., 2007). Empirical evidence suggests that projects with robust risk management practices are more likely to be completed on time, within budget, and to the required quality. Figure 1 shows the analytical framework which demonstrates that a structured approach to risk management is vital for project success. Each component - identification, analysis, and control - plays a critical role in mitigating risks and enhancing project performance to succeed. Therefore, organisations should invest in developing comprehensive risk management frameworks to improve their project outcomes and ensure sustainable success standards (Smith &Merritt, 2006; Kaliba, Muya & Mumba, 2009).

3. MATERIALS AND METHODS

The study adopted an explanatory research design to explore the relationship between independent variables (project risk identification, project risk analysis, and project risk control) and the dependent variable, namely the project success. The area of the study was Morogoro Municipal Council (MMC) in Morogoro region. A total of 162 respondents from various departments were selected through simple random sampling as proposed by Yamane (1967). Yamane's random sampling technique provides a simplified method for determining sample sizes in research studies, especially when dealing with large populations. Developed by Taro Yamane in 1967, this formula is particularly useful for researchers who need to ensure their sample size is statistically significant while maintaining efficiency and simplicity. The formula is expressed as:

$$n=\frac{N}{1+N(e^2)}$$

Where the sample size is (n), the margin of error or precision is (e), and population size is (N). This method assumes a confidence level of 95% and a margin of error of 5%, which are standard parameters in many research studies (Yamane, 1967). Therefore we had:

$$n=\frac{272}{1+272(0.05^2)}=162$$

The appeal of Yamane's technique lies in its straightforward approach, which simplifies the process of calculating the required sample size without the need for complex statistical software. This makes it particularly advantageous for researchers with limited resources or those conducting preliminary studies like the researcher in this study who used his own resources in the investigation. However, while it provides a convenient and quick estimation, it is essential to consider the underlying assumptions, such as population homogeneity and a defined margin of error, to ensure the results' validity (Israel, 1992). HomeKit was also considered in the study and conducted in Morogoro among the contractors' employees. Therefore, the study chooses Yamane (1967) because Yamane's random sampling technique remains a widely used and respected method for sample size determination in various fields of study, offering a balance between simplicity and statistical rigor.

Data collection involved structured surveys and interviews, utilising both descriptive and inferential statistics to explore construction project risk management components dynamics. Ethical considerations, including informed consent and confidentiality, were strictly observed. Closed-ended questionnaires provided predefined alternatives, streamlining data collection from 162 participants. These structured questions aimed to capture opinions on how independent variables - project risk identification, project risk analysis, and project risk control - influence the dependent variable, i.e. construction project performance. Data were cleaned, tabulated, coded, and analysed using SPSS software version 20. Findings were presented via frequency distribution tables and percentages. Analytical techniques such as multiple linear regression and bivariate correlation provided inferential insights, with results communicated through tables and figures for clarity (Kothari, 2004).

Multiple logistic regression was suitable since the dependent variable was probabilistic in nature assessing the levels of performance as presented in Table 1 below showing the variables used in this study.

Table 1 shows the operationalisation of the variables, assessing the impact of risk management components on construction project performance in Morogoro Municipal Council, Tanzania. From this table, we have the following tested hypotheses:

- H1: Identifying project risks is positively associated with construction project performance, whereas the null hypothesis (H0) posits no such association.

- H2: Analysing risks is directly related to construction project performance, whereas the null hypothesis (H0) posits no such relationship.
- H3: Project risk control increases construction project performance, whereas the null hypothesis (H0) posits no such effect.

Table 1: Variables symbols, descriptions, measurement and hypotheses

Sn	Variable	Variable symbols	Description	Measurement	Hypotheses (Exp. Sign)
1	Performance of construction projects	Y	Project preformation criteria based on completion time High=1=Yes (strongly agree) Low=0=No (otherwise)	categorical (binary)	Dependent
2	Project Risk Identification	X_1	Ranking the degree of risk identification is done	Categorical (ranking)	+Ve
3	Project Risk Analysis	X_2	Ranking the degree of risk analysis after identification	Categorical (ranking)	+ve
4	Project Risk Control	X_3	Ranking the degree of control after the analysis	Categorical (ranking)	+ve

Source: Author's construct

The questionnaire asked the respondents to put the tick on the relevant perceived applied ranking responses to capture induvial perceptions as non-parametric approach (Frölich, 2006). Ranking choice model was employed because it is essentially used in various economic applications (Wright & Bates, 2023). Ranking created a binary ranking such as 0=low and 1=high indicators used to tank those two categories during assessment of project performance. The study used Multiple logistic regression because is a statistical technique applied when modeling the relationship between a binary dependent variable and several independent variables (Hosmer, Lemeshow & Sturdivant, 2013). This approach was appropriate as the study had a binary outcome variable, and therefore multiple logistic regression was suitable for analysing the dependent variable. The respondents were to evaluate the project as having high performance without delay and it seemed to be completed on time. Another possible outcome was late delivery which was already not expected to follow the milestones and time plan. Filed (2013) argues that the available criteria of binary are such as success/failure, yes/no, or presence/absence of a condition. In our case, we had two binary outcomes of 1= expected to be completed on time and 0 = not expected to be completed on time.

Another reason for choosing Multiple Logistic Regression is already used Multiple Predictors. Multiple Logistic Regression is used when assessing the impact of

multiple predictors, which can be a mix of continuous and categorical variables on the outcome (Hosmer, Lemeshow & Sturdivant, 2013). In this study, three predictors were used as portrayed in Table 1 above. Furthermore, this method allows for controlling confounding variables that may influence the relationship between the predictors and the dependent variable (Kleinbaum & Klein, 2010). A confounder is an extraneous variable that correlates with both the predictor and the outcome, thereby possibly distorting the true relationship between them (Kleinbaum, Kupper, & Morgenstern, 1982). We also wanted to determine the interaction effect. Multiple logistic regression can examine interaction effects between predictors, determining how the effect of one predictor changes at different levels of another predictor (Field, 2017). In addition, we wanted to build a project performance model. Multiple Logistic Regression is employed in building predictive models to classify or predict the probability of an event occurring based on several factors (Peng, Lee & Ingersoll, 2002) in the study with three risk element factors. Multiple Logistic Regression is a technique used to test hypotheses about the relationships between multiple predictors and the binary outcome (Hosmer, Lemeshow & Sturdivant, 2013). It has been advocated to be used in Risk Assessment. It is used to evaluate the risk of events such as loan default based on variables like credit score, income, employment status, and debt-to-income ratio (Peng, Lee & Ingersoll, 2002). In this study it is used in similar dimension but fussing on overall risk element being perquisite in determining project performance in times of completion in time (high performance) while the expected delay being perceived as low performance.

The study sought to estimate the conditional mean $[E\langle Y \mid X=x\rangle - E\langle Y \mid X=x\rangle]$ and the marginal effects $[E\langle Y \mid X=x\rangle - E\langle Y \mid X=x\rangle]$. As we used a non-parametric regression model we avoided strict functional form assumptions. We focus on local likelihood logit regression which performs well in finite samples (Peng, Lee & Ingersoll, 2002) like that of Morogoro Municipal council. Smith & Jones (2023) define a finite sample as a subset of data points or observations drawn from a population, where the number of observations is limited and countable. This allows researchers to make inferences about the larger population based on the analysis of this manageable subset. In Morogoro Municipal Council out of 272 (100%), 172 (approximately 60%) sample size of construction project was a subset chosen in the study. Construction project included buildings and roads. Moreover, local logit regression allows for heterogeneity in treatment effects (Bender & Grouven 2009), which is crucial in scenarios like ours. In simulations, local logit regression outperforms parametric regression (such as maximum likelihood logit) when dealing with many explanatory variables and small sample sizes. Peng, Lee & Ingersoll (2002) argue that local logit

regression is 25% to 55% more precise than parametric regression in Monte Carlo simulations. Frölich (2006), who conducted a study in German, applied local logit to female labour supply. The study revealed heterogeneity in the effects of children on employment that parametric estimation misses. Further he revealed how having children influences women's employment. By using local logit modeling, the researchers identified variations in the impact of children on employment that traditional parametric methods failed to capture. This approach allowed for a more nuanced understanding of the factors affecting female labour supply. Therefore local logistic regression was relevant to our study which the follow asymptotic single tale curve shows as in Figure 2.

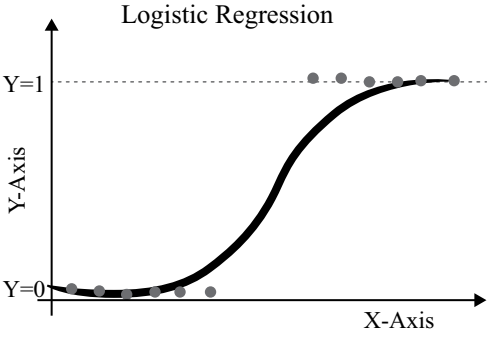

Figure 2: Asymptotic single tale logistic regression model
Source: Hosmer, Lemeshow & Sturdivant, 2013.

Figure 2 displays the asymptotic nature of the multivariate logistic regression curve which involves understanding how the model's estimates behave as the sample size approaches infinity (Hosmer, Lemeshow, & Sturdivant, 2013). Asymptotically, the estimates of the regression coefficients in a multivariate logistic regression become unbiased, consistent, and normally distributed. This implies that with a sufficiently large sample size, the parameter estimates converge to the true population parameters, and the distribution of these estimates approximates a normal distribution. This property is crucial for hypothesis testing and constructing confidence intervals. Furthermore, Agresti (2015) literates that multivariate logistic regression, the likelihood function, which is used to estimate the parameters, becomes increasingly accurate as the sample size grows. The asymptotic normality of the parameter estimates allow for the application of standard inferential techniques, such as Wald tests and likelihood ratio tests, to determine the significance of predictors. Henceforth, the given equations relate to the logistic regression model and the process of estimating its parameters (θ) through maximum likelihood estimation (MLE) following step-by-step approach (Aiken, West & Reno, 2020).

Log-likelihood function:

$$l(\theta)=log(L(\theta))j-log(\sum_{l=1}^{m}\prod(h\vartheta(x^i)^{(1-y)^i})=\sum_{l=1}^{m}y^1log(h(x^i)+(1-y^i)log(1-h(x^i)\mapsto(Ex(2))$$

The log-likelihood function, where \($l(\theta)$ is the likelihood function of the parameters θ. The log-likelihood is used because it simplifies the mathematics of differentiation and maximisation. The parameter estimates $\hat{\theta}$ maximise the log-likelihood function. We need to solve for θ such that the partial derivative of $l(\theta)$ with respect to θ is zero, i.e. $\frac{\eth l(\theta)}{\eth\theta}=0$ at maximum.

Finding θ which relates to $l(\theta)$, at maximum, we have:

For simplicity, we evaluate it with (x^i,y^i) such that:

$$\frac{\partial l(\theta)}{\eth\theta_j}=\sum_{i=1}^{m}[y^i\frac{1}{log(x^i)}\eth\frac{dh_\theta(x^i)}{\partial(\theta_j)}-(1-y^i)(\frac{1}{\eth 1-h_\theta x^i})(\frac{\partial h_{\theta(x^i)}}{\eth\theta_j})]$$

Through this we simplified the log-likelihood for logistic regression by allowing:

$$x_i=x^j \text{ and } dh_\theta(x^i)=\frac{1}{1+e^{-\theta^{Tx^i}}}$$

Then:

$\frac{\partial l(\theta)}{\eth\theta_j}=\sum_{i=1}^{m}[y^i(1-y^i)h_\theta(x^i)]x_i^i$. Further simplification gives:

$$\frac{\partial l(\theta)}{\eth\theta_j}=\sum_{i=1}^{m}\left[y^i-h_\theta(x^i)x_i^i\right]$$

This is the gradient of log-likelihood function used to draw the curve in Figure 2, derived assessing the impact of risk management components in construction project performance in Morogoro Municipal Council in Tanzania.

4. RESULTS

The respondents in this study being employees of contracting firms (contractor of buildings) had varying levels of education which this study attributes with the capability of identifying risks, analysis and control and finally have high level of project performance. The research on "capability" examines how individuals' abilities and opportunities to achieve various outcomes impact their

overall well-being and development. The significant study in this area is Sen (1999) and Sen (2008) capability approach, which emphasises the importance of what individuals are able to do and be their "capabilities" as opposed to merely their economic wealth or resources. This approach has been influential in fields such as development economics, public health, and education. This framework shifts the focus from traditional welfare economics, which often measures well-being in terms of income, to a broader evaluation of human potential and freedom. Capabilities are seen as the real opportunities and individuals have to lead the kinds of lives they value. This approach considers a wide range of factors, including social, political, and environmental influences that contribute to individuals' abilities to pursue their goals (Nussbaum, 2000). The other social status are also presented in Table 2.

Table 2: Respondents Social Status

Variable	Categories	Number of respondents	Percentage
Level of education	University postgraduate	53	33%
	Below university postgraduate	109	67%
Total		**162**	**100%**
Experience of project management	Five years and above	68	42%
	Under five years	94	58%
Total		**162**	**100%**
Knowledge of risk management	Respondents with knowledge	32	20%
	Respondents with no knowledge	130	80%
Total		**162**	**100**

Source: Descriptive Statistical Analysed Field Data

Table 2 shows that out of 162 participants, 53 (33%) had university postgraduate degrees, as presented and the rest had not attained university education. The majority, comprising 67%, held qualifications below the postgraduate level. Regarding experience in construction project, 42% of participants had substantial experience, having worked on construction projects for five years or more, while the remaining 58% had less than five years of experience. Furthermore, the data reveals that only 20% of respondents claimed proficiency in risk management, whereas a significant 80% acknowledged a lack of experience in area of construction project.

This study is similar to the study on risk management in construction projects conducted in China (Zou, Zhang &Wang 2007). This research explored how effective risk management practices can enhance the capabilities of construction project teams, ultimately leading to better project outcomes. Their study

concluded that integrating risk management practices into the construction process significantly improves the capability of project teams to handle uncertainties and unexpected events.

Further we studied the correlation between dependent (binary) and independent (ranking) variables. In this logistic regression analysis, the relationship between various project risk management components (independent variables) and the performance of construction projects (dependent variable) is examined. Each variable is ranked or binary, indicating the presence or absence of a particular attribute or outcome.

Table 3: Correlation Matrix

Variable	Project Risk Identification	Project Risk Analysis	Project Risk Control	Project Performance
Project Risk Identification	1			
Project Risk Analysis	0.57219**	1		
Project Risk Control	0.75299**	0.62259*	1	
Project Performance	0.8249*	0.6518**	0.7317**	1

Source: Descriptive Statistical Analysed Field Data

Table 3 displays the correlation ecoefficiencies among the risk management components and the project performance.

- *Project Risk Identification:* There is a strong positive correlation between Project Risk Identification and Performance of Construction Projects (0.8249*), suggesting that better identification of project risks is associated with improved performance outcomes.
- *Project Risk Analysis:* Project Risk Analysis is significantly correlated with Project Risk Identification (0.57219**) and Project Risk Control (0.62259*). This indicates that effective risk analysis is likely to be associated with better risk identification and control practices. There is also a significant positive correlation between Project Risk Analysis and Performance of Construction Projects (0.6518**), implying that thorough risk analysis contributes positively to the overall project performance.
- *Project Risk Control:* Project Risk Control shows significant correlations with both Project Risk Identification (0.75299**) and Project Risk Analysis (0.62259*), highlighting the interdependence among these risk management activities. The correlation between Project Risk Control and Performance of Construction Projects (0.7317**) indicates that controlling project risks effectively leads to better performance outcomes.

- *Performance of Construction Projects:* The performance of construction projects is positively correlated with all three risk management activities: Project Risk Identification (0.8249*), Project Risk Analysis (0.6518**), and Project Risk Control (0.7317**). This suggests that robust risk management practices are crucial for achieving better performance in construction projects.

The logistic regression correlation matrix demonstrates that all three aspects of project risk management (identification, analysis, and control) are strongly interrelated and significantly contribute to the performance of construction projects as expected. The high correlations between risk management components and project performance underscore the importance of comprehensive risk management practices in achieving successful project outcomes. Based on Figure 1, Figure 2, Table 1, Table 2 and Table 3, Table 4 displays Logistic Regression Analysis output as explained in the methodology above.

Hypotheses Testing

Hypothesis 1 (H1)

The correlation between Project Risk Identification and Project Performance is 0.824, indicating statistical significance. There is a strong positive association between Project Risk Identification and Project Performance. The statistically significant correlation supports the hypothesis that identifying project risks is positively associated with construction project performance, rejecting the null hypothesis (H0).

Hypothesis 2 (H2)

The correlation between Project Risk Analysis and Project Performance is 0.6518, there is a moderate to strong positive association between Project Risk Analysis and Project Performance. The statistically significant correlation supports the hypothesis that analysing risks is directly related to construction project performance, rejecting the null hypothesis (H0).

Hypothesis 3 (H3):

The correlation between Project Risk Control and Project Performance is 0.7317, indicating a higher level of statistical significance. There is a strong positive association between Project Risk Control and Project Performance. The statistically significant correlation supports the hypothesis that project risk control increases construction project performance, rejecting the null hypothesis (H0).

Studies in the field of project management consistently show that risk management practices are crucial for project success. For example, Raz, Shenhar, and Dvir (2002) found that risk management activities, including risk identification, analysis, and control, are significantly associated with project success across various industries. Similarly, Zwikael and Ahn (2011) demonstrated that effective risk management positively impacts project performance, particularly in complex projects.

The analysis of the correlation matrix in Table 3 supports all three hypotheses, indicating that identifying, analysing, and controlling project risks are positively associated with construction project performance. These findings are consistent with existing literature, further emphasising the importance of comprehensive risk management practices in enhancing project outcomes.

Multiple Logistic Regression

Table 4 displays the regression coefficients for the model assessing the relationship between the independent variables (Project Risk Identification, Project Risk Analysis, and Project Risk Control) and the dependent variable (performance of construction projects). All predictors measured in terms of Likert scale in nature based on the degrees of assessment and based on the set criteria (1=strongly disagree to 5 =strongly agree) as indicated in the questionnaire used. Therefore, from the multiple regression model in Table 4, the estimated model is as follows:

$$lnY = 2.798 + 0.320 lnX_1 + 0.382 lnX_2 + 0.476 lnX_3 + \epsilon$$

Y = Construction project performance
X_1 = Risk identification
X_2 = Risk analysis
X_3 = Risk control
ϵ = Standard error = 0.2182 (approx 20%)

This logistic regression model with the predictors (Project Risk Control, Project Risk Analysis, and Project Risk Identification) demonstrates a strong ability to explain the variability in the dependent variable, with a high R Square and Adjusted R Square, and a relatively low standard error of the estimate. This indicates a well-fitting model with significant predictive power. Table 4 below is the Multiple logistic regression analysis.

Table 4 presents the logistic regression coefficients for the model predicting the performance of construction projects based on three predictors: Risk Identification, Risk Analysis, and Risk Control. We will analyse the data to test the following hypotheses:

– *H1: Identifying project risks is positively associated with construction project performance.*

Table 4: Multiple Logistic Regression

Model	Unstandardised Coefficients			t	Sig.
	B	Std. Error	Beta		
(Constant)	2.793	0.299		9.341	0.000
Risk Identification (X1)	0.320	0.083	0.303	-2.646	0.010
Risk Analysis (X2)	0.382	0.051	0.398	3.562	0.001
Risk Control (X3)	0.476	0.099	0.560	3.793	0.000
Model Summary					
R-squared	0.703				
F-value	0.000				
Dependent Variable	performance of construction projects				

Source: Regression Statistical Analysed Field Data

The regression results indicate that Project Risk Identification has a significant positive effect (B = 0.320, Beta = 0.303, p = 0.010) on the performance of construction projects in Morogoro region. The positive unstandardised coefficient (B = 0.320) indicates that risk identification is positively associated with construction project performance. The standardised coefficient (Beta = 0.303) shows a moderate positive effect size. The t-value of -2.646 is significant at p = 0.010, which is less than the conventional threshold of 0.05, rejecting the null hypothesis (H0). Therefore, there is a significant positive relationship between risk identification and project performance.

– *H2: Analysing risks is directly related to construction project performance.*

Project Risk Analysis shows a significant positive impact (B = 0.382, Beta = 0.398, p = 0.001). The positive unstandardised coefficient (B = 0.382) suggests that risk analysis is positively related to construction project performance. The standardised coefficient (Beta = 0.398) indicates a moderate to strong effect. The t-value of 3.562 is highly significant at p = 0.001, rejecting the null hypothesis (H0). Thus, there is a significant direct relationship between risk analysis and project performance.

– *H3: Project risk control increases construction project performance.*

The positive unstandardised coefficient (B = 0.476) indicates that risk control significantly increases construction project performance. The standardised coefficient (Beta = 0.560) shows a strong positive effect. The t-value of 3.793 is significant at $p < 0.001$, rejecting the null hypothesis (H0). Therefore, there is a significant positive effect of risk control on project performance.

The results of this logistic regression analysis align with findings from previous research in project management and risk management literature. For instance, Raz, Shenhar, and Dvir (2002) demonstrated that comprehensive risk management practices, including identification, analysis, and control, are significantly linked to successful project outcomes. Similarly, Zwikael and Ahn (2011) found that effective risk management planning positively impacts project performance across different industries. The logistic regression analysis from Table 5 provides strong evidence to support all three hypotheses. Identifying, analysing, and controlling project risks are significantly associated with improved performance in construction projects. These findings are consistent with existing research, emphasising the critical role of comprehensive risk management in enhancing project success.

Reliability Test of Multiple Logistic Regression Output

The formula for calculating the Odds Ratio (OR) from the coefficient (B) in a logistic regression model is:

$$\text{Odds Ratio} = e^{B}$$

$$\text{Odds Ratio} = e^{B}$$

where:

e is the base of the natural logarithm (approximately equal to $(2.71828)^{B}$

B is the regression coefficient for the independent variable.

In essence, the Odds Ratio is the exponentiation of the logistic regression coefficient. This formula converts the log-odds scale used in logistic regression to an odds ratio, which is more interpretable in terms of the effect size.

Table 5: Variance Inflation Factor (VIF)

Variable	B	Odds Ratio
Project risk identification	0.32	1.377
Project risk analysis	0.382	1.465
Project risk control	0.476	1.61

Source: Regression Statistical Analysed Field Data

Table 5 shows Variance Inflation Factor (VIF) values which is less than 10, where greater than 10 indicates significant multicollinearity. These Odds Ratios suggest that each of the risk management components (identification, analysis, and control) positively impacts the performance of construction projects, with project risk control having the highest impact among the three.

Also the model goodness of fit in Table 6 below shows the reliability of the data.

Table 6: Model Summary and F-Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F-value	P-value
1	0.862	0.749	0.703	0.218	95.49	0.000

Predictors: (Constant), Project Risk Control, Project Risk Analysis, Project Risk Identification,
Source: Regression Statistical Analysed Field Data

Table 6 shows:

- *R(Correlation Coefficient*): The value of R is 0.862, which indicates a strong positive correlation between the predictors (Project Risk Control, Project Risk Analysis, Project Risk Identification) and the dependent variable. This suggests that the predictors collectively have a strong relationship with the dependent variable.
- *R-Square (Coefficient of Determination): The* R Square value is 0.749. This means that approximately 74.9% of the variability in the dependent variable can be explained by the predictors included in the model. In other words, the model accounts for a substantial portion of the variability in the dependent variable.
- *Adjusted* Pseodo-R Square: The adjusted R Square is 0.703. This value adjusts the R Square for the number of predictors in the model, providing a more accurate measure of the model's explanatory power, especially when multiple predictors are involved. An adjusted R Square of 0.703 still indicates a strong

explanatory power of the model, although slightly less than the R Square due to the adjustment for the number of predictors.

Standard Error of the Estimate: The standard error of the estimate is 0.2182. This statistics measures the average distance that the observed values fall from the regression line. A lower standard error indicates that the model's predictions are closer to the actual data points, suggesting a good fit of the model. This is according to Hosmer-Lemeshow Test assessing the fit of the multiple logistic regression model to the data. A p-value greater than 0.05 indicates a good fit.

This comprehensive reliability test will help ensure that the logistic regression model is robust and reliable, providing accurate insights into the relationships between risk management practices and project performance.

5. DISCUSSIONS

The primary objective of this study was to analyse the impact of risk management components on the performance of construction projects in Morogoro Municipal Council, focusing on project risk identification, analysis, and control. The examination of the educational background of respondents revealed that 33% possessed a university postgraduate level, while the majority (67%) had educational qualifications below this level. Comparable findings in other studies, such as Butt et al. (2021), underscore a prevalent trend of stakeholders in construction projects holding educational qualifications below the postgraduate level. The study also explored the respondents' experience in construction project management. It was found that 42% had five or more years of experience, while 58% had less than five years. This finding is similar to the findings from Nigeria. The Nigerian study indicates a prevailing culture in Nigeria, highlighting a lack of awareness and knowledge about formal risk management processes. Construction practitioners in Nigeria were advised to strive to enhance their awareness of project and risk management processes to mitigate the impact of risks effectively (Otobo, 2016). Notably, only 20% of respondents demonstrated a substantial understanding of risk management, while 80% lacked experience in this domain (Otobo, 2016). This suggests a significant knowledge gap in assessing and managing risks within construction projects. The findings align with previous research, indicating a broader cultural issue among construction contractors regarding risk concepts and a lack of awareness about formal risk management processes. Construction practitioners in Tanzania are also encouraged to strive to enhance their awareness of project

and risk management processes to minimise the likelihood and impact of risks on their projects.

The findings from this study indicate a significant positive relationship between project risk management components and the performance of construction projects in the Morogoro Municipal Council. Specifically, the results show that Project Risk Identification (B = 0.320, Beta = 0.303, p = 0.010), Project Risk Analysis (B = 0.382, Beta = 0.398, p = 0.001), and Project Risk Control (B = 0.476, Beta = 0.560, p = 0.000) all positively influence construction project performance. The standardised coefficients suggest that Project Risk Control has the strongest impact, followed by Project Risk Analysis and Project Risk Identification.

These findings align with existing literature that emphasises the critical role of risk management in improving project outcomes. For instance, Zou et al. (2007) identified risk management as a fundamental factor in achieving project success, highlighting that effective risk identification, analysis, and control can significantly reduce uncertainties and enhance performance. Similarly, Tummala and Schoenherr (2011) demonstrated that structured risk management processes lead to better decision-making and project outcomes in the construction industry.

The Odds Ratios calculated for each of the risk management components further reinforce the positive impact of these practices. The Odds Ratios indicate that Project Risk Identification, Project Risk Analysis, and Project Risk Control increase the likelihood of project success by factors of 1.377, 1.465, and 1.61, respectively. These values suggest that implementing these risk management components considerably enhances project performance, with risk control being the most influential.

The strong effect of Project Risk Control observed in this study is consistent with the findings of Fan, Lin, and Sheu (2008), who argued that proactive risk control measures are crucial for mitigating potential risks and ensuring project success. Furthermore, the significant impact of Project Risk Analysis supports the work of Raz and Michael (2001), who found that thorough risk analysis helps in identifying potential issues early, allowing for timely and effective interventions.

Overall, this study contributes to the growing body of evidence that underscores the importance of comprehensive risk management practices in the construction industry. By demonstrating the significant positive effects of risk identification, analysis, and control on project performance, this research provides valuable insights for construction project managers and policymakers aiming to enhance project outcomes through effective risk management strategies. Based on Butt

et al. (2021) findings and ours in Morogoro, we underscore the importance of promoting higher education among construction professionals to enhance their skills and improve overall project performance. We advocates for policies that encourage continuous education and professional development within the industry.

The study's correlation analysis uncovered strong positive correlations between project risk identification, project risk analysis, and project risk control with the performance of construction projects. This aligns with the findings of Hauke and Kossowki (2011) and emphasises the critical role of early risk identification, thorough analysis, and effective control or mitigation in project success. The results imply a heightened probability of adverse effects on construction project performance when risks are not adequately addressed.

