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Content

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Editorial

The current issue of the South East European Journal of Economics and Business publishes twelve contributions from diverse economic and business empirical studies. In the first paper, Budak and Erdal (2022) investigates the mediating effect of burnout syndrome on toxic leadership and job satisfaction in businesses using primary data from Turkey. The results confirm that toxic leadership has negative consequences for burnout syndrome and job satisfaction, advocating importance of the type of leadership for employees performance. The second contribution by Almasri (2022) investigates emergence of mobile applications that are used to support the healthcare services linked to the Corona pandemic. The author collects primary data in Aman and finds numerous systematic influences of different perceptions and expectations on the use of such applications. The third research is by Markić et al. (2022) who examine the impact of knowledge management on the organizational performance of companies in Bosnia and Herzegovina. The paper finds that the size of companies affects systematically knowledge management, which is reported to have a positive impact on various indicators measuring performance of companies.

The following few studies are more economically oriented, including the first contribution by Frey et al. (2022) who investigate perception of corruption, but in two different contexts, corruption in business-to-business and business-to-government interactions, relying on primary evidence from Serbia. The analysis shows that small and medium enterprises are specifically affected by negative corrupt environment, while large companies are seen often as the source of corruption. The next paper is by Petrovska et al. (2022) who examine the monetary transmission mechanism in North Macedonian economy over the last decade. The results imply that monetary tightening in this country has number of systematic influences on economic mechanism that should be carefully observed by policy makers. Another empirical contribution covering all Western Balkans countries is written by Williams and Gashi (2022), who analyse the formal institutional failings associated with informal employment. The analysis reveals that the perceived incidence and share of informal employment is a complex issue affected by number of factors linked to government and its policies.

The next study focuses on banking sector of Bosnia and Herzegovina, in which Dede and Kuşakci (2022) use survey data and examine the effect of motivation on work performance. The result of their empirical analysis suggests that job performance is affected positively by intrinsic and negatively by extrinsic motivation, with other related findings that can be found in this paper. Özen et al. (2022) examine whether tax policies affected non-performing household loans in Turkey over the last couple of years. The results from this analysis indicate that the effect of tax regulations on non-performing household loans is quite strong, suggesting importance of fiscal policy for the type of loans used in this economy.

Panteli and Delipalla (2022) investigate whether the effect of institutions on environmental quality differs among the European western and post-socialist states. The study signifies importance of observing not only the direct, but also indirect effects of institutions

associated with environmental pollution and quality by reporting different effects and for different groups of countries. Raguž Krištić and Rogić Dumančić (2022) analyse if there is product market integration in the Euro area using two decades long dataset, which confirms evidence of integration, including some brakes over time, and confirmation of different outcomes for different countries. Interestingly, membership in the Euro area is found to be not a sufficient condition for market integration.

The last two contributions look at contemporary topics associated with digitalization and cryptocurrencies. Bon Nguyen (2022) analyses the impact of digitalization on inequality for a sample of advanced and developing economies over the last two decades. The paper reveals that digitalization narrows inequality in developed economies but it widens the gap in developing countries, thus having different effects in countries with different levels of development. The second study by Levkov at al. (2022) investigates the demographic and socio-economic characteristics of crypto users and their financial behaviour in North Macedonia. The authors find that crypto-adopters have some common characteristics and systematic patterns which can be identified for this specific group of people.

On behalf of Editorial Board

Adnan Efendic, Editor-in-chief
University of Sarajevo
School of Economics and Business

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THE MEDIATING ROLE OF BURNOUT SYNDROME IN TOXIC LEADERSHIP AND JOB SATISFACTION IN ORGANIZATIONS

Olkan Budak, Nurgül Erdal

Abstract

Today, leaders who contribute positively to businesses, as well as leaders who contribute negatively to businesses are increasing day by day. This study was conducted to investigate the mediating effect of burnout syndrome (BS) on toxic leadership (TL) and job satisfaction (JS) in businesses. The results of the SEM analysis, using a sample of 412 participants working in public hospitals in the Marmara region of Turkey in İstanbul, show that toxic leadership (TL) has negative effects on burnout syndrome (BS) and job satisfaction (JS). Although there are studies investigating the direct effect of toxic leadership on job satisfaction, there are limited data testing the burnout syndrome subcomponents on the effect of toxic leadership on job satisfaction. This research is critical in showing the mediating role of personal achievement burnout (PRS_Scc) dimension in the effect of toxic leadership (TL) on job satisfaction (JS) sub-components.

Keywords: *Burnout Syndrome, Hospital, Job Satisfaction, Organizations, Toxic Leadership*

Jel Classification: *M10, M12*

1. INTRODUCTION

With globalization, intense competition environment, and growing markets, businesses that want to cope with technological advances are trying to prevent situations against performance and productivity. There is an effect between leadership style in businesses and BS and JS (Uzunbacak et al. 2019). Employees are most affected by these situations. Despite working under tiring and difficult conditions, healthcare professionals always strive to perform at the highest level (Erdal and Altındağ 2020). The job requirements of healthcare workers are basically the reason for tiring and difficult working conditions. Considering this in health institutions, it is very important to determine the toxic characteristics of leaders or managers, the factors affecting job satisfaction and burnout to better motivate employee profits. Businesses can only be more successful when they identify and improve them, and they can continue their activities in an intensely competitive environment.

While value-centered leadership has a positive effect on employees such as transformative leadership,

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ethical leadership, democratic leadership, and authentic leadership, some types of leadership such as authoritarian leadership, narcissistic leadership, destructive leadership, abusive leadership, and toxic leadership also harm employees in working life. It has been studied in many studies (Yalçınsoy and Işık 2018). TL, which is based on transformational leadership theory, is a management approach that causes severe and irreversible harm to its employees with its destructive and negative features. These leaders who have destructive aspects, exhibit negative behaviors, and create major problems in businesses are called toxic leaders (Mehta and Maheshwari 2014). Often, TL is a charismatic person who is high in physical attributes and influences their followers. To mistreat their followers, belittle them, intentionally, intimidate them by threatening them, reduce motivation, act unfairly, cheat, discourage them, to show behavioral disorders that can lead to torture and even killing are toxic leader behaviors (Erickson et al. 2015). Toxic leaders affect their employees negatively (Çelebi et al. 2015). Employees' morale motivation decreases, stress and anxiety increase, burnout is seen and job satisfaction decreases.

Lipman-Blumen (2005) divided TL into intentional and unintentional. Deliberate toxic leaders deliberately harm others to increase their status. Unintentional toxic leaders are incompetent people who seriously harm the organization with their meaningless and irresponsible behavior (Mueller 2012). It is thought that the toxic and destructive behaviors of toxic leaders can cause the burnout of employees (Çetinkaya and Ordu 2017). In addition, studies support these findings (Uzunbacak et al. 2019; Yılmaz and Bakan 2019). The level of burnout syndrome created by toxic leadership in employees becomes important at this point. In other words, the psychological state of the employees is as important as their physical health.

Negative situations in the workplace turn into apathy and boredom in individuals and people begin to face failures. The continuation of this negative situation in individuals leads to the development of the syndrome defined as burnout. They define BS as an illness with emotional dimensions, including exhaustion, hopelessness, helplessness, fatigue, and indifferent and negative behaviors of the individual towards his / her job and other people (Kaçmaz 2005). BS, which develops at the end of emotional exhaustion depending on the job, is the feeling of being psychologically inadequate due to the interruption of emotional nutritional resources. As a result of all these developments, negative and cynical feelings occur in individuals toward the people they are in contact with and an unhappy picture develops (Maslach and Jackson 1981).

This study aims to determine the mediating role of burnout in toxic leadership and job satisfaction of employees in university hospitals that direct health education and research to protect and improve the health of individuals who have an important place in the economy. The study consists of two parts. In the first part, a literature review on the subject was made. In the second part, the research methodology, findings, conclusions, and recommendations are given.

2. LITERATURE REVIEW

The concept of TL (Wicker 1996) was defined for the first time, but no standard definition was made (Green 2014). There are definitions similar to this concept. Kellerman (2004) used the term "bad leadership", (Padilla et al. 2007) "destructive leadership". Today, the concept of toxic leadership has become important for many organizations. In particular, the United States military has begun to understand and evaluate TL (De Genio 2002; Reed 2004; Williams 2005). In the literature, the words toxic leader, toxic manager, a toxic culture, and toxic organization have been used frequently (Reed 2004). Analyst Gillian Flynn described the toxic manager as a bully, threatening, and shouting manager (Flynn 1999). The concept of TL was popularized by the American academic Jean Lipman-Blumen and stated that some leaders show toxic tendencies that lead to polarization and division in organizations (Heppell 2011)

TL is examined in four sub-dimensions: toxic leadership, selfish, manipulative, unappreciative, and negative mental state (Çelebi et al. 2015; Demir 2020). Although the scale developed by Çelebi et al. (2015) was examined in four sub-dimensions as ignorance, selfishness, and self-interest, Erdal and Budak (2021) examined it as a single dimension in their study with healthcare professionals. Toxic leaders prefer their interests to organizational interests and cause great harm to employees and organizations (Mehta and Maheshwari 2014). At the same time, they cause the destruction of organizations and the distress of employees (McCleskey 2013; Boddy 2011).

Lipman-Blumen (2005) states that the toxic leader is intentionally toxic, that is, deliberately harming others and unintentionally, i.e., with low intention to harm, but their relative incompetence and reckless attitude distinguishes those who harm and those who do. In toxic leadership theories, narcissism can be considered as causing harm, acting deliberately, and engaging in harmful activities (Grijalva and Harms 2014; Krasikova et al. 2013).

Table 1. Toxic Leadership and its Sub- Dimensions

Authors and Year	Number of Toxic Leadership and Its Sub-Dimensions	Definition of Toxic Leadership,
Whicker (1996).	2	Abusive to Subordinates, Narcissistic.
Flynn (1999).	2	Abusive to Subordinates, Controlling / Stifling
Lipman-Blumen (2005).	3	Abusive to Subordinates, Controlling / Stifling, Narcissistic.
Wilson-Starks (2003).	2	Abusive to Subordinates, Controlling / Stifling.
Reed (2004).	2	Abusive to Subordinates, Narcissistic.
Schmidt (2008).	5	Abusive Control, Authoritarian Leadership, Narcissism, Self-Promotion, Unpredictability.
Çelebi, Güner and Yıldız (2015).	4	Selfish, Manipulative, Unappreciative, Negative Mental State.
Erdal and Budak (2021).	1	Toxic leadership.

BS has been defined as the exhaustion of the mental and physical energy of a person who is a social problem since the 1970s (Köse et al. 2011). It was first examined by Freudenberger and Maslach. Freudenberger, who works in the field of health, observed that people around him experience emotional exhaustion and their motivation decreased and expressed this as burnout. Maslach, who researched the field of social psychology, discovered burnout while examining the emotions that activate individuals' feelings on work (Maslach and Schaufeli 1993). The feeling of BS can be considered as a loss of enthusiasm, idealism, energy, perspective, and goals. The individual who experiences burnout feels like constant stress, helplessness, hopelessness, and trapped. As a result, physical, emotional, and mental exhaustion occurs (Gürbüz and Karapınar 2018). It is stated that BS is a frequently seen situation in people who have to work face-to-face with people due to their job (Akyürek 2020). The definition of burnout, which is especially accepted today, is the definition made by Maslach et al. (Maslach 1982; Maslach and Jackson 1981; Pines and Maslach 1980) and deals with burnout as a three-dimensional concept. In the literature, burnout dimensions are considered as emotional exhaustion, depersonalization, and a decrease in personal accomplishment (Ergin 1992).

Exhaustion/depersonalization: In this dimension, the individual feels emotionally worn out, fatigued, and lacking energy. It is the internal dimension of burnout and is the most important determinant of burnout (Sağlam Arı and Çına Bal 2008).

– Burnout caused by problem-solving / contributing Desensitization, Depersonalization) is the second dimension of burnout and the individual consciously distanced himself from the people he/she has relationships with, disregarding them, behaving as objects, and exhibiting negative attitudes towards the people they serve (Maslach et al. 2001).
– Personal success-induced burnout: this is the third and last stage of burnout. The individual's self-confidence decreases, he thinks that he is not sufficient and unsuccessful in his job, and this sense of failure increases over time and feels guilty by making wrong behaviors and mistakes. Self-confidence and self-esteem decrease.

BS causes both individual and organizational problems. Therefore, it is very important.

The concept of JS was first discussed in Hoppock's (1935) "Job Satisfaction" book and job satisfaction was evaluated as the level of satisfaction regarding the physical and psychological work environment of the

Table 2. Burnout Syndrome and its Sub-Dimensions

Authors and Year	Number of Burnout Syndrome and Its Sub-Dimensions	Definition of Toxic Leadership
Maslach and Jackson (1981).	3	Emotional Exhaustion, Depersonalization, Personal Accomplishment.
Ergin (1992).	3	Emotional, Depersonalization, Personal accomplishment.
Maslach, Jackson and Leiter (1996).	3	Emotional, Depersonalization, Personal accomplishment.
Şıklar and Tunalı (2012).	3	Emotional Exhaustion, Depersonalization, Low Personal Achievement.
İnce and Şahin (2015).	3	Emotional Exhaustion, Depersonalization, Personal Accomplishment.
Armağan, Baysal and Armağan (2017).	5	Emotional Exhaustion, Professional Failure, Personal Depersonalization, Professional Depersonalization Personal, Failure.

employee (cited in You et al. 2013; Dursun 2011). The positive attitude that emerges as a result of the evaluation between the employees' expectations about their jobs and the work environment and the realizations can be explained by job satisfaction, and negative attitude by job dissatisfaction (Tuna et al. 2016). The most frequently cited definition in defining job satisfaction was made by Locke (1976). Accordingly, Locke defined job satisfaction as "the positive or positive emotional state that emerges as a result of the evaluation of one's work and work experiences" (Locke 1976).

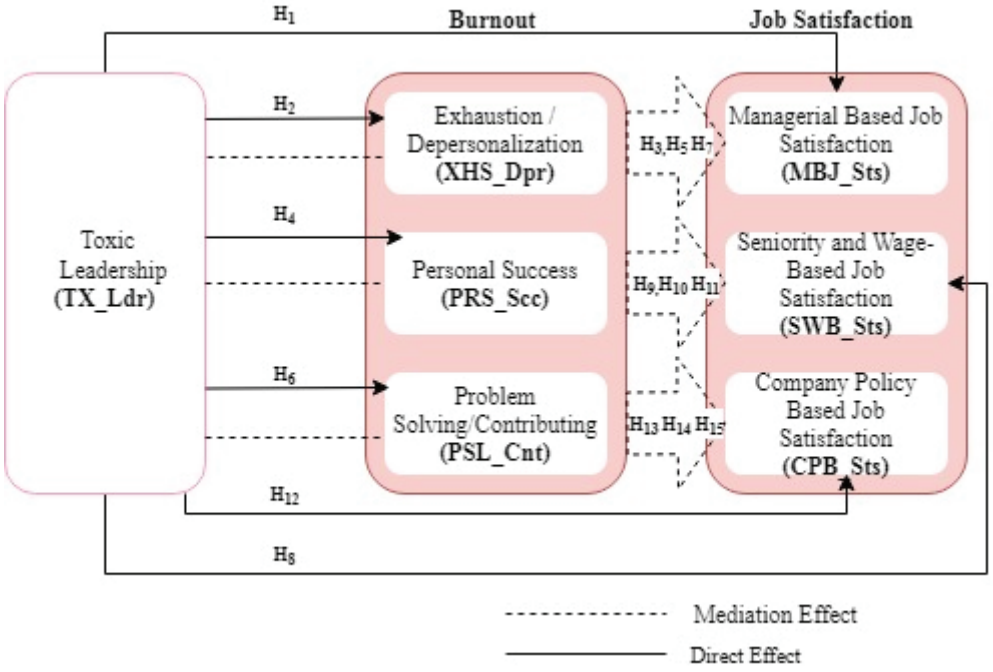
JS is a multidimensional and complex concept. Job satisfaction affects individual characteristics, organizational characteristics, and environmental characteristics. Individual characteristics; personality, age, educational background, intelligence, abilities, interests, and experiences. Organizational features; management philosophy, organizational structure, organizational policies, relations with managers and colleagues, human resources management practices, and working conditions. Environmental features; social and social psychological factors (Özsoy et al. 2014). At the same time, job satisfaction is considered in two dimensions, internal and external (Büyükyılmaz et al. 2018). Inner satisfaction is satisfaction related to the content of the work done. Work structure, job requirements, and tasks required by the job affect the formation of internal satisfaction (O'Reilly and Caldwell 1980). External satisfaction is the satisfaction of the factors that are not related to the job, but that can be influenced by the work environment (Shim et al. 2002). Job satisfaction plays an important role in the success of businesses and the realization of their goals (Cindiloğlu Demirer 2019).

3. RESEARCH MODEL AND HYPOTHESES

3.1. Conceptual Model

This study examines the mediating effect of burnout in the relationship between toxic leadership TL and JS. The TL takes his power from his status and manages his followers in line with his interests and offends the employees, reduces their motivation, sees the success of the employee as his success, and blames the employee for the problems that arise in the working environment (Demir 2020). Individual differences affect the perception of JS (Kalleberg 1977). (TL) is directly related to the behavioral style and increases the burnout of employees (Uzunbacak et al. 2019). Most of the causes of BS are related to work and work. BS often stand out for reasons related to the business environment. Studies show that the personal characteristics of the employees, as well as the workplace conditions, cause burnout. It is seen that burnout can be caused

Figure 1. Conceptual Model



by both individual effects and organizational environmental effects. Burnout is associated with individuals' relationships with other people, attitudes towards problems, self-efficacy, and self-control (Sağlam Arı and Çına Bal 2008).

In this study, toxic leadership was examined in one dimension. Burnout is divided into three dimensions: exhaustion/depersonalization, personal success induced burnout, burnout caused by problem-solving / contributing. Employment is divided into three sections: managerial-based job satisfaction, seniority, and wage-based job satisfaction, company policy-based job satisfaction.

JS consists of salary, seniority, manager, firm policy, and customer sub-dimensions. In this study, it was considered as managerial-based job satisfaction, seniority, and wage-based job satisfaction, and company policy-based job satisfaction**.**

3.2. Toxic Leadership and Job Satisfaction

The most prominent characteristics of toxic leaders are that they benefit from uncertainties, problems, and negativities (Çetinkaya 2017; Eriş and Arun 2020). These destructive behaviors of the leader affect the concepts related to business, organization, and followers. (Ashforth 1994). A toxic leader systematically engages in attitudes and behaviors that sabotage the motivations and job satisfaction of the followers (Reyhanlıoğlu and Akın 2016). In terms of these characteristics, the effect of toxic leadership behaviors have been mostly investigated on JS (Schyns and Schilling 2013; Tepper 2000; Tepper et al. 2004). In the study by Schmidt (2014), it was determined that toxic leadership also harmed group cohesion, group cohesion, self-promotion and misconduct, control and unpredictability, and a full mediating effect on group-level job satisfaction. Tezcan Uysal (2019) found a significant relationship between toxic leadership and job stress JS. Toxic leadership is a partial manager variable on job satisfaction of job stress. Lok and Crawford (2003) found a strong relationship between leadership and organizational culture, and job satisfaction. Labreguue (2020) et al. determined the negative effects of toxic leadership on job satisfaction, absenteeism, psychological distress, and intention to leave the profession. Akman found in his 2016 study that there is a significant relationship between teachers' destructive leadership perception and their professional burnout. Eriş and Arun (2020) in general, the perceived TL level of bank employees decreases their JS level. In the study, a significant negative relationship was found between TL and JS. Erdal and Budak (2021) found a negative significant relationship between toxic leadership and job satisfaction and its sub-dimensions. They also found that it affects managerial job satisfaction and job satisfaction based on company policy through organizational trust. In addition, people who are not satisfied with the job want

to leave the job. Akça (2017) found in his research that toxic leadership affects the intention to quit by 50%.

The following hypotheses have been developed based on studies showing the effect of toxic leadership on job satisfaction:

H1: Toxic leadership has a negative impact on managerial-based job satisfaction.

H8: Toxic leadership has a negative impact on seniority and wage-based job satisfaction.

H12: Toxic leadership has a negative impact on company policy-based job satisfaction.

3.3. Toxic Leadership and Burnout

It has been pointed out that there may be a relationship between leadership styles and burnout levels. Cinnioğlu (2019) found that change-oriented leadership styles had a significant effect on burnout levels, and production-oriented leadership style had no effect on burnout levels (Cinnioğlu et al. 2019). It can be thought that TL is directly related to the behavior style and that there is a relationship between the autocratic leadership dimension and burnout perceptions of leaders who mistreat their followers. If the employee feels that the leader behaves badly BS level increases, but when he feels a situation arising from the personality of the leader, there is no change in the feeling of burnout (Uzunbacak et al. 2019). In the study conducted by Ordu (2017), a low-level significant relationship was found between all sub-dimensions of burnout and the dependability sub-dimension of toxic leadership and overall. The highest correlation was found between depersonalization (burnout) and self-interest (toxic leadership) sub-dimensions. Significantly predicted a decrease in emotional exhaustion, depersonalization, and personal accomplishment along with the dimensions of depravity, selfishness, selfishness, and negative mood of toxic leadership. Bakan and Yılmaz's (2019) study showed that employees' toxic leadership perceptions significantly and positively affect their burnout perceptions. In a study conducted by Larson and Gouwens (2008), Kıyıkçı and Sezici (2017) found that destructive leadership and emotional exhaustion, depersonalization and personal accomplishment, which are sub-dimensions of burnout, significantly predicted the decrease in personal accomplishment. Uzanbacak et al. (2019) found that autocratic management style increased burnout. Koropets et al. (2020) found that toxic leadership increases work stress and cause burnout, disrupts the balance of life, and causes fatigue.

Subsequent hypotheses are proposed based on studies described showing the effect of toxic leadership on burnout:

H2: Toxic leadership has a negative impact on exhaustion/depersonalization.

H4: Toxic leadership has a negative impact on personal success-induced burnout.

H6: Toxic leadership has a negative impact on burnout caused by problem-solving / contributing.

3.4. Mediating Role of Burnout Syndrome in Toxic Leadership-Job Satisfaction Relationship

Toxic leaders may say bad words to their subordinates or followers, or even make insulting expressions, exploit them, ignore them, do bad things to them, disrupt the psychology of the employees and reduce their motivation to work, and harm both employees and the organization with their negative behaviors (Reyhanoğlu and Akın 2015). Schmidt (2008), on the other hand, evaluates toxic leadership as abusive management, narcissism, self-interest, and changeable mood. Parallel to the work of Çelebi et al. (2015), it is discussed under four main dimensions: worthlessness, selfishness, selfishness, and negative mood. As seen in all these studies, toxic leadership employees can have an impact on physical, mental, and social burnout and job satisfaction. Studies on toxic leadership are very few. No study has been found in the literature on the mediation aspect of burnout on the satisfaction of toxic leadership.

Based on studies showing the mediating role of burnout syndrome in the effect of toxic leadership on job satisfaction, the following hypotheses have been developed:

H3: Toxic leadership significantly affects managerial-based job satisfaction through exhaustion/depersonalization.

H5: Toxic leadership significantly affects managerial-based job satisfaction through personal success-induced burnout.

H7: Toxic leadership significantly affects managerial-based job satisfaction through burnout caused by problem-solving / contributing.

H9: Toxic leadership significantly affects seniority and wage-based job satisfaction through exhaustion/depersonalization.

H10: Toxic leadership significantly affects seniority and wage-based job satisfaction through personal success-induced burnout.

H11: Toxic leadership significantly affects seniority and wage-based job satisfaction through burnout caused by problem-solving / contributing.
H13: Toxic leadership significantly affects company policy-based job satisfaction through exhaustion/ depersonalization.
H14: Toxic leadership significantly affects company policy-based job satisfaction through personal success-induced burnout.
H15: Toxic leadership significantly affects company policy-based job satisfaction through burnout caused by problem-solving / contributing.

4. SAMPLING AND RESEARCH METHOD

4.1. Sampling

Factors such as research methods as well as compliance with normality assumptions affect correct sampling. The main body of the study consists of hospital staff working in Istanbul. Data were collected as a result of interviews with 412 hospital employees working in different fields in İstanbul. This hospital is a university hospital in Istanbul, located in the Marmara region. This university hospital was chosen because it is one of the important universities in Turkey and because it reflects Turkey. The reason why university hospitals are chosen as research environments is that they have the opportunity to allocate more time and resources to on-the-job training and orientation than other private hospitals. When the distribution of the interviews participating in the study is examined, it represents the main population. Since the research includes thirty observed variables included in the analysis, the number of observed variables recommended is above 5 (Hair, et al. 2010). The sample size is over 384 calculated for the convenience sampling method (Yükselen 2006). The average age of the participants who answered the research questions was calculated as 37.2 (SD = 8.81) years, and the average duration of employment was 15.49 (SD = 8.72) years. 292 (70.9%) women and 120 (29.1%) men participated in this study. 108 participants in the 36-40 age group constitute the majority (26.2%). 68 (16.5%) participants in the 31-35 age group and 62 (15.0%) participants in the 46-50 age groups constitute the other weighted age groups. The sum of 60 (14.6%) participants in the 26-30 age group and 46 (11.4%) participants in the 41-45 age group constitutes 25% of the sample size. Other participant groups are 39 (9.5%) in the 21-25 age group, 17 (4.1%) in the 51-55 age group, and 4 (1.0%) over the age of 56.