The regression analysis further elucidated the relationships, providing beta coefficients for each independent variable. An increase in project risk identification was associated with a 0.320 increase in construction project performance, emphasising the foundational role of early risk recognition (Tchankova, 2002). Tchankova (2002) studied the similar phenomenon and discussed several methods for identifying risks, including brainstorming, Delphi technique, checklists, and SWOT analysis. The study emphasised that using a combination of these methods can enhance the comprehensiveness of risk identification. It emphasised the importance of involving various stakeholders in the risk identification process. Engaging stakeholders ensures a broader perspective and helps in identifying risks that might be overlooked if only a limited group is involved. The study stressed the need for thorough documentation and effective communication of identified risks. Proper documentation facilitates tracking and managing risks throughout the project lifecycle, while clear communication ensures that all project team members are aware of potential risks and their implications. Tchankova (2002) concluded that successful risk management heavily depends on the initial step of risk identification. By employing diverse methods and involving key stakeholders, project managers can better anticipate and mitigate risks, ultimately leading to more successful project outcomes. Similarly this study has further analysed the risk management components as key in project performance in this study conducted in Morogoro Municipal Council.

Similarly, an increase in project risk analysis was linked to a 0.382 improvement in project performance, underscoring the ongoing significance of risk analysis in project management (PMI, 2008). The PMBOK Guide (PMI, 2008) provides a robust and comprehensive framework for project management, encompassing essential processes and knowledge areas. By adhering to these guidelines,

project managers can enhance their ability to deliver successful projects, meeting the defined scope, time, cost, and quality objectives. Based on the relationship of project analysis and performance, 38.2% shows the importance of using PMBOK guide. Lastly, an increase in project risk control corresponded to a 0.224 enhancement in project performance, highlighting the importance of effective control mechanisms throughout the project lifecycle.

Furthermore, the study emphasises the need for heightened awareness and knowledge among construction practitioners in Morogoro Municipal Council regarding risk management processes. The positive correlations and regression coefficients underscore the pivotal role of early risk identification, thorough analysis, and effective control in enhancing the performance of construction projects. Implementing robust risk management strategies is vital for mitigating the impact of uncertainties and unforeseen events, ultimately contributing to project success.

6. CONCLUSIONS

The study titled aimed to assess the influence of risk management strategies on the performance of construction projects in Morogoro Municipal Council. The regression analysis has highlighted the significant impact of three key risk management components on the performance of construction projects: project risk identification, project risk analysis, and project risk control.

The regression coefficients indicate that all three components positively influence project performance. Specifically, project risk identification ($B = 0.320$, $p = 0.010$) significantly enhances project performance, underscoring the importance of early risk recognition. Project risk analysis ($B = 0.382$, $p = 0.001$) has a substantial positive impact, reflecting the critical role of thorough risk analysis in mitigating potential project issues. Project risk control ($B = 0.476$, $p = 0.000$) demonstrates the strongest positive influence on project performance, highlighting the necessity of effective risk control mechanisms throughout the project lifecycle.

Policy Recommendations:

Based on these findings, several policy recommendations can be made to improve construction project performance through enhanced risk management:

- *Enhance Training and Education:* Implement training programs focused on risk management for all stakeholders involved in construction projects. This

should include workshops, seminars, and certification courses to improve knowledge and skills related to risk identification, analysis, and control.

- *Standardise Risk Management Processes:* Develop and enforce standardised risk management procedures across all construction projects within the Morogoro Municipal Council. This will ensure a consistent approach to identifying, analysing, and controlling risks, leading to better project outcomes.
- *Promote Early Risk Identification:* Encourage early and proactive risk identification by integrating it into the initial stages of project planning. This can be facilitated by using comprehensive risk identification tools and techniques, such as checklists and brainstorming sessions.
- *Strengthen Risk Analysis Capabilities*: Invest in advanced risk analysis tools and methodologies to enable more accurate and thorough risk assessments. Training project managers and teams on these tools will enhance their ability to foresee potential issues and plan accordingly.
- *Implement Robust Risk Control Mechanisms:* Establish robust risk control mechanisms that are regularly reviewed and updated throughout the project lifecycle. This includes developing contingency plans, conducting regular risk audits, and ensuring effective communication of risk management plans to all project stakeholders.
- *Foster a Culture of Risk Awareness:* Promote a culture of risk awareness within the construction industry by encouraging open communication about risks and their potential impacts. This can be achieved through regular meetings, risk reporting systems, and encouraging a collaborative approach to risk management.

By adopting these policy recommendations, the Morogoro Municipal Council can significantly improve the performance of its construction projects, mitigating the impact of risks and enhancing overall project success.

Conflict of interests

The author declares there is no conflict of interest.

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APPENDIX: QUESTIONNAIRE

Research Survey Questionnaire

Introduction: We are conducting a survey to understand the impact of various risk management practices on the performance of construction projects. Your responses will provide valuable insights that will contribute to our research. Please answer the following questions based on your experience and knowledge. All responses will be kept confidential.

Section 1: Demographic Information

1. **What is your role in the construction project?**
   - Project Manager
   - Site Engineer
   - Risk Manager
   - Other (Please specify): _____

2. **How many years of experience do you have in the construction industry?**
   - Less than 1 year
   - 1-5 years
   - 6-10 years
   - More than 10 years

3. **What type of construction projects do you primarily work on?**
   - Residential
   - Commercial
   - Infrastructure
   - Industrial
   - Other (Please specify): _____

4. Your level of education :

   University degree (High) = 2
   Never attended any university degree (Low) = 1

Section 2: Risk Management Practices

Risk Identification:

4. **To what extent do you agree with the following statement: "Risk identification practices are thoroughly implemented in our construction projects."**
   - Strongly Agree
   - Agree

- Neutral
- Disagree
- Strongly Disagree

5. **How frequently are risk identification activities conducted in your projects?**

- Very Frequently
- Frequently
- Occasionally
- Rarely
- Never

Risk Analysis:

6. **To what extent do you agree with the following statement: "Risk analysis is effectively performed in our construction projects."**

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

7. **How often is quantitative risk analysis used in your projects?**

- Very Often
- Often
- Sometimes
- Rarely
- Never

Risk Control:

8. **To what extent do you agree with the following statement: "Risk control measures are adequately implemented in our construction projects."**

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

9. **How effective are the risk control measures in mitigating identified risks in your projects?**

- Very Effective

- Effective
- Neutral
- Ineffective
- Very Ineffective

Section 3: Performance of Construction Projects

10. **How would you rate the overall performance of your construction projects?**

- Excellent
- Good
- Average
- Below Average
- Poor

11. **To what extent do you agree with the following statement: "Effective risk management practices have positively impacted the performance of our construction projects."**

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Section 4: Open-Ended Questions

12. **In your opinion, what are the key challenges in implementing effective risk management practices in construction projects?**

- [Open text box]

13. **What improvements do you suggest for enhancing the performance of construction projects through better risk management?**

- [Open text box]

Conclusion: Thank you for participating in this survey. Your responses are crucial to our research on improving construction project performance through effective risk management practices. If you have any additional comments or suggestions, please feel free to add them below.

- [Open text box for additional comments]

Researcher Contact Information: If you have any questions about this survey or the research, please contact [Researcher's name] at [email address].

Consent: By completing this survey, you consent to participate in this research study. Your participation is voluntary, and you may withdraw at any time without penalty.

ПРОЦЈЕНА УТИЦАЈА КОМПОНЕНТИ УПРАВЉАЊА РИЗИЦИМА НА ПЕРФОРМАНСАМА ГРАЂЕВИНСКОГ ПРОЈЕКТА У МОРОГОРО ОПШТИНИ, ТАНЗАНИЈА

1 Аурелија Ингрва Камузора, Економски факултет, Универзитет Мзумбе, Морогоро, Танзанија

САЖЕТАК

Ова студија испитује утицај компоненти управљања ризицима на перформансама грађевинских пројеката у општини Морогоро, Танзанија. Подаци од 162 радника извођача показују да 33% има постдипломске студије, док 67% има квалификације испод овог нивоа. Поред тога, 42% радника има преко пет година искуства у управљању пројектима, а само 20% је вјешто у управљању ризицима. Анализа логистичке регресије истраживала је односе између идентификације ризика пројекта, анализе ризика пројекта, контроле ризика пројекта и перформанси грађевинског пројекта. Корелациона матрица показује снажне позитивне корелације између ових компоненти управљања ризицима и перформанси пројекта, сугеришући да ефективне праксе управљања ризиком воде до бољих исхода пројекта. Резиме модела указује на снажну позитивну корелацију (R=0,862) између предиктора и зависне варијабле, са вриједношћу R-квадрата од 0,749, што значи да је приближно 75% варијабилности у перформансама пројекта објашњено моделом. Коефицијенти логистичке регресије истичу значајан утицај идентификације ризика пројекта (β = 0,303), анализе ризика пројекта (β = 0,398) и контроле ризика пројекта (β = 0,560). У закључку, ова студија наглашава важност свеобухватне праксе управљања ризиком у побољшању перформанси грађевинских пројеката у општини Морогоро. Ови налази пружају вриједан увид практичарима и креаторима политике у управљању грађевинским пројектима.

Кључне ријечи: *управљање ризицима, перформансе грађевинских пројеката, идентификација ризика пројекта, анализа ризика пројекта, контрола ризика пројекта*.

Прегледни научни чланци
Review Scientific Papers

ASSESSMENT OF THE IMPACT OF PERCEIVED CORRUPTION ON ECONOMIC GROWTH USING THE GLS MODEL

1 Vasko A. Kelić, Institute of Social Sciences, Centre for Economic Research, Belgrade, Serbia
2 Ivana M. Ostojić, Institute of Social Sciences, Centre for Economic Research, Belgrade, Serbia
3 Predrag P. Jovanović, Institute of Social Sciences, Centre for Economic Research, Belgrade, Serbia
*Corresponding author's e-mail: ivanaostojic27@yahoo.com, iostojic@idn.org.rs
1 ORCID ID: 0000-0002-9124-7302
2 ORCID ID: 0000-0002-8608-9506
3 ORCID ID: 0000-0003-0841-7022

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ABSTRACT

Researchers not only dissent on what effect corruption has on economic growth but also whether this effect holds in different institutional contexts. Some economists argue that corruption can stimulate economic growth in environments with poor governance and ineffective institutions (such as those in the Western Balkans region), while others suggest otherwise. This paper aims to investigate the relationship between perceived corruption and GDP per capita change in ten European countries from 2012 to 2021. Our goal is to examine whether non-EU Western Balkans countries, characterised by ineffective governance and underdeveloped institutions, are more or less sensitive to corruption compared to more developed European countries. To obtain robust estimates, we employ a feasible generalised least squares estimation method (GLS). Besides showing a negative effect on the full sample, our analysis confirms different intensities of corruption impact on economic growth under the two governance regimes. The research suggests that the negative effect of corruption is stronger in countries with developed institutions (EU countries). We find that the impact of corruption on economic growth in such countries amounts to up to 1.94 percent drop in GDP per capita after a one-unit rise in corruption level, while the one in non-EU WB countries stands at a maximum of 0.75 percent decrease. Compared to earlier findings, ours are characterised by the focus on Western Balkans countries, the inclusion of more recent data and a more comprehensive pre-estimation analysis.

1. INTRODUCTION

Corruption is widely acknowledged as a phenomenon that significantly negatively impacts societies. It undermines crucial social goals such as non-discrimination, transparency, equality and poverty reduction. While sociologists and legal experts condemn corruption as a wholly negative force that should be eradicated, some economists take a different perspective, moving beyond a purely moralistic approach, as noted by Nye (1967) and Leys (1965). They argue that corruption can sometimes have a beneficial effect when governance is poor and institutions are ineffective. In this paper, we consider institutions as a "system of social factors that are exogenous to each individual whose behavior they influence… and consist of rules, norms, beliefs, and organizations… that enable, guide, and motivate (individuals) to follow specific behavior" (Gräbner & Ghorbani, 2019). In cases when institutions are ineffective, bribery or "greasing the wheels", some think, may help to overcome obstacles created by inefficient bureaucracy (Meon & Sekkat, 2005). On the other hand, numerous economic researchers find evidence of negative impact of corruption on economic growth, including Mauro (1995), Brunetti and Weder (1998) and Mo (2001). Even the findings from the World Economic Forum go on to say that corruption causes a loss in gross domestic product (GDP) of $2.6 trillion or 5% on a global scale (World Economic Journal, 2024). Furthermore, some researchers, including Agale-Kolgo (2018), argue that corruption has neither a negative nor positive influence on economic growth.

Our goal is to explore what can be inferred about the effect of corruption on economic growth from the empirical evidence taking into account both less and more institutionally-developed countries. We draw inspiration from the work of Aidt, Dutta & Sena (2008), Hodge et al. (2011), and Gründler and Potrafke (2019) that examined the impact of corruption on economic growth within two different governance frameworks: 1) advanced governance with high-performance institutions, and 2) poor governance with underdeveloped institutions. However, these studies produced conflicting results: while the first two found that the economic growth in countries with more advanced institutions is more susceptible to the rise in corruption, the third study discovered the opposite. One of the motivations of our study is to see which of these two findings is more consistent with the more recent empirical data.

Our paper aims to find out how corruption is correlated with economic growth in a sample of ten European countries in a ten-year period (2012-2021). The sample consists of two groups of countries. The first group includes the Western Balkans countries that are not EU members and are in the process of joining the

EU, while the second group includes neighboring countries that have fulfilled the conditions to become EU members. Compared to similar studies, our goal is to see if focusing our sample specifically on non-EU Western Balkan countries, as well as more recent data, produces any difference compared to the conclusions based on the full sample.

Our paper is also characteristic as it includes a number of pre-estimation tests that help us determine robust feasible generalised least squares (GLS) as an appropriate estimation method. As it will be made clear shortly, our results imply the existence of a negative effect of perceived corruption on economic growth, albeit less pronounced in non-EU Western Balkans countries.

The remainder of this paper is structured as follows: Section 2 reviews the existing literature on corruption and its impact on economic growth. Section 3 outlines our model, variables and estimation method. Section 4 presents the estimates from various model specifications and their interpretations. Finally, Section 5 highlights the key conclusions of the paper.

2. LITERATURE REVIEW

For more than half of a century, numerous studies explored the relationship between corruption and economic growth. Some researchers analysed that relation in the context of institutional quality and governance efficiency. Some of them concluded that many countries suffer from "red tape", which includes the extensive, unnecessary administrative burden and oversized bureaucracy. In such conditions, officers are demotivated and demonstrate suboptimal personal productivity (Jovanović et al, 2022; Bach, Løkke Møller & Villadsen, 2021; Bellé & Cantarelli, 2017; Bozeman, 1993; Brewer & Walker, 2010; Buchanan, 1975; Cooke, Brant & Woods, 2019). Their inefficient work may result in a slowdown of transactions between the public and private sectors as well as an increase in costs in terms of time and efforts needed.

Regarding the potential impacts of an extensive and rigid bureaucracy on economic growth Huntington (1968), however, maintained that "in terms of economic growth, the only thing worse than a society with a rigid, overcentralized, dishonest bureaucracy is one with a rigid, overcentralized, honest bureaucracy". This suggests that corruption can help in overcoming bureaucratic constraints in some ways. For instance, bribes could provide officers an incentive to speed up the process, thus reducing unnecessary waiting time (Lui, 1985; Leys, 1965). Summers (1977) argues that corruption "greases the wheels" by stimulating public officials to operate efficiently, thus reducing the bureaucracy burden as

an obstacle to economic development. Beck and Maher (1986) and Lien (1986) came to the similar conclusions.

Furthermore, it may be that the more complicated regulation, the more chances that some formal and not necessarily substantive requirement is not fulfilled. Assistance of officers compensated by the bribe in fulfilling all requirements could provide a significant advantage to the client compared to others who could not rely on such informal help (Huntington, 1968). Leys (1965) and Bayley (1966) argue that corruption may help overcome the widespread problem of public administration – non-competitive salaries of its employees compared to the private sector which results in officers' lower competencies. The possibility of earning an extra income in the form of a bribe could attract more capable professionals to public administration, thus upgrading its efficiency.

Contrary to those who emphasised the positive effects of corruption on governance and economic growth, many researchers argued the opposite. Mauro (1995) pointed out the negative impact of corruption on economic development due to constraints it creates for investment. According to Mauro's analysis, improving the corruption perceptions index for one standard deviation may increase GDP per capita from 0.2 to 0.8 percentage points, depending on the model specification applied.

Mauro's findings were confirmed by Mo (2001) according to whom a one-point increase in corruption results in economic growth slowdown by 0.545 percentage points. Moreover, the study by Gründler and Potrafke (2019), which included data for 175 countries in the period between 2012 and 2018, found more significant negative impact of corruption on GDP in the long run. Specifically, an increase of the relevant corruption index of one standard deviation was shown to lead to the reduction of GDP per capita by a tremendous 17%.

Corruption's negative impact on economic growth was confirmed by numerous studies based on panel data. These include the ones from Aidt, Dutta & Sena (2008), AlQudah, Zouaoui & AboElsoud (2020), Brunetti and Weder (1998), Chang and Hao (2017), Cieślik and Goczek (2018), d'Agostino, Dunne & Pieroni (2016), Hodge et al. (2011), Huang (2016), Johnson, LaFountain & Yamarik (2011), Méon and Sekkat (2005), Swaleheen (2011) and Tsanana Chapsa & Katrakilidis (2016).

The restrictive influence of corruption on economic growth is explained by its constraining effect on investment (Mauro, 1995), inflation of prices of goods, services and works (Nwabuzor, 2005), increase in unnecessary public expenditures that reduce economic activity and efficiency of public spending,

lowering of quality of public services, and increase in shadow economy that causes unfair distribution of tax burden (Spyromitros & Panagiotidis, 2022).

The majority of researchers on corruption consider it as a "sanding the wheels" issue that limits economic growth (Rose-Ackerman, 1978; Shleifer & Vishny, 1993; Mauro, 1995). Tanzi and Davoodi (1998) even stressed that corruption favors public investment over private one and thus disrupts efficient and productive use of capital in an economy.

In practice, corruption is believed to establish new forms of exchanges between companies and the public sector compared to the regular ones (Cuervo-Cazurra, 2015). A prerequisite for corruption is that the costs of illegal transactions are lower than those of legal ones (Polinsky & Shavell, 1992). Transaction costs of corrupt practice refer to enforcement and detection (Von Lampe, 2008). Enforcement costs are generated based on risks of failure to obtain needed goods or services as well as the risk of no protection in such cases while detection costs are related to the risk of being discovered by third parties (Lambsdorff & Teksoz, 2004).

Williamson (2008) recognised three major factors that determine transaction costs: 1) the uncertainty under which the transaction takes place, 2) the frequency of the transaction, and 3) the level of transaction investment. In cases where regulation is bureaucratic and with a high administrative burden that generates additional costs, stakeholders from both the private and public sectors will have a motive to improve efficiency by cutting them (Lui, 1985). For example, in public procurement complex procedures and demanding "paperwork" would create significant transaction costs for potential bidders (Čudanov, Jovanović & Jaško, 2018). In addition to that, a high level of institutional uncertainty, which means that institutions are ineffective in law enforcement with a low probability that those involved in corruption will be detected and sanctioned decreases detection costs and result in a more favorable environment for corruption (Troisi & Alfano, 2023). In such circumstances corruption may be perceived as an instrument that enables operation at lower transaction costs, thus increasing the efficiency and economic of transactions between public sector and private companies. Furthermore, reduced transaction costs are expected to have a positive impact on economic growth.

Although some empirical studies confirmed the positive impact of corruption on economic growth, the authors pointed out that this kind of relation is valid only under certain conditions. Mendez and Sepulveda (2006) stated that corruption had a small but positive impact on economic growth in countries with high levels of civil liberties and political rights. In the research of Hodge et al. (2011), which

included 81 countries in the period 1984-2005, the findings were that corruption may have a positive (or less negative) impact on economic growth but only in countries with low-quality public administration and unnecessarily high levels of regulation. Ang (2020) detected a specific form of corruption in China marked as "access money" and viewed it as a significant positive factor during the period of fast economic growth in China. Using a panel of 65 countries over 25 years, Trabelsi (2023) concluded that corruption can have either a positive or negative effect on growth depending on whether its level passes certain thresholds.

However, some studies, such as the Agale-Kolgo (2018), based on a fairly large sample of 101 developing countries in the period 2009 – 2015, failed to detect either a negative or positive influence of corruption on economic growth. In the next section, we will present the model and estimation method that we plan to use to estimate the effect of corruption on economic growth. It would be of vital importance to show that our model possesses qualities that enable it to produce reliable estimates of relevant parameters.

3. MATERIALS AND METHODS

The starting point of our analysis is the augmented version of the model of economic growth developed by Solow (1956) and expanded by authors such as Mankiw, Romer & Weil (1992) and Barro (1989) to include variables such as human capital and government consumption. To obtain a more complete estimate of the human capital on economic growth, we include both the commonly used education variable and the less frequently used health variable. This produces the following model:

$$\ln Y_t = \beta_0 + \beta_1 \ln INV_t + \beta_2 LAB_t + \beta_3 GOV_t + \beta_4 EDU_t + \beta_5 HEA_t + \mu_t$$

In the given model, *Y* indicates the GDP per capita of a certain country (in constant 2015 prices). *INV* indicates gross investments in fixed capital in constant prices, *LAB* refers to labour force participation (among people older than 15), while the variable *GOV* indicates the share of public spending on final consumption as a percentage of GDP. Finally, the variable *EDU* represents the level of public spending on education (measured as a share of GDP), and *HEA* includes national life expectancy at birth for each country. μ represents a random error, while *t* is the time index.

Following AlQudah Zouaoui & AboElsoud (2020, p. 43), we modify the aforementioned model by adding the corruption variable. We also add a time dummy to account for the effects of 2012 and 2020 recessions:

$$\ln Y_t = \beta_0 + \beta_1 \ln INV_t + \beta_2 LAB_t + \beta_3 EDU_t + \beta_4 HEA_t + \beta_5 GOV_t + \beta_6 COR_t + \beta_7 DUMMY_t + \mu_t$$

To measure corruption (COR), we utilised the values of Transparency International's corruption perceptions index (CPI) for the given countries and periods. COR is the normalised corruption perceptions index (CPI) for a specific country. In this model, normalisation was achieved using the following equation: (1-CPI/100)*100. This kind of normalisation was achieved so that higher values of the index indicate higher levels of corruption. In some model specifications we estimated, the COR variable is based on values of the World Bank's control of corruption index (CC). Even though both indices are based on perceived corruption, CC is more directed toward the so-called bureaucratic corruption of unelected officials while CPI comprises more sources related to higher-level political corruption (Hamilton & Hammer, 2018, pp. 14-5). Evaluating the effect of both of these measures may help us obtain more robust estimates of perceived corruption on economic growth.

We employed a model with a log value of GDP per capita in constant prices as our dependent variable. We did this in order to estimate the effects on the change in GDP per capita, which is the specified goal of our research. To get accurate estimates of the effects of corruption, we controlled for the aforementioned variables commonly viewed as determinants for economic growth, which include proxies for investment, labour force participation, education, health and public spending, as well as a time dummy. To obtain estimates that are not susceptible to heteroskedasticity and correlation, we employed a robust feasible generalised least squares estimation method (GLS). We also analysed a couple of different model specifications to see whether or how estimation results differ among them. In one of them, we inspected the robustness of our model by substituting the investment variable with another control variable – private capital stock.

Most of the data was retrieved from the World Bank database of global development indicators (World Bank, 2024a): GDP per capita (constant 2015 US$); gross fixed capital formation (constant 2015 US$); labour force participation rate (% of total population ages 15+); life expectancy at birth (years); final consumption expenditure (% of GDP), while data on education (mean years of schooling) were retrieved from the United Nations Development Programme database (UNDP, 2024). International Monetary Fund investment and capital stock

database helped us obtain data on capital stock (IMF, 2024). Data sources on corruption variables, however, included Transparency International (2024) for CPI and the World Bank database of global governance indicators (World Bank, 2024b) for CC.

In the study of the impact of corruption on economic growth, we use a sample of ten European countries and observed the period from 2012 to 2021. Besides the analysis of the full sample, we examine and compare the influence of corruption on economic growth in the two groups of countries that are included in our sample. The first group consists of the Western Balkan non-EU countries (WB) that are in the process of transformation and accession to the EU. One of the major goals of the process is the upgrading of governance and development of institutions to achieve EU standards, which brings to the conclusion that their governance is still poor and institutions weak. This group includes the following countries: Albania, Bosnia and Herzegovina, Montenegro, North Macedonia and Serbia.

The second group consists of WB neighboring countries that have already achieved EU standards in terms of quality of governance and strength of their institutions, thus fulfilling conditions to become EU Member States. This group includes Slovenia, Croatia, Hungary, Romania and Bulgaria. In the paper, we will investigate if there is a difference in the intensity of corruption influence on GDP growth between the two groups.

4. RESULTS AND DISCUSSIONS

First, we present some basic descriptive statistics of the data. Table 1 shows data on mean, maximum and minimum values for each variable comprising the model above, along with their standard deviations. In the end, the table also shows the results of the LM Jarque-Bera Normality Test for the regression having GDP per capita in constant prices as a dependent variable and other listed variables as independent ones.[1]

1 The table includes descriptive statistics of variables in their non-logarithmic form. Expectedly, similar resolution of Jarque-Bera Test follows if we include natural logarithm versions of any variable in the regression to assess the normality of standard error distribution (results available upon request).

Table 1. Basic descriptive statistics and LM Jarque-Bera Normality Test

Variable	Mean	St. dev.	Minimum	Maximum	Observations
GDP per cap. overall	9253.61	5381.505	3736.34	24744.84	N=100
($USD, 2015) between		5555.81	4191.65	22081.09	n=10
within		948.48	7104.99	11927.36	T=10
Investment overall	12.4 billion	14 billion	676 million	53.6 billion	N=100
($USD, 2015) between		14.4 billion	1.1 billion	45.8 billion	n=10
within		2.56 billion	3.73 billion	21.2 billion	T=10
Labour force overall	46.96	5.79	32.85	56.91	N=100
(% of 15+ pop.) between		5.29	36.29	53.68	n=10
within		2.84	39.87	53.81	T=10
Education overall	11.16	1.03	7.89	12.8	N=100
(avg school ys) between		1	9.54	12.62	n=10
within		0.38	9.51	12.15	T=10
Health overall	76.47	2.03	71.51	81.53	N=100
(life expectancy) between		1.97	74.31	80.88	n=10
within		0.75	73.67	77.65	T=10
Public spending overall	18.01	3.3	10.84	25.03	N=100
(% of GDP) between		3.25	11.36	22.66	n=10
within		1.16	15.86	21.03	T=10
Corruption level overall	56	7.03	39	69	N=100
(inverse CPI) between		6.93	40.5	64.8	n=10
within		2.41	49.4	61.4	T=10
LM Jarque-Bera Normality Test	LM Test statistic = 1.06679		p-value = 0.58661		N=100

Source: Authors' calculations using Stata 14 software

As shown in Table 1, values of each variable are provided as either overall, between or within-group measurements. This provides us with a basic overview of data characteristics and variability. Worth noting are the results for the investment variable. The higher values for the overall and between standard deviations compared to the mean suggest high variation between countries and, given the lack of negative and zero values of investment, a likely departure from normal distribution. To correct for this result, we include a natural logarithm form of investment in the following model estimations.[2] Also important is the result of the Jarque-Bera Test, which points to the non-rejection of the null hypothesis. This suggests that errors in the linear panel model with the GDP per capita as a dependent variable are normally distributed, thus enabling a reliable statistical

2 Standard deviations of the log form of Investment show much smaller values compared to the mean (22.67. mean and 1.105 overall standard deviation). Full descriptive statistics for the log form of investment variable are available upon request.

inference. Another important step is to perform a correlation analysis to check for possible multicollinearity issues that may affect the quality of the estimates' features. Table 2 shows the Pearson correlation matrix for the variables included in the model.