4.2. Measures

The following scale was used in the study: toxic leadership, burnout syndrome, and job satisfaction. The validity and reliability analysis of these scales were tested. In this study, the scale of toxic leadership, burnout, and work integrity was used.

Toxic Leadership Scale: The "Toxic Leadership Scale" developed by Çelebi Güner and Yıldız (2015) was used. The scale consists of a total of thirty questions and four sub-dimensions: selfish, manipulative, unappreciative, and negative mental state.

Burnout Scale: The data of the study were developed by Maslach and Jackson (1981) and the "Maslach Burnout Scale" was used, which was adapted to Turkish by Ergin (1992). The scale, which consists of twenty-two items, was examined under three subtitles as emotional exhaustion, depersonalization, and decrease in personal accomplishment.

Job Satisfaction Scale: (Churchill et al. 1974; Comer et al. 1989) developed by Schwepter (2001); The job satisfaction scale developed by the company is used. It consists of salary, seniority, manager, firm policy, and customer sub-dimensions.

The validation of the research questions taken from the scales of which validity and reliability were demonstrated was made through interviews with fourteen hospital staff. After the test versions were made later, data were collected through the research questions that were finalized.

4.3. Measurement Model Analysis

Since the Kaiser-Meyer-Olkin (KMO) values were greater than 0.70 and the p-value of the Bartlett Sphericity test results was less than 0.05, it was decided that the data set was suitable for factor analysis (Pallant 2005). In this study, there are 30 observed variables that define 7 latent variables. Implicit variables are: Toxic leadership (TX_Ldr), Exhaustion / Depersonalization (XHS_Dpr), Personal Success İnduced Burnout (PRS_Scc), Burnout Caused by Problem Solving / Contributing (PSL_Cnt), Managerial Based Job Satisfaction (MBJ_Sts), Seniority and Wage-Based Job Satisfaction (SWB_Sts) and Company Policy Based Job Satisfaction (CPB_Sts). First of all, with the significance test, it was examined whether the t-values between the observed variables and the latent variables were significant at the 95% confidence level. As a result of the analysis, it was concluded that the relationships between implicit and observed variables were significant, since all t-values were greater than 1.96. In the next step, factor weights between latent variables and observed variables were evaluated, and factor weights were

Table 3. Discriminant Validity Assessment Scales – The Fornell and Larcker (1981) Criterion

	1	2	3	4	5	6	7
TX_Ldr (1)	0.892						
XHS_Dpr (2)	0.797**	0.621					
PRS_Scc (3)	0.330**	0.474**	0.552				
PSL_Cnt (4)	0.306**	0.351**	0.498**	0.611			
MBJ_Sts (5)	-0.565**	-0.411**	0.053	-0.054	0.717		
SWB_Sts (6)	-0.328**	-0.194**	0.077	-0.049	0.773**	0.892	
CPB_Sts (7)	-0.317**	-0.222**	0.106*	-0.026	0.776**	0.723**	0.655
	**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).						

Notes: Abbreviation: TX_Ldr = Toxic Leadership, XHS_Dpr = Exhaustion / Depersonalization, PRS_Scc = Personal Success İnduced Burnout, PSL_Cnt = Burnout Caused by Problem Solving / Contributing, MBJ_Sts = Managerial Based Job Satisfaction, SWB_Sts = Seniority and Wage-Based Job Satisfaction, CPB_Sts = Company Policy Based Job Satisfaction. Diagonal elements (in italics) are the square root of AVE between the constructs and their corresponding measures and the off-diagonal elements are the correlations between constructs

maintained at the 0.70 level. Therefore, the observed variables with the square of the factor weight less than 50% were excluded from the model. While making this decision, by looking at the χ^2 changes suggested by Anderson and Gerbing (1988), 20 observed variables in the Toxic leadership scale, nine variables in the burnout scale, and nine observed variables in the job satisfaction scale were excluded from the analysis one by one, and necessary analyzes were repeated each time. As a result, it was decided to keep a total of seven latent variables and thirty observed variables describing these variables in the structural model.

The Cronbach Alpha values obtained in the exploratory factor analysis (EFA) applied are above the Cronbach Alpha value of the model variables and sub-components. According to this result, it can be said that the scales of model variables and subcomponents are reliable. It was tested whether the model remained within the reference values in the factor analysis performed by AMOS using the covariance matrix. The model fit values obtained after the analysis are shown in Table 1, the features of the scales we use (structural items, factor loadings, Average Variance Extracted (AVE), Composite Reliability (CR), and associated fit indices.

Table 3 shows the Fornell and Larcker (1981) criteria results of the scales used in the study and the sample in the study. It is understood from the values in the table that the square root of each independent variable's AVE is greater than the correlations with other latent constructs.

When the measurement model is examined, it is seen that the results are at an acceptable level. Convergent validity has been described as the convergence of elements in the structure or sharing a high percentage of common variance (Hair et al. 2010). Cronbach's alpha, Average Variance Extracted (AVE), and Composite Reliability (CR) indicators can give an idea in terms of convergent validity. If the AVE value calculated by the author is greater than 0.5, it indicates that the AVE value of the indicators is greater than the error variance and that sufficient convergence has been achieved. Show that there is internal consistency The fact that all CR values above 0.7 support the conformity of the structural model with this basic rule (Bagozzi and Yi 1988). Although it is seen that the toxic leadership variable in the structural model has a positive and significant correlation with burnout syndrome, there is a negative and significant correlation with job satisfaction. When the correlation coefficients are examined in general, it can be said that there is no multiple linear connection problem since the tolerance values calculated for all variables do not take a value below 0.10 and VIF values above 10 (Pallant, 2005).

Table 4. Scales Properties and Items

	Loadings
Toxic Leadership (Çelebi, Güner and Yıldız, 2015)	
7-point Likert scale (1= strongly disagree, 2= moderately disagree, 3= slightly disagree, 4= neither agree or disagree, 5= slightly agree, 6= moderately agree, 7= strongly agree), AVE=0.892 and CR=0.989	
*TL5 (Speaks poorly about subordinates to other people in the workplace).	0.916
*TL6 (Publicly belittles subordinates).	0.908
*TL16 (Puts personal interests first).	0.954
*TL19 (Promotion/position is what matters most).	0.951
*TL20 (Has arbitrary behavior and/or decisions).	0.963
*TL21 (Thinks that he/she is more capable than others).	0.960
*TL23 (He/She believes that the future and the course of the hospital will only get better with him/her).	0.954
*TL25 (Believes that he/she is an extraordinary person).	0.951
*TL29 (Allows his/her mood to affect his/her vocal tone and volume).	0.956
*TL30 (There is instability/variability in his/her behavior).	0.960
Burnout (Ergin, 1992)	
7-point Likert scale (1= strongly disagree, 2= moderately disagree, 3= slightly disagree, 4= neither agree or disagree, 5= slightly agree, 6= moderately agree, 7= strongly agree), AVE=0.621 and CR=0.830	
- Exhaustion/Depersonalization	
*T20 (I feel like I've come to the end of the road).	0.726
*T22 (I feel that the people I meet in my job act as if I created some of their problems).	0.784
*T16 (Working directly with people puts a lot of stress on me).	0.850
-Personal Success Induced Burnout, AVE=0.552, and CR=0.831	
*T17 (I create a comfortable atmosphere with the people I come across as part of my job).	0.741
*T19 (I have had many notable successes in this business).	0.779
*T21 (I approach emotional problems at work calmly).	0.731
*T12 (I am strong enough to do many things).	0.721
-Burnout Caused by Problem Solving/Contributing, AVE=0.611, and CR=0.758	
*T7 (I find the most appropriate solutions to the problems of the people I come across as part of my job).	0.764
*T9 (I believe that I contribute to people's lives through my work).	0.799
Job Satisfaction (Schwepter, 2001)	
7-point Likert scale (1= strongly disagree, 2= moderately disagree, 3= slightly disagree, 4= neither agree nor disagree, 5= slightly agree, 6= moderately agree, 7= strongly agree),	
-Managerial Based Job Satisfaction, AVE=0.717, and CR=0.910	
*IT12 (My manager expresses and praises his/her confidence in us in return for a job well done).	0.842
*IT1 (My manager usually tries to get our opinion on matters).	0.820
*IT3 (Management is open to development).	0.874
*IT6 (The manager has always been honest about my matters).	0.852
-Seniority and Wage-Based Job Satisfaction, AVE=0.892 and CR=0.989	
*IT9 (In my opinion the salaries in this hospital are higher than other hospitals).	0.625
*IT7 (Top management does their job well).	0.925
*IT8 (There are opportunities for development in the institution).	0.904
-Company Policy-Based Job Satisfaction, AVE=0.655, and CR=0.882	
*IT19 (Our customers (patients) are very understanding).	0.663
*IT14 (The institution runs its business well).	0.874
*IT17 (My job is satisfactory).	0.794
*IT15 (There are enough good jobs here for those who want to progress).	0.887
Fit Indices (CFA measurement model)	
df=381, CMIN/df=1.734, RMSEA=0.042, RMR=0.176, GFI=0.908, CFI=0.980, NFI=0.954, AGFI=0.888	

Table 5. Correlation Matrix (Model Constructs)

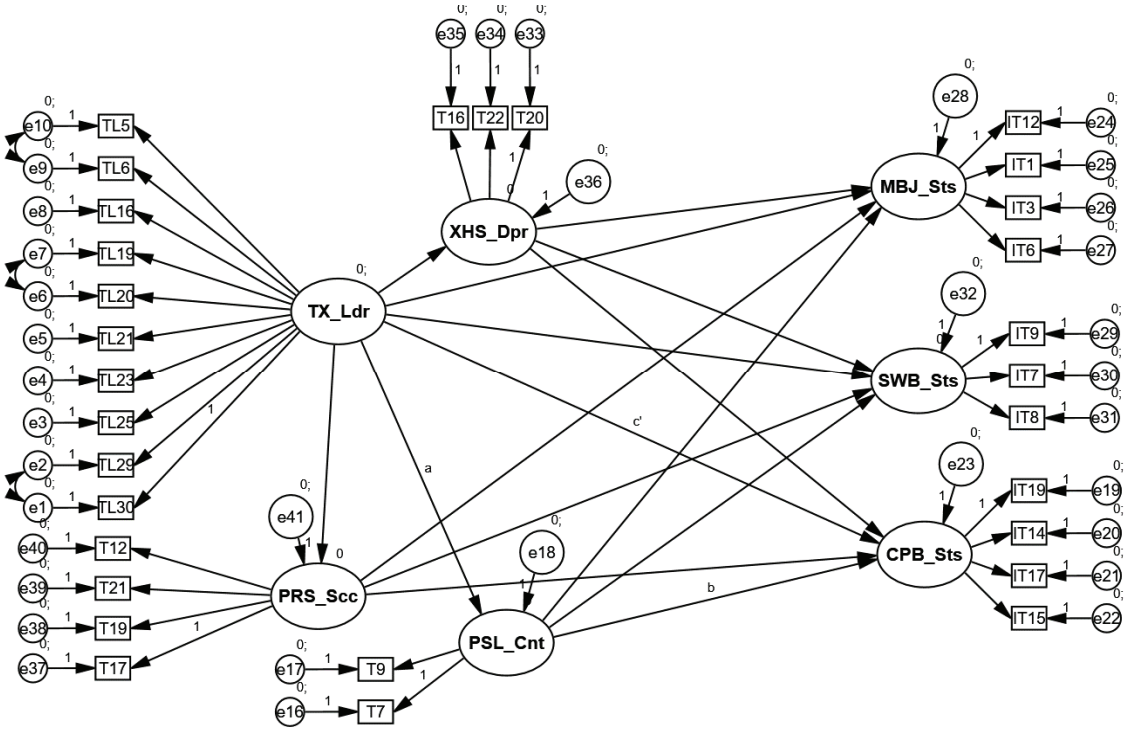
	Mean	Std. Deviation	VIF	1	2	3	4	5	6	7
TX_Ldr (1)	4.410	2.112	2.791	1						
XHS_Dpr (2)	4.424	1.608	3.184	0.797**	1					
PRS_Scc (3)	5.377	1.229	1.561	0.330**	0.474**	1				
PSL_Cnt (4)	5.277	1.408	1.371	0.306**	0.351**	0.498**	1			
MBJ_Sts (5)	4.328	1.651	-	-0.565**	-0.411**	0.053	-0.054	1		
SWB_Sts (6)	3.486	1.795	-	-0.328**	-0.194**	0.077	-0.049	0.773**	1	
CPB_Sts (7)	4.338	1.692	-	-0.317**	-0.222**	0.106*	-0.026	0.776**	0.723**	1
	**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).									

Notes: Abbreviation: TX_Ldr = Toxic Leadership, XHS_Dpr = Exhaustion / Depersonalization, PRS_Scc = Personal Success İnduced Burnout, PSL_Cnt = Burnout Caused by Problem Solving / Contributing, MBJ_Sts = Managerial Based Job Satisfaction, SWB_Sts = Seniority and Wage-Based Job Satisfaction, CPB_Sts = Company Policy Based Job Satisfaction.

4.4. Structural Model Analysis

Direct and indirect effects were tested through the structural model created. It is expected that the p-value, which is one of the goodness-of-fit values, is less than 0.05 (Munro, 2005). In the structural model, the p-value was found to be 0.000. CMIN/DF value below 5 indicates the acceptability of the test (Hooper and Mullen 2008). The CMIN/DF value of the structural model was calculated as 2.53. When the CFI value is above 0.90 and close to 1, it means that there is no relationship between the variables in the model (Munro 2005). The CFI value was determined as 0.958. The fact that NFI, one of the other fit indices, is close to 1 explains that the fit is higher (Marsh and Grayson, 1995). The result of the NFI value was obtained as 0.932. Similarly, TLI values of 0.952 and IFI values of 0.958 are also within the reference ranges of the goodness-of-fit. Unlike other indices, the RMSEA value is expected to be less than 0.80, and the level of significance

Figure 2. Structural Model



increases as it approaches 0 (Schumacker and Lomax 2010). It has been observed that the RMSEA value, which was calculated as 0.061, has a result converging to 0. It has been observed that the structural model meets the reference values in the compatibility indices. As a result of the analysis in which the results were tested with the transformed data, the hypotheses developed were retested and the same results were obtained.

5. DISCUSSION

This study, it is aimed to reveal the effects of toxic leadership characteristics on burnout syndrome and job satisfaction. In addition, the mediating role of burnout syndrome in the effect of toxic leadership on job satisfaction was tried to be revealed. It was aimed to determine the effects of toxic leadership behaviors of middle and lower-level managers working in the hospital on different components and to make suggestions to upper-level managers, health policy developers, and practitioners. Although the toxic leadership scale (*Çelebi*, Güner and Yıldız 2015) is considered as a variable whose negative effects on job satisfaction are known, the mediating effect of burnout syndrome, which was not included in other studies, was tried to be tested. The analysis unit of this research consists of hospital staff such as doctors, nurses, caregivers, technical and administrative staff. The said employees included in the study work under a lower or middle-level manager. From this point of view, it can be said that toxic leadership, burnout syndrome, and job satisfaction, which are the 3 main components examined in the research, only reflect the hospital staff. With this feature, the work design gives employees the chance to produce concrete suggestions about the managers to which they are affiliated.

The effect of toxic leadership on job satisfaction

The effect of toxic leadership on job satisfaction was tested with the suggested H_1, H_8, and H_{12} Hypotheses. As shown in Table 3, all 3 hypotheses were accepted. Toxic leadership appears to have a significant negative effect on managerial based job satisfaction ($p = 0.000$, $= -0.467$), seniority and wage-based job satisfaction ($p = 0.000$, $\beta = -0.247$) company policy-based job satisfaction ($p = 0.000$, $\beta = -0.208$). This result is in parallel with the results obtained by other studies (Paltu and Brouwers 2020; Mehta and Maheshwari 2013; Kusy and Holloway 2009; Schmidt 2014).

According to the coefficient of determination, toxic leadership explains 35.1% of managerial-based job satisfaction, 17.1% of seniority and wage-based job satisfaction, and 3.3% of company policy-based job satisfaction ($p < 0.001$). It is expected that toxic leadership has more negative effects on managerial-based job satisfaction when the literature is examined.

In the study of Eriş and Arun (2020), a moderately significant negative relationship was found between toxic leadership and job satisfaction. In the study conducted by Schmidt (2008), a medium-level negative relationship was determined between Job Satisfaction and Toxic Leadership.

According to the literatür K*ırbaç* (2013) 's research; In fact, we see that all organizations potentially contain more or less toxicity and gain a rapid increase, cost the success achieved by subordinates, and exhibit unethical behavior. Thus, it may be more deadlocked in administering (Bektaş and Erkal, 2015). Toxic leadership has the highest negative Beta coefficient on managerial-induced job satisfaction, which is one of the subcomponents of job satisfaction. Therefore, it can be said that one unit increase in the toxic leadership variable affects managerial job satisfaction with a coefficient of -0.467.

The effect of toxic leadership on burnout syndrome

Supporting the studies conducted, the effect of toxic leadership on burnout syndrome is supported by the acceptance of the proposed H_2, H_4, and H_6 hypotheses. As a result of testing the proposed hypotheses, toxic leadership had a negative significance on exhaustion / depersonalization ($p = 0.000$, $\beta = 0.512$), personal success induced burnout ($p = 0.000$, $\beta = 0.208$) and burnout caused by problem solving / contributing ($p = 0.000$, $\beta = 0.207$) appears to have an effect. When the obtained R^2 values are examined, toxic leadership explains 62.0% of exhaustion/depersonalization, 15.2% of personal success induced burnout, and 12.9% of burnout caused by problem-solving / contributing ($p < 0.001$). It is expected that toxic leadership has more negative effects on burnout syndrome when the literature is examined. No study has been found on the mediating role of burnout in the effect of toxic leadership on job satisfaction.

Studies have shown that toxic leadership increases employees' burnout syndrome. In their study, Çetinkaya and Ordu (2018) found a low-level significant relationship between all sub-dimensions of burnout and the depravity sub-dimension of toxic leadership and overall. All dimensions of toxic leadership together significantly predict emotional

exhaustion, depersonalization, and a decrease in personal accomplishment. Bakan and Yılmaz (2019) found that toxic leadership perceptions in their employees significantly and positively affect their burnout perceptions.

When the results are examined, it is seen that toxic leadership has the highest positive beta coefficient on exhaustion/depersonalization. In other words, it can be said that a one-unit increase in the toxic leadership variable affects exhaustion/depersonalization with a coefficient of 0.512.

The mediating role of burnout syndrome in the effect of toxic leadership on job satisfaction

There are studies in the literature showing the mediating role of burnout syndrome in the effect of toxic leadership on job satisfaction In the structural model created, the mediating role of burnout syndrome in the effect of toxic leadership on job satisfaction sub-dimensions was tested. While the H_5, H_{10}, and H_{14} hypotheses were supported, the H_3, H_7, H_9, H_{11}, H_{13}, and H_{15} hypotheses were not accepted.

The mediating role of personal success induced burnout

The effect of toxic leadership on managerial-based job satisfaction was found to be statistically significant (p = 0.000, B = -0.467). A positive path and regression coefficient were obtained between toxic leadership and personal success-induced burnout (p = 0.000, 0.208). The indirect effect between toxic leadership and managerial-based job satisfaction was obtained as 0.133 and a 95% confidence interval of 0.049-0.133, since this range does not contain a value of 0, the indirect effect was found to be statistically significant. According to the coefficient of determination, toxic leadership explained managerial-based job satisfaction through personal success induced burnout at a rate of 41.8% (adjusted R^2 = 0.418). For this reason, the H_5 hypothesis that "toxic leadership significantly affects managerial-based job satisfaction through personal success induced burnout" was accepted. On contrary to the current studies, it can be said that thanks to the mediating role of personal success induced burnout, middle and lower-level managers with toxic leadership provide managerial job satisfaction in employees with burnout syndrome due to personal success. While it is a result that hospital employees who provide health care services can be expected to experience burnout syndrome due to personal success due to managers who have toxic leadership characteristics, the mediating role undertaken by personal success burnout syndrome can be explained directly by the professional requirements arising from the provision of health services.

For the H_{10} hypothesis where the mediating effect of personal success induced burnout is tested, the effect of toxic leadership in the structural model on seniority and wage-based job satisfaction was tested and found significant (p = 0.000, B = -0.247). At the same time, a positive path and regression coefficient was obtained between toxic leadership and personal success-induced burnout (p = 0.000, 0.209). The indirect effect between toxic leadership and job satisfaction was obtained as 0.048 and 95% confidence interval 0.021-0.082. The indirect effect can be said to be significant since the range found does not contain the value 0. According to the calculated coefficient of determination, toxic leadership explains seniority and wage-based job satisfaction through personal success induced burnout with a rate of 20.7% (adjusted $R^2 = 0.207$). In line with this result, the H_{10} hypothesis of "toxic leadership significantly affects seniority and wage-based job satisfaction through personal success induced burnout" was supported. Supporting the mediating role of personal success-induced burnout tested for this hypothesis can be explained by the average working years of the hospital staff in the profession (mean=15.49) and the institution (mean=14.46). Hospital staff can achieve seniority and wage-based job satisfaction due to their long years of work in the profession and institution.

In the structural model tested, the effect of toxic leadership on company policy-based job satisfaction was found to be statistically significant (p = 0.000, B = -0.208). However, as stated before, a positive path and regression coefficient were obtained between toxic leadership and personal success-induced burnout (p = 0.000, 0.209). The indirect effect between toxic leadership and company policy-based job satisfaction was obtained as 0.068 and a 95% confidence interval of 0.036-0.106. Since this confidence interval does not contain a 0 value, the indirect effect was found to be statistically significant. According to the coefficient of determination, toxic leadership explains company policy-based job satisfaction through personal success-induced burnout at a rate of 18.4% (adjusted R^2 = 0.184). In line with this result, the H_{14} hypothesis of "toxic leadership significantly affects company policy-based job satisfaction through personal success

Table 6. Significant Findings of Direct/Indirect Effects among Model Variables

	Model Pathways	Beta Value	Std. Error	R squared	Indirectly Estimated	95% CI Lower	95% CI Upper	Results
H1	TX_Ldr ➔ MBJ_Sts	-0.467	0.037	0.351***				Supported
H2	TX_Ldr ➔ XHS_Dpr	0.512	0.350	0.620***				Supported
H3	TX_Ldr ➔ XHS_Dpr ➔ MBJ_Sts	-0.558	0.670	0.357*	0.910	-0.25	0.244	Not Supported
	XHS_Dpr ➔ MBJ_Sts	0.177	0.105					
H4	TX_Ldr ➔ PRS_Scc	0.208	0.290	0.152***				Supported
H5	TX_Ldr ➔ PRS_Scc ➔ MBJ_Sts	-0.556	0.410	0.418***	0.133	0.049	0.133	Supported
	PRS_Scc ➔ MBJ_Sts	0.412	0.780					
H6	TX_Ldr ➔ PSL_Cnt	0.207	0.350	0.129***				Supported
H7	TX_Ldr ➔ PSL_Cnt ➔ MBJ_Sts	-0.508	0.410	0.367*	0.041	0.030	0.082	Not Supported
	PSL_Cnt ➔ MBJ_Sts	0.196	0.760					
H8	TX_Ldr ➔ SWB_Sts	-0.247	0.033	0.171***				Supported
H9	TX_Ldr ➔ XHS_Dpr ➔ SWB_Sts	-0.297	0.057	0.175	0.050	-0.054	0.144	Not Supported
	XHS_Dpr ➔ SWB_Sts	0.097	0.087					
H10	TX_Ldr ➔ PRS_Scc ➔ SWB_Sts	-0.296	0.037	0.207***	0.048	0.021	0.082	Supported
	PRS_Scc ➔ SWB_Sts	0.231	0.065					
H11	TX_Ldr ➔ PSL_Cnt ➔ SWB_Sts	-0.262	0.036	0.175	0.015	-0.014	0.046	Not Supported
	PSL_Cnt ➔ WB_Sts	0.070	0.061					
H12	TX_Ldr ➔ CPB_Sts	-0.208	0.033	0.115***				Supported
H13	TX_Ldr ➔ XHS_Dpr ➔ CPB_Sts	-0.267	0.059	0.121	0.059	-0.031	0.155	Not Supported
	XHS_Dpr ➔ CPB_Sts	0.115	0.093					
H14	TX_Ldr ➔ PRS_Scc ➔ CPB_Sts	-0.277	0.036	0.184***	0.068	0.036	0.106	Supported
	PRS_Scc ➔ CPB_Sts	0.327	0.071					
H15	TX_Ldr ➔ PSL_Cnt ➔ CPB_Sts	-0.229	0.036	0.123	0.021	-0.007	0.054	Not Supported
	PSL_Cnt ➔ CPB_Sts	0.096	0.064					

Notes: *** p< 0.01 (2.33) **p< 0.05 (1.645) * p< 0.10 (1.282). Abbreviation: TX_Ldr = Toxic Leadership, XHS_Dpr = Exhaustion / Depersonalization, PRS_Scc = Personal Success İnduced Burnout, PSL_Cnt = Burnout Caused by Problem Solving / Contributing, MBJ_Sts = Managerial Based Job Satisfaction, SWB_Sts = Seniority and Wage-Based Job Satisfaction, CPB_Sts = Company Policy Based Job Satisfaction.

induced burnout" was accepted. Based on this result, it can be concluded that even if they work with managers who have toxic leadership characteristics, hospital staff may feel company policy-based job satisfaction depending on the type of burnout syndrome they experience. Burnout personal success-induced burnout stands out as one of the subcomponents of burnout syndrome that draws attention to the accepted mediation hypotheses and provides an opportunity to make inferences for the dimensions of job satisfaction.