Table 2. Pearson correlation matrix

	GDP per capita	Invest-ment	Labour force	Educa-tion	Health	Public spending	Corrup-tion level	Time dummy
GDP per capita	1							
Investment	0.3065	1						
Labour force	0.5948	0.4923	1					
Education	0.7456	0.2477	0.7356	1				
Health	0.5501	-0.3064	0.1713	0.3340	1			
Public spending	0.4079	0.0037	-0.2610	0.2157	0.0334	1		
Corruption	-0.8844	-0.2314	-0.4133	-0.6538	-0.4673	-0.4619	1	
Time dummy	-0.0286	-0.0018	-0.0538	-0.0417	-0.0942	0.1514	0.0250	1

Source: Authors' calculations using Stata 14 software

Although these correlation findings may hint at what relationship may exist between the variables included in the model, regression analysis is required to reveal how different variables actually affect GDP per capita. Correlation analysis may, however, help in exploring the possible multicollinearity among independent variables by showing values higher than the absolute value of 0.7. In Table 2, such a value can be found in the case of the correlation between the labour force and education. Variance inflation factor analysis (reported in Table 3, on the left side) indicates that further scrutiny is required as the value for labour force surpasses 5.

Table 3. Variance inflation factor analysis: full model (left), model w/o labour force (middle), and model w/o education (right)

	VIF (full model)	1/VIF (full model)	VIF (model w/o labour force)	1/VIF (model w/o labour force)
Investment	2.01	0.496679	1.52	0.658510
Labour force	5.61	0.178190	-	-
Education	4.52	0.221248	1.82	0.550876
Health	1.89	0.528023	1.89	0.528023
Public spending	2.74	0.365434	1.50	0.667308
Corruption level	3.07	0.326001	3.00	0.333248
Time dummy	1.05	0.950268	1.04	0.962833
Mean VIF	2.99		1.79	

Source: Authors' calculations using Stata 14 software

However, when labour force (right side of Table 3) is excluded from the model, variance inflation factor analysis produces more satisfying values of below 5.[3] Even though caution is needed, dropping variables based on VIF alone might not be warranted given that neither variable shows values above 10, which would be an almost certain indicator of multicollinearity (Menard, 2001, p. 76-7).

Before proceeding to the estimation of the model parameters, we should see if our data suffer from heteroskedasticity or some form of residual correlation. To check the former, we conducted two heteroskedasticity tests. The first is the so-called Breusch-Pagan/Cook-Weisberg test for heteroskedasticity which makes use of residuals from the pooled linear model regression. The second one, on the other hand, is a Wald-type test for groupwise heteroskedasticity that is based on the residuals from the unmodified generalised least squares regression. Both regressions were conducted on a model with natural logarithm versions of both GDP per capita and investment. The results from these tests are written in Table 4.

Table 4. Heteroskedasticity tests results

Test	χ^2 test statistic	p-value	Outcome
Breusch-Pagan/Cook-Weisberg	9.91	0.0016	Rejection of null
Modified Wald	49.81	0.0000	Rejection of null

Source: Authors' calculations using Stata 14 software

Both Breusch-Pagan/Cook-Weisberg and the Wald-type test unambiguously suggest that residuals suffer from heteroskedasticity. That these results point to heteroskedasticity in the model presents one of the main motivations for resorting to heteroskedasticity-robust generalised least squares (GLS) estimation. Another reason to make use of the GLS estimation method lies in the evidence of serial correlation of residuals, obtained from the Wooldridge test for autocorrelation in panel data (shown in Table 5).[4]

3 VIF of labour force achieves values below 5 if education variable is omitted from the model. Moreover, the model without education but with labour force possesses lower Akaike and Schwarz information criteria values than the model with education but without labour force (parameter estimates do not show significant differences). The model with both variables, however, shows even lower information criteria values (all results are available upon request). Due to this outcome, as well as the need for inclusion of proxy variable for human capital and the robust estimates of its strong effect expressed later in our article, we choose to keep education variable as a vital part of our model.

4 Neither heteroskedasticity nor any type of correlation dissapear if we omitt either education or labour force variable from the model (results available upon request).

Table 5. First-order serial correlation test results

Test	F test statistic	p-value	Outcome
Wooldridge	23.472	0.0009	Rejection of null

Source: Authors' calculations using Stata 14 software

The F test statistic indicated that residuals possess a structure of the first-order AR process. Further tests reveal that the AR coefficient varies among groups. This can be inferred from the different rho values for the subsamples of EU and non-EU countries.[5] The advantage of the GLS estimation method is that it can accommodate for such a group-specific serial correlation. Finally, we need to address the issue of cross-sectional correlation. Pesaran tests taken for individual variables separately yield results presented in Table 6.

Table 6. Pesaran pre-estimation cross-dependence test results

Variable	CD test statistic	p-value	Outcome
lnGDP per capita	20.217	0.000	Rejection of null
lnInvestment	16.028	0.000	Rejection of null
Labour force	15.473	0.000	Rejection of null
Education	19.703	0.000	Rejection of null
Health	15.676	0.000	Rejection of null
Public spending	7.573	0.000	Rejection of null
Corruption level	0.614	0.539	Non-rejection of null
Time dummy	21.213	0.000	Rejection of null

Source: Authors' calculations using Stata 14 software

These results clearly show that only the corruption level does not exhibit any sort of cross-sectional correlation. All other variables are, however, characterised by cross-sectional dependence at a level of 1-percent significance. Other types of estimation, such as those involving fixed and random effects, do not solve the cross-dependence issue, as is revealed by Pesaran-type post-estimation tests.[6] The results of these tests are provided in Table 7.

Table 7. Pesaran post-estimation cross-dependence test results

Model specification	CD test statistic	p-value	Outcome
Fixed effects	2.310	0.0209	Rejection of null at 5 percent
Random effects	4.325	0.0000	Rejection of null at 1 percent

Source: Authors' calculations using Stata 14 software

5 These rho values amount to around 0.994 for the EU and around 0.985 for the non-EU countries subsample, respectively. There are minor differences depending on whether the labour force is included in the model or not. The detailed results and procedure information of the subsample rho estimation are available upon request.

6 More on this type of testing can be found in Pesaran (2004).

The outcomes of all the previously conducted tests both offer the justification of the GLS estimation procedure and point to modifications that need to be taken into account to get the most reliable parameter estimates. These are provided in Table 8 and include modifications for both heteroskedasticity and (both serial and cross-sectional) correlation.

Table 8. Generalised least squares static model estimation with standard errors in parentheses (corrected for heteroskedasticity and cross-sectional and serial correlation)

Variable	1	2	3	4	5	6
Constant	1.012*** (0.106)	3.2845*** (0.1513)	0.1047 (0.1306)	0.5401*** (0.1038)	0.0941 (0.4029)	-0.0367 (0.1588)
lnInvestment	0.2134*** (0.0031)	0.1753*** (0.0045)	0.1995*** (0.0035)	0.1693*** (0.0014)	-	0.1793*** (0.003)
Education	0.2931*** (0.0054)	0.154*** (0.0069)	0.1621*** (0.003)	0.1696*** (0.0018)	0.2324*** (0.0232)	0.1505*** (0.0054)
Public spending	0.0407*** (0.0009)	0.037*** (0.0019)	0.0414*** (0.0011)	0.0428*** (0.0006)	0.0378*** (0.0031)	0.0422*** (0.0012)
CPI-based corruption	-0.0186*** (0.0006)	-0.0112*** (0.0011)	-0.0088*** (0.0005)	-0.0152*** (0.0003)	-0.0131*** (0.0013)	-
Time dummy	-	-0.0646*** (0.0041)	-0.0614*** (0.0035)	-0.0592*** (0.0019)	0.0235** (0.0104)	-0.0587*** (0.0021)
Health	-	-	0.0301*** (0.0011)	0.0313*** (0.0009)	0.0673*** (0.0067)	0.0297*** (0.0018)
Labour force	-	-	-	0.0088*** (0.0002)	0.0082*** (0.0017)	0.0063*** (0.0008)
lnCapital Stock	-	-	-	-	0.1633*** (0.0072)	-
Control of Corruption	-	-	-	-	-	0.2617*** (0.1856)
Wald χ^2 test:	6155.8***	19248***	16154***	27111***	6628.58***	17041.7***

*, **, and *** indicate 10, 5, and 1 percent significance, respectively.

Source: Authors' calculations using Stata 14 software

Table 8 yields parameter estimates for six model specifications. The first specification presents the simplest model that includes investment (log form), education, public spending and CPI-based corruption as explanatory variables. The second specification is extended with the inclusion of a time dummy, while the third one also adds health as a variable to capture wider aspects of human capital. The fourth specification extends the model even further, including labour force among the other explanatory variables. The robustness of the corruption effect is checked with the last two specifications: while the fifth one assesses the robustness of investment as a control by substituting it with capital stock (in the log from as well), the sixth one utilises the aforementioned CC variable to see whether a change in corruption variable may bring about different conclusions.

The majority of variables exhibit significant effects at 1 percent. The strongest effect is seen in cases of investment and education. For investment, estimates show that a hundred percent increase in real gross capital formation may lead to a 16.93 to 17.93 percent increase in real GDP per capita if we take into account specifications 4 and 6, respectively. The estimates go even higher in other specifications, reaching up to 21.34 percent in the first specification. In the case of education, the first specification shows that an additional year of schooling for an average person can increase national GDP per capita by as much as 29.31 percent in the first model. The more realistic estimates, however, point to values between 15 and 17 percent (as is the case in all other specifications).

Other effects tend to be somewhat more similar among specifications. All but one specifications show the time effect of 2012 and 2020 recessions to be markedly strong, lowering national GDP per capita by 5.87 to 6.46 percent. The only exception is the fifth specification which shows an unexpectedly positive value. This result is almost certainly due to the omission of the period after 2019 from the sample due to the lack of more recent IMF data on private capital stock. This means that the time dummy failed to cover the 2020 recession, the strongest one in the observed period. On the other hand, a one-year increase in average life expectancy is estimated to bring about between 2.97 (as for the sixth specification) and 3.13 (based on the fourth specification) percent rise in national GDP per capita, with the 6.73 percent effect in the fifth specification sticking out as an outlier. Public spending is also shown to bear positive result for real GDP growth per capita, ranging from a 3.7 to 4.28 percent increase in GDP per capita as a result of a 1 percent increase in the share of government expenditure in GDP. Furthermore, the specifications that contain it reveal that a one percent rise in labour force participation makes national GDP per capita around 0.6 to 0.9 percent higher.

Finally, we should take account of the crucial corruption level estimates. The results from all model specifications are clear: a rise in CPI-based corruption (or, at least, the perception of it) leads to a decrease in real GDP per capita. More concretely, this effect is estimated to lie between -1.9 (in the first specification) and -0.9 percent decrease (in the third specification) following a one-point boost in corruption level. Even though seemingly smaller than the other ones in absolute terms, this effect is nonetheless highly statistically significant and can especially diminish the level of national income if the negative trend of rise in corruption endures. Both the coefficient sign and statistical significance remain the same regardless of the variations among different model specifications.

What is more, the effect of perceived corruption is estimated to be even stronger if we include the aforementioned CC-based variable. The model estimation

shows that a one-point rise in this indicator may raise national per capita income by around a quarter. As this indicator tends to be more focused on various lower-level types of corruption, this result may suggest that these practices may even be more detrimental to economic growth than the ones involving political or other types of higher-level corruption.

It would also be worth investigating how stable are the GLS regression estimates among our subsamples. As can be seen from the previous section, the sample is constructed to include an equal number of EU member states and countries that still do not belong to the EU even though they possess candidate country status. If, along these lines, we divide the full sample into two, we get two subsamples with 5 groups and 10 periods each. Applying the heteroskedasticity and correlation-corrected GLS estimation procedure to these two subsamples yields parameter estimates presented in Table 9 (for the non-EU subsample) and Table 10 (for the EU subsample).

Table 9. Generalised least squares static model estimation with standard errors in parentheses: non-EU WB countries subsample

Variable	1	2	3	4	5	6
Constant	6.7477*** (0.4353)	7*** (0.4043)	7.8872*** (0.7344)	7.8552*** (0.5264)	6.0102*** (0.8285)	7.5103*** (0.541)
lnInvestment	0.0515*** (0.0153)	0.0249* (0.0142)	0.0262 (0.017)	0.0007 (0.0125)	-	0.0019 (0.0129)
Education	0.1343*** (0.01)	0.1209*** (0.0104)	0.1335*** (0.008)	0.0934*** (0.0111)	0.1301*** (0.0128)	0.092*** (0.0111)
Public spending	-0.0092** (0.0042)	0.0101*** (0.0033)	0.008** (0.0034)	0.017*** (0.0033)	0.0248*** (0.0039)	0.0177*** (0.0033)
CPI-based corruption	-0.0075*** (0.0019)	-0.0059*** (0.0015)	-0.0046** (0.0018)	-0.0029** (0.0015)	-0.0024 (0.002)	-
Time dummy	-	-0.045*** (0.0068)	-0.0521*** (0.0144)	-0.0511*** (0.0077)	-0.0246** (0.0112)	-0.0522*** (0.0069)
Health	-	-	-0.0145** (0.006)	-0.0123*** (0.004)	0.0057 (0.0104)	-0.0104 (0.0038)
Labour force	-	-	-	0.0136*** (0.0018)	0.0099*** (0.0024)	0.0142*** (0.0018)
lnCapital Stock	-	-	-	-	0.0154* (0.0091)	-
Control of Corruption	-	-	-	-	-	0.0517 (0.032)
Wald χ^2 test:	316.59***	250.64***	575.13***	794.73***	638.66***	850.79***

*, **, and *** indicate 10, 5, and 1 percent significance, respectively.

Source: Authors' calculations using Stata 14 software

Table 10. Generalised least squares static model estimation with standard errors in parentheses: EU countries subsample

Variable	1	2	3	4	5	6
Constant	2.6537*** (0.9371)	3.8106*** (0.889)	1.0879 (0.8319)	1.992* (1.0755)	0.986 (0.6564)	-0.0679 (0.699)
lnInvestment	0.0724** (0.0353)	0.0693** (0.0332)	0.072** (0.0324)	0.0666 (0.045)	-	0.151*** (0.0115)
Education	0.4714*** (0.0288)	0.3828*** (0.0276)	0.3296*** (0.0475)	0.2664*** (0.0382)	0.189*** (0.0303)	0.1368*** (0.032)
Public spending	013*** (0.0031)	0.0202*** (0.0028)	0.0235*** (0.0031)	0.0402*** (0.0037)	0.02*** (0.0032)	0.0372*** (0.0039)
CPI-based corruption	-0.0143*** (0.0026)	-0.0176*** (0.0025)	-0.0157** (0.0024)	-0.0194*** (0.0021)	-0.0046*** (0.001)	-
Time dummy	-	-0.056*** (0.0193)	-0.0398** (0.0199)	-0.0645*** (0.0195)	0.0468*** (0.0099)	-0.046*** (0.013)
Health	-	-	0.0405*** (0.0082)	0.0292*** (0.0085)	0.0672*** (0.0088)	0.0364*** (0.0087)
Labour force	-	-	-	0.0138*** (0.0027)	0.0182*** (0.0026)	0.0158*** (0.0032)
lnCapital Stock	-	-	-	-	0.0015 (0.0216)	-
Control of Corruption	-	-	-	-	-	0.4452*** (0.0412)
Wald χ^2 test:	2291.47***	792.28***	3234.32***	3945.83***	17650.7***	3663.21***

*, **, and *** indicate 10, 5, and 1 percent significance, respectively.

Source: Authors' calculations using Stata 14 software

These results reveal some differences among parameters depending on the subsample. Thus, the statistically significant positive and strong effect of investment remains in the case of EU countries, at least in the vast majority of model specifications,[7] while this significance and strength fully erode when we turn to non-EU WB countries. The latter results may have to do with the influence of certain factors that restrain the pro-growth activity of capital formation in the sampled non-EU countries. On the other hand, the values for the labour force and education remain positive and statistically significant. The value of the latter, however, rises up to 50 percent as we drop various control variables from the model and restrict ourselves to the sample of EU countries. This estimate, entailing a rise in GDP per capita by around a half as a result of an additional year of schooling for an average person, makes up the largest effect of any variable in our analysis so far.

7 In the case of specification with the labour force, the EU countries' subsample estimation produces a relatively strong effect with a p-value that is marginally higher than 0.1 (more details are available upon request).

Yet, the most surprising finding concerns the effect of health on real GDP per capita. While the parameter estimate almost equals the full sample one in the case of EU member states, it turns out to be both negative and statistically significant for non-EU WB countries. This result would imply that a one-year increase in the average life span may lead to a 1 to 1.5 percent drop in real GDP per capita in sampled countries that do not belong to the EU. One possible explanation of this finding may entail that increased life expectancy in non-EU WB countries from our sample brings some economic costs (including those for pensions, welfare and healthcare) that offset any benefits from the prolonged workforce participation. To assess this hypothesis, a further examination of age-dependent productivity and costs in these countries is required. In addition, the estimates for the effects of health, along with the ones for investment, may be affected by relatively small sizes of both subsamples (50 observations each).

The estimated effects of variables such as public spending and the time dummy, however, mostly possess size, direction and statistical significance that approach the ones for the full sample and do not differ between subsamples. The only important difference concerns the smaller (but still negative) effect of time dummy in non-EU WB countries and an unexpectedly positive effect of this variable among EU countries in the fifth specification. As already indicated, this outcome is highly obviously related to the omission of the 2020 recession from the sample.

The effect of corruption level, as our treatment variable, turns out to be negative in all our subsample specifications. The main difference lies in the finding that the negative effect of CPI-based corruption seems to be stronger in EU countries (ranging between 0.46 and 1.94 percent drop in GDP per capita after a one unit rise in corruption) than in their non-EU counterparts (where it stands at around 0.24 to 0.75 percent decrease). Worth noting is the variation in the effect of CC-based corruption in the non-EU WB subsample compared to the EU one. Whereas the effect among the EU countries ends up being quite strong and resoundingly significant, the effect among the non-EU countries, even though expectedly positive, happens to be much smaller in size (around 5.17 percent) and virtually on the threshold of 10 percent statistical significance (p-value of 0.0106).[8]

However, regardless of the model specification and the subsample analysed, the effect of corruption level remains negative, while its control tends to

8 Of course, these results are very likely affected by the smaller sizes of subsamples. This is especially the case with the fifth specificaiton where, due to omission of two years, the subsample includes only 40 observations. This may explain the lack of statistical significance of negative estimated CPI-based corruption effect among non-EU WB countries.

significantly increase economic growth. Given that the same holds for the full sample, we may conclude that our empirical results confirm the "sanding-the-wheels" hypothesis about the effect of corruption on economic growth. This result generally confirms the findings from other empirical studies that show the negative effects of corruption on economic growth. If we take a closer look at our subsample analysis, we may, however, conclude that our results are more aligned with the results from studies such as those from Mendez and Sepulveda (2006), Aidt, Dutta & Sena (2008), or Hodge and others (2011) which suggest that, while generally negative, the effect of corruption on growth is less negative (or even nonexistent) in the case of countries with lower quality of governance, which is generally the case with the non-EU WB countries from our sample.[9] This is much to the contrary of the findings from the research of Gründler and Potrafke (2019) which points out that better governance tempers the strength of negative corruption effects on economic growth while the lower quality of governance makes it more pronounced.

5. CONCLUSIONS

Our research confirms that corruption generally exhibits negative effects on economic growth, theoretically supporting the "sanding-the-wheels" hypothesis. It also shows that corruption has a more severe negative impact on economic growth in countries with established institutions and effective governance, such as those in the EU. In contrast, the effect of corruption in Western Balkan countries aspiring to join the EU and facing challenges of poor governance and underdeveloped institutions is less pronounced. In that respect, this paper's findings align with the results of studies by Mendez and Sepulveda (2006), Aidt, Dutta & Sena (2008) and Hodge et al. (2011).

The "sanding the wheels" effect of corruption on economic growth in non-EU countries of the Western Balkans necessitates adopting a "zero tolerance" policy toward corruption. Strong institutional performance is the first pillar of an effective anti-corruption policy. This includes establishing rules and legal frameworks that meet high standards and allow for effective enforcement. The second essential component of strong institutions is the presence of regulatory bodies that operate independently, free from political influence while fulfilling their oversight and control responsibilities. At the same time, they must be accountable to national assemblies and the public. Additionally, it is crucial to

9 That non-EU WB countries from our sample generally exhibit lower governance levels than the EU ones can be inferred from the World Bank's World Governance Indicators Database (World Bank, 2024b).

strengthen their capacities to enable them to perform their tasks effectively. This means it is essential to avoid the pitfall of "institutional isomorphism", where institutions in developing countries resemble those in developed countries in terms of structure, organisation and rules, yet achieve very different outcomes due to a lack of capacity and other factors that hinder their operations (Sakib, 2020).

An effective anti-corruption policy requires merit-based recruitment for civil servants in regulatory bodies and measures to reduce nepotism and clientelism. In countries with poorly performing institutions, fostering a culture of ethics and accountability within the public sector is crucial. Civil servants' salaries should be competitive enough to encourage them to remain in public service. Additionally, it is essential to offer public officers various forms of motivation to promote excellence in their work.

Promoting transparency and accountability in public spending, especially in public procurement, is essential for an effective anti-corruption policy. This can be achieved through regular reviews and audits. Additionally, it is important to create models and indicators that assess the impact of anti-corruption measures and policies. This will provide insights into their effectiveness and highlight any significant weaknesses.

Even though it covered a range of model specifications and testing, our research has its limitations. Further research should explore the level of influence of corruption on economic growth transmission channels such are government size, rule of law, free competition and political stability, all to detect channels that are most sensitive to corruption. Moreover, the research sample should be enlarged to include countries with more nuanced differences in governance regimes (and thus include, say, all European countries).

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Conflict of interests

The authors declare there is no conflict of interest.

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ПРОЦЈЕНА УТИЦАЈА ПЕРЦЕПЦИЈЕ КОРУПЦИЈЕ НА ЕКОНОМСКИ РАСТ КОРИШЋЕЊЕМ GLS МОДЕЛА

1 Васко А. Келић, Институт друштвених наука, Центар за економска истраживања, Београд, Србија

2 Ивана М. Остојић, Институт друштвених наука, Центар за економска истраживања, Београд, Србија

3 Предраг П. Јовановић, Институт друштвених наука, Центар за економска истраживања, Београд, Србија

САЖЕТАК

Спроведене су бројне студије како би се истражио утицај корупције на економски раст. Рад има за циљ да открије корелацију између корупције и економског раста на узорку од десет европских земаља за период од

десет година (2012-2021). Да би се добиле процјене које нису подложне хетероскедастичности и корелацији, коришћен је метод уопштених најмањих квадрата (Generalised Least Squares - GLS). Истраживање је потврдило свеукупни негативан утицај корупције на БДП по глави становника, фаворизујући хипотезу о „посипању точкова пијеском“ (“sanding the wheels“). Процјењује се да је ефекат у статичком моделу у распону између -1,5 (у случају модела са радном снагом) и -0,9 процената (када је радна снага искључена) након повећања нивоа корупције за један поен. У динамичким спецификацијама модела, ефекат је процијењен између -0,65 и -1,36 процената у истој години. Анализа је потврдила различите интензитете утицаја корупције на економски раст у оквиру два режима управљања који се разликују по квалитету институција (један се састоји од земаља које су чланице ЕУ, а други од земаља Западног Балкана које треба да испуне услове за приступање ЕУ). Истраживање сугерише да је негативан ефекат корупције интензивнији у земљама са развијеним институцијама (земље ЕУ). Истраживањем је потврђено да се ефекат корупције на економски раст у таквим земљама креће између 1,57 и 1,94 процената пада БДП-а по глави становника након повећања нивоа корупције за једну јединицу. Ове процјене су много веће од оних које су утврђене за земље Западног Балкана, које нису чланице ЕУ, код којих се пад БДП-а по глави становника креће између 0,29 и 0,46 процената.

Кључне ријечи: *корупција, економски раст, бруто домаћи производ, институције, управљање*

HOUSEHOLD DEBT AND INTEREST RATES: A CASE STUDY OF SOUTH AFRICA

1 Kgomotso Molefe, Department of Business Management, University of South Africa, South Africa
2 Ashley Mutezo, Department of Finance, Risk management & Banking, University of South Africa, South Africa
*Corresponding author's e-mail: esegoekp@unisa.ac.za, muteza@unisa.ac.za
1 ORCID ID: 0000-0002-9764-8254
2 ORCID ID: 0000-0002-3002-0040

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ABSTRACT

South African households have increased their debt uptake, even during periods when the cost of credit has increased, which runs counter to theory. The purpose of the study is to determine both households' borrowing reactions to interest rates and the impact of credit demand on interest rates in South Africa. A quantitative approach was followed by econometric analysis of the data. The study employed the autoregressive distributive lag and vector error correction model to analyse the time-series data for the period from 1990 to 2019. The results of the study indicate both a long-run relationship and short-run causality between household debt and interest rates in South Africa. These results support theory as they confirm claims that a low interest rate environment encourages borrowing and vice versa. Policy makers and credit regulators should be alert to the effects of policy-induced changes in interest rates, which are slow to reflect on household debt and can only be witnessed in the long run. The recommendation is that households should be advised to speed up debt repayments rather than stretch themselves during periods of low interest rates. The theoretical contribution of this study is to the loanable fund's theory and the channels of the monetary transmission mechanism. The period analysed captured most important periods, such as the end of the Apartheid era, the National Credit Act and the financial crisis.

1. INTRODUCTION

Household debt is considered an important part of an economy, as it contributes positively to economic growth and improves consumption (Lombardi, Mohanty, & Shim, 2017). Household debt can stimulate the economic system by improving economic development and stability (Mian, Sufi, & Verner, 2017). However, high levels of household debt can have a negative impact on the economy, as indicated by their role in financial crises and recessions (Lombardi et al., 2017). Moreover, high household debt levels pose a threat to the stability of the macroeconomy and to financial institutions and households (André, 2016). The liquidity constraints on households affect future consumption and their ability to service existing debt obligations (Price, Beckers, & La Cava, 2019).

Household debt has increased in developed and emerging economies since the early 2000s (Zabai, 2017). Developed countries such as the United States and the United Kingdom have increased interest rates to combat rising debt levels by reducing the demand for debt. This has forced households to focus on paying off existing debt and reducing consumption (Zabai, 2017). Emerging economies such as Brazil have experienced significant increases in their aggregate household debt. Brazil passed a new law that regulated payroll loans by allowing banks to deduct debt payments directly from individuals' income (Garber, Mian, Ponticelli, & Sufi, 2019). Coelho, De Mello and Funchal (2012) argue that this law led not only to an increase in payroll lending but also to a substantial increase in household debt and a drop in interest rates.

In South Africa, significant increases in household debt began before the 2007/8 financial crisis and debt levels have remained high. During this period of high indebtedness, efforts have been made by the National Credit Regulator (NCR) to help lower the uptake of debt by households. According to the NCR (2019), debt obligations include mortgage debt, other secured credit granted, credit card debt, short-term credit transactions, and unsecured lending. Unsecured lending refers to debt for which the lender does not require security to guarantee the repayment of the loan and is referred to as an unsecured debt (NCR, 2019). The increase in unsecured lending was the result of improper affordability checks by credit providers (de Wet, Botha, & Booyens, 2015). These credit providers relaxed access to credit to extend it to previously disadvantaged households (Owusu-Sekyere, 2017).

The NCR urges consumers and members of households to make sure that they understand the credit agreements they commit to, and that they do not borrow from unregistered credit providers, as these tend to charge excessive interest rates that are not in line with the National Credit Act (NCA) of 2005 (NCR, 2018). The

regulator points out how consumers have been stretched and have become deeply indebted since the 2008/9 financial crisis, and the high cost of living has forced households to rely on debt. In their 2018/2019 annual report, the NCR notes that high levels of consumer debt resulting from these macroeconomic factors remain a challenge. This situation highlights the importance of good credit protection standards and sound macroeconomic policies, especially monetary policies.

Monetary policy decisions in South Africa are made by the Monetary Policy Committee (MPC). The aim of the MPC is to achieve and maintain price stability through an inflation-targeting framework (South African Reserve Bank [SARB], 2019). Decisions taken ensure that monetary stances regulate the rate of inflation, accommodate temporary shocks, and sustain economic growth. A monetary tightening stance increases interest rates and restricts economic growth (SARB, 2019). During a tightening phase, increased interest rates discourage household borrowing and the repayment of existing debt. The MPC chooses this stance to depress credit supply by reducing the pool of loanable funds.