6. CONCLUSION

6.1. Theoretical Implications

With this research, the effects of TL on BS and JS have been tried to be revealed. The studies carried out revealed the direct effects of TL on the JS level (Uzunbacak et al. 2019; Çetinkaya and Ordu, 2018). The research findings of previous studies also support the research findings in terms of the direct effect of TL on JS. However, it is seen that the mediating role of BS on this direct effect is not included in the literature.

Therefore, this study fills an important gap in the literature. From this point of view, the research conducted in terms of revealing the mediating role of the personal success-induced burnout dimension is critical. With the research done, it may be possible to make the following theoretical suggestion: The TL scale can be leveled for different leadership types. Although it requires a very comprehensive study, there will be a chance to measure TL levels according to different leadership profiles with the new scale to be obtained.

6.2. Managerial Implications

In terms of the mediation effect of personal success induced burnout, three critical suggestions can be made: The first of these suggestions is to create rational business processes by deducing that the personal success focus of hospital staff is high in terms of personal success induced burnout, which has an intermediary effect in all dimensions of job satisfaction and training the lower and middle-level managers they work with in terms of leadership requirements. The second suggestion is that employees who have a longer working year in the profession than other employees should be given additional responsibilities and authority to increase their job satisfaction level compared to other employees. In university hospitals, additional duties and responsibilities can be added to the employees with various additional assignments in case of need. Since long-term employees know the institution and employees better, their decisions will be more efficient and job satisfaction will be provided.

Finally, it can be measured and rational performance and reward systems can be developed to contribute to job satisfaction dimensions to increase the personal success focus in personal success induced burnout, which acts as an intermediary in all sub-dimensions of job satisfaction.

6.3. Limitations

One of the important constraints of the study is that only hospital workers are included. More explanations about managerial-based job satisfaction and company policy-based job satisfaction dimensions can be provided with a study including hospital managers. In addition, with the data to be obtained in higher sample numbers, different suggestions can be made to increase the job satisfaction levels of the employees.

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THE USERS' BEHAVIORAL INTENTION TO USE MOBILE HEALTH-TECH APPLICATION TO PREVENT THE SPREADING OF CORONAVIRUS

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Abstract

The emergence of mobile health applications (MH-Apps) has enhanced the healthcare field's services, particularly in the treatment, diagnosis, and follow-up. AMAN Mobile Health Application (AMAN MH-App) is one of the health-tech solutions used to fight the Coronavirus pandemic. It has a built-in feature to track users' activities to protect users from contacting an infected person. However, the acceptance of AMAN MH-App in Jordan is still in an early stage, and the number of users has reached 15% of the country's population. Therefore, this study aims to assess the use of AMAN MH-App among young people using the quantitative method. A total of (450) valid samples participated in the study after removing 33 invalid samples. Smart-PLS 3.2.7 was used for data analysis. The findings showed that all independent variables (Perceived usefulness, Perceived ease of use value, Subjective norms, Perceived behavioral control, Information Credibility, and Optimism) positively impact on the dependent variable (Behavioural Intention to use AMAN MH-App). We believe that AMAN MH-App's information's credibility (i.e. providing up-to-date, authoritative, accurate, and trustworthy information) will increase the number of the App's users. The results of this research can be applied to similar context and applications in different countries.

Keywords: *Behavioral Intention, Mobile Health Application, AMAN MH-App, Covid-19*

JEL Classification *: M15, M19, I11, I12, I18*

1. Introduction

After incorporating technologies into the health sector, people's motivation to use technology has been central for developing the health care system. It is of great importance to health informatics to consider the way people adapt to the introduction of new technology, such as using smartphones in healthcare. According to the World Health Organization (WHO), Mobile Health Technology (MHT) consistently uses mobile devices in the medical field (World Health Organization Writing Group et al. 2006). Many studies found that younger people are more ready to adopt new technology smartphones than older adults (Almasri 2015a).

The speedy evolutions of mobile devices (Pilav-Velić et al. 2021) contribute the integration of mobile services into the healthcare field as a broad part of daily life (Babic-Hodovic et al. 2017). Mobile

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devices help people control and manage diseases by utilizing Mobile Health Applications (MH-Apps) in prevention and health. The MH-Apps are essential in our daily lives to assist health services in disease detection, risk assessment, case recognition, touch tracking, and monitoring circumstances. The MH-Apps, as one of the most important and widely used sub-sectors of e-Health, seeks to increase the quality and access to health services (Erfannia et al. 2020). The MH-Apps are essential in disease management during a pandemic and can support the health system through surveillance of disease (Kodali et al. 2020), risk assessment (Ren et al. 2020), patients and suspected cases identification, contact tracing of positive cases, and status monitoring (Kodali et al. 2020). This process includes collecting anonymous data to track people's movements and tracking confirmed cases to track suspicious cases and their connections (Bassi et al. 2020). These strategies were individual and compulsive in some cases, while in some areas, data was collected public and anonymously (Ekong et al. 2020).

Many countries have used mobile data to respond quickly to Covid19. The Indian Ministry of Family Health and Welfare has developed remote counseling guidelines as the number of cases increases (Bassi et al. 2020). Also, they found that there is a serious need to include remote counseling options in mobile apps. In China (Ye et al. 2020), platforms such as Cloud computing was used to store and analyze disease-related big data. The IoT was used to collect real-time data, and artificial intelligence capabilities were used to intelligently diagnose disease, measure temperature, and provide robots for patients. Also, the 5G platform was used as the infrastructure for video conferencing and remote detection. In the United States (Ekong et al. 2020), $500 million of the $2 trillion economic stimulus budget has been assigned to the Centers for Disease Control and Prevention to build a novel collection and surveillance system to monitor Covid19. Germany, Austria, and Italy collect call detail records (CDRs) to enforce quarantine and stay at home strategies (World Health Organization 2020). In Korea, Hospitals, in addition to collecting vital real-time data from suspected and confirmed patients and displaying it through dashboards to health personnel and data storage in the hospital information system database, provided a rich and up-to-date data source (Ekong et al. 2020).

Through cooperation with telecommunications companies, the governments have started monitoring people with travel history to in the pandemic's early days (Ekong et al. 2020). Also, it is worth noting that the number of countries in the world that have started using virus exposure detection applications as part of the emerging Coronavirus containment strategy is increasing continuously to include India (Bassi et al. 2020), Africa (Umezuruike et al. 2020) South Korea (Bae et al. 2020), Zurich (Vokinger et al. 2020), China (Ye et al. 2020), Switzerland (Zamberg et al. 2020), South Korea (Bae et al. 2020), Nigeria (Ekong et al. 2020), and others. In Jordan, the government has made a series of processes to reduce the physical contact among people, preventing the spreading of Covid-19. One of the innovative steps is developing a mobile health application named "AMAN MH-App" to track infected persons and send alerts to individuals who have been in contact with those infected people.

The AMAN MH-App is a tracking app that is part of the Hashemite Kingdom of Jordan's response plan to contain the emerging Coronavirus. That is a privacy-protected mobile program that warns users if they are suspected of being exposed to the virus or in contact with an infected person, using geolocation technology (GPS), and soon Bluetooth. The AMAN MH-App was created as a community project for the Ministry of Health (MOH) by the Covid-19 JOTECH COMMUNITY group. This group of experts volunteer their knowledge and skills to assist Jordan with efforts to contain the spread of Coronavirus and beat this pandemic. The group aim to benefit from Jordanian technological talents in Jordan and the world by providing the Jordanian government with the necessary support. For example, they provide research, offer consultation, share with the government the world's leading countries' experiences in the optimal use of technology to contain the spread of the virus, as well as provide human resources from expert volunteers to support the government in implementing technological initiatives. Day after day, the AMAN MH-App demonstrates its efficacy in controlling interactions and identifying the source of infection, emphasizing that the number of users has reached one million and 650 thousand which represents 15 % of the country's population. However, the number of cases of coronavirus infection is continually growing, owing to the lack of AMAN MH-App use among people.

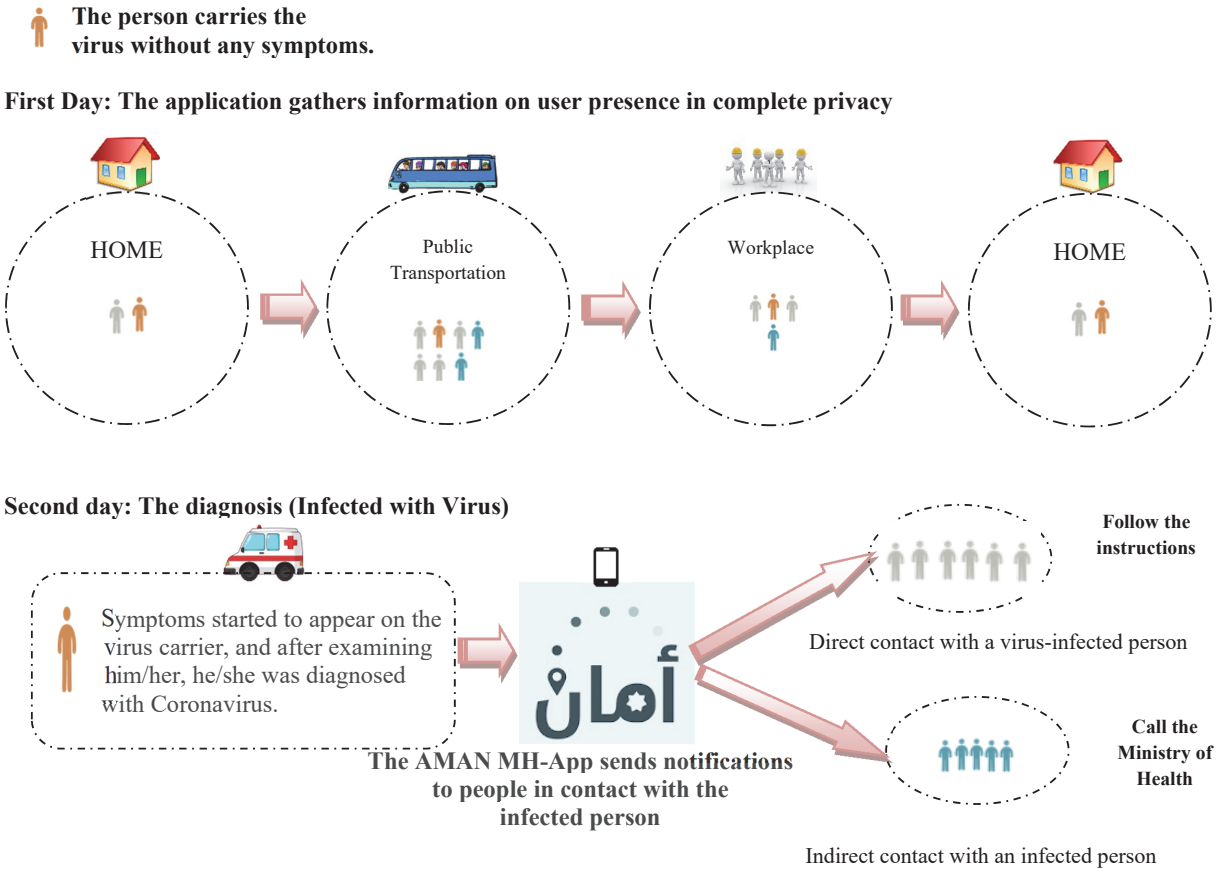
However, people use MH-Apps unregularly, likely because these apps are realized as an erratic and not secure (Wu et al. 2022). It is believed that high rejection of using MHT will result in delays in the successful implementation of mobile health applications (MH-Apps), or even failure, and will hinder the achievement of related organizational objectives, such as efficient patient records monitoring and analysis (Ghose et al. 2021). The continuous using and development of MH-Apps depends on users' behavioral and intention to use these Apps. Therefore, the success of MH-Apps usage relies on understanding users' behavioral

and intention. In addition, resistance to MH-Apps would entail clear policy steps to improve acceptance and perhaps to familiarize future users with the advantages of the IT applications being discussed. So far, research has identified a range of key independent factors that predict user intentions in adopting AMAN MH-App. This study developed and tested our model based on the original Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB) to determine the best predictors of users' behavioral intentions to use AMAN MH-App. This study aims to determine the relationships between independent variables, namely Perceived Usefulness (PU), Optimism (OP), Subjective Norms (SN), Perceived Behavioral Control (PBC), Information Credibility (IC) and Perceived Ease of Use (PEU) and dependent variables, namely Behavioral Intention (BI) to use AMAN MH-App, and also to find out how the independent variables influence the dependent variable. Also, the results of this research is not limited to one country but it can be applied to similar context and applications in different countries.