A monetary expansion stance includes reduced interest rates, which lead to cheaper borrowing, increased spending and increased loanable funds. However, the MPC needs to consider the economic effects of interest rate changes on household debt levels. According to SARB (2019) South Africa's history of a combination of low growth and higher long-term interest rates is an indicator of deeper issues. During the same period South Africa experienced high levels of debt. Theoretically, the relationship between interest rates and debt has been negative (Koivu, 2009) but recent interest rate hikes, coupled with high levels of household debt, have highlighted the need for a deeper look at this relationship. The aim of this paper is to examine the relationship between household debt and interest rates by testing theory.

Previous studies, such as those by Meniago, Mukuddem-Petersen, Petersen & Mongale (2013), de Wet et al. (2015) and Mutezo (2014) have focused on household debt in South Africa. A study by Mutezo (2014) examined the relationship between household debt and consumption, while de Wet et al. (2015) focused on the effect of the National Credit Act on household debt. Meniago et al. (2013) researched determinants of household debt and found a negative insignificant relationship between household debt and interest rates. Therefore, the objectives of this study are to explore households' borrowing behaviour during changes in interest rates and to determine whether such changes affect households' borrowing behaviour.

2. LITERATURE REVIEW

The theories applicable to this study are the interest rate channel of monetary transmission mechanisms and the loanable funds theory.

2.1. Theoretical Background

2.1.1. Loanable Funds Theory

The theory of loanable funds was originally developed by Swedish economist Wicksell in 1907. It is known as the neoclassical theory of credit as it is an extension of the classical theory (Gootzeit, 1988). The loanable funds theory proposes that the interest rate is determined by the demand and supply of loanable funds (credit) (Ohlin, 1937). In more recent work, Brandl (2017) simplifies the loanable funds theory as a loanable funds model that involves a discussion between savers and borrowers who determine the price of loanable funds (the interest rate). When the interest rate is higher than the equilibrium interest rate, the quantity of funds supplied increases while the quantity demanded decreases. This creates a surplus of funds that are not borrowed, lower interest rates and a demand for loanable funds (Brandl, 2017). In the same vein, when the interest rate is lower than the equilibrium interest rate it creates a shortage of funds. The demand for funds increases while the quantity supplied decreases; however, surplus units want to lend at a higher interest rate (Brandl, 2017). Therefore, this theory suggests that there is a negative relationship between household debt and interest rates.

2.1.2. Interest Rate Channel

The interest rate channel is the main channel in a transmission mechanism, and it is also considered more dominant than other channels (Mishkin, 1996). This channel focuses on short-term interest rates which affect the prime overdraft rate and eventually consumption and debt uptake by households (Gumata, Kabundi, & Ndou, 2013). Gumata et al. (2013) conclude that the changes in short-term interest rates affect households' balance sheets through debt servicing costs and the demand for credit. Similarly, Igan, Kabundi, Nadal-De Simone and Tamirisa (2013) found that the household demand for credit is differently affected by the various monetary policy stances. During monetary tightening, the demand for credit declines, while it increases during monetary loosening (Ciccarelli, Maddaloni, & Peydro, 2015). The demand for credit results in increases in household debt.

2.2. Empirical Literature

The empirical literature reviewed concerns the influence of household debt and interest rates on each other.

2.2.1. Household debt

Household debt is defined as the total amount of loans and other credit granted to households (Kim, 2016). A loose monetary policy, characterised by low interest rates encourages households to take on more debt, as Stockhammer and Wildauer (2016) found. They investigated determinants of household debt in eleven countries within the Organisation for Economic Co-operation and Development (OECD) during the period 1980-2011. The results of the long-run estimations by Stockhammer and Wildauer (2016) indicated that interest rates had a negative significant influence on household debt. Even though Granger causality was mentioned in the study, it does not mention the results. Similar findings have been made by other researchers, such as Bhutta and Keys (2016), who used panel data from 1999 to 2010 to analyse borrowing behaviour in response to variations in policy-driven interest rates. The findings of their study indicated that lower interest rates were strongly associated with high levels of household debt, leading to equity withdrawal from mortgage loans. A study in Malaysia used time series data to identify selected macroeconomic variables as determinants of Malaysian household debt (Azmin, Zaidi, & Mohamad, 2019). The results of the study indicated that interest rates had a positive and significant relationship with household debt using the Ordinary Least Squares method for regression during the period 2012-2016. Findings by Azmin et al. (2019) indicated that increases in interest rates led to increases in household debt. The results of this study are consistent with those of Khan, Abdullah and Samsudin (2016). The two studies used Malaysian household data but used different econometric models. The study by Khan et al. (2016) analysed data from 1999 to 2014, using the Auto Regressive Distributive Lag (ARDL) model and divided household debt into two categories. They found a positive relationship with consumer debt and a negative relationship with mortgage debt. The findings of both studies imply that households use credit facilities to sustain their household consumption during periods of higher interest rates but consider purchasing property during low interest rate periods to take advantage of the lower cost of debt. A South African study found interest rates, particularly the prime rate, to be a major factor in the level of over-indebtedness of households as it yielded a negative significant relationship. De Wet et al. (2015) found that their results implied that households take up new debt to pay for old credit commitments during periods of low interest rates.

2.2.2. Interest rate

The interest rate is the price that a lender of funds charges the borrower for using the borrowed funds. The supply and demand of funds regulate market interest rates (SARB, 2015). An increase in interest rates is driven by a demand for loanable funds, while keeping the supply of funds constant (Ekwe, Ogbonnaya, & Omodero, 2017). Mian et al. (2017) made a similar finding: if the supply of funds remains constant with an increase in the demand for credit, interest rates will drop. Jakab and Kumhof (2015) disagree; they found that the demand for funds had no influence on the interest rate. McLeay, Radia and Thomas (2014) argue that a low demand for funds by households leads to lower interest rates being offered by individual banks. A study by Alpanda and Zubairy (2019) examined the effect of household debt on the monetary transmission mechanism in the US economy. They found that high levels of household debt had a negative effect on the success of a monetary policy that operates through interest rate changes.

3. MATERIALS AND METHODS

Secondary data were extracted from the South African Reserve Bank (SARB) and the World Bank. The quarterly time-series data are from the first quarter of 1990 to the fourth quarter of 2019. The household debt to disposal income ratio from SARB was used as proxy for the household debt (HHD) variable. The prime overdraft rate from SARB was used as proxy for the interest rate (IR) variable, and the monthly data were converted to quarterly data. The total Consumer Price Index for urban areas was used as proxy for the inflation (INFL) variable and the Gross Domestic Product growth rate was used as proxy for the GDP (GDPG) variable. The inflation and gross domestic product annual data were adjusted to quarterly data. Household debt and interest rate were the focus variables of this study, and the inflation and GDP variables were used as control variables, as the stability of the economy affects household decisions.

3.1 Estimation Techniques

3.1.1 Auto Regressive Distributed Lag (ARDL) Bounds Testing Approach

The ARDL bounds testing approach was originally proposed by Pesaran and Shin (1995) and later extended by Pesaran, Shin and Smith (2001). The ARDL integrates short-run dynamics with long-run equilibrium. The technique can be used when variables are integrated at the order of zero, one or a combination

of both (Pesaran & Shin, 1995). Unit root tests are not compulsory but assist in ascertaining that no variable is integrated at the order of two. This technique has superior sample properties and fairer estimates than the long-run model. The model is efficient when using a small sample size. The procedure is based on the joint F-statistic (or Wald statistic) for co-integration analysis.

ARDL model estimation:

$$\Delta HHD_t = a_0 + b_1 HHD_{t-1} + b_2 IR_{t-1} + b_3 INFL_{t-1} + b_4 GDPG_{t-1} + \sum_{i=1}^{n} \partial_{1i} \Delta HHD_{t-1} + \sum_{i=1}^{n} \mu_{2i} \Delta IR_{t-1} + \sum_{i=1}^{n} \mu_{3i} \Delta INFL_{t-1} + \sum_{i=1}^{n} \mu_{4i} \Delta GDPG_{t-1} + \varepsilon_t \quad [1]$$

$$\Delta IR_t = a_0 + b_1 IR_{t-1} + b_2 HHD_{t-1} + b_3 INFL_{t-1} + b_4 GDPG_{t-1} + \sum_{i=1}^{n} \partial_{1i} \Delta IR_{t-1} + \sum_{i=1}^{n} \mu_{2i} \Delta HHD_{t-1} + \sum_{i=1}^{n} \mu_{3i} \Delta INFL_{t-1} + \sum_{i=1}^{n} \mu_{4i} \Delta GDPG_{t-1} + \varepsilon_t \quad [2]$$

$$\Delta INFL_t = a_0 + b_1 INFL_{t-1} + b_2 IR_{t-1} + b_3 HHD_{t-1} + b_4 GDPG_{t-1} + \sum_{i=1}^{n} \partial_{1i} \Delta INFL_{t-1} + \sum_{i=1}^{n} \mu_{2i} \Delta IR_{t-1} + \sum_{i=1}^{n} \mu_{3i} \Delta HHD_{t-1} + \sum_{i=1}^{n} \mu_{4i} \Delta GDPG_{t-1} + \varepsilon_t \quad [3]$$

$$\Delta GDPG_t = a_0 + b_1 GDPG_{t-1} + b_2 IR_{t-1} + b_3 INFL_{t-1} + b_4 HHD_{t-1} + \sum_{i=1}^{n} \partial_{1i} \Delta GDPG_{t-1} + \sum_{i=1}^{n} \mu_{2i} \Delta IR_{t-1} + \sum_{i=1}^{n} \mu_{3i} \Delta INFL_{t-1} + \sum_{i=1}^{n} \mu_{4i} \Delta HHD_{t-1} + \varepsilon_t \quad [4]$$

Where: Δ is the first difference operator, a_0 is the constant, ∂ and μ are coefficients and ε_t is a white noise error term, b_1, b_2, b_3 and b_4 correspond to the long-run parameters. In equation [1] *HHD* = household debt is the vector, in equation [2] *IR* = interest rates is the vector, in equation [3] *INFL* = inflation is the vector and in equation [4], *GDPG* = gross domestic product is the vector. The F-test or Walt test was conducted to investigate the existence of a long-run relationship among the variables. Based on its numerous advantages, the ARDL technique was the preferred approach to co-integration in this study.

3.1.2 Error Correction Model (ECM)

The association between co-integration and the error correction mechanism was first introduced by Granger (1981); it was later extended by Engle and Granger (1987) to develop the ECM approach. If a series has one or more cointegrating vectors, then ECM is the appropriate estimation technique as it adjusts to short

and long-run deviations from equilibrium in variables (Andrei & Andrei, 2015). The ECM approach was used to test the short-run causality of HHD and other variables and to establish the speed of adjustment to equilibrium when there is a disturbance in the model.

ECM model estimation:

$$\Delta HHD_t = a_0 + \sum_{j=1}^{p} a_1 \Delta HHD_{t-j} + \sum_{j=1}^{q} a_2 \Delta IR_{t-j} + \sum_{j=1}^{q} a_3 \Delta INFL_{t-j} + \sum_{j=1}^{q} a_4 \Delta GDPG_{t-j} + \partial ECT_{t-1} + \varepsilon_t \quad [5]$$

Notes: δ is the speed of adjustment parameter, *ECT* is the error correction term, $a_{1\text{-}4}$ are short-run dynamic coefficients.

4. EMPIRICAL RESULTS AND DISCUSSIONS

In this section, we examine the empirical relationship between household debt and interest rates, using results from the Auto Regressive Distributive Lag (ARDL) and Vector Error Correction Model (VECM) techniques obtained from E-views 10 software.

4.1 Unit Root Results

Table 1. Unit root results

Variables	Intercept	Trend & Intercept	None
Household debt (HHD)	3.535946*** I(1)	3.569492*** I(1)	3.481090*** I(1)
Interest Rate (IR)	6.766405*** I(1)	3.416945* I(0)	6.743990*** I(1)
Inflation (INFL)	7.675364*** I(1)	7.836759*** I(1)	7.521718*** I(1)
GDP growth (GDPG)	10.19842*** I(1)	10.22626*** I(1)	10.24695*** I(1)

Source: Authors' compilation using EViews 10
Notes: Notes: *, **, *** show that the Augmented Dickey-Fuller test statistic are significant at 10%, 5%, and 1% respectively. I(0) denotes stationary at level, while I(1) denotes stationary at first difference.

Unit root tests are performed to examine whether a variable is stationary or not stationary. Although unit root tests are not compulsory for the ARDL bounds test, it is important to verify that none of the variables are integrated at the order of more than one. If any of the variables are integrated at order 2, this will prohibit the use of the ARDL technique. The results from the Augmented Dickey Fuller

(ADF) test in Table 1 indicate that the series are all integrated at the order of one. These results confirm the use of the ARDL technique for cointegration.

4.2 ARDL Bounds Test Results And Discussion

Table 2. ARDL results

Dependent variables	F-stats value	Lower bound I(0)	Upper bound I(1)	Decision
Household Debt (HHD)	9.8606***	5.17	6.36	Cointegrated
Interest rate (IR)	7.1463***	5.17	6.36	Cointegrated
Inflation (INFL)	7.9670***	4.4	5.72	Cointegrated
Gross Dom. Product (GDPG)	10.2873***	5.17	6.36	Cointegrated

Source: Authors' compilation using EViews 10
*** denotes significance at 1%

Long-run relationship was examined using the ARDL bounds test. Table 2 reports a summary of ARDL results using the long-run form and bounds test on an unrestricted constant and unrestricted trend. The null hypothesis is that there is no level relationship, meaning that there is no long-run association. The f-statistic value is compared to the I(0)/ lower bounds and the I(1)/ upper bounds values at 0.05 level provided by bounds test and also given in Pesaran et al. (2001:303). The model used case III, meaning that it is unrestricted and has indicated an intercept and no trend. When the f-statistic value is higher than the upper bound value, we can reject the null hypothesis. When the f-statistic is lower than the lower bound value, we fail to reject the null hypothesis, and if the f-statistic is between the upper bound and the lower bound then the results are inconclusive. The summary of the bounds test results provided in Table 2 indicates that the series are cointegrated and exhibit a long-run relationship. The bounds test indicated a structural break when inflation was a dependent variable; the equation was corrected by adding a time dummy (TD). The Cusum test was also run to test for stability and to ensure that there were no structural breaks. This implies that the series are related and can be combined in a linear manner. The results also indicated that the series would eventually converge in the long run, despite disturbances by shocks in the short run. However, only the relationship between household debt and interest rate was the focus of this study.

These results indicate that household debt and interest rate move together over time and the distance between them is stable. These results confirm the loanable funds theory of Wicksell (1907) as well as the interest rate channel of monetary transmission mechanism. The results also confirm claims that a low interest

rate environment encourages borrowing, and vice versa. The cointegration relationship affirms that household borrowing tends to increase during periods of cyclical upturn when the cost of debt is lower. These low borrowing costs also make existing debt cheaper to repay. However, access to credit during these times contributes to an increase in household debt. Conversely, during economic downturns, when borrowing is expensive, households are discouraged from borrowing. From these results, we can conclude that an upsurge in household debt can be linked to reduced interest rates in the long run. These results are consistent with other studies, for example Meng, Hoang and Siriwardana (2013) also deduced that interest rates have a negative impact on household debt. They also found that households are discouraged from borrowing during rises in interest rates as borrowing becomes expensive and repayment costs increase for those with flexible interest on their existing debt. Bhutta and Keys (2016) agree that a decrease in the interest rate induces an increase in household debt.

4.3 ECM Results And Discussion

The ECM results provide estimates of the long-run relationship and the short-run causal relationship between our two main variables.

Table 3. VECM long run results

Dependent variable: DHHD					
Independent variables	**Lags**	**Probability**	**Std. Error**	**t-Stats**	**Coefficient**
Error Correction Term	1	0.0000	0.0076	-6.37768	-0.04854
Interest rate (DIR)	1	0.0072	0.11872	2.74792	0.32624
Dependent variable: DIR					
Error Correction Term	1	0.0000	0.100306	-5.65986	-0.567719
Household debt (DHHD)	1	0.0000	0.11491	-3.71466	-0.426866

Source: Authors' compilation using EViews 10

Unit root results indicated that all the variables in the series were integrated at first difference, while the probability value should be less than 0.05 for a significant long-run relationship to exist. The coefficient of the error correction term indicates that the previous quarter deviation from long-run equilibrium is adjusted in the current quarter at a speed of 4.85 percent. The long-run results presented in Table 3 reveal a significant bidirectional long-run relationship between interest rates and household debt. The long-run negative influence of interest rate on household debt confirms the results found by the ARDL model. The outcomes reveal that one percent increase in interest rates will result in

0.32 percent increase in household debt. The implication of these results is that changes in interest rates have an influence on the borrowing of households in the long run. The positive changes in interest rates discourage consumers from borrowing while negative changes encourage borrowing in the long run. These results are consistent with other studies such as the one by Zimunya and Raboloko (2015), who found a significant long-run relationship; however, the relationship was positive.

These results further indicate a long-run relationship from household debt to interest rates. The results also confirm the ARDL results and indicate that when households increase their debt uptake, the economy is affected in the long run, and interest rates are alleviated. The outcome further indicates that one percent increase in household debt will result in 0.43 percent decrease in interest rates. Even though these results coincide with theory, there are very few studies other than Jakab and Kumhof's (2015) that focus on the influence of household debt on interest rates.

Table 4. VECM Short-run results

Dependent variable: DHHD	**Probability**	**Coefficient**
Interest rate **(DINT)**	0.2618	1.2593
Dependent variable: DINT	**Probability**	**Coefficient**
Household debt **(DHHD)**	0.0091	6.7980

Source: Authors' compilation using EViews 10

The results of the ECM short-run causal relationship between household debt and interest rates are presented in Table 4. These results indicate a short-run causal relationship running from household debt to interest rates; however, no relationship running from interest rates was found. The results also indicate that one percent change in household debt is associated with 6.79 percent increase in interest rates. The results imply that household debt appears to contribute marginally towards interest rates. This means that when households take up more debt, it boosts the economy but shortly after that the monetary policy committee lowers or stabilises interest rates to stabilise inflation.

5. IMPLICATIONS AND RECOMMENDATIONS

The ARDL and VECM results indicated a long-run relationship between household debt and interest rates. The VECM also indicated short-run causal relationship from household debt to interest rate. These results imply that

policy makers should consider household debt while inflation targeting through monetary policy. Households should be advised to speed up debt repayments rather than overstretch themselves during periods of low interest rates. Policy makers and credit regulators should be alert to the effects of policy-induced changes in interest rates, which are slow to reflect in household debt and can only be witnessed in the long run. For future research, we recommend a comparative analysis with another emerging economy. This analysis would be significant for the interpretation and comparison of complex relationships in similar economies.

6. ETHICAL CONSIDERATIONS

The study discussed in this article adhered to all ethical standards for research without direct contact with human or animal subjects.

7. CONCLUSIONS

The aim of the study discussed in this paper was to examine the relationship between household debt and interest rates in South Africa, using the ARDL and VECM approaches. The results from both approaches indicated a long-run relationship, meaning that changes in interest rates have an influence on household debt in the long run. The results imply that households increase their borrowing during periods of low interest rates when the cost of debt has decreased. The short-run causal relationship indicates that the demand for credit boosts the economy and eventually results in lower interest rates. The results confirm the suggestions made by both the loanable funds theory and the interest rate channel of monetary transmission mechanism. The implication of this study is that policy makers and credit regulators should be vigilant of the effects of inflation-targeting, in both the short run and the long run.

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Conflict of Interests

The authors declare there is no conflict of interest.

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ДУГ ДОМАЋИНСТАВА И КАМАТНЕ СТОПЕ: СТУДИЈА СЛУЧАЈА ЈУЖНЕ АФРИКА

1 Комотсо Млефеи, Одсјек за пословни менаџмент, Универзитет у Јужној Африци, Јужноафричка Република
2 Ашли Мутезо, Одсјек за финансије, управљање ризицима и банкарство, Универзитет у Јужној Африци, Јужноафричка Република

САЖЕТАК

Домаћинства у Јужној Африци повећавала су своје задужење, чак и током периода када су трошкови кредита расли, што је у супротности са теоријом. Сврха студије јесте да се утврде реакције задуживања домаћинстава на каматне стопе и утицај потражње за кредитима на каматне

стопе у Јужноафричкој Републици. Праћен је квантитативни приступ кроз економетријску анализу података. Студија је користила ауторегресивно дистрибутивно заостајање и модел корекције векторске грешке за анализу података временске серије за период од 1990. до 2019. године. Резултати студије указују на дугорочну везу и краткорочну узрочност између дуга домаћинства и каматних стопа у Јужноафричкој Републици. Ови резултати подржавају теорију јер потврђују тврдње да окружење ниске каматне стопе подстиче задуживање и обрнуто. Креатори политике и кредитни регулатори треба да буду свјесни ефеката промјена каматних стопа изазваних политиком, које се споро одражавају на дуг домаћинстава и могу се посматрати само у дугорочном периоду. Препорука је да домаћинства треба савјетовати да убрзају отплату дуга умјесто да се периоди отплате кредита растежу током периода ниских камата. Теоријски допринос ове студије јесте допринос теорији кредитног фонда и каналима механизма монетарне трансмисије. Анализирани период обухватио је већину важних периода, као што је крај ере апартхејда, Закон о националном кредиту и финансијску кризу.

Кључне ријечи: *дуг домаћинстава, каматне стопе, потражња за кредитима*.

THE VOLATILITY SPILLOVER EFFECT OF COVID-19 ON INVESTOR SENTIMENT IN JOHANNESBURG STOCK EXCHANGE

1 Kago Amiel Matlhaku, North-West University, Vanderbijlpark, South Africa
2 Suné Ferreira-Schenk, North-West University, Vanderbijlpark, South Africa
*Corresponding author's e-mail: k.a.matlhaku@gmail.com
1 ORCID ID: 0000-0003-1386-0168
2 ORCID ID: 0000-0002-3112-4132

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ABSTRACT

This study investigates the volatility spillover effect of the COVID-19 pandemic on investor sentiment for the Johannesburg Stock Exchange (JSE). The study analyses how new cases and deaths affected the sentiment of participants in the stock market during the pandemic. It uses the South African Volatility Index (SAVI) as the main measure of market sentiment and the returns of the JSE main index. Daily data on the pandemic from 03/01/2020 to 19/03/2023 was obtained from the World Health Organisation (WHO) while the rest of the financial data was obtained from Yahoo Finance. The methods used are the Baba, Engle, Kraft and Kroner (BEKK) and dynamic conditional correlation (DCC) multivariate GARCH with the mean equations as a Vector Auto-Regressive (VAR) system. The results show that the pandemic had a spillover effect on investor sentiment. This spillover was asymmetric implying that negative news had more effect than positive news. Furthermore, new cases had more spillover effects on investor sentiment than new deaths recorded. The study recommends that investors should trade cautiously during pandemics considering the increased volatility and that policymakers need to minimise contagion effect from the virus to financial markets by calming down the markets or even halting trading temporarily.

1. INTRODUCTION

The COVID-19 virus changed how investors perceive, look at and understand markets during sustained periods of pandemics. One of the most pertinent topics for consideration is gaining insight how sentiment changes during different

phases of the cyclical market. In this study, investor sentiment is defined as the belief about the prospect of future cash flows and investment risks that are not justifiable by any current factual information in possession (Baker & Wurgler, 2007).

Even though it has been universally accepted, this behavioural finance concept continues to interest researchers. What is known though is that investor sentiment affects stock returns and that when investors are more bullish and optimistic, returns tend to be high and vice versa (Kim & Lee, 2022). Much of this field's work has investigated how this sentiment affects stock makets (Ángeles López-Cabarcos et al., 2020). This study contributes to the body of literature by analysing the effect of COVID-19 on investor sentiment. Previous research investigated how this sentiment affects stock market performance during periods of financial turmoil, especially in 2008 but little work has been done to study how pandemics affect it. Only a few papers have tried to gain insight into this topic but unfortunately, not enough research has been conducted to tackle this problem. Fundamentally it would make reasonable sense to assume that the virus was fear-inducing, making market participants more fearful.

In this paper, we empirically test whether, during the pandemic in South Africa, there was a spillover effect from new infections and new deaths on investor sentiment. Theoretically, it would make sense that during this time, the pandemic induced widespread fear that affected the behaviour of investors, making markets volatile. This fact, compounded by other aspects including lockdowns which were also caused by the virus, means that the risk perceived by the market was heightened and, therefore, trading was abnormal for the Johannesburg Stock Exchange (JSE).

In simple terms, this study investigates whether the pandemic caused investors to be more fearful when trading in the JSE at a time when the virus was highly prevalent. Furthermore, it also seeks to look into whether this spillover was asymmetric or not. This is rather important because we need to understand if good news about the virus had the same effect as bad news on investor sentiment. It has been shown that in finance, bad news has more impact than good news on financial performance (Eil & Rao, 2011; Gambetti et al., 2023; Soroka, 2006), therefore, this needs to be tested in the South African context. This research also tries to establish if there is a dynamic conditional correlation (DCC) between COVID-19 and investor sentiment.

In developing the hypothesis for the theory, this research article came up with proximate variables that can be tested. Most studies construct complex indices, however, there is no need for that as there are already instruments in the market

which are good enough proxies. One hypothesis this investigation tries to develop is to test if COVID-19 has a spillover effect on investor sentiment for the JSE by looking at the South African Volatility Index (SAVI) and the returns of the JSE main index. Furthermore, it will also analyse if the spillover effect is asymmetric both in the short-run and long-run periods. Finally, the paper will determine the most appropriate model for forecasting in such an environment in South Africa.

2. THE THEORY OF IATROGENIC PANDEMIC AND MARKET PERFORMANCE

The effect of the virus on the stock market has been of recent interest to most researchers since the World Health Organisation declared it a global pandemic. Bonneux & Van Damme (2006) studied why pandemics induce fear in the general public, and they argue that firstly the perception of risk by an individual is solely subjective to the feeling of control. The authors further explain that the fear of pandemics makes human nature feel out of control of their current situation hence leading them to partake in aimless activities like panicking. Worse still, people tend to perceive unlikely catastrophes and disasters as more threatening than regular risks with COVID-19 as an example of a catastrophic event. It has been shown that this iatrogenic panic leads to panic with buying or selling as individuals try to regain control of their current situation (Arafat et al., 2020). The same thing can be said about investors who in panic sell and cash in on the gains so that they feel in control during pandemics. This can lead to volatility in the market as everyone is trying to offload their portfolio stock while no one wants to buy them. Henceforth the perceived sense of losing control, especially during flu-like pandemics can be linked to panic behaviour in financial markets resulting in market volatility.

There is one aspect that has recently been noticed about the psychology of pandemics, especially during the COVID-19 pandemic. It has been observed that most media including social and mainstream contributed to the panic behaviour because of how fast news travels (Taylor, 2022). Some of this news which has the inherent risk of being false also worsens the panicking of individuals during this period.

The literature further shows that when the pandemic started, global financial markets did not react to the news regarding it. However, when human-to-human transmission was confirmed, markets reacted negatively (Khan et al., 2020; Ngwakwe, 2020; Okorie & Lin, 2021). It has also been shown that global markets suffered a negative shock when the pandemic started and that there was a

bidirectional spillover effect between Asian, European and American markets (He et al., 2020; Yu, Xiao & Liu, 2022). In China, Mezghani, Boujelbène and Elbayar (2021) found that there is a dynamic connectedness and dual causality between investor sentiment and financial markets in both optimistic and pessimistic situations during COVID-19, indicating that the pandemic affected sentiment. In emerging markets, it has been indicated that the virus brought about asymmetric volatility spillover and that Russia, India, Brazil, and Peru were more volatile during the disease than during the global financial crisis (GFC) of 2008 (Rakshit & Neog, 2022). When focusing on Africa, Takyi & Bentum-Ennin (2021) also concluded that most countries had no chance of escaping the negative effects of the illness on the performance of African stock markets.