2. How does AMAN MH-App work?

The AMAN MH-App application aims to detect virus exposure using GPS and later Bluetooth technology. It allows more straightforward and more effective processes to monitor and isolate new cases of Coronavirus, which leads to the virus being contained and to protect the app users, their families, and their societies (MoH 2020). Applications for the detection of virus exposure show their ability to help control the spread of infectious diseases by warning users as soon as possible of their interaction with infected cases to take the necessary steps promptly (MoH 2020). As far as the evolving Coronavirus is concerned, current studies suggest that many cases of infection with this virus are transmitted by airborne droplets captured at an average distance of about two meters. Consequently, it becomes extremely necessary to warn people who were in contact or were in close proximity to any infected person to speed up the diagnostic process and allow the virus to be managed (see figure 1 for more details).

Figure 1. Flowchart of a Covid-19 detection AMAN MH-App (MoH 2020)



AMAN MH-App operates in two interrelated ways. First, to equate the user's movement with the movement of users who are later diagnosed with the latest Coronavirus by the Ministry of Health, the application saves location data exclusively on the user's computer. Let us suppose that contact happens between a user and another who later tests positive. In this case, the program sends warnings with the location and time to users who have been present in the infected person's vicinity. On the other end, when receiving a warning, the application also displays guidance and measures to be taken by the warned individuals. Moreover, the second method by which the user diagnosed with the new Coronavirus, the application will be able to conveniently recover his/her whereabouts and movements over the last 14 days, including dates, times, and locations. This stage's primary objective is to warn other users who happen to be in the vicinity of the diagnosed user, which eventually speeds up infection detection and virus spread control.

3. Related works on Mobile Health Technology (MHT)

Table 1 provides various research that deployed MHT tools to diagnose, treat, and monitor the Covid-19 pandemic. It also identifies the main objectives of the studies that have implemented MHT in the health sector.

Table 1. Related work on MHT

Authors	MHT opportunities	MHT effect	Study objective
(Pan 2020)	Managing travel and contact with patients	Diagnosis Follow up	This study aims to use the mobile phone to prevent the spreading of Covid-19.
(Pulia et al. 2020)	Active surveillance of disease	Diagnosis Follow up	Using EHR base data to active monitoring of Covid-19patients.
(Ren et al. 2020)	Integration of health data	Diagnosis Follow up	Using MTS (mobile telehealth system) to enable the following patients remotely and discuss the cases.
(Timmers et al. 2020)	Self-assessment, Self-education	Diagnosis Follow up	This paper evaluates mobile health apps' use by people to assist them for 7 days with Covid-19.
(Umezuruike et al. 2020)	Patient tracking	Follow-up	In this study, a tracking and alert system for Covid-19 is proposed.
(Vokinger et al. 2020)	Tracing and geolocation tracking	Diagnosis	This research aims to develop a framework to guide a specific app's alignment with an epidemiological principle.
(Wang, Ding, and Xiong 2020)	Early diagnosis of infection	Diagnosis	Developing a mini program within the app WeChat to early diagnosis of infection is proposed.
(Ye et al. 2020)	Tracking of close contacts Identify of epidemic trends Diagnosis remotely	Diagnosis	Establish a technical system for reacting to the outbreak of Covid-19 using MH-Apps.
(Zamberg et al. 2020)	Providing evidence-based treatment, timesaving	Diagnosis	The use of a dedicated mobile health application (MH-Apps) to keep SARS-CoV-22's patients' data up to date.
(Bassi et al. 2020)	1-A mobile app can self-testing, quarantine monitoring, and contact tracing of Covid-19 patients. 2-Mobile App can increase information dissemination regarding preventative measures.	Diagnosis Treatment Follow-up	Explore mobile apps in India relevant to Covid-19 and discover the apps' roles and emphasize issues in informing the establishment of potential mHealth plan.
(Ekong et al. 2020)	1-Find confirmed cases of mobility and travel patterns. Patients' mobility data is very effective in mapping intervention strategies. 2-Improving the timely outbreak response.	Follow-up	To survey remote contact tracing techniques for the Covid-19 disease and present how the use of mobile location data complies with Nigeria's data protection and regulations.
(Kodali et al. 2020)	High user score acceptance and usefulness. The users also noted expectations to include the app's additional features.	Diagnosis Follow up	Analyzing Arogya Setu app user's experiences and expectations in India

4. Theoretical background and research hypotheses

In the reviewed literature, two approaches were adopted: the first approach is driven by the features of technology in embracing assessments, while the other emphasizes the technical and psychological factors that affect the adoption decision. Accordingly, the Technology Acceptance Model (TAM) represents the first approach to adopt new technology, while the Theory of Planned Behavior (TPB) focuses on psychological factors that affect our decision to adopt new technology.

4.1. TAM model

The Technology Acceptance Model (TAM) is one of the most influential models used to describe the behavior of information technology (IT) usage due to its practicality and appropriateness(Davis, 1989). Specifically, the best predictors of user intentions have been found to be perceived usefulness (PU) and Perceived Ease of Use (PEOU) to the IT applications. In TAM, created by Davis to test the acceptance of new technologies by IBM employees, the tripartite of PU, PEOU, and attitudes have been well summarized. TAM research has grown considerably over the last 20 years, and TAM prominently features among the leading theoretical methods used to evaluate people's intent to use different information technology types. In addition, the novel TAM is extended with different variables by developing alternative models. Thus, the adoption of technology can be witnessed in a number of environments, online banking systems(Munoz-Leiva, Climent-Climent, and Liébana-Cabanillas 2017), e-commerce(Chi 2018), smartphone use(Xia, Zhang, and Zhang 2018), online travel communities (Agag and El-Masry 2016), mobile learning (Almasri 2015b) and health informatics(Ammenwerth 2019). Previous related works on TAM model have proven its stability and reliability, and it can consistently explain a significant amount of variation in technology use behavior. Also, it has found that Perceived Ease of Use (PEU) and Perceived Usefulness (PU) are the main factors of the users' acceptance of an information system or any technology. Nonetheless, few studies have used TAM to model user behaviors intention, especially for mobile health apps. In our study, users' behaviors intention to use AMAN MH-App to control and manage Covid-19 diseases is explained.

4.1.1. Perceived Ease of Use (PEOU)

According to (Davis 1989), PEOU refers to "the extent to which an individual believes that using a particular system is free of effort". Perceived ease of use refers to the degree to which a person feels that a given device is effortless. Related works have agreed that the overall adoption of technologies has been directly impacted by PEOU. Based on our study, the perceived ease of use is to the degree that the individual feels that it is effortless to use the AMAN MH-App and has no trouble coping with it. Therefore, the following hypotheses were suggested:

H1: PEOU will have a positive effect on BI to use AMAN MH-App

4.1.2. Perceived Usefulness (PU)

Perceived usefulness refers to "the extent to which an individual believes that using a particular system would improve work performance"(Davis 1989). PU is also defined as the degree to which an individual assumes that using a particular system will increase the job's efficiency. Previous related works have clearly stated that the overall adoption of technologies has been directly impacted by PU. In this study, PU refers to how users believe that AMAN MH-App provides up-to-date information, which will boost the efficacy in controlling interactions and identifying the source of infection. Therefore, the following hypotheses were suggested:

H2: PU will have a positive effect on BI to use AMAN MH-App.

4.2. The Theory of Planned Behavior (TPB)

To describe actions in various domains, the Theory of Planned Behavior (TPB) was developed by Ajzen and Fishbein (2005). It has been successfully used over the past few decades to describe actions in different contexts, such as consumer behavior, ecological behavior, sexual behavior, and sports participation. In several of these studies, the theory has provided a reasoned explanation of the behavior under consideration. Based on the theory, three kinds of thoughts play a crucial role in human guidance: behavioral beliefs, normative beliefs, and control beliefs. (Guo et al. 2019) suggest that TPB is a useful theory for healthcare administrators' behavioral intention to use a particular technology.

4.2.1. Subjective Norms (SN)

The Subjective Norms (SN) refer to a person's response to social preferences in undertaking a specific behavior (Ajzen 1991; Cheon et al. 2012). It refers to the response of a person to social preferences to a given activity. Many researchers have investigated SN and their impact on users' intention to use innovative technology. Most of them found that SN have a positive effect on the intention and adoption behaviors. Therefore, the following hypotheses were suggested:

H3. SN will have a positive effect on BI to use AMAN MH-App.

4.2.2. Perceived Behavioral Control (PBC)

Perceived Behavioral Control (PBC) refers to "an individual's perception of the degree to which they are capable of, or have control over, performing a given behavior" (Ajzen 1991). It refers to an individual's understanding of whether a given action is straightforward or difficult to execute. PBC is a combination of perceived control and self-efficacy, and there has been a consensus in the literature that PBC has a direct impact on behavior intention (Ajzen 2002). Therefore, the following hypotheses were suggested:

H4. PBC will have a positive effect on BI to use AMAN MH-App.

4.2.3. Information Credibility (IC)

Information credibility (IC) refers to "the degree to which an individual perceives information provided by the mobile applications to be believable"(McKnight and Kacmar 2007). Previous related studies have indicated that users' IC perceptions are linked to the accessibility of application interfaces (Wathen & Burkell 2002), such as the presentation and organizing of information. Ease of use (EOU) interfaces will help create trust, particularly in using online applications that rely on internet aconnection (Gefen, Karahanna, and Straub 2003). EOU apps would be less doubtful (Moon and Kim 2001; Shen, Cheung, and Lee 2013), meaning that PEOU is expected to endorse the users' credibility perceptions by using those apps. Also, evidence has demonstrated that users of EOU interface apps can achieve greater perceived credibility. A user is expected to develop a higher sense of credibility for the applications that greater EOU interfaces. However, few studies have used IC of users' perception regarding their intention to use new technology, especially mobile health apps. In our research, AMAN MH-App's success depends on how reliable people consider the app's data. They will not act on the advice and will not build loyalty to the AMAN MH-App unless people think the app's data is reliable. Therefore, the following hypotheses were suggested:

H5: IC of AMAN MH-App will have a positive effect on BI to useAMAN MH-App.

4.3. Other Factors

4.3.1. Optimism (OP)

It refers to the positive perspective on technology that increases productivity, flexibility, and influence in people's lives (Parasuraman and Colby 2015). It will also be less likely for positive people to emphasize the negative implications and, therefore, tend to implement revolutionary technologies (Walczuch, Lemmink, and Streukens 2007). Thus, the following hypotheses were suggested:

H6: OP will have a positive effect on BI to use AMAN MH-App.

4.3.2. Behavioral intention to use AMAN MH-App (BI)

According to (Ajzen and Fishbein 2005), Behavioral Intentions (BI) refer to the perception that a person will carry out any action. Any behavior or actions can be assumed to be practised using technology. Previous related works within and outside HIT have repeatedly demonstrated that BI is a widely validated true behavior indicator and the most commonly used acceptance determine (Almasri 2014). In our study, users' behavioral intention to use AMAN MH-App to control and manage Covid-19 diseases is introduced as a dependent variable.

4.2. Measures

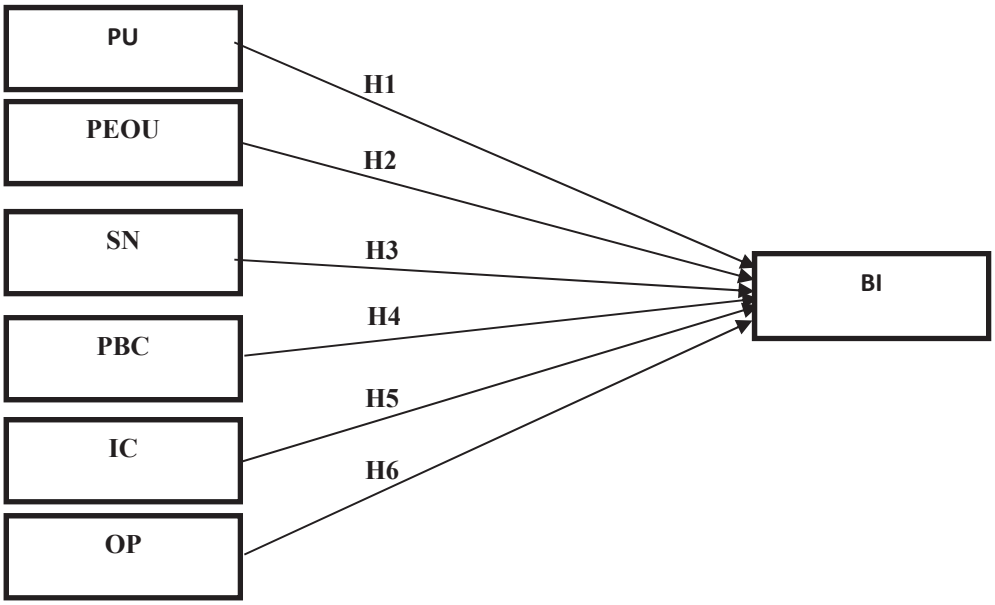
All measurement items for the chosen variables were adapted from previously related works that have already validated them. The data collection instrument was a survey questionnaire that was established based on previous studies. Using a 7-point Likert scale that ranges from (1) extremely disagree to (7) extremely agree, all measurement items were gauged. Table 2 lists the questionnaire elements and their sources.