By looking at COVID-19 and investor sentiment, Reis & Pinho (2020) analysed how the pandemic affected market returns and investor sentiment. They concluded that since the United States of America (USA) has mass news informational sources, the virus had a negative impact on investor sentiment. This is also shared by Yarovaya et al. (2022). Some of the research has focused on designing a sentiment index to test against COVID-19 and measure its predictive power in stock markets. The studies conclude that there is some connection between the pandemic and the constructed sentiment indices (Huynh et al., 2021; Jiang et al., 2021). Other studies have looked at the asymmetric spillover nature of the pandemic. Hanif, Mensi & Vo (2021) provide evidence of asymmetric tail dependence during the COVID-19 pandemic breakout in the US across different industry sectors. They find time-varying bidirectional asymmetric spillover from the US to the Chinese market and vice versa. The spillover effect of news of the pandemic on travel and leisure stocks has also been recorded. It was found that the effect was mainly due to volatility induced by panic sentiment (Wang et al., 2023).

It is noted that at the beginning of the pandemic in the US and Chinese markets, the markets experienced extreme volatility as a result of pessimistic investor expectations that was caused by the virus (Nian et al., 2021). The two markets, however, had a negative correlation and, as the pandemic progressed, the effect of the virus was different in these markets. In the USA, China, and Japan, further studies suggest that the pandemic caused investors' psychological behaviours to be negative, leading to lower returns (Naseem et al., 2021).

3. MATERIALS AND METHODS

This study uses the multivariate GARCH (M-GARCH) method to test for conditional covolatility among the time series that are investigated (Bauwens et al., 2006). The M-GARCH approach is most appropriate for this analysis, as our goal is to test the time-varying conditional variance between variables (Hemche et al., 2016). Particularly in this paper, the two main M-GARCH models that are employed are the BEKK (BABA, Engle, Kraft and Kroner) by R. F. Engle & Kroner, (1995) and the DCC (Dynamic conditional correlation) method. Specifically, the asymmetric VAR-BEKK-GARCH model is used to test for volatility spillovers and asymmetric behaviour among multiple time series (Arfaoui & Yousaf, 2022; Hashmi et al., 2022).

3.1 Asymmetric VAR-BEKK-GARCH model

As an extension from the VAR-GARCH that was presented by Ling and McAleer (2003) and applied in multiple volatility spillover studies, (Kuhe, 2019; Manasseh et al., 2019; Thiem, 2018) the asymmetric VAR-BEKK-GARCH will be implemented. This is a variance decomposition approach which is ideal to study conditional means and variances/volatilities efficiently as the estimated parameters are not computationally intensive. The model comprises of two components which are the VAR and the regular asymmetric BEKK-GARCH. It is an appropriate model in this study as it can be used to study the combined evolutionary dynamics of spillovers from multiple time series.

The vector autoregressive (VAR), is an extension of the univariate autoregressive (AR) and also achieves its purpose by using the main variables of the problem as endogenous variables and using their previous lags to construct the model. This VAR model can be expressed in the following way:

$$R_t = C + \sum_k A_k R_{t-k} + \varepsilon_t \quad \text{.....(1)}$$

$$\varepsilon_t | I_{t-1} \sim N(0, H_t) \quad \text{.....(2)}$$

where it is given that R_t is the value of the vector of endogenous variables at time t, C is the constant vector, and A is the estimated coefficient matrix. Furthermore, ε_t is the residual vector that is assumed to be distributed with zero mean and constant variance while k is the lag order and I_{t-1} is all the market information available at the time t-1. Usually, the lag order (k) is chosen using the Akaike information criterion (AIC), and the likelihood ratio. For simplicity, the VAR(1) with one lag for each endogenous variable is used in this paper.

The BEKK(p,q)–GARCH model proposed by Engle and Kroner (1995) has some special properties that make it ideal for the problem in this study. This is because the model guarantees that the variance-covariance is always positive-definite without imposing any restrictions on the parameters to be estimated. This makes it easy to estimate as the model reduces parsimony. Also, as mentioned before for the VAR portion of the model, a lag order of one is employed such that $p=q=1$, therefore the formulation of the model is:

$$e_{i,t} = v_{i,t} h_{i,t}, \quad v_{i,t} \sim N(0,1) \quad \text{.....(3)}$$

$$h_{i,t} = c_i + \alpha_i e^2_{i,t-1} + \beta_i h_{i,t-1} \quad \text{.....(4)}$$

$$H_t = C^T C + A^T e_{t-1} e^T_{t-1} A + B^T H_{t-1} B \quad \text{.....(5)}$$

From the equations above, eq.(3) represents the relationship between the residual term $e_{i,t}$ and the conditional variance $h_{i,t}$ with $v_{i,t}$ as the standard normal distribution residuals. α, β are coefficients while $H_{i,t}$ is the conditional variance-covariance matrix. C indicates the lower triangular matrix while A and B are square arrays. It is given that if C^TC is positive, then it is almost positive everywhere. H_t, A, B, and C can be formalised in the following way:

$$H_t = \begin{pmatrix} h_{11,t} & h_{12,t} & h_{13,t} \\ h_{21,t} & h_{22,t} & h_{23,t} \\ h_{31,t} & h_{32,t} & h_{33,t} \end{pmatrix} \quad C = \begin{pmatrix} c_{11} & 0 & 0 \\ c_{21} & c_{22} & 0 \\ c_{31} & c_{32} & c_{33} \end{pmatrix}$$

$$A = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix} \quad B = \begin{pmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{pmatrix}$$

The main diagonal of H_t symbolises the main variables of interest. In this case, $h_{11,t}$ represents the proxy for investor sentiment, the JSE main index returns and the SAVI index. Furthermore, $h_{22,t}$ denotes the COVID-19 infection rate, while $h_{33,t}$ is the COVID-19 death rate and $h_{ij,(ij)}$ is the conditional covariance of i and j. Matrix A displays the ARCH coefficients of the model, with the main diagonal a_{11}, a_{22} and a_{33} representing the three-time series of interest. It is the same interpretation as H_t except that it shows the ARCH effect. B is the GARCH effect coefficient matrix of the model with the main diagonal being the GARCH effects of the main time series. It is reflective of the persistence of the volatilities in the series

themselves, while the off-diagonals show the spillover effects between different series. If the sum of the ARCH effect and the GARCH effect approaches one, then there is evidence of a longer volatility spillover effect.

When considering the asymmetric effect, the asymmetric BEKK (1,1) is applied in this investigation and is shown as:

$$H_t = C_0^T C_0 + A_1^T (e_{t-1} e_{t-1}^T) A_1 + B_1^T H_{t-1} B_1 + D_1^T (z_{t-1} z_{t-1}^T) D_1 \quad \text{.....(6)}$$

Matrix D is formulated similarly to A and B, and z_{t-1} is the k-dimensional column vector. Therefore, if $e_{t-1} \leq 0$ then it implies that there is bad news or negative shocks, then $z_{t-1} = e_{t-1}$, else $z_t = 0$. Therefore, matrix D measures the asymmetric effects of the time series being analysed.

3.2 Asymmetric DCC-GARCH model

The DCC-GARCH model (Engle 2002) is based on the constant conditional correlation (CCC) model. The CCC model assumes that the correlations are constant over time. However, in reality, correlations vary over time as the conditional correlations are updated by conditional volatility. The DCC-GARCH model solves this problem by relaxing the constant correlation condition and accounts for time-varying correlation which is what this study aims to investigate. The DCC-GARCH model is an effective tool for examining the conditional covolatility across several time series since it may consider time-varying correlation. It is a better strategy than the present time-varying approaches because it offers a more flexible and realistic approach to modelling and forecasting volatility and correlation.

The model decomposes the covariance matrix H_t as follows:

$$e_t | \psi_{t-1} \sim N(0, H_t), \quad H_t = D_t R_t D_t \quad \text{.....(7)}$$

where *it* is the residual vector comprising the residues of each series, the available market information available at time *t-1* is given by ψ_{t-1}, while H_t is the dynamic condition covariance matrix. $D_t = diag\left\{\sqrt{h_{it}}\right\}$ is a k x k diagonal matrix time varying standard deviations estimated from the univariate GARCH processes and R_t is the dynamic correlation coefficient matrix.

The standardised residuals, given as $\alpha_{it} = e_{it} / \sqrt{h_{it}}$, are given as an expression for measuring the dynamic correlation matrix, R_t:

$$R_t = diag(Q_t)^{-1}(Q)diag(Q_t)^{-1} \quad \text{.....(8)}$$

where $Q_t = (q_{ij,t})$ is a positive definite matrix with the conditional variances covariance of e_{it} and $diag(Q_t)^{-1}$ is the inverted diagonal matrix given as:

$$diagQ_t = \begin{pmatrix} \sqrt{q_{11,t}} & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & \sqrt{q_{kk,t}} \end{pmatrix} \quad \text{.....(9)}$$

In this regard, the DCC model can be estimated by the unconditional covariance of the standardised distribution $\bar{Q}$, of the univariate GARCH model:

$$Q_t = (1-\theta_1-\theta_2)\bar{Q}+\theta_1\tilde{e}_t\tilde{e}_t^{'}+\theta_2 Q_{t-1} \quad \text{.....(10)}$$

Then the dynamic conditional correlation is given by:

$$p_{ij} = \frac{q_{ij,t}}{\sqrt{q_{ii,t}q_{jj,t}}} \quad \text{.....(11)}$$

It should be noted that θ_1 and θ_2 are non-negative scaler parameters that satisfy $\theta_1+\theta_2 < 1$.

3.3 COVID-19 Data

Daily smoothed data on new cases and new deaths related to the virus are obtained from the World Health Organisation (WHO) spanning from 03/01/2020 to 19/03/2023. WHO uses a 7-day rolling average method to remove noise which is preferred in this analysis (McConnel, 2020). The author uses the rolling average of a time series to estimate parameters throughout a rolling window with a defined size that runs through the sample. This is a frequent method to evaluate a model's parameter consistency. The estimations over the rolling windows should not change significantly if the parameters are consistent over the whole sample. The rolling estimates ought to account for any instability caused by parameter changes that occur during the sample (Zivot & Wang, 2003). The proxy variables will then be new cases for new infection rates and new deaths for new death rates as a result of the virus using the rolling method.

The following chart shows the trend for the two series.

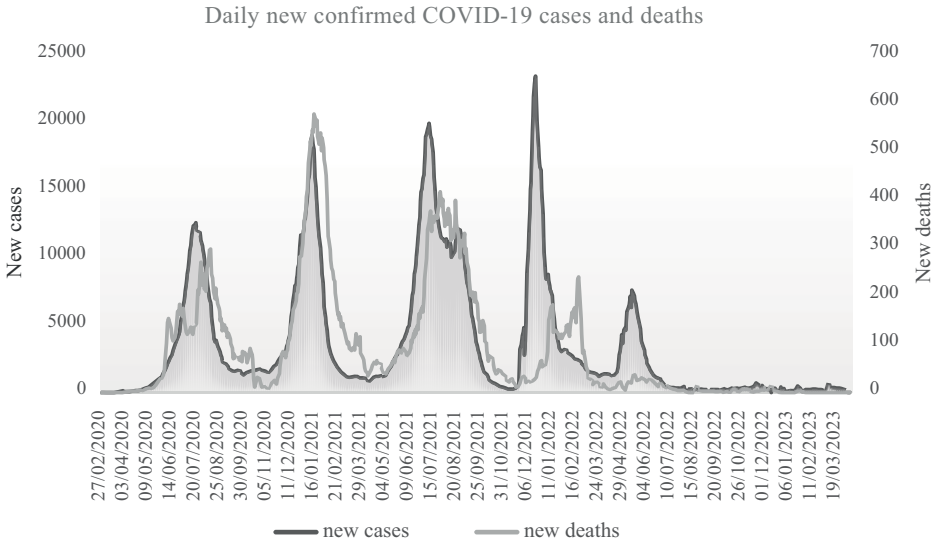

Figure 1. Daily new confirmed COVID-19 cases and deaths
Notes: Data was obtained from the World Health Organisation (WHO) for new COVID-19 infection rates and new death rates. The data was smoothed using the seven-day rolling method.
Source: Authors' calculations

Figure 1 above shows that South Africa went through approximately 5 waves of the pandemic. During the period under investigation, the daily infection rate peaked at around 23,000 cases infected in the fourth wave. Death rates also peaked at around 600 in the second wave.

3.4 Investor sentiment data

This study will use data ranging from 03/01/2020 to 19/03/2023 in the analysis.

The first proxy used to measure investor sentiment is the South African Volatility Index (SAVI). The SAVI was launched in 2007 as a gauge to measure market expectation of three-month market volatility. It is not a tradeable index and has been thought of as a 'fear' index (Kotze et al. 2009). It was updated by the JSE in 2009 to be an index more reflective of expected market volatility. When it was updated a new method of estimating the projected 3-month volatility was incorporated. Currently, the SAVI is calculated using the at-the-money volatilities and is based on the FTSE/JSE Top40 index level. Since the new SAVI includes a market crash protection volatility premium, it can be considered a more effective "fear" indicator, since the volatility skew represents the market's expectation of a crash. The weighted average prices of calls and puts with a wide variety of strike prices that expire in three months are used to determine the index.

Therefore, it is intuitive to say that the index can be used to measure investor sentiment (Harrilall & Seetharam, 2015). It should be noted that since the SAVI is a volatility index, there is no need for any transformation for this analysis and in this study, this name is referred to throughout the paper.

The second proxy used in this study is the daily return of the JSE main index (JSER) and it is chosen because similar studies have also utilised it (Huang et al. 2015; Yadav and Chakraborty 2022; Zi-Long, Su-Sheng & Ming-Zhu 2021). The data is obtained from Yahoo Finance and transformed accordingly. The adjusted closing price for the JSE main index is transformed into a daily log return calculated as, *log*(current price/previous price) as in previous studies (Jaffe et al., 1989; Zi-Long, Su-Sheng & Ming-Zhu, 2021). The log transformation is frequently used in time series analysis to stabilise the series' variance. Lütkepohl & Xu, (2012) look at the circumstances in which logging data is useful for predicting. They compare log-based forecasts with forecasts based on the original series in their study. It is discovered that the preference for the former or the latter depends on the data-generating procedure. If the log transformation really stabilises the volatility of the underlying series, then taking logs for a variety of economic variables results in significant forecasting benefits. For this analysis, the variance must be stable, hence the need for the log transformation.

The raw data chart for the period under analysis is shown below. The adjusted closing price for the JSE main index and SAVI trend can be seen in Figure 2 below.

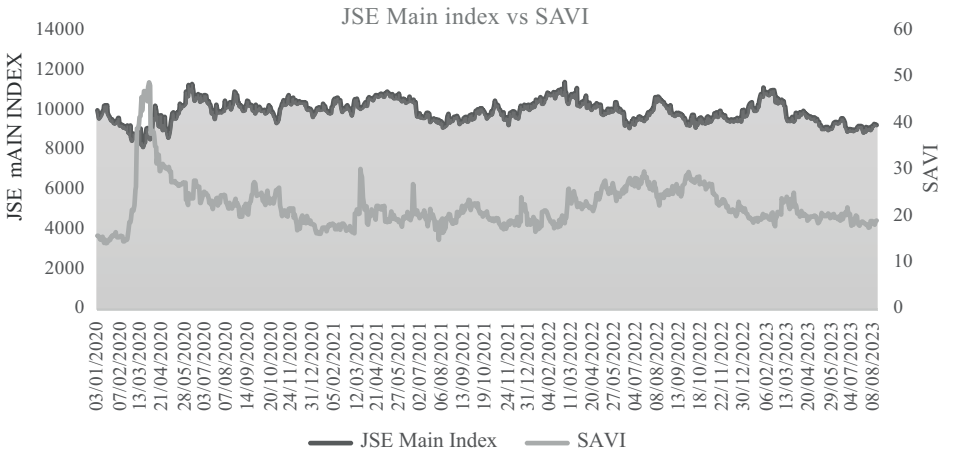

Figure 2. Adjusted closing price of the JSE main index and the SAVI

Notes: Data obtained from Yahoo Finance. The graph shows the SAVI against the adjusted closing price of the JSE for the period under review.

Source: Authors' calculations

Figure 2 above shows the results for the SAVI and the JSE Main index. During the beginning of the pandemic, the SAVI spiked to almost 50 indicating that as new cases started to increase, volatility also rose considerably showing that the market was becoming more fearful as a result of the uncertainty caused by the virus. By mid-2023, it had slumped to nearly 20 as infection and death rates dropped and market confidence improved. The chart also shows the adjusted closing price for the JSE main index shown in Rands. When the pandemic started, the market experienced slightly lower returns which became more erratic and volatile as the pandemic spread.

3.5 Summary statistics

The summary statistics of the data are shown in Table 1 below.

Table 1. Summary statistics

	SAVI	JSER	New cases	New deaths
Mean	15.278	0.000	3080.585	77.606
Median	19.455	0.000	1187.429	21.857
Maximum	49.040	0.026	23437.140	577.571
Minimum	14.300	-0.040	0.000	0.000
Standard Deviation	11.116	0.006	4589.761	116.293
Skewness	-0.284	-0.277	1.972	2.015
Kurtosis	2.097	8.554	6.366	6.870
Jarque-Bera	62.772***	1715.709***	1481.849***	1719.374***
Sum	20197.810	-0.033	4072533.000	102595.000
Observations	1322	1322	1322	1322

Notes: *** Implies that the variable is significant at the 1 percent significance level.
Source: Authors' calculations

There were 1322 observations from the data set in total. Table 1 shows that the financial data, being the SAVI, had an average of 15.278 index points which is low compared to a maximum of 49.04 caused by elevated uncertainty due to the virus. JSER seems to be constant with average returns remaining at 0 for the period under review. The SAVI and the JSER have negative skews implying that there are tails on the left side. New cases and new deaths are positively skewed implying that the data is distributed mostly on the right side of the mean. When considering kurtosis one can infer that the SAVI is platykurtic while the rest of the variables are leptokurtic.

4. RESULTS

The first results presented in Table 4 are the VAR system results for the two systems under analysis, the model is a VAR(1) type with only one lag.

Table 2. VAR Systems Results

System 1	SAVI	New cases	New deaths
1. SAVI{1}	0.722***	0.674	-0.013
	(0.019)	(0.505)	(0.015)
2. New cases {1}	0.001**	1.015***	0.001***
	(0.000)	(0.003)	(0.001)
3. New deaths {1}	0.008*	-0.844***	0.975***
	(0.004)	(0.106)	(0.003)
F-Test		F-Statistics	
SAVI	1435.790***	1.777	0.833
New cases	5.780**	143134.663***	87.102***
New deaths	3.751*	63.866***	100885.260***
System 2	JSER	New cases	New deaths
1. JSER{1}	-0.073***	-416.362	77.714*
	(0.028)	(1429.942)	(41.513)
2. New cases{1}	0.000	1.015***	0.001***
	(0.000)	(0.003)	(0.000)
3. New deaths{1}	0.000	-0.825***	0.975***
	(0.000)	(0.105)	(0.003)
F-Test		F-Statistics	
JSER	6.978***	0.085	3.505
New cases	0.155	146971.825***	87.134
New deaths	0.087	62.044	102852.663***

Note: *** are variables that are significant at the 1% level and ** are significant at the 5% level, while * is significant at the 10% level. The numbers in brackets are standard errors for the coefficients.
Source: Authors' calculations

From Table 2 above, the one-day lagged SAVI index is positively significant at the 1% level on itself. This means that if the SAVI value of yesterday increased by 1%, then the same index of today will grow by 0.72% exhibiting volatility clustering. COVID-19 New cases with a one-day lag are positively significant at the 5% level in determining volatility, measured using the SAVI. New deaths on the other hand were positively significant at the 10% level with the volatility index. The one-day lagged JSER is negatively significant at the 1% level in explaining the current returns of the JSE main index.

After looking at the VAR model and getting a clear picture, one can analyse the variance decomposition results which are the BEKK and DCC GARCH-type models. The M-GARCH results are shown next.

Table 3. SAVI M-GARCH model

	BEKK			DCC		
Variable	Coeff	Std Error	T-Stat	Coeff	Std Error	T-Stat
	Mean Model(SAVI)					
Constant	10.906***	0.573	19.046	12.758***	0.263	48.561
SAVI{1}	0.324***	0.026	12.549	0.194***	0.014	14.209
New cases{1}	0.000	0.000	-0.325	0.000**	0.000	2.078
New deaths{1}	-0.005	0.003	-1.482	-0.006***	0.002	-2.730
	Mean Model(New cases)					
Constant	-0.001***	0.000	-6.109	-21.876***	8.118	-2.695
SAVI{1}	0.000***	0.000	9.298	0.434	0.390	1.114
New cases{1}	0.911***	0.001	978.242	1.041***	0.001	1027.670
New deaths{1}	0.856***	0.015	56.518	-0.962***	0.048	-20.220
	Mean Model(New deaths)					
Constant	0.000	0.000	-0.000	0.001***	0.000	3.380
SAVI{1}	0.000	0.000	0.000	0.000	0.000	0.107
New cases{1}	0.000	0.000	0.258	0.002***	0.001	30.006
New deaths{1}	0.985***	0.004	256.291	0.977***	0.001	981.850
	Variance					
C(1,1)	8.735***	0.611	14.300	52.819***	2.423	21.795
C(2,2)	0.000	0.001	0.000	5162.744***	323.536	15.957
C(3,3)	0.000	0.000	0.000	0.000	0.000	0.384
A(1)	0.054*	0.031	1.755	0.417***	0.017	24.559
A(2)	2.488***	0.091	27.325	0.234***	0.003	81.681
A(3)	0.615***	0.020	31.154	0.587***	0.007	78.510
B(1)	-0.471***	0.111	-4.236	0.255***	0.024	10.841
B(2)	0.236***	0.040	5.910	0.462***	0.004	105.333
B(3)	0.921***	0.001	1615.123	0.575***	0.008	72.360
D(1)	-0.338***	0.064	-5.316	-0.193***	0.026	-7.521
D(2)	1.265***	0.449	2.816	0.340***	0.007	51.940
D(3)	-0.165	0.103	-1.604	0.694***	0.015	47.907
M(2,1),DCC(A)	0.001	0.001	0.930	0.010***	0.000	28.641
M(3,1),DCC(B)	0.000	0.000	0.000	0.524***	0.008	66.951
M(3,2)	0.000	0.000	0.000			
Observation	1321			1321		
Log-likelihood	-14437.598			-16022.219		

Note: *** are variables that are significant at the 1% level and ** are significant at the 5% level, while * is significant at the 10% level.
Source: Authors' calculations

The spillover effect of COVID-19 on SAVI is shown in Table 5 above with the mean equations of the VAR(1) system in the first three rows, while the conditional covariance results are shown in the fourth row. In the table, both the results for the BEKK and DCC models are presented.

In the conditional covariance section of the results in row four, the news effect in A(1) which is the SAVI is weakly and positively significant at the 10% level, indicating that the news effect has a spillover effect on the current conditional covariance. New infection cases A(2) and new deaths A(3) also had a news spillover effect on the conditional covariance. This means that COVID-19 had a short-term volatility spillover effect on investor sentiment. In the case of the BEKK model concerning volatility persistence, one can observe that the SAVI represented by B(1) is negatively significant at 1% in explaining the conditional covariance, implying that in the long run, the SAVI reduced volatility in the system. In the case of the DCC model, the persistence was positively significant at the 1% level indicating a conflict within the results. However, the authors of this study chose the BEKK results as the log-likelihood is higher than that of the DCC. The COVID-19 proxy of new cases, B(2) and new deaths, B(3) are positively significant. Consequently, since these two factors positively contribute to the growth in conditional covariance, they are ultimately accountable for the persistence of volatility. The results are consistent for both the BEKK and DCC models.

The SAVI index represented by D(1) shows that the coefficient is negatively significant at the 1% level in explaining conditional covariance. This means that positive news about the index reduces volatility and market fear. New-cases of infections as shown by D(2), have a positive and significant asymmetric effect at 1% in increasing conditional covariance. It makes sense that negative news, especially about rising infection rates, should have a larger negative effect on volatility and investor sentiment than good news has.

Lastly, based on the DCC(A) and DCC(B) results, it can be concluded that both the long- and short-term dynamic correlations are positively significant at the 1% level. This suggests that volatility clustering can occur when there is a positive correlation between the three variables, which in turn influences the dynamic correlation over the course of the two periods.

The next results to be presented represent how COVID-19 spilled over to returns, these are shown in Table 6 below.

Table 4. JSER M-GARCH model

	BEKK			DCC		
Variable	Coeff	Std Error	T-Stat	Coeff	Std Error	T-Stat
	Mean Model(JSER)					
Constant	-0.000**	0.000	-2.108	-0.001	0.000	-0.308
JSER{1}	-0.118***	0.028	-4.251	-0.0862***	0.026	-3.261
New cases{1}	0.000*	0.000	1.746	0.000	0.000	1.032
New deaths{1}	0.000	0.000	-1.571	0.000	0.000	-1.066
	Mean Model(New cases)					
Constant	-12.329***	3.537	-3.485	-30.286***	6.334	-4.781
JSER{1}	-1865.253***	542.641	-3.437	1956.339*	1173.850	1.667
New cases{1}	1.014***	0.002	695.572	1.036***	0.001	796.869
New deaths{1}	-0.984***	0.055	-17.780	-0.928***	0.051	-18.269
	Mean Model(New deaths)					
Constant	-0.005	0.014	-0.368	0.119***	0.021	5.821
JSER{1}	3.378	3.182	1.062	-5.792	4.454	-1.304
New cases{1}	0.001***	0.000	40.081	0.001***	0.000	25.581
New deaths{1}	0.969***	0.001	820.094	0.965***	0.002	531.716
	Variance					
C(1,1)	0.004***	0.000	81.308	0.001***	0.000	30.944
C(2,2)	62.734***	2.277	27.548	2785.425***	448.675	6.208
C(3,3)	-0.026***	0.009	-3.017	-0.007	0.018	-0.390
A(1)	0.193***	0.020	9.861	0.231***	0.008	28.27
A(2)	0.687***	0.007	95.514	0.259***	0.006	41.555
A(3)	0.468***	0.037	12.662	0.540***	0.009	61.598
B(1)	0.699***	0.008	85.919	0.484***	0.011	43.168
B(2)	0.716***	0.004	170.543	0.563***	0.019	29.714
B(3)	0.901***	0.006	152.350	0.743***	0.011	66.616
D(1)	-0.037	0.069	-0.536	-0.196***	0.020	-9.782
D(2)	0.226***	0.044	5.094	0.353***	0.007	51.062
D(3)	-0.612***	0.059	-10.447	0.401***	0.033	12.297
M(2,1),DCC(A)	-1.451	2.902	-0.500	0.046***	0.004	12.347
M(3,1),DCC(B)	0.009	0.009	1.003	0.543***	0.010	57.255
M(3,2)	-0.044***	0.011	-4.077			
Observations	1321			1321		
Log-likelihood	-7114.266			-7294.734		

Note: *** are variables that are significant at the 1% level and ** are significant at the 5% level, while * is significant at the 10% level.

Source: Authors' calculations

Table 4 above shows that A(1), A(2) and A(3), which represent the short-run volatility spillover impact from the news effect of returns, new infections, and new deaths, respectively, are all positively significant at the 1% level. The results confirm that the three variables all influenced the system's volatility. B(1), B(2) and B(3) represent the long-run volatility spillover effect of the three variables in the same order. All three coefficients linked to the variables are positively significant at the 1% level, implying a persistent effect of the volatility spillover in the long run.

For the BEKK model D(2) is positively significant at the 1% level, implying that new infections had an asymmetric spillover effect on the system. D(3) is negatively significant at the 1% level, meaning that new deaths had an asymmetric spillover effect on volatility. The negative effect, though, implies that good news about the reduction in new deaths had a more positive effect in reducing conditional covariance. DCC(A) and DCC(B) are all positively significant. Therefore, for both the short-run and the long-run, an increase in correlation between the three variables will lead to further correlation the following day causing volatility clustering.

It is evident from the models that COVID-19 had a net positive spillover effect on investor sentiment. The results are empirically definitive in explaining how the virus spread to investor emotions via sentiment. In most cases, the COVID-19 representations had a positive asymmetric effect, meaning that bad or negative news has a higher magnitudinal spillover impact than positive news on the conditional covariance and overall volatility regarding investor sentiment. The results further show that the BEKK model is best suited for forecasting the JSE during pandemics as the log-likelihood for the model is always higher than for the DCC.