Table 2. Measurement items

Constructs	Measurement Item	Sources
Perceived Usefulness (PU)	MU1: I find AMAN MH-App offers information that I finduseful.	(Davis 1989)
	MU2: Using AMAN MH-App improve my effectiveness in controlling interactions and identifying the source of infection.	
	MU3: Using AMAN MH-App would save time in virus tracking.	
	MU4: Using AMAN MH-App enables me to detect who is infected quicker.	
Perceived Ease of Use (PEOU)	MEOU1: Wording in the AMAN MH-App is clear and easy tounderstand.	(Davis 1989)
	MEOU2: The information interfaces in the AMAN MH-App are readable.	
	MEOU3: The AMAN MH-App uses easy structures to read.	
	MEOU4: Inside most components of an interface, I can understand AMAN MH-App in seconds.	
Subjective Norms (SN)	SN1: People who can influence my behavior think I should use AMAN MH-App.	(Ajzen 1991)
	SN2: People important to me think I should use AMAN MH-App.	
	SN3: I most certainly prefer to benefit from the knowledge of others and their advice.	
	SN4: People around me encourage me to use AMAN MH-App.	
Perceived Behavioral Control (PBC)	PBC1: I am confident that I could to use AMAN MH-App.	(Ajzen 1991)
	PBC2: For me to use AMAN MH-App is easy.	
	PBC3: The decision to use AMAN MH-App is beyond my control	
	PBC4: Whether I to use AMAN MH-App or not is entirely up to me	
Information Credibility (IC)	IC1: AMAN MH-App providing me up-to-date information.	(McKnight and Kacmar 2007)
	IC2: AMAN MH-App providing me accurate information.	
	IC3: AMAN MH-App providing me trustworthy information.	
	IC4: AMAN MH-App providing me authoritative information.	
Optimism (OP)	OP1: AMAN MH-App gives me more control over my daily life.	(Lu et al. 2011)
	OP2: AMAN MH-App is much more convenient to use.	
	OP3: I like the conception of technologies to tackle illness, and I am not limited by traditional means.	
Behavioral Intention (BI)	BI1: In the near future, I am likely to use AMAN MH-App	(Davis 1989)
	BI2: I would use the AMAN MH-App, granted the opportunity.	
	BI3: In the coming future, I will be able to use AMAN MH-App.	
	BI4: When the chance arises, I aspire to use AMAN MH-App.	
	BI5: I'm going to start thinking AMAN MH-App usage	

Figure 2 shows the conceptual structure of this research paper, demonstrating that the users' behaviors intention to use AMAN MH-App (BI) will be influenced based on the following latent variables: (1) The dimension of the technology characteristics represented by the TAM model with its two main elements, the PU and PEOU, (2) The psychological dimension represented by the SN, PBC, and OP, (3) Information dimension represented by IC. The model aims to explore the relationships between all independent variables (Perceived Usefulness, Perceived Ease of Use value, Subjective Norms, Perceived behavioral Control, Information Credibility, and Optimism) and the dependent variable (Behavioural Intention to use AMAN MH-App). Accordingly, six hypothesized models for this study were proposed.

Figure 2. The Proposed research model



5. Methodology and Results

5.1. Participants

The study proposes a theoretical model to explain citizens' intention to use AMAN MH-App in the emerging Coronavirus (Covid-19). A field survey was conducted in Jordan to collect data from citizens, specifically young people. Thus, Participants were selected from universities in Jordan by random student sampling. As these students formed the largest user community of smartphones in Jordan, we confined our participants to university students, and that a relatively homogeneous sample helps control confounding variables that may confuse the variables under discussion. All respondents possessed a smartphone and had access to the internet and smartphone apps.

Before collecting data through an online questionnaire, we sent short video explains the AMAN MH-App that was downloaded from Ministry of Health (MOH) website to ensure that all students understood AMAN MH-App. Then, the e-questionnaire was created through Microsoft Forms and the link has sent through Microsoft Teams and Moodle platforms in Arabic language. We obtained 450 valid samples for data analysis after removing 33 invalid samples that either did not complete it (missing values) or given too many unreliable answers (e.g. select 1 or 7 for all answers). There were 39.3 % of male and 60.7% of female respondents in the sample.

5.2. Analysis and Results

5.2.1. Measurement Model Analysis

- **Convergent and Discriminate Validity**

The measurement model analysis aims to find "a confirmatory assessment of reliability", "convergent validity", and "discriminant validity" (Anderson & Gerbing 1988). According to (Lowry & Gaskin 2014), reliability is "the degree to which a scale yields consistent and stable measures over time". The first step to measure the model was investigating the values of each item's reliability (factor loading) for each variable using smart PLS (PLS algorithm). The results showed that factor loading for all items exceeded the recommended value of 0.7, and the results were ranged from 0.715 (for IC2) to 0.942 (for PBC1). By evaluating all variables' factor loadings with their corresponding constructs, we evaluated individual items' reliability. At that point, the reliability is usually assessed using two essential methods Cronbach's Alpha and Composite Reliability (Hew, Lee, Ooi, & Lin, 2016). In terms of Composite Reliability (CR), the results showed that all CR of variables ranged from 0.830 (for IC) to 0.961 (for PBC) which means values were greater than 0.7 (Hair Jr, Hult, Ringle, & Sarstedt, 2016). Also, we could see that the Cronbach's Alpha values range from 0.801 (for IC) to 0.913 (for BI). All values have met the lowest value of 0.7 as indicated by(Hair Jr et al. 2016). The results in Table 3 highlight that the model's final reliability

measurement (Wynne 1998) and (Fornell and Larcker 1981) were met for all constructs. We thus concluded that our research model's reliability was satisfactory.

The convergent validity refers to "the extent to which a measure correlates positively with alternative measures of the same construct" (Hair Jr et al. 2016). The convergent validity could be tested in this analysis by analyzing the Average Variance Extracted (AVE) values. The AVE for all constructs exceeded 0.5, which fulfilled the requirement (Fornell and Larcker 1981), as shown in Table 3. This also implies that the scales have fair and sufficient convergent validity.

In addition, discriminant validity refers to "the extent to which a construct is truly distinct from other constructs by empirical standards" (Hair Jr et al. 2016). According to (Hair Jr et al., 2016), the Fornell-Larcker and cross-loading requirements should be tested to determine the discriminant validity. The Fornell-Larcker criteria allow each variable's AVE to be greater than its highest association with other variables in the square root. The Fornell-Larcker criteria is fulfilled, according to Table 4. As far as cross-loading is concerned, the outer loading on the relevant construct must be greater than all the cross-loading of the related construct on the other constructs. Based on the readings in Table 5, it can be noticed that the cross-load criterion is satisfied.

Table 3. Indicators measurement in the questionnaire

Latent Variable	Indicator	Standardized Factor Loading	Cronbach's Alpha	Composite Reliability	AVE
		<0.70	<0.70	<0.70	<0.50
Perceived Usefulness (PU)	PU1	0.798	0.835	0.876	0.640
	PU2	0.820			
	PU3	0.810			
	PU4	0.770			
Perceived Ease of Use (PEOU)	PEOU1	0.810	0.842	0.878	0.644
	PEOU2	0.808			
	PEOU3	0.788			
	PEOU4	0.803			
Subjective Norms (SN)	SN1	0.760	0.813	0.837	0.562
	SN2	0.781			
	SN3	0.721			
	SN4	0.735			
Perceived Behavioral Control (PBC)	PBC1	0.942	0.838	0.961	0.862
	PBC2	0.938			
	PBC3	0.924			
	PBC4	0.909			
Information Credibility (IC)	IC1	0.762	0.801	0.830	0.550
	IC2	0.715			
	IC3	0.762			
	IC4	0.726			
Optimism (OP)	OP1	0.881	0.887	0.921	0.795
	OP2	0.895			
	OP3	0.898			
Behavioral Intention (BI)	BI1	0.886	0.913	0.951	0.794
	BI2	0.878			
	BI3	0.893			
	BI4	0.898			
	BI5	0.901			

Table 4. Fornell-Larcker criterion

	BI	OP	IC	PBC	SN	PEOU	PU
BI	**0.891**						
OP	0.508	**0.892**					
IC	0.452	0.552	**0.742**				
PBC	0.528	0.563	0.649	**0.928**			
SN	0.463	0.642	0.575	0.603	**0.750**		
PEOU	0.527	0.643	0.568	0.518	0.627	**0.802**	
PU	0.514	0.625	0.536	0.568	0.537	0.643	**0.800**

Table 5. Cross-loadings results

	BI	OP	IC	PBC	SN	PEOU	PU
BI1	**0.932**	0.632	0.501	0.503	0.403	0.462	0.468
BI2	**0.922**	0.654	0.507	0.409	0.452	0.492	0.503
BI3	**0.931**	0.623	0.524	0.526	0.436	0.466	0.576
BI4	**0.901**	0.623	0.525	0.533	0.401	0.486	0.523
BI5	**0.912**	0.601	0.521	0.536	0.487	0.482	0.501
OP1	0.502	**0.885**	0.475	0.498	0.485	0.572	0.589
OP2	0.532	**0.883**	0.523	0.488	0.515	0.554	0.545
OP3	0.544	**0.887**	0.502	0.504	0.478	0.523	0.561
IC1	0.384	0.456	**0.752**	0.502	0.501	0.456	0.452
IC2	0.301	0.401	**0.726**	0.522	0.499	0.413	0.402
IC3	0.298	0.421	**0.798**	0.489	0.485	0.431	0.421
IC4	0.323	0.389	**0.736**	0.439	0.487	0.436	0.433
PBC1	0.315	0.402	0.452	**0.902**	0.472	0.522	0.388
PBC2	0.382	0.389	0.511	**0.884**	0.418	0.478	0.372
PBC3	0.336	0.410	0.523	**0.889**	0.451	0.465	0.396
PBC4	0.335	0.411	0.505	**0.876**	0.458	0.455	0.412
SN1	0.401	0.502	0.440	0.566	**0.766**	0.519	0.477
SN2	0.398	0.487	0.432	0.521	**0.778**	0.495	0.489
SN3	0.378	0.498	0.485	0.532	**0.736**	0.508	0.478
SN4	0.410	0.521	0.481	0.528	**0.753**	0.509	0.563
PEOU1	0.525	0.535	0.501	0.425	0.521	**0.810**	0.478
PEOU2	0.510	0.542	0.454	0.444	0.542	**0.813**	0.525
PEOU3	0.587	0.521	0.521	0.521	0.487	**0.798**	0.539
PEOU4	0.542	0.487	0.438	0.487	0.475	**0.782**	0.463
PU1	0.413	0.475	0.448	0.378	0.425	0.454	**0.788**
PU2	0.425	0.511	0.492	0.425	0.429	0.475	**0.810**
PU3	0.457	0.517	0.436	0.410	0.431	0.501	**0.822**
PU4	0.425	0.523	0.413	0.372	0.433	0.498	**0.765**

- **Model Testing**

To evaluate the explanatory power of the model, the divergence for the dependent variables should be measured. Thus, R square and path coefficients have been used to assess the structure of our proposed model. As shown in Figure 3, the model has an R Square value of 56% for the independent variable. In other words, the total variance in Behavioural Intention to use AMAN MH-App by users accounted for by six latent variables, namely PU, PEOU, SN, PBC, IC, and OP, was 77%. The structural analysis results expose that the proposed model explains 77% of the variance in using AMAN MH-App.

In terms of path analysis, Table 6 and Figure 3 demonstrate the path coefficients and P-values for each hypothesis. In the model, path coefficients and P-value values for all independent variables were less than 0.2 and greater or equal to 0.05, respectively. Accordingly, all independent variables were directly and significantly predicted BI which indicated that all hypotheses were confirmed, and this points out that all the paths are significant between the independent (PU, PEOU, SN, PBC, IC, and OP) and dependent variables (BI).