5. CONCLUSIONS

Understanding how investors react to certain conditions in the market is very important for policymakers and practitioners. One such market condition has been increased market volatility due to COVID-19 globally. The pandemic brought with it great uncertainty about future prospects with financial markets not being spared. Although much work has been done to understand the impact of the virus on financial markets, little has been done to understand how it affected investor behaviour during that period. This study looked at how the pandemic affected investor behaviour, especially looking at investor sentiment in terms of fear and overconfidence. The 7-day rolling smoothed COVID-19 data for new

cases and new deaths was used to investigate whether there was a spillover effect between the virus and market fear/confidence. Using two multivariate GARCH approaches, the BEKK and DCC methods, this study empirically shows that there was a positive spillover effect between COVID-19 and investor sentiment in the JSE. This spillover was asymmetric, and negative news was more impactful than positive news most of the time. Also, investors seem to pay more attention to news concerning new cases rather than new deaths because they react more to new cases as evidenced by 1 percent significance compared to 5 percent significance from new deaths. Furthermore, there is evidence to suggest that COVID-19 is persistent in both short-run and long-run and that there is a dynamic conditional correlation in those time frames.

To investors and practitioners, these results have certain implications, being that during periods of pandemics, they should trade more cautiously and not sell in panic or buy in panic. This is because if they want to gain maximum utility from their portfolio investment they should hold their positions until market conditions return to equilibrium. Also, smart investors can take advantage of speculative trading opportunities created by conditions such as COVID-19 by taking advantage of strategies such as short selling and option trading. Still, when looking at options trading, some investors can hedge some of their positions effectively by factoring in the short- and long-term dynamic correlations of the virus and returns. Since the short-term and long-term dynamic correlations vary over time in the JSE, practitioners can time these changes in correlations to hedge against potential excessive correlated assets which might increase portfolio risk and reduce returns.

The study recommends that during pandemics investors should trade cautiously to avoid considering the heightened volatility and that policymakers need to minimise contagion from the virus to financial markets by calming down the markets or even halting trading temporarily.

For policymakers, the results are important to understand how the current and future dynamics will affect the behaviour of investors participating in the market. The results of this research are vital in that they can be used in the South African context to understand how pandemics affect investor wealth. This is essential in future when similar situations erupt to make markets more stable by learning from past events and how they propagated volatility. Finally, policymakers and investors can use the BEKK framework to forecast investor sentiment and returns for the JSE. Future work that can be done is to delve deep and understand how the spillover differed from each major sector in the JSE.

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Conflict of interests

The authors declare there is no conflict of interest.

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ЕФЕКАТ ПРЕЛИВАЊА ВОЛАТИЛНОСТИ ПАНДЕМИЈЕ ИЗАЗВАНЕ ВИРУСОМ КОРОНА НА РАСПОЛОЖЕЊЕ ИНВЕСТИТОРА НА ЈОХАНЕСБУРШКОЈ БЕРЗИ

1 Каго Амиел Матлаку, Сјеверозападни универзитет, Вандербијлпарк, Јужноафричка Република
2 Сане Ферејра-Шенк, Сјеверозападни универзитет, Вандербијлпарк, Јужноафричка Република

САЖЕТАК

Ова студија истражује ефекат преливања волатилности пандемије изазване вирусом корона на расположење инвеститора на Јоханесбуршкој берзи. Студија анализира како су нови случајеви и смрти утицали на расположење учесника на берзи током пандемије. Студија користи јужноафрички индекс волатилности као главну мјеру тржишног расположења и приноса главног индекса јоханесбуршке берзе. Дневни подаци о пандемији од 03. 01. 2020. до 19. 03. 2023. добијени су од Свјетске здравствене организације, док су остали финансијски подаци добијени са странице Yahoo Finance. Коришћене методе су баба, енгле, крафт и кронер и динамичка условна корелација, мултиваријантни GARCH са средњим једначинама као троваријантним векторским ауто-регресивним системом. Резултати показују да је пандемија имала ефекат преливања на расположење инвеститора. Ово преливање је било асиметрично, што имплицира да су негативне вијести имале више ефекта него позитивне вијести. Штавише, нови случајеви имали су више ефеката преливања на расположење инвеститора него нови смртни случајеви. Студија препоручује да инвеститори треба да тргују опрезно током пандемије с обзиром на повећану волатилност и да креатори политике морају да минимизирају преношење ефеката вируса на финансијска тржишта тако што ће смирити тржишта, или чак привремено зауставити трговање.

Кључне ријечи: *КОВИД 19, преливање волатилности, BEKK garch, DCC garch, расположење инвеститора*.

THE CONTRIBUTION OF SMALL AND MEDIUM-SIZED ENTERPRISES IN THE ALGERIAN ECONOMY: AN ENTROPY INDEX APPROACH

1 Khaled Khellil, COFIFAS Laboratory, Oum El Bouaghi University, Algeria.
2 Kamilia Loucif, Oum El Bouaghi University, Algeria.
*Corresponding author's e-mail: khelil.khaled@univ-oeb.dz
1 ORCID ID: 0000-0003-0652-2179
2 ORCID ID: 0000-0002-6342-6346

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ABSTRACT

The role of small and medium enterprises in the economic development of nations cannot be overstated. These businesses, ranging from small family-owned bakeries to medium-sized manufacturing plants, play a vital role in job creation, innovation, and overall economic growth. Numerous studies have established the crucial significance of SMEs to economic success and the development of regions. Our research aims to investigate the extent to which SMEs in Algeria contribute to the country's economic development and diversification. Considering the economic status of Algeria as a developing nation heavily reliant on oil revenues, it presents a unique case for study. To achieve our research objectives, over 120 official government reports published between 2001 and 2022 are analysed. Descriptive data analysis was conducted, and the Entropy index was calculated to address the problematics and verify the hypotheses. The results reveal that SMEs in Algeria make considerable contributions to employment rates and GDP values. However, their numbers in export operations are very low. The study found that SMEs in Algeria are potent locally, but their performance in global markets is very poor.

1. INTRODUCTION

There are quite abundant studies on the topic of small and medium enterprises and their substantial contributions to economic growth and job creation. Research has focused on various aspects of SMEs, including skill supply, training, and development (Hendry, Jones & Arthur 1991), information internalisation and hurdle rates in internationalisation (Liesch and Knight 1999), financing challenges in developing countries like Ghana (Quartey 2003),

and risk management practices in South Africa (Yolande, 2012). Studies have also explored the dynamics of SMEs in different countries, such as Indonesia, where technology diffusion through foreign buyers and subcontracting has been identified as key mechanisms for SME development (Berry, Rodriguez & Sandee, 2001). Additionally, research has examined the impact of bank size, credit discretion, competition, and the institutional environment on SME lending in countries like China (Shen et al., 2009). Efforts have been made to fill gaps in SME data landscape, with new datasets introduced to provide a better understanding of SMEs across different countries (Ardic, Mylenko & Saltane, 2011). Furthermore, difficulties in capitalising on open innovation's full potential in industries like food, particularly for SMEs, have been highlighted, with recommendations for collaboration, new innovation ecosystems, and revised curricula promoting innovation (Saguy & Sirotinskaya, 2014). The adoption of business process management (BPM) in micro, small, and medium-sized firms has also been studied, emphasising the importance of defining and structuring BPM activities within these organisations (Dobrosavljević & Urošević, 2019). Additionally, frameworks for implementing enterprise resource planning (ERP) systems in SMEs have been developed to enhance operational efficiency and competitiveness (Alaskari, Pinedo-Cuenca & Ahmad, 2021).

Overall, the literature on SMEs covers a wide range of topics, from human resource development and internationalisation to financing, risk management, innovation, and technology adoption. These studies provide useful grasp of the challenges and opportunities faced by SMEs in different contexts, facilitating a better understanding of their role in the economy, and helping oil-reliant nations to achieve economic security.

The objective of our research is to investigate the extent to which small and medium-sized businesses in Algeria contribute to the country's economic development and diversification.

We have conducted the study analysing over 120 quarterly and annual government reports from four official national institutions (Ministry of Industry and Pharmaceutical Production/ The National Office for Statistics/ Bank of Algeria/ The General Directorate of Customs) over the period of 22 years (2001-2022). Our research is based on analysing the performance of SMEs in three macroeconomic indicators (employment/ gross domestic product/ exports). We have implemented descriptive statistics and calculations of the Entropy index to verify the research hypotheses and determine the magnitude to which SMEs in Algeria contribute to economic development and diversification.

We have found that SMEs in Algeria are potent locally, but very fragile externally. They provide significant new job opportunities, and help contribute

to the country's overall GDP. However, their contribution to the nation's exports is very poor, as exports operations are dominated by oil companies and bigger firms.

We have contributed to the existent research in many ways. First, we have provided additional evidence supporting SMEs' positive impact on employment rates and GDP in developing countries. Second, we have provided new evidence on how adopting SMEs in an oil-reliant nation will not always improve the country's export values. Thirdly, we have contributed to the research on SMEs' impact on the economy in an African developing country which relies heavily on hydrocarbon revenues, as there are abundant studies on SMEs in developed countries.

The paper is presented in a structured manner: first, we provide a literature review on the challenge of defining SMEs, a theoretical perspective on SMEs and economic development, and discuss the literature on the aspects of innovation and entrepreneurship in SMEs. Then we determine the research gap, hypotheses, and present the research plan to address the problematics in the methodology section. Later, we report the results, discuss and compare them with the previous ones. Lastly, we present the conclusions.

2. LITERATURE REVIEW

2.1 The challenge of defining SMEs

The definition of small and medium enterprises has been a topic of discussion in various research studies. According to J.E.Bolton (Bolton, 1982), small businesses are defined using three criteria: firstly, by having a small share of the market. Secondly, it is managed in a personalised manner by its owners or part-owners, rather than through a formal management structure. Lastly, it is independent and not associated with a bigger company, allowing owner-managers to make decisions without outside control. Leone (1991) highlights the challenges faced in defining SMEs and emphasises the importance of finding a homogeneous criterion to precisely distinguish between small and medium enterprises. Soriano (2005) explores the relationship between the size of an enterprise, its corporate strategy, and functional strategies such as marketing, technology, human resources, and finance. Ardic, Mylenko & Saltane (2011) introduce a new dataset to analyse SMEs across different countries, noting that while there is no world-wide definition of SMEs, variations in definitions do not significantly impact lending volumes. Kurdgelia (2021) discusses comparative analysis of SME standards in the EU and Georgia, highlighting the importance

of standardization in defining SMEs. Economic Research Institute Bulgarian Academy of Sciences and Angelova (2020) analyses the challenges in defining SMEs, considering international definitions and the differences in economies and legal systems.

2.2 SMEs' traits and characteristics

Small and medium enterprises are distinguished by their size, number of employees, productivity, legal form, number of managers, form of production, foreign country activities, and strategy (Vaněček and Fára 2013). In the food industry, they are known for their specialty, flexible mechanisms, and scientific research, but also face challenges in sales and training (Mei, 2012). SMEs are small in scale, have little pledged assets, high market risk, and indefinite benefits, but have potential for growth (Youfeng, 2007). The relationship between SMEs' traits and performance, including owner demographics, business acquisition, and resource investments, is a key area of study (Heileman, Pett & Mayer, 2016).

2.3 SMEs and economic development: theoretical perspective

The question of whether SMEs contribute to economic expansion necessitates an exploration from multiple angles. An increasing volume of empirical research substantiates the significance of SMEs as key contributors to overall employment and the generation of jobs, both in developed and developing economies. Birch's seminal work in 1979 presented initial evidence that reinforced the idea of SMEs serving as the primary drivers of job expansion. His study revealed that substantial 81.5% of all newly created jobs in the US between 1969 and 1976 stemmed from businesses with 100 or fewer workers (Birch, 1987). Kirchhoff and Phillips conducted a study in 1988 to scrutinise how small and large enterprises contribute to job growth in the US. Their research revealed that businesses with fewer than 100 employees emerge as the primary generators of net new job opportunities. Conversely, enterprises with over 1,000 employees, despite constituting 37% of total employment, contributed merely 13% of all new jobs (Kirchhoff & Phillips 1988). In accordance with Schreyer's insights from 1996, SMEs hold significant importance for nearly all global economies. This is especially true for developing nations, where they play a crucial role in addressing substantial labor and income dispersion obstacles. When viewed from a "static" perspective, SMEs contribute to economic output and the generation of "adequate" employment opportunities. On the other hand, from a "dynamic" standpoint, they serve as a breeding ground for future larger firms, make direct and frequently substantial contributions to overall savings and investment, and actively participate in the development

of relevant technologies (Schreyer, 1996). As highlighted by Romijn in 2001, SMEs take center stage as the primary players in the evolving landscape of a knowledge-driven revolution. This shift signifies a transition from an economy that primarily relies on physical and tangible resources to one in which knowledge reigns supreme. Essential characteristics such as an entrepreneurial mindset, strong interpersonal connections, a high degree of group cohesion, adaptability, and dynamic organisational structures are fundamental aspects of a knowledge-based economy. These qualities are typically associated with small, agile entities. Consequently, there is a significant alignment between small enterprises and a knowledge-driven economy (Romijn, 2001).

Taking a contrasting perspective, Schumpeter (1934) highlighted a particular aspect of large companies in terms of their ability to secure capital. He foresaw that this capability could potentially supplant entrepreneurial functions in the course of economic progress. Nevertheless, he underscored the significance of entrepreneurship in driving economic expansion and characterized an entrepreneur as someone who introduces innovation and assumes the pivotal position in achieving economic advancement through inventive contributions (Croitoru, 2012).

In more recent points of view, SMEs tend to use more labor-intensive production operations, which boosts employment and leads to more equitable income distribution. Additionally, SMEs provide livelihood opportunities through simple, value-adding processing activities, particularly in agriculturally based economies (Ayandibu & Houghton, 2017). In emerging economies, SMEs address socio-economic challenges by employing a substantial portion of the workforce - about 70 % in the case of Ghana - and contributing maximally to the GDP. Governments are encouraged to support SMEs with tailor-made policies to help unleash their full potential for enhancing economic growth (Amoah et al., 2022). Furthermore, SMEs contribute to sustainable economic development by affecting the structure of production, income distribution, and the ecological environment. They play a critical role in developed and developing countries, with government programs aimed at encouraging the SME sector to increase its contribution to sustainable development (Elkhalek, 2019). Regionally, SMEs have shown positive impacts on gross value added through the count of workers and their productivity, emphasising the relevance of government policy in supporting an advantageous SME environment (Glonti, Manvelidze & Surmanidze, 2021). Thus, SMEs are key for a competitive and competent market and are vital for poverty reduction, especially in developing countries where they dominate economically active enterprises and significantly influence job creation and economic growth (Ayandibu & Houghton, 2017).

Considerable effort has been expended in assessing the contributions of SMEs to economic development. The findings indicate that SMEs are indispensable for economic well-being, both in affluent and less affluent economies worldwide.

2.4 Innovation and entrepreneurship in SMEs

A range of theories have been proposed to explain the connection amid innovation, entrepreneurship, and performance in SMEs. Dushime, Muathe & Kavindah (2021) emphasise the resource-based view theory and dynamic capability theory, while Chaldun, Yudoko & Prasetio (2022) identify the Uppsala theory, Network theory, Resource-based theory, international entrepreneurship theory, and institutional theory as key theories in the globalisation process of SMEs. Ramdani, Raja & Kayumova (2022) highlight the role of digital innovation in SMEs, impelled by a configuration of antecedents and resulting in improvements in the performance of organisational and business processes. Zeb & Ihsan (2020) further explore the influence of entrepreneurship and innovation on the performance of women-owned SMEs in Pakistan, emphasising the intermediate role of innovation in this relationship. These studies collectively underscore the importance of innovation and entrepreneurship in driving performance in SMEs, with specific theories providing valuable insights into the mechanisms and processes involved.

Entrepreneurship certainly influences the dynamic capabilities of firms, which in turn enhances their innovation performance. This relationship is mediated by the organisational innovation environment, suggesting that fostering a supportive innovation environment is crucial for SMEs to translate entrepreneurial activities into tangible innovation outcomes (Cui & Song, 2022). Furthermore, the inter-organisational collaboration (IOC) among SMEs also plays a critical role in fostering innovation. Collaborative efforts between organisations can lead to a more profound innovation impact, as these collaborations provide access to diverse resources and knowledge, which are essential for innovation (Zahoor & Al-Tabbaa, 2020).

In the context of women-owned SMEs in Pakistan, entrepreneurship and innovation are directly linked to improved entrepreneurial performance. Attributes that are associated with risk-taking and accomplishments among women entrepreneurs significantly boost innovation and, consequently, the performance of their enterprises. Innovation not only has a direct relationship with performance but also mediates the relationship amid entrepreneurship and performance, highlighting the central role of innovative practices in realising the benefits of entrepreneurial activities (Zeb & Ihsan, 2020). In Nigeria, the linkage

between disruptive innovation and sustainable entrepreneurship illustrates that innovation, particularly disruptive types, can significantly contribute to the sustainability and long-term success of SMEs. This relationship is crucial for transitioning economies that are diversifying their economic activities beyond traditional sectors (Ibidunni, Ufua & Opute, 2022).

Overall, innovation and entrepreneurship significantly impact the performance and competitive advantage of SMEs across various contexts and regions, and are intertwined processes that significantly enhance the performance, sustainability, and competitive positioning of SMEs in various economic and cultural contexts.

2.5 Research gap

Upon examining previous studies, there is a lack of research on the following points:

- **Understudied areas:** there is limited research on SMEs' impact in some sectors or regions, particularly in oil-reliant countries.
- **Regional and Rural Development:** there is limited research on the role of small and medium firms in promoting regional and rural economic development, especially in underdeveloped areas, as insights into regional impacts can help in designing localised support mechanisms.
- **Lack of long-term studies:** few longitudinal studies track the long-term impact of SMEs on economic development, as these types of studies are essential for understanding sustainable development and growth patterns.

Building on the previous studies in this field and research gaps mentioned above, the next hypotheses can be formulated:

H0: SMEs in Algeria do not contribute to economic development;

H1: SMEs in Algeria significantly contribute to economic development;

H2: SMEs in Algeria contribute poorly to economic development.

The justification for the hypotheses is that SMEs have huge capability to deal with the economic issues that nascent economies face, and these expectations could or could not be true in reality when studying some macro indicators in Algeria, in addition to the findings of Amoah et al. (2022) and Kurdgelia (2021). We believe that, despite the unique characteristics and flexibility of SMEs that distinguish them from larger firms and help them cope better with economic crises and the success they have had in developed countries, this could not be the case in an underdeveloped country, such as Algeria, that has been known to rely on hydrocarbon income since its discovery in the 1950s.

3. DATA AND METHODOLOGY

Our study plan involves several steps. The first step is to adopt the way SMEs are defined officially in Algeria and other formal global institutions. Next, we present the data collected, and measure the level of economic diversification and development using the Entropy index to verify the hypotheses.

3.1 SMEs in Algeria and other formal institutions

There is no universally accepted, standardised concept of SMEs. Several experts and associations have defined SMEs differently, leading to variations in their categorisation be-tween countries and even within the same country over time. These diverse definitions often consider variables like overall assets, the number of individuals employed, annual turnover, and capital investments. Additionally, officials from different multilateral development institutions have their own unique interpretations of what constitutes an SME, reflecting their respective institutional definition (Gibson and H.J 2008), as illustrated in Table 1.

Table 1. SMEs according to multilateral institutions and countries

Institution (region or country)	Max # of employees	Max revenue or turnover	Max assets
European Union	10-250	40 million EUR	-
World Bank	300	15 million USD	15 millions USD
MIF-IADB	100	3 million USD	-
African Development Bank	50	-	-
Asian Development Bank	No official definition. Uses only definitions of various national Governments.		
UNDP	200	-	-
OECD	20-500	-	-
Algeria	10-250	>20 million EUR	-
China	>2000	300 million CNY	400 million CNY

Source: prepared by the authors using (Gibson and H.J 2008)

In accordance with the guiding law for the development of SMEs, dated December 2001, SMEs are defined without regard to their legal status, based on certain characteristics delineated in Table 2.

Table 02. SMEs in Algeria according to law n° 01-18

Enterprises	Employees	Annual turnover (D.A)	Annual revenue (D.A)
Micro	01-09	< 20 million	< 10 million
Small	10-49	< 200 million	< 100 million
Medium	50-250	200 million- 2 billion	100- 500 million

Source: prepared by the authors according to (Official Gazette of the Algerian Republic 2001)

The prior legislation underwent a revision with the issuance of law n° 17-02 in 2017, leading to adjustments in the maximum annual turnover and annual revenue thresholds. These thresholds were raised to 4 billion Algerian dinars and 1 billion Algerian dinars respectively from their previous figures of 2 billion Algerian dinars and 500 million Algerian dinars in 2001. Notably, the criteria concerning the number of employees remained consistent in both laws as illustrated in Table 3.

Table 3. SMEs in Algeria according to law n° 17-02

Enterprises	Employees	Annual turnover (dinars)	Annual revenue (dinars)
Micro	01-09	< 40 million	< 20 million
Small	10-49	< 400 million	< 200 million
Medium	50-250	400 million- 04 billion	200- 01 billion

Source: prepared by the authors according to (Official Gazette of the Algerian Republic 2017)

3.2 Variables

Table 4 presents the set of variables used to measure economic development and diversification in the study.

Table 4. The set of variables used in the study and their formula

Variable	Formula	Unit
Entropy index	$ENT = -\sum_{i=1}^{N} S_i log_2(S_i)$	From 0 to $Max\ ENT = log_2(N)$ In which (N) represents the number of sectors.
Employment	The amount of newly created jobs in a given period	Number of created jobs
Gross domestic product	The total market value of all final goods and services produced by a state in a given period	Billion Algerian dinars
Exports	Goods and services that are produced in one country and sold to buyers in another	Million USD

Source: Based on the authors' elaboration.

3.3 Methods

To measure the degree of economic development and diversification and verify the hypotheses, we use the Entropy index. The index was first used by Horowitz & Horowitz (1968) to measure the competitiveness of the brewing industry in the United States back then, relying on the market shares of the firms active in the market, in addition to the degree of the industrial concentration of this market between 1944 and 1964.

The formula for the index is given as follows:

$$ENT = -\sum_{l=1}^{N} S_i log_2(S_i)$$

In which:

(N): The number of sectors in a given economy or market;
(Si): The contribution of each sector to the whole contribution value;
(Log2): Logarithm to the base of 2.

The higher the index values are, the closer they are to the maximum values; this means better diversification and a higher contribution of many sectors in a given economy. The lower the index values are, the closer they are to zero; the lower the efficiency of a given economy or market.

The maximum value of index is obtained by calculating the logarithm of the number of sectors (N) to the base of 2, where:

$$Max\ ENT = log_2(N)$$

To help measure the extent to which SMEs can help the economy reach maximum output, Relative Entropy will be calculated using Horowitz and Horowitz (1968: 199):

$$R = ENT / log_2(N)$$

Relative Entropy values ranges between zero and 1, the closer its value to 1, the closer we are to a perfect economy state and vice versa.

3.4 Data gathering and source

The study covers a period of 21 years: from 2001 to 2022. We include the year in which the first law regarding SMEs in Algeria was issued -n° 01-18-, and the years to come to cover the financial crisis in 2008, the crash of oil prices in 2014-2017, and the Covid 19 pandemic 2020-2022. We think this timeframe is sufficient to study SMEs contribution to economic development and verify the hypotheses.

The data gathered is obtained scanning through multiple annual reports from (The National Office for Statistics 2022), periodic reports from (General Directorate of Customs 2022), statistical bulletins from (Ministry of Industry

and Pharmaceutical Production 2022) and (Bank of Algeria 2022). The reports are analysed using the inductive approach (Prince and Felder 2006) to have a clear view on SMEs' impact on economic development and diversification and verify the hypotheses.

4. RESULTS

The results section comprises three distinct components: an examination of the growth rates of SMEs during the period of study; a comprehensive analysis of the influences of SMEs on employment rates, GDP, and export levels; and a presentation of the computed values of the entropy index.

4.1 A census of SMEs in Algeria

Table 5. SMEs' growth since 2001

Year	Number of private SMEs	Number of public SMEs	Density of SMEs/1000 inhabitants
2001	244560	788	8
2003	287805	782	9
2005	341953	835	10
2006	375998	769	11
2008	518901	625	15
2010	618515	557	17
2012	711275	557	20
2014	851511	542	21
2016	1022231	390	17
2018	1141602	261	27
2019	1193096	243	28
2020	1230844	229	28
2021	1286140	225	28
2022	1359580	223	30

Source: prepared by the authors using (Ministry of Industry and Pharmaceutical Production 2022)

There is a positive trend in SMEs creation. The count of SMEs increased from 245,348 in 2001 to 342,788 enterprises by 2005, representing the establishment of nearly 100,000 new SMEs over a five-year span. This momentum persisted into the 2nd half of the decade (2006-2010), which saw a doubling in the count of SMEs between the 1st and 2nd stages. Furthermore, this growth trajectory continued into the second decade culminating in 1,359,803 SMEs by the end of 2022.

Compared to the count of private SMEs that were registered during the same period, the number of public SMEs that were registered since 2001 has been steadily declining and is extremely small, barely exceeding 900 firms.

The metric denoted as "SME Density per 1,000 residents" as computed in Table 5 using the formula (Ministry of Industry and Pharmaceutical Production 2022: 11-12):

$$Density\ of\ SMEs = \frac{The\ number\ of\ SMEs}{The\ country's\ population\ /\ 1000}$$

The values presented above distinctly underscores the limited presence of SMEs within the national economy. To be specific, a density of 30 SMEs per 1,000 inhabitants in 2022 falls notably short of the figures observed in OECD countries (OECD 2023), where the average SME density typically ranges from 45 to 50 SMEs per 1,000 inhabitants.

4.2 Analytical study

Impact of SMEs on the country's workforce

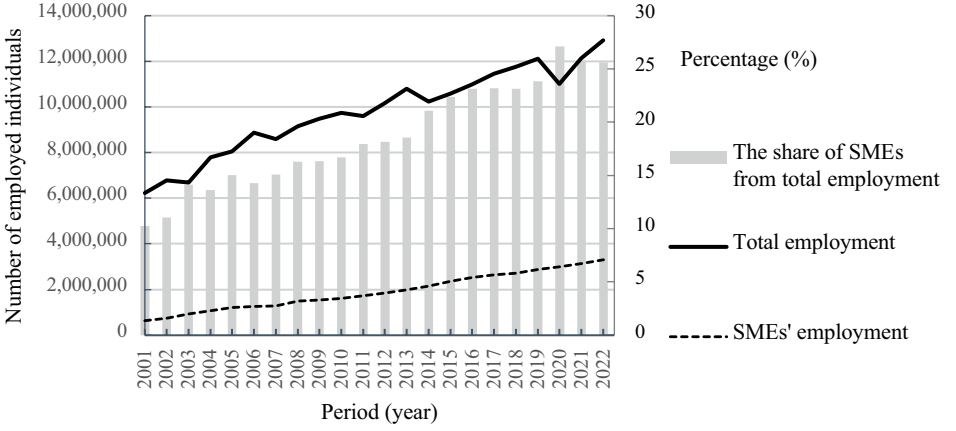

Figure 1. SMEs' contribution to employment since 2001
Source: compiled by the authors based on (The National Office for Statistics 2022) and (Ministry of Industry and Pharmaceutical Production 2022).

Figure 1 illustrates the growing role of SMEs in overall employment, displaying an escalation from just over 639,000 jobs in 2001 to surpassing 3,307 million jobs in 2022. Nevertheless, it is essential to acknowledge that despite this progress, contribution of SMEs to total employment remains relatively modest standing at 25.6% in 2022.

SMEs' impact on GDP

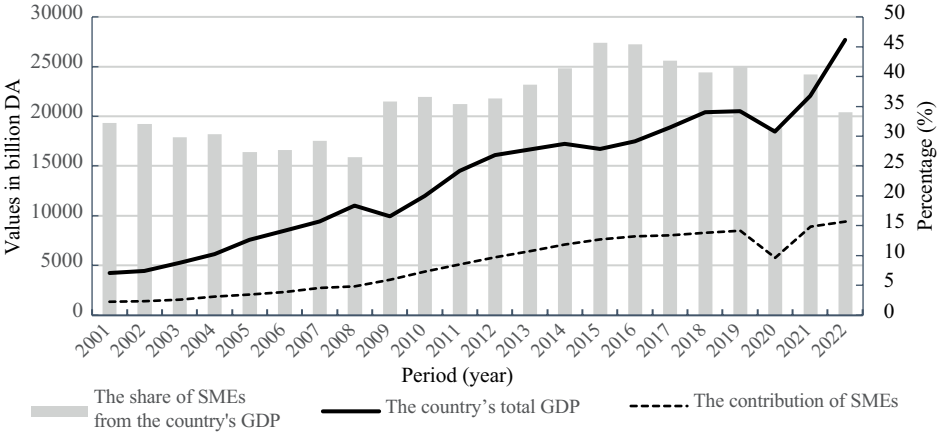

Figure 2. SMEs' contribution to GDP since 2001
Source: compiled by the authors based on (Ministry of Industry and Pharmaceutical Production 2022) and (Bank of Algeria 2022).

As depicted in Figure 2, Algeria's GDP has consistently expanded, with SMEs playing a modest role. In 2001, SMEs contributed with 32,22% to the GDP, which rose to 34,04% by 2022, accounting for a total of 9,425,05 billion Algerian dinars. This underscores the significance of SMEs, especially considering the economic reforms aimed at optimising its role in the nation's development.

SMEs' impact on exports

Table 6. SMEs' contribution to exports since 2001
Unit: million USD

Year	Overall exports	SMEs' exports	Percentage of total exports (%)
2001	19091	107,4	0,56
2003	24465	95,42	0,39
2005	46495	190,57	0,4
2006	54792	236,8	0,43
2008	79120	385,6	0,48
2010	57762	239,61	0,41
2012	72620	430,48	0,59
2014	61172	523,18	0,85
2016	29698	350,89	1,18
2018	41115	421,42	1,02
2019	35312	289,59	0,82
2020	21925	76,36	0,34
2021	38632	494,45	1,27
2022	65716	1337,8	2,03

Source: compiled by the authors based on (Bank of Algeria 2022), (Ministry of Industry and Pharmaceutical Production 2022), and (General Directorate of Customs 2022)

Looking at the broader pattern from 2001 to 2014, there is a clear upward trajectory in exports from sectors other than hydrocarbons. Nevertheless, in post-2014 period, the values exhibit some fluctuations due to the decline in oil prices during this period reaching 69,84 USD and 43,67 USD per barrel in December 2014 and January 2016 respectively (OPEC 2014) and (OPEC 2016), then there was a more notable decrease in 2020 followed by a substantial rise in both 2021 and 2022.

Exports from SMEs in sectors other than oil have exhibited steady growth over time, increasing from 107,4 million USD in 2001 to 1337,8 million USD in 2022. This development highlights the growing impact of SMEs on promoting non-oil exports in the country.

4.3 Entropy index calculations

For SMEs' impact on employment

Table 7. Entropy index results for employment

Year	ENT
2001	0.477196932
2003	0.587084516
2005	0.610574209
2006	0.591276349
2008	0.64074145
2010	0.6507728
2012	0.68378887
2014	0.742807245
2016	0.78064965
2018	0.78081432
2019	0.79681473
2020	0.84331102
2021	0.82420677
2022	0.8206352

Source: calculated by the authors based on the data from Figure 1

The ENTROPY values for SMEs' impact on employment show an overall increasing trend from 2001 to 2022, indicating a growing diversity or complexity over the years. While there is a general upward trend, there are some fluctuations in the values: the ENT values decrease slightly from 2005 (0.610574209) to 2006 (0.591276349) and again from 2020 (0.84331102) to 2021 (0.82420677) and 2022 (0.8206352). Significant increases are observed in certain periods, such

as from 2008 (0.64074145) to 2010 (0.6507728) and from 2016 (0.78064965) to 2019 (0.79681473).

The ENT values from 2018 onwards show a period of relative stability, with values remaining high and showing smaller changes year to year compared to earlier periods.

For SMEs' impact on GDP

Table 8. Entropy index results for GDP

Year	ENT
2001	0.90678838
2003	0.8788578
2005	0.84617164
2006	0.85582164
2008	0.83684574
2010	0.94780667
2012	0.94120827
2014	0.97833032
2016	0.9937916
2018	0.97503076
2019	0.9795488
2020	0.8976722
2021	0.97279024
2022	0.92517776

Source: calculated by the authors based on data from figure 02

The ENT values show both increasing and decreasing trends over the years, suggesting fluctuations in the contribution of SMEs in GDP. There is a noticeable decline in ENT values from 2001 (0.90678838) to 2008 (0.83684574), indicating a decrease in the contribution of SMEs during this period. A substantial increase occurs from 2008 (0.83684574) to 2010 (0.94780667), followed by relatively high values in subsequent years as from 2010 onwards, ENT values remain high, often above 0.94, with a peak in 2016 (0.9937916) and consistently high values through 2021 (0.97279024). In the last few years, there are fluctuations, with a notable drop in 2020 (0.8976722) and some recovery in 2021 (0.97279024) and 2022 (0.92517776).

The high ENT values from 2010 to 2022 suggest a stable state of high involvement from SMEs in Algeria's GDP. The sector seems to have maintained a high level of diversity, which could indicate robustness, adaptability, or a mature state.

For SMEs' impact on exports

Table 9. Entropy index results for exports

Year	ENT
2001	0.0499446288
2003	0.0368238118
2005	0.037622872
2006	0,0399925669
2008	0.0438830784
2010	0.0384156993
2012	0.0521761317
2014	0.0706733225
2016	0.092501925
2018	0.082112142
2019	0.068608584
2020	0.0327772924
2021	0.098203112
2022	0.143115923

Source: calculated by the authors based on data from table 06

The ENT values reveal a low level of contribution from SMEs to the Algeria's exports throughout the analysed period. From 2001 to 2010, the ENT values fluctuated slightly, but remained fairly stable, with minor fluctuations around a low baseline. From 2010 onwards, there was a gradual increase in ENT values, indicating a positive improvement in SMEs' contribution to exports, despite the low level. The values peaked significantly in certain years, including 2014 (0.0706733225), 2016 (0.092501925), 2021 (0.098203112), and 2022 (0.143115923). There was a notable drop in the ENT value in 2020 (0.0327772924), followed by a sharp increase in the subsequent years.

5. DISCUSSIONS

The data presented in Table 7 and Table 8 offers evidence to support the assertion of H1, as the index values, particularly in recent years, are close to 1, which suggests that SMEs in Algeria significantly contribute to economic development. However, the findings in Table 9 show that the index values are consistently low and do not exceed 0.1, except for the year 2022. This implies that H2 is true with regards to SMEs' contribution to exports. These findings are consistent with the rejection of H0, assuming that SMEs in Algeria contribute to economic development, whether to a significant or negligible extent. This conflict of results indicates that Algerian SMEs are potent in local economy, but they suffer internationally.

The results found on SMEs' contribution to job creation, provides support for the findings of Birch (1987), Kirchhoff & Phillips (1988), Schreyer (1996), and Amoah et al. (2022) who also confirmed that the majority of newly created jobs in developed and developing economies stem from small and medium firms with a low labor force, unlike larger firms that may have a bigger number of workers but offer very few new job opportunities.

In addition, the findings on SMEs' impact on GDP support the notion that Amoah et al. (2022) discuss, especially in developing nations, such as Ghana and Algeria. Small and medium-sized enterprises act as engines for generating wealth, maintaining social stability, and generating tax revenues. Additionally, they are capable of effectively distributing economic activities in remote areas, thereby promoting local prosperity and facilitating the convergence and integration of domestic regions.

Moreover, the results from Table 5 pertaining to the growth of SMEs in Algeria indicate a notable increase in the number of SMEs, which underscores the proactive measures taken by the Algerian state to support this sector. This trend reflects the growing entrepreneurial culture in Algeria since the enactment of law n° 01-18, as this shift in mentality can facilitate a change in the Algerian individual's mindset from communism to capitalism, ultimately leading to economic development and diversification. These findings align with the outcomes of Croitoru (2012), Ayandibu & Houghton (2017) and Cui & Song (2022).

Nevertheless, the data presented in Table 6 and Table 9 indicate that the contribution of SMEs to exportation activities is relatively minimal compared with the nation's hydrocarbon exports. As of the end of the 2022 fiscal year, the aggregate value of non-hydrocarbon exports was approximately 4606 billion USD, representing a mere fraction below 10% of the total export revenue. When considering only the exports that exclude those conducted by Sonatrach (the state oil company) and other prominent firms such as the currently inactive Fertial, along with Somiphost and Cevital, this percentage diminishes further to about 1.1% (Bank of Algeria, 2022).

6. CONCLUSIONS

Our research purpose is to examine the extent to which SMEs contribute to the economic growth and diversification in Algeria, by examining their performance across various macroeconomic indicators, including employment, gross domestic product, and exports, using annual statistical government reports since 2001. Our findings reveal that SMEs have had a positive influence on employment in

Algeria, particularly in the past ten years of the research period. Furthermore, SMEs have exhibited a consistent and substantial positive effect on GDP throughout the entire study period. However, our analysis indicates that SMEs have a limited impact on Algerian exports. This suggests that SMEs in Algeria are highly effective in the local market, but may be fragile and vulnerable in the global market.

We assert that our findings hold practical significance, as they provide a unique perspective on the effect of SMEs in an African developing nation that heavily depends on hydrocarbon revenue to sustain its economy.

Our research is constrained by several limitations. First, it is limited to a single country, which restricts its generalisability. Second, acquiring recent financial statements of active SMEs in the sector, as stated by official authorities, poses a significant challenge, leading to delayed government reports and a loss of relevance in our research. Most importantly, many SMEs in Algeria, particularly micro and small enterprises, resort to fiscal fraud to evade taxes, which undermines the credibility of their financial statements and produces less-than-accurate government reports.

The aforementioned limitations present a solid foundation for future research. Conducting a comprehensive examination of the influence of SMEs on additional macroeconomic indicators, including nations exhibiting similar economic characteristics, in a single study, could yield more definitive and convincing findings.

Conflict of interests

The authors declare there is no conflict of interest.

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ДОПРИНОС МАЛИХ И СРЕДЊИХ ПРЕДУЗЕЋА АЛЖИРСКОЈ ЕКОНОМИЈУ: ПРИСТУП ИНДЕКСА ЕНТРОПИЈЕ

1 Калед Келил, Лабораторија ЦОФИФАС, Универзитет у Ум Ел Буаги, Алжир.
2 Камилиа Лусиф, Универзитет у Ум Ел Буаги, Алжир.

САЖЕТАК

Улога малих и средњих предузећа у економском развоју економија не може се прецијенити. Ова предузећа, од малих породичних пекара до средњих производних погона, играју кључну улогу у стварању радних мјеста, иновацијама и укупном економском расту. Бројне студије су утврдиле кључни значај МСП за економски успјех и развој региона. Наше истраживање, које има за циљ да истражи у којој мјери МСП у Алжиру доприносе економском развоју и диверзификацији земље, узимајући у обзир економски статус Алжира као земље у развоју која се у великој мјери ослања на приходе од нафте, представља јединствен случај за проучавање. Да бисмо постигли циљеве нашег истраживања, анализирано је преко 120 званичних владиних извјештаја објављених између 2001. и 2022. године. Спроведена је дескриптивна анализа података и израчунат је ентропијски индекс да би се ријешио проблем и потврдиле хипотезе. Резултати откривају да МСП у Алжиру дају значајан допринос стопама запослености и висини БДП-а. Међутим, њихов број у извозним операцијама је веома низак. Студија је показала да су мала и средња предузећа у Алжиру моћна на локалном нивоу, али је њихов учинак на глобалним тржиштима веома лош.

Кључне ријечи: *мала и средња предузећа, запослење, бруто домаћи производ, извоз, Алжир.*

THE IMPACT OF HOUSEHOLD DEPOSITS ON BANK CREDIT ACTIVITIES: EVIDENCE FROM SELECTED WESTERN BALKAN COUNTRIES

1 Gorana Krunić, Deposit Insurance Agency of Bosnia and Herzegovina, Banja Luka, Bosnia and Herzegovina
*Corresponding author's e-mail: gorana_krunic@aod.ba
1 ORCID ID: 0009-0006-3706-5651

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ABSTRACT

Credit activities of banks are significantly conditioned by the level of bank deposits as the main source of bank financing, especially for banks operating in underdeveloped financial markets. A notably significant part of the bank deposit base comprises household deposits, which in the banking sectors of the Western Balkan countries have a considerable share of total deposits. This paper investigates the dependence of bank lending activities on the total household deposits in the banking sectors of the Western Balkan countries. The research was conducted for the period from 2000 to 2021 for the banking sectors in Republika Srpska and the Federation of Bosnia and Herzegovina, for the period from 2002 to 2021 for the banking sector in Montenegro and for the period from 2003 to 2019 for the banking sector in Serbia. The level of total loans in banks represents the dependent variable, while household deposits in the observed banking sectors represent independent variables. This research has also opened some new directions in research work in terms of the intensity of the factors that can contribute to the growth of household deposits as a source of financing bank lending activities in the Western Balkan countries.

1. INTRODUCTION

Deposits, taken loans, issued debt and equity securities, and bank capital can be used as sources of financing banking activities. In Western Balkan countries, deposits are usually the most common source of financing banking activities, while bank assets are mostly made up of loans which are one of the primary sources of funding economic activities.

Bank deposits can be owned by individuals, governments and government institutions, financial institutions, non-profit organisations, public and private companies and other entities.

This research pays special attention to the household deposits which are the subject of deposit insurance and, as such, represent a stable source of financing bank activities. More specifically, it studies the conditionality of bank loans on household deposits as part of the total deposit potential. Deposits (especially, as we will see, insured deposits) are a stable source of funding for banks.

In order to determine the dependence between changes in loans and household deposits in banks, this paper researches how the level of loans in the banking sectors of the selected Western Balkans countries changed in relation to household deposits. The research covers the period from 2000 to 2021 for the banking sectors of Republika Srpska and the Federation of Bosnia and Herzegovina, the period from 2002 to 2021 for the banking sector of Montenegro and the period from 2003 to 2019 for the banking sector of Serbia.[1]

This research aims to determine the correlation and degree of connection between bank loans and household deposits in the selected Western Balkan countries. The study proposes the hypothesis that loans in the observed banking sectors are primarily conditioned by the changes in the level of household deposits. By verifying the hypothesis above, this study paves the way for further research directions. In addition, the findings from this paper can support decision-makers by showing the importance of adopting measures that should contribute to the growth of household deposits in banks and, thus, the bank credit potential.

2. LITERATURE REVIEW

Banks are the backbone of the economy. The simplest operational definition of a bank is that it is an institution whose activities are related to granting loans and receiving deposits from the public (Freixas & Rochet, 2008). By acting as financial intermediaries, banks enable a smooth functioning of an economic system. Financial intermediation represents intermediation between sectors that have a surplus of financial resources (households, real economy, external sources) and sectors that have a deficit of financial resources (households, real economy, state) (Bašić, 2012).

Constant banking activity manifests itself in the activities of accepting a deposit, recording it and the obligation to return it. In terms of historically variable

1 For the banking sectors in Serbia and Montenegro, the research periods are somewhat shorter due to the availability of comparable data, but still long enough to verify the hypothesis.

features, the predominant ones are the change in the shape and requirements of banking institutions, different subject of a bank deposit or the way in which deposit safety is ensured (Mikliński, 2021).

Banks use their sources of financing to lend funds to those who need them. By placing the aforementioned funds, banks build their own assets that can take various forms, namely, liquid assets, loans, securities, tangible and intangible assets and other forms of assets. That way, banks perform one of their fundamental roles in financial markets: financial intermediation. Furthermore, bank credit activities play a key role in determining the aggregate economic activity because deposits are necessary for economic exchange and economic exchange is required for production and consumption (Kumhof & Wang, 2021). The loan-to-deposit ratio had a positive and significant effect on commercial bank deposits. This result implies that when the loan amount is high, a large amount of money circulates in the country. Therefore, this large amount of money in the country can lead to an increase in commercial bank deposits (Teshome, 2017).

Deposits act as the driving force of bank lending (Disyatat, 2011) as banks use deposits as a primary source of funding for their lending activities (Gobat, 2012). For commercial banks, deposits are generally considered as low cost finances (Pitoňáková, 2016). Empirical studies suggest that banks with larger increases in deposits expand their credit activities (Carletti et al., 2021). Economic development via real GDP has a consistent influence on bank deposits, so policymakers must target it and concentrate on the interest rate and the re-discount rate as significant instruments for monetary policy in attracting deposits and funding loans (Saleh et al., 2023). A bank with insufficient deposits to finance lending loans must rely more heavily on non-deposit sources of funds whose availability and price are much more sensitive to changing economic or financial conditions (Disalvo & Johnston, 2017).

On the other side, the problem of credit shortages may be due to significant credit risks that banks are not willing to take (Vyhovska, Lysenok, Hranovska & Krykunova, 2021). The loss reserve and the liquidity ratio have a positive effect on total loan growth. From a macro perspective, the inflation rate has a positive effect on the total loan growth rate, while the interest rate has a positive effect on total loan growth rather than a negative effect (Chun & Ardaaragchaa, 2024). The factors that determine the level of credit growth in Indonesia are deposit growth, the ratio of nonperforming loans in the previous year, the bank capital adequacy ratio, GDP, real growth, and the Indonesian benchmark interest rate (Jessica & Chalid, 2021). Some researchers demonstrate the reverse effect between macroeconomic indicators such as GDP per capita, the ratio of loans

to GDP, the ease of doing business index and bank loan rates (Ivakhnenkov, Hlushchenko & Sverenko, 2021).

The importance of researching the bank deposit potential stems from the existing literature and studies indicating the importance of deposits as a source of financing for banks, i.e. the riskiness of the funding from non-deposit potential. Generally, banking strategies that principally rely on attracting non-deposit funding are very risky and require maintaining relations with rather complex nonretail customers and capital market participants (Demirgüç-Kunt & Huizinga, 2010).

Literature suggests that a decrease in bank financing from deposits, along with an increase in market financing, represents a negative factor for financial stability. Market funding has proved to be less stable than customer deposits, and reliance on market funding has thus made the banks' liquidity positions more vulnerable to external shock (Berg, 2012). Access to core deposits insulates a bank's cost of funds from exogenous shocks that may be caused by external shocks in the financial markets (Berlin & Mester, 1999). The banks that relied more on deposits for their financing in 2006 fared better during the crisis (Beltratti & Stulz, 2012).

Many banks predominantly rely on household deposits as a primary source of funding. In many economies, households are the sector that saves the most (Fredriksson & Staal, 2021). At the bank level, focusing on retail deposits (consisting of household deposits and small business deposits) can produce a more diversified and stable funding base which is generally less sensitive to market changes (Han & Melecky, 2013). At an individual and household level, savings support stability thus contributing to the stability of the financial system (Cull et al., 2012).

The research for Bosnia and Herzegovina shows that the representation of household savings was not that significant before the financial crisis of 2007 and 2008 due to the free inflow of capital that opened up a wide credit facility for banks. After the crisis, there was a change in the strategy of the banks in the direction of paying more attention to mobilising the household savings (Vladušić, 2010). Such trends have led to the fact that household deposits in Bosnia and Herzegovina in recent years have made up a significant part of total bank deposits. In the other observed Western Balkans countries, the share of household deposits in total bank deposits is also substantial.

Several factors influence changes in the level of household deposits. For instance, research in Croatia has confirmed that the level of household deposits can be influenced by factors such as financial, social, psychological, political, organisational and technical conditions of banks, among others. However,

without attempting to undermine the importance of those factors in creating household savings, the most significant role is played by the achieved gross domestic product, directly or indirectly (Jurman, 2008).

Research results in Slovakia show that the real interest rate, the elderly dependency ratio, inflation and gross disposable income boost up deposits, while income growth reduces household deposits. Outcomes indicate that elder generation tends to increase financial wealth in the form of bank deposits (Pitoňáková, 2016). The most important role in the formation of deposit resources of households is played by the level of their income, namely the number of wages received by household members (Dubyna et al., 2022).

Research conducted in Ukraine resulted in proposed measures to increase household bank deposits, as follows: reducing unemployment; creation of favourable conditions for increasing the average monthly salary in the regions and modifying household spending to make savings; formation of an appropriate interest rate policy aimed at actively attracting temporarily available funds of the population to commercial banks (Kichurchak, 2021).

There is an interesting research that analysed the impact of remittances from abroad on bank deposits. Remittances do not appear to promote utilising financial services such as bank savings accounts. One possible explanation is that remittances are spent on consumption rather than saved or invested. However, fees for remittance services are an additional factor. Considering the high transfer fees, poor migrants avoid using banks for money transfers (Cekrezi, 2022).

Previous research has shown a significant correlation between bank loans and deposits, emphasising that bank deposits essentially determine credit activities. The reverse effect of loans on deposits is not significant, suggesting it could be that depositors do not hold their funds in banks due to their efficiency but due to other factors such as security and specific benefits (Nguyen & Tripe & Ngo, 2018).

Research on developing countries has confirmed that bank deposits and loans play a key role in the process of monetary transmission in the economy (Kassim & Majid, 2009). Research in Republika Srpska has shown that there is a very strong positive correlation between changes in the volume of bank loans and changes in the gross domestic product (Ćurić, Popović & Bašić, 2021).

The importance of the research on the relationship between loans and deposits is also reflected in contributing to the findings of the earlier studies, which showed that there is a causal connection between interest rates and the volume of deposits. When interest rates are reduced, investors reduce their investment in deposits

because their return on invested funds diminishes, and it is assumed that they are looking for other investment opportunities (Ozen, Vurur & Grima, 2018.). In such conditions, the reduction of the deposit base in banks has an impact on the lending activities of banks which contribute to the economic development of a country.

In case there is a decrease in the demand for deposits, not only do the costs of bank financing increase, which directly decreases the supply of bank loans, but it also decreases interbank lending, thus reducing the demand of companies for loans (Berlin & Mester, 1999). Demand deposits, savings and time deposits, according to the study and discussions, have a positive and significant impact on the credit offer of Regional Development Banks in Indonesia (Zufikar, 2024).

Research at the European level has shown significant differences in loan-to-deposit ratios in certain European countries, suggesting a different degree of reliance on deposits as a source of bank financing in the countries of the European Union. From 2007 to 2019, that ratio ranged between the minimum amount of 0.75 (France, the Netherlands, Belgium) to the maximum amount that Denmark, Sweden and Finland had, that is 2.87, 2.23 and 1.59, respectively. Significant differences in the relationship between loans and deposits in European countries suggest that the importance of deposits as the main source of financing varies across banks in different European countries. Banks in the Scandinavian countries prefer to provide significant sources of funding in the financial markets rather than in deposits. Until the second half of 2008, the average loan-to-deposit ratio of European banks grew, given that banks had considerable market funding available for lending activities (Beijer, 2020).

3. DATA AND METHODOLOGICAL FRAMEWORK

In this research, multi-year time series data relevant to the applied methodological framework were used. Sources of data on loans in banks and household bank deposits, which are observed variables in this research, are the officially published reports of institutions that supervise the operations of banks, i.e. banking supervisory authorities.

Determining the interrelationships and relationships between two or more observed phenomena is the subject of regression and correlation analysis, and the goal is to quantitatively express the average ratio of the observed phenomena if such a relationship exists. At the same time, the degree and direction of the interconnectedness of the observed phenomena is expressed. If two phenomena

are observed, then it is a simple regression and correlation analysis (Komić, 2000).

This paper determines the relationship between household deposits and total loans using a simple linear regression analysis. Household deposits in banks represent an independent variable, loans in banks are a dependent variable, and they are observed in the aggregate amount at the level of the banking sector of Republika Srpska, the Federation of Bosnia and Herzegovina, Serbia and Montenegro. Therefore, there is a functional connection between household deposits and total loans in banks and it is shown as:

$$Y = f(def, X)$$

The simple linear regression model can be written as:

$$Y_i = \beta_0 + \beta_1 x_i + \varepsilon_i \quad i = 1,2,\ldots,N$$

Where:

- Y_i: means dependent variable, in this analysis, total loans;
- x_i: means independent variable, in this analysis, household deposits;
- β_0 and β_1 are unknown constants or regression parameters;
- ε_i is a stochastic member or a disorder, or accidental error, and
- N means the size of the base set.

The estimates of the parameters in the regression equation are obtained using the least squares method (Lovrić et al., 2006), and it is shown as follows:

$$b_1 = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - \left(\sum x\right)^2}$$

$$b_0 = \overline{y} - b_1 \overline{x}$$

The parameter b_0 shows the expected value of the dependent variable Y if the independent variable X has the value of zero, while the parameter b_1 shows the average change of the dependent variable with a unit increase of the independent variable.

For this analysis, the econometric program EViews was used. The obtained coefficient of determination shows that the applied model is representative, that there is a strong connection between the observed variables, and that the applied model is good at forecasting trends.

4. RESULTS

Household deposits have the most significant share of total bank deposits in the observed banking sectors. Table 1 shows graphs with the shares of household deposits in total bank deposits.

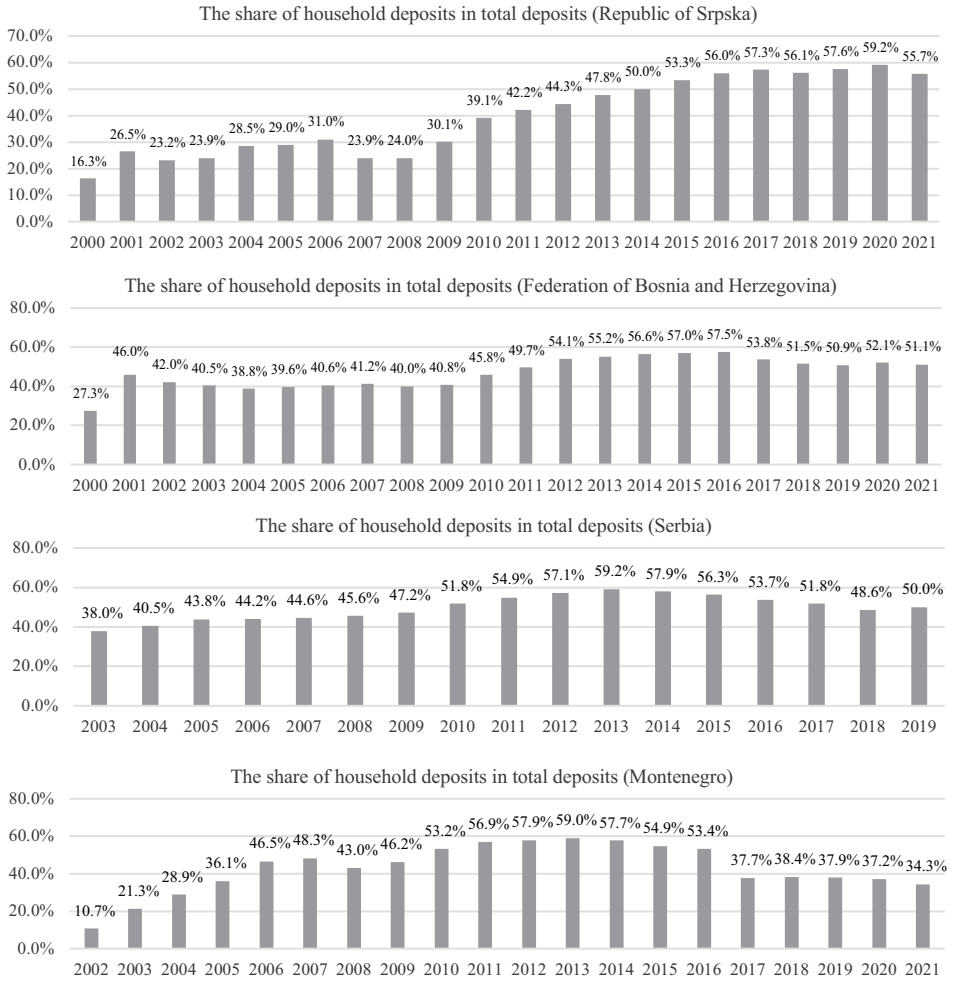
Regarding the banking sector of Republika Srpska, a significant decrease in the share of household deposits in total deposits occurred in 2007 (from 31% to 24%), following an increase in deposits of government institutions that resulted from the sale of state-owned enterprises.[2]

As for the banking sector of Montenegro, more significant changes occurred in 2017, when there was a decrease in the share of household deposits in total deposits (from 53% to 38%). These changes were possibly influenced by the introduction of temporary administration in two banks, which had significant funds deposited by the citizens.[3] After 2017, the share of household deposits in total deposits did not recover its share from previous periods. Excluding the banking sector of Montenegro, in other sectors, it is evident that in recent years, the share of household deposits in total bank deposits has been around 50% or above.

2 During 2007, the deposits of government institutions increased by about 5 times or by 1.4 billion BAM and the share of these deposits in the total deposits of the banking sector increased to 39%. At the same time the share of household deposits decreased to 24% as of the end of 2007 in total deposits (Report on the situation in the banking system of Republika Srpska for the period from January 1, 2007 to December 31, 2007).

3 In the annual macroeconomic report of the Central Bank of Montenegro for 2017, the amount of household deposits for 2017 was stated as EUR 1,705, but later in the report from 2018, this data for 2017 was EUR 1,232 (https://www.cbcg.me/me/publikacije/redovne-publikacije/makroekonomski-izvjestaj-cbcg/godisnji-izvjestaj). The assumption is that the changes were made for the sake of easier data comparison, because in 2018, temporary administration was introduced in two banks in Montenegro, which probably had an impact on a significant decrease in household deposits within the banking system of Montenegro on the observed dates (www.cbcg.me/me/javnost-rada/aktuelno/saopstenja/uvedena-privremena-uprava-u-atlas-i-ibm-banci?id=1452).

Table 1. The graphs of the share of household deposits in total deposits



Source: Author's analysis[4]

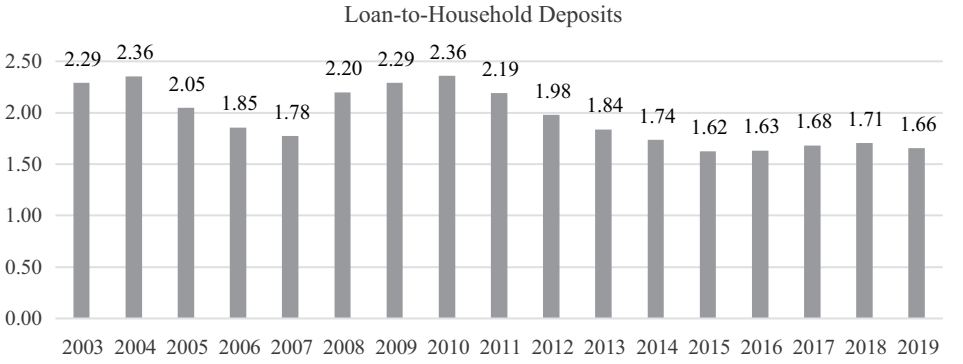
Considering that household deposits as a source of financing banking activities have a significant share in total bank deposits in the observed banking sectors and that they form a safe deposit basis, this research analyses the impact of

4 Source: The reports on the situation in the banking system of the Republika Srpska (https://abrs.ba/izvjestaji/), Information on subjects of the banking system of the Federation of Bosnia and Herzegovina (https://www.fba.ba/bs/publikacije-subjekti-bankarskog-sistema-federacije-bosne-i-hercegovine), The reports of the banking sector in Serbia (https://nbs.rs/sr/finansijske-institucije/banke/izvestaji-i-analize/), Macroeconomic reports of the Central Bank of Montenegro (https://www.cbcg.me/me/publikacije/redovne-publikacije/makroekonomski-izvjestaj-cbcg).

household deposits on credit activities. A regression analysis was performed for household deposits and total loans in banks in selected banking sectors of the Western Balkan countries.[5]

4.1 The impact of household deposits on the level of total loans in the banking sector in Serbia

Graph 1 shows how the relationship between loans and household deposits in the banking sector of Serbia moved over a sixteen-year period. During 2008 (last quarter), when household deposits were significantly withdrawn from banks, the loan-to-household deposits ratio increased sharply. There was a growth trend in the ratio between 2008 and 2010, after which it decreased and, after a few years, returned to the level before the financial crisis.

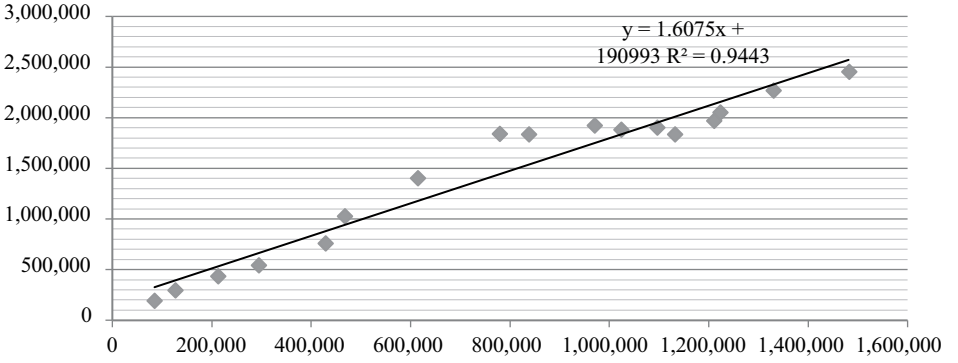


Graph 1. The relationship between loans and household deposits (Serbia)
Source: Author's analysis[6]

The extent to which household deposits determine loans is shown through the results of regression analysis, which suggests that in the banking sector of Serbia, 94% of changes in loans in banks are explained by changes in the level of household deposits (r2= 0.944). At the same time, the coefficient for the independent variable shows that an increase/decrease in the level of household deposits by one observed unit leads to an increase/decrease in the level of total loans in banks in Serbia by 1.61 units. The regression equation of household deposits and total bank loans is shown in Graph 2.

5 The choice of banking sectors of the Western Balkan that are included in this research was influenced by the availability of comparable data.

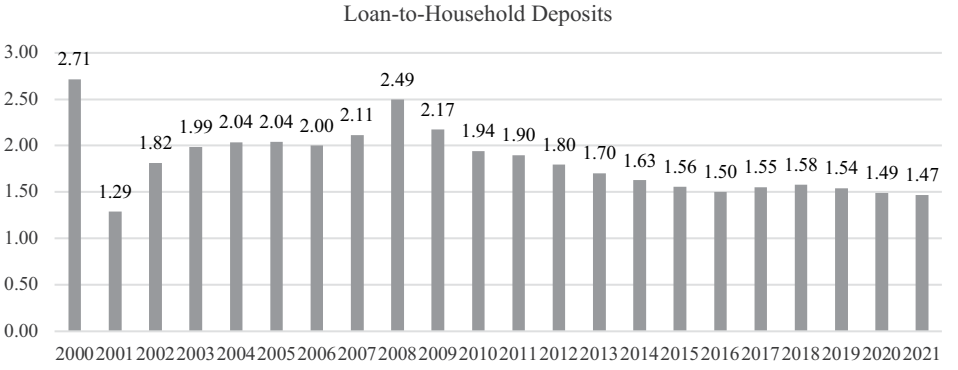
6 Source: The reports of the banking sector in Serbia (https://nbs.rs/sr/finansijske-institucije/banke/izvestaji-i-analize/).



Graph 2. The regression equation of household deposits and total loans (Serbia)
Source: Author's analysis[7]

4.2 The impact of household deposits on the level of total loans in the banking sector in the Federation of Bosnia and Herzegovina

During 2008 (last quarter), the withdrawal of household deposits from banks led to an increase in the loan-to-household deposit ratio in the banking sector of the Federation of Bosnia and Herzegovina. After 2008, the ratio of the observed variables gradually decreased and, in the short term, returned to the period before the financial crisis (Graph 3).

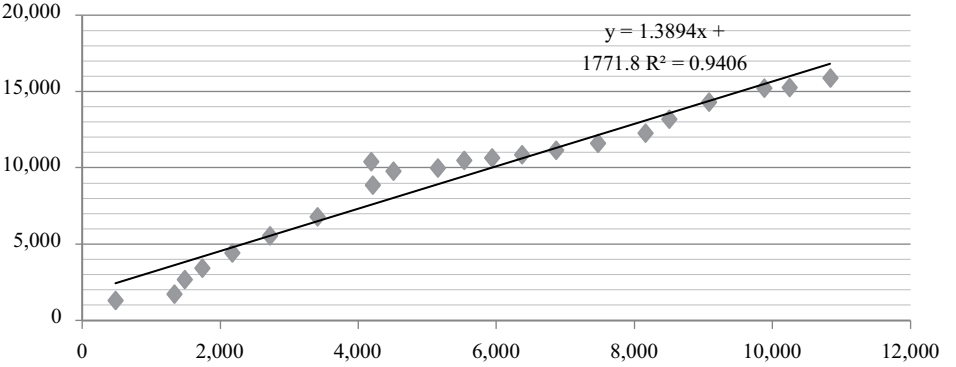


Graph 3. The relationship between loans and household deposits
(Federation of Bosnia and Herzegovina)
Source: Author's analysis[8]

7 Ibid

8 Source: Information on subjects of the banking system of the Federation of Bosnia and Herzegovina (https://www.fba.ba/bs/publikacije-subjekti-bankarskog-sistema-federacije-bosne-i-hercegovine).

The regression analysis results show the similarity of the banking sectors of Serbia and the Federation of Bosnia and Herzegovina when analysing the dependence of loans on household deposits. The coefficient of determination of 94% (r2=0.941) for the banking sector of the Federation of Bosnia and Herzegovina is almost equal to the coefficient of determination in the banking sector of Serbia. The coefficient for the independent variable shows that an increase/decrease in the level of household deposits for one observed unit leads to an increase/decrease in the level of total loans in banks in the Federation of Bosnia and Herzegovina by 1.39 units, which is lower compared to the banking sector in Serbia (Graph 4).

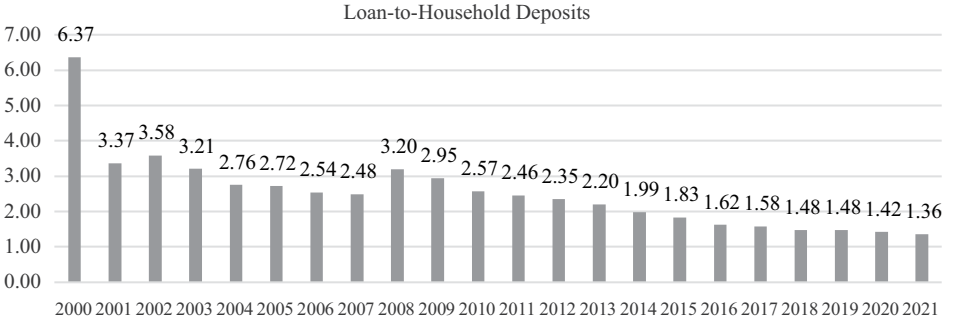


Graph 4. The regression equation of household deposits and total loans (Federation of Bosnia and Herzegovina)
Source: Author's analysis[9]

4.3 The impact of household deposits on the level of total loans in the banking sector in the Republika Srpska

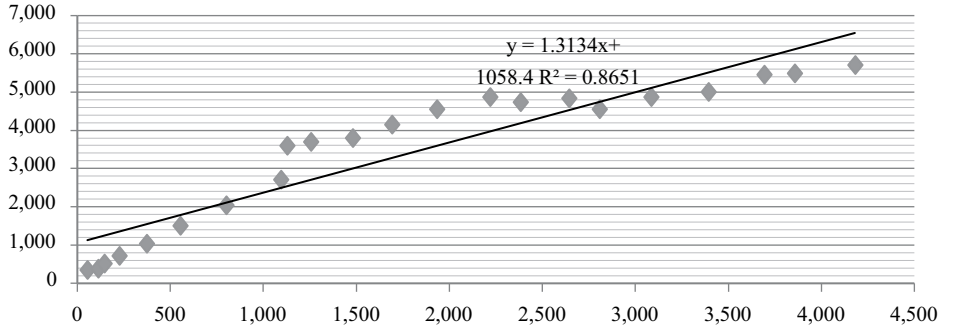
In the case of the banking sector of Republika Srpska the loan-to-household deposit ratio was significantly higher than the ratio in the banking sectors of Serbia and the Federation of Bosnia and Herzegovina, in previously observed years. In the banking sector of Republika Srpska in 2008, there was a significant increase in the loan-to-household deposit ratio conditioned by the withdrawal of the deposits mentioned above from the banking sector in last quarter 2008 (Graph 5).

9 Ibid



Graph 5. The relationship between loans and household deposits (Republika Srpska)
Source: Author's analysis[10]

Regression analysis shows that in the banking sector of Republika Srpska the degree of dependence of loan changes in response to changes in household deposits is lower (r^2= 0.87) than in the case of the banking sectors of Serbia and the Federation of Bosnia and Herzegovina. The coefficient for the independent variable shows that an increase/decrease in the level of household deposits for one observed unit leads to an increase/decrease in the amount of total loans in banks in Republia Srpska by 1.31 units (Graph 6).



Graph 6. The regression equation of household deposits and total loans (Republika Srpska)
Source: Author's analysis[11]

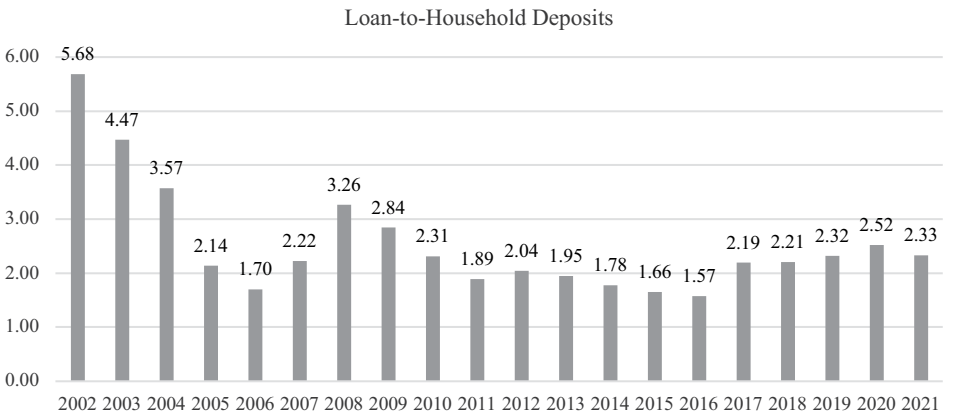
In the case of the banking sector of Republika Srpska, a lower degree of dependence of changes in loans with respect to changes in household deposits can be found in the way the Investment Development Bank of Republika Srpska

10 Source: The reports on the situation in the banking system of Republika Srpska (https://abrs.ba/izvjestaji/)
11 Ibid

operates (IDBRS). IDBRS is a state development bank that partly invests its own funds through banks as financial intermediaries in Republika Srpska. Such a relationship between IDBRS and banks leads to the creation of obligations of banks for loans taken from IDBRS as a significant source of bank credit activities.[12]

4.4 The impact of household deposits on the level of total loans in the banking sector in Montenegro

In the banking sector in Montenegro, there was a sudden increase in the loan-to-household deposit ratio in 2008, which resulted from a significant withdrawal of household deposits in the last quarter of 2008. What distinguishes the sector in Montenegro from the previously analysed banking sectors is that after 2016, there was a significant increase in the loan-to-household deposit ratio, which remained at such a high level in the following years (Graph 7). The earlier mentioned temporary administration in two banks and the exclusion of household deposits of those banks from the system could have impacted the above. Nevertheless, the retention of the loan-to-household deposit ratio at a high level even after the mentioned period indicates that banks did not manage to restore the ratio to the level sustained before 2017 and that their activities are financed to a significant extent from sources other than household deposits.

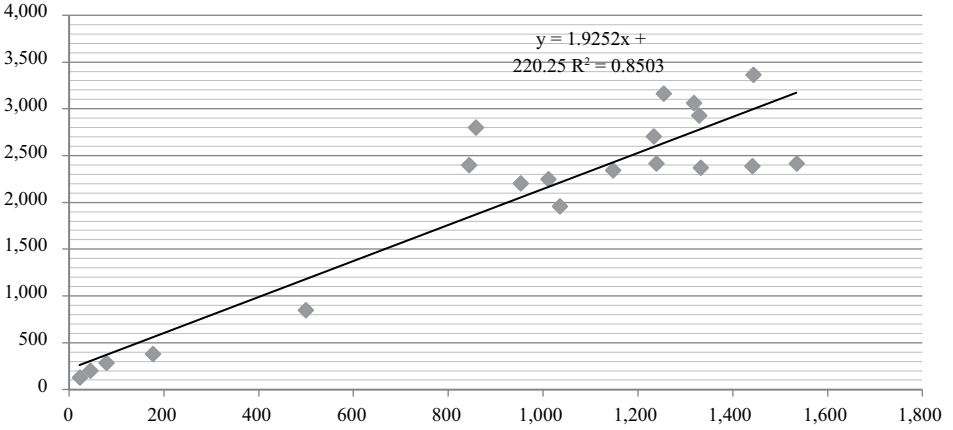


Graph 7. The relationship between loans and household deposits (Montenegro)
Source: Aauthor's analysis[13]

12 The reports on the situation in the banking system of Republika Srpska (https://abrs.ba/izvjestaji/).

13 Source: Macroeconomic reports of the Central Bank of Montenegro (https://www.cbcg.me/me/publikacije/redovne-publikacije/makroekonomski-izvjestaj-cbcg)

The regression analysis results show a lower degree of dependence of loans in relation to household deposits (r^2=0.85) in the banking sector of Montenegro in relation to banking sectors in Serbia and the Federation of Bosnia and Herzegovina (Graph 8).



Graph 8. The regression equation of household deposits and total loans (Montenegro)
Source: Author's analysis[14]

5. DISCUSSIONS

Modern times are characterised by doing business in an environment full of uncertainties. The risks are high, making bank operations in such conditions difficult. Inadequate risk management can lead not only to the deterioration of the quality of the banking sector but also to the scenario of bank failure and the negative consequences of such events on the entire economic development of countries.

For instance, the global financial crisis of 2007 and 2008 led to significant losses in the banking sector, bank failures, and macroeconomic problems such as recession in certain countries. The crisis also led to the deterioration of global liquidity conditions and the problem of the lack of sources of funding for banks. The lack of appropriate sources of financing prevented the necessary level of credit activities and caused additional negative consequences for the country's economic development.

On the one hand, there are different types of sources of bank financing, such as deposits, loans taken, securities issued and bank capital. On the other hand, the

14 Ibid

bank assets financed from the mentioned above sources can also take different forms, such as liquid assets, loans, securities, tangible and intangible assets, and other types of assets.

Traditional banking is usually explained as bank credit activities and their financing from deposit potential. The percentage of lending from deposits can differ significantly both between banking sectors in individual countries and between banks themselves. Research has shown that the average loan-to-deposit ratio in 10 European countries in the period 2008-2019 is 1.23, with significant differences across countries. The largest loan-to-deposit ratio is in the banking sectors of the Scandinavian countries, exceeding 2 (Beijer, 2020).

Comparing the observed countries of the region, we can see that these amounts are significantly lower compared to the European average, especially compared to the Scandinavian countries. In the observed periods for Serbia, Republika Srpska, the Federation of Bosnia and Herzegovina and Montenegro, the average loan-to-deposit ratio was 0.96, 0.88, 0.84 and 0.98, respectively[15]. The above indicators confirm that the observed banking sectors of the Western Balkan countries finance their credit activities for the most part from the deposit potential.

Furthermore, it is important to note that household deposits represent a significant part of the total bank deposit base in the observed countries of the Western Balkan, which suggests the importance of these deposits as a source of financing for banks. Therefore, this paper additionally researched the correlation between household deposits and total loans in the banking sectors of the Western Balkan countries.

Previous research on the banking sector of Bosnia and Herzegovina has shown that two key elements are crucial for citizens when deciding to invest funds in a bank. These elements relate to the reputation of the bank and the interest rate. Another important factor, which also represents a certain type of macroeconomic measure, is the existence of deposit insurance (Krunić, 2016). The factors that can also affect the growth of household deposits in banks refer to the trust that depositors have in banks, but also in institutions that are members of the financial safety net responsible for preserving financial stability.

15 Source: The reports on the situation in the banking system of Republika Srpska (https://abrs.ba/izvjestaji/), Information on subjects of the banking system of the Federation of Bosnia and Herzegovina (https://www.fba.ba/bs/publikacije-subjekti-bankarskog-sistema-federacije-bosne-i-hercegovine), The reports of the banking sector in Serbia (https://nbs.rs/sr/finansijske-institucije/banke/izvestaji-i-analize/), Macroeconomic reports of the Central Bank of Montenegro (https://www.cbcg.me/me/publikacije/redovne-publikacije/makroekonomski-izvjestaj-cbcg).

This study also points to future research directions regarding the intensity of the effect of interest rates on household deposits, as well as the conditionality of the growth of household deposits by the level of insured deposits in the banking sector.

The growth of the state's wealth observed through the growth of the gross domestic product can be a factor in the growth of household deposits in the banking sectors, and the degree of this dependence is also an area for further research.

6. CONCLUSIONS

Financial intermediation is one of the basic activities of banks. This activity implies that banks collect funds from those who have surplus funds and distribute them to those who need these funds. Funds collected from those who have surpluses are bank financing sources, and in countries where financial markets are not developed, they usually appear in the form of deposits. On the other hand, placement of funds to those who need these funds most often appears in the form of loans.

This paper studies the relationship between household deposits as a source of bank financing and loans as a form of bank placements in the banking sectors of some Western Balkan countries. The research confirmed a significant correlation between household deposits and total loans in the mentioned banking sectors. This dependence is higher in the banking sector of Serbia and the Federation of Bosnia and Herzegovina but less so in the banking sectors of Republika Srpska and Montenegro. The lower dependence between household deposits and loans in the banking sector of Republika Srpska is explained by the fact that loans in the banking sector of Republika Srpska are partially financed from the funds of the Investment Development Bank of Republika Srpska.

The correlation between household deposits and loans in the banking sectors is particularly important for research since the last decade has been characterised by a significant share of household deposits in the total deposits of the banking sectors of the Western Balkan countries.

From a long-term perspective, household deposits are, by their very nature, a stable source of financing banking activities, which is why it is important to strengthen the factors that lead to the growth of these deposits.

The main results of this research confirmed that changes in household deposits significantly condition changes in total loans. Such results suggest that

policymakers should conduct further research regarding the type and significance of factors that can contribute to the growth of household deposits and, thus, greater credit activities.

Conflict of interests

The author declares there is no conflict of interest.

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APPENDIX

APPENDIX 1: Household deposits and total bank loans[16]

Republika Srpska (in thousands of BAM)

	HOUSEHOLD DEPOSITS (X)	LOANS (Y)	Y/X
2000	54	344	6.37
2001	112	377	3.37
2002	146	523	3.58
2003	227	728	3.21
2004	374	1,033	2.76
2005	554	1,509	2.72
2006	801	2,036	2.54
2007	1,095	2,720	2.48
2008	1,128	3,606	3.20
2009	1,254	3,700	2.95
2010	1,479	3,805	2.57
2011	1,690	4,149	2.46
2012	1,932	4,547	2.35
2013	2,217	4,876	2.20
2014	2,381	4,733	1.99
2015	2,643	4,847	1.83
2016	2,806	4,559	1.62
2017	3,083	4,870	1.58
2018	3,393	5,006	1.48
2019	3,690	5,463	1.48
2020	3,856	5,494	1.42
2021	4,180	5,705	1.36

16 The reports on the situation in the banking system of Republika Srpska (https://abrs.ba/izvjestaji/), Information on subjects of the banking system of the Federation of Bosnia and Herzegovina (https://www.fba.ba/bs/publikacije-subjekti-bankarskog-sistema-federacije-bosne-i-hercegovine), The reports of the banking sector in Serbia (https://nbs.rs/sr/finansijske-institucije/banke/izvestaji-i-analize/), Macroeconomic reports of the Central Bank of Montenegro (https://www.cbcg.me/me/publikacije/redovne-publikacije/makroekonomski-izvjestaj-cbcg).

Federation of Bosnia and Herzegovina (in thousands of BAM)

	HOUSEHOLD DEPOSITS (X)	LOANS (Y)	Y/X
2000	482	1,308	2.71
2001	1,334	1,724	1.29
2002	1,482	2,691	1.82
2003	1,737	3,450	1.99
2004	2,173	4,423	2.04
2005	2,717	5,545	2.04
2006	3,403	6,820	2.00
2007	4,202	8,875	2.11
2008	4,182	10,434	2.49
2009	4,507	9,797	2.17
2010	5,145	9,982	1.94
2011	5,531	10,488	1.90
2012	5,933	10,666	1.80
2013	6,366	10,852	1.70
2014	6,863	11,170	1.63
2015	7,465	11,611	1.56
2016	8,155	12,270	1.50
2017	8,501	13,179	1.55
2018	9,071	14,326	1.58
2019	9,877	15,221	1.54
2020	10,237	15,255	1.49
2021	10,833	15,891	1.47

Serbia (in millions of RSD)

	HOUSEHOLD DEPOSITS (X)	LOANS (Y)	Y/X
2003	84,795	194,295	2.29
2004	126,687	298,497	2.36
2005	212,293	434,527	2.05
2006	294,269	545,481	1.85
2007	428,220	760,905	1.78
2008	466,956	1,027,581	2.20
2009	614,700	1,406,600	2.29
2010	779,100	1,840,600	2.36
2011	837,600	1,837,100	2.19
2012	969,900	1,923,100	1.98
2013	1,023,000	1,880,700	1.84
2014	1,095,500	1,902,155	1.74
2015	1,131,500	1,836,685	1.62
2016	1,209,800	1,972,815	1.63
2017	1,223,000	2,053,649	1.68
2018	1,329,100	2,267,162	1.71
2019	1,481,200	2,456,884	1.66

Montenegro (in thousands of EUR)

	HOUSEHOLD DEPOSITS (X)	LOANS (Y)	Y/X
2002	22	125	5.68
2003	45	201	4.47
2004	79	282	3.57
2005	176	376	2.14
2006	499	847	1.70
2007	1,010	2,246	2.22
2008	857	2,798	3.26
2009	843	2,398	2.84
2010	952	2,200	2.31
2011	1,034	1,956	1.89
2012	1,147	2,342	2.04
2013	1,238	2,414	1.95
2014	1,332	2,367	1.78
2015	1,440	2,386	1.66
2016	1,534	2,416	1.57
2017	1,232	2,701	2.19
2018	1,328	2,929	2.21
2019	1,317	3,062	2.32
2020	1,254	3,159	2.52
2021	1,443	3,360	2.33

УТИЦАЈ ДЕПОЗИТА СТАНОВНИШТВА НА КРЕДИТНЕ АКТИВНОСТИ БАНАКА: ДОКАЗИ ИЗ ОДАБРАНИХ ЗЕМАЉА ЗАПАДНОГ БАЛКАНА

1 Горана Крунић, Агенција за осигурање депозита Босне и Херцеговине, Босна и Херцеговина

САЖЕТАК

Кредитне активности банака су значајно условљене нивоом банкарских депозита као основног извора финансирања, поготову код банака које послују у недовољно развијеним финансијским тржиштима. Посебно значајан дио депозитне основе банака чине депозити становништва који у банкарским секторима држава Западног Балкана имају значајан удио у укупним депозитима. Предмет овог истраживања је утврђивање зависности

кредитних активности банака у односу на депозите становништва у банкарским секторима држава Западног Балкана. Истраживање је спроведено за период 2000-2021. године за банкарске секторе у Републици Српској и Федерацији Босне и Херцеговине, за период 2002-2021. године за банкарски сектор у Црној Гори и за период 2003-2019. године за банкарски сектор у Србији. Ниво укупних кредита у банкама је одређен као зависна варијабла, док су депозити становништва у посматраним банкарским секторима одређени као независна варијабла. Ово истраживање је отворило и неке нове правце истраживачког рада у погледу интензитета дјеловања фактора који могу да допринесу расту депозита становништва као извора финансирања кредитних активности банака у државама Западног Балкана.

Кључне ријечи: *банкарски депозити, банкарски депозити становништва, банкарске кредитне активности.*