Figure 3. Path Analysis Results

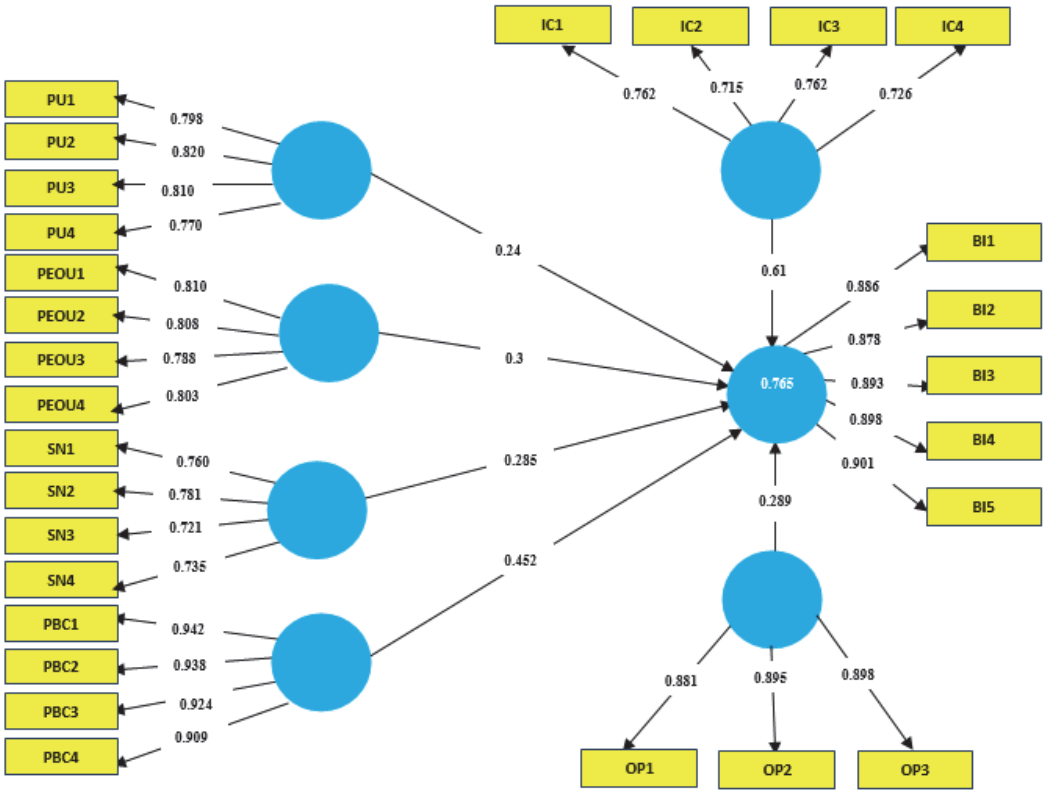


Table 6. Hypothesis testing

Hypothesis: Structural paths	t-value	Path Coefficient	Suppoted
H1: PU →BI	4.185	0.24**	yes
H2: PEOU→ BI	6.184	0.30**	yes
H3: SN→ BI	2.88	0.285**	yes
H4: PBC→ BI	5.21	0.452**	yes
H5: IC→ BI	13.215	0.61**	yes
H6: OP→ BI	2.958	0.289**	yes

Note: **p < 0.05

6. Discussion

This study explores the contributing variables of the intention to use AMAN MH-App among young Jordanian citizens. Numerous noteworthy aspects of the results will be discussed in this part as follows. Firstly, this study explains that all independent variables (Perceived Usefulness, Perceived Ease of Use value, Subjective Norms, Perceived Behavioral Control, Information Credibility, and Optimism) significantly impact on the dependent variable (Behavioural Intention to use AMAN MH-App).

The results show that all independent variables were directly and significantly predicted users' behaviors intention to use AMAN MH-App, which is explained by the following. The H1 hypothesis results showed that PU ($\beta = 0.24$, $p < 0.05$) has a positive impact. This indicates users' awareness and understanding that using the AMAN MH-App to reduce physical contact among people will be beneficial for them and protect their health, taking into consideration the fact that this virus is dangerous and deadly, and that was a justified reason for them to use the app in order to prevent Covid-19 from spreading. These results are consistent with previous related works (Wu, Wang, and Lin 2007) which found that perceived usefulness positively impacts on behavioral intentions to use the mobile application. The H2 hypothesis's results found that PEOU ($\beta = 0.3$, $p < 0.05$) has a positive impact. This points to users' recognition that using the AMAN MH-App during spreading Coronavirus will be effortless and easy to use. The majority of respondents asserted that mobile technology is easy to use. The direct reasons may be referred to as their previous knowledge of how to use smartphones, experience, and knowledge of mobile phone technology, especially in distance learning which was a result of the spread of the Coronavirus worldwide. These results are consistent with previous related works (Sun et al. 2013; Wu et al. 2007) which found that perceived ease of use has a significant impact on behavioral intentions to use the mobile application.

In terms of the H3 hypothesis, the results indicated that SN ($\beta = 0.285$, $p < 0.05$) positively impacts on using the app. The person's feelings, opinions, or behavior are influenced by who is important to him/her as a family member or because of other people's encouragement and advice (e.g. friends or relatives) who have already downloaded and used it before. Accordingly, the parents might only be affected by young people's behavior to encourage them to use AMAN MH-App due to their perceived friends' and families' recommendations as highly trustworthy. These results on SN are consistent with previous related works (Ketikidis et al. 2012; Ku and Hsieh 2018; Sun et al. 2013; Zhang, Geng, and Sun, 2017) that found Subjective Norms positively and directly influence the MHIT usage intentions. The H4 hypothesis results showed that PBC ($\beta = 0.452$, $p< 0.05$) has a positive impact. Based on the users' responses, the decision to use the AMAN MH-App stems from their desire and their full confidence in using it. This is due to that fact that young people have a high ability to deal with smartphone applications owing to their skills and experience. These results are consistent with previous related works (Zhang et al. 2017) which found perceived behavioral control positively and directly influences mobile health IT usage intentions. However, (AlBar and Hoque 2019; Ku and Hsieh 2018) found that perceived behavioral control has no significant influence on BI's use of e-health services.

The results of H5 and H6 have showed IC ($\beta = 0.61$, $p < 0.05$) and OP ($\beta = 0.289$, $p < 0.05$) have positive impacts. As far as IC is concerned, the AMAN MH-App provides users with information that is up-to-date, accurate, trustworthy, and reliable, which will encourage them to use it in the Covid-19 pandemic. Thus, young people normally perceive families' recommendations as highly trustworthy, encouraging them to use AMAN MH-App. Accordingly, when they receive useful, up-to-date and accurate information, that would increase their intention to use the app, particularly if they are suspected of being exposed to the virus, or have had contact with an infected person. The study results on Information Credibility effect is consistent with previous related works (Chen, Tao, and Zhou 2019) that found Information Credibility positively and directly influence the mobile health IT usage intentions. In terms of OP impact, this AMAN MH-App is perfect for use in the Corona pandemic and provides advantages that help people control and protect their daily life from infection as they feel positive about the AMAN MH-App usage. These results are consistent with previous related works (Zhang et al. 2017) that found Perceived Optimism positively and directly influences mobile health IT usage intentions.

7. Implications

Since MH-Apps are an emerging technology in Jordan, understanding users' behaviour and intentions of MH-Apps are required. Our purpose is to explore the effects of users' behavioural and intention with MH-Apps from the perspective of the Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB). There are some theoretical and practical implications in the study need to discuss.

7.1. Theoretical Implications

First, this study pays attention to users' behavioral intention of emerging technologies of MH-Apps. Previous related studies mainly examined the users' initial behavioral intention and continuous usage behaviors of MH-Apps while ignoring the psychological factors that affect our decision to use a new technology. However, users' behaviour and intentions of MH-Apps along with psychological factors are significantly essential for the success of any emerging technologies. This study combines TAM model and TPB theory into one model in the field of MH-Apps usage.

Second, it contributes by incorporating Subjective Norms, Perceived Behavioral Control, and Information Credibility into TAM model to validate the effects of these variable on users' behaviour and intentions with MH-Apps. In the context of healthcare service sector, as a result of the pandemic, Information Credibility is the most vital and direct determinant for their selection. In the context of mobile apps, they believe that mobile apps are valuable sources of information when people consider the app's data as reliable source. They will not be active on the mobile devices or Apps data if not think the app's data and content is reliable. Thus, this study integrates Subjective Norms, Perceived Behavioral Control, and Information Credibility into the TAM model, which enriches the theoretical context.

7.2. Practical Implications

This research has many practical outcomes for encouraging citizen involvement in the MH-Apps. First, The behavioral intent to use the MH-App is mainly due to the app's characteristics (e.g. PU and PEOU), which help produce a more optimistic and credible perception (Moon and Kim 2001; Shen et al. 2013). Thus, the government of Jordan should understand what people use mobile health apps for, outline the advantages of using MH-App and then design the apps to facilitate their intended uses in order to improve the adaptive behavior of MH-App. The friendly and Ease of Use (EOU) interfaces, in particular, facilitate the perception of the functionality and layout of MH-App and create a more relaxed user experience. PEOU can change the mindset of using MH-App. Thus, the plans to increase the usability degree of MH-App are also highly effective because of these applications' increasing difficulty. For example, providing different types of alerts (text message, voice message, auto call ..etc.) if valuable information is sent to infected people, or to people who have had contact with them in order to reduce the transmission of Covid-19. Therefore, in the product life cycle of the application, evaluating and maintaining the design standards of the AMAN MH-App could be a key feature of the government policy. Second implication, Information credibility (IC) is a significant precursor of BI to use AMAN MH-App. Thus, the government should also develop an information monitoring mechanism to guarantee the accuracy of the information provided via AMAN MH-App in order to create a reliable material and atmosphere. Third, family and friends' role in supporting youth decisions regarding the benefits of using such mobile health apps and developing strategies to improve citizens' intention to use health IT should be emphasised. Also, the government has to utalise their role in providing the citizens with a variety of resources and information on Covid-19 through TV, Social Media, Radio, and official websites. However, the path coefficient for the variable PBC is higher than SN. This indicates that the people whose decision to use the AMAN MH-App stems from their complete desire are more willing to use the app than those whose feelings, opinions, or behavior are influenced by others.

In summary, Information credibility is the most vital and direct determinant of intention, followed by perceived ease of use and perceived behavioral control. In determining citizens' intention to use AMAN MH-App, the research demonstrates the comprehensiveness, applicability and efficacy of the integrative model. The analytical outcomes also form the basis on which policies may be formulated to support the intention to use AMAN MH-App. It would not be possible for people to continue using AMAN MH-App unless the individual was already inspired or had the discipline or commitment. Ultimately, it is the intrinsic commitment and determination of a person who will decide whether they will choose to use the app for health gain or behavior change. The app might directly provide the information, or it might be generated and shared on the app. Using different types of information is recommended so that individuals with special needs may be able to find relevant information such as voice messages or sign language used by deaf people. Additional technical issues should also be considered when developing mobile health applications such as phone storage, phone battery, system quality, and more.

8. Limitation and Future Work

There are some drawbacks to the research that we encourage potential studies to overcome. Our goal in this analysis was to investigate the factors that positively impact users' behavioral intention to use AMAN MH-App. The research sample was limited to the context of young people who already use AMAN MH-App. Thus, future work is researching the multigroup analysis such as gender, education level, age, income, work experience, and more. Future research recommendations are to conduct additional research on the same topic but include the various segments of people from different cities in Jordan. Finally, this study was only limited to six variables, but in future work it is recommended to include other factors that could affect the users' behavioral intentions to use AMAN MH-App in Jordan, such as technology Anxiety, trust, compatibility, Self-Efficacy, Risk, and perceived trust. Also, this study suggested to use Machine Learning techniques (Almasri, Alkhawaldeh, and Celebi 2020; Almasri, Celebi, and Alkhawaldeh 2019) and Deep Learning methods (Alkhawaldeh 2022) to predict the user's intention to use mobile health Apps.

9. Conclusion

The mobile health applications (MH-apps) enhanced our lives, especially for their services, such as treatment, diagnosis, and follow-up. MH-apps enable people to control and manage diseases using built-in technology. AMAN Mobile Health Application (AMAN MH-App) is one of the health-tech solutions used to detect virus exposure using GPS and later Bluetooth technology. However, the acceptance of AMAN MH-App is not fully witnessed among people in Jordan. Therefore, this study aimed to explore the factors that affect the usage of AMAN MH-App among young people using the quantitative method. The findings showed that all independent variables (Perceived Usefulness, Perceived Ease of Use value, Subjective Norms, Perceived Behavioral Control, Information Credibility, and Optimism) positively impact on the dependent variable (Behavioural Intention to use AMAN MH-App). The results also indicated that Information Credibility is the most vital and direct determinant of intention, followed by perceived ease of use and perceived behavioral control. Accordingly, the results of this research can be applied to similar context and applications in different countries.

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THE IMPACT OF KNOWLEDGE MANAGEMENT ON THE ECONOMIC INDICATORS OF THE COMPANIES

Marko Markić, Željko Požega, Boris Crnković

Abstract

This paper analyzes the impact of knowledge management on the organizational performance of companies measured through previously defined economic indicators. Knowledge management in the company is observed through the factors that make up a knowledge management system, namely: business processes, people (employees), and information technology, while the same has been done for economic indicators through indicators of liquidity, indebtedness, activity, economic efficiency, and profitability. Knowledge management as a variable is described by ordinal data, while the business indicator variable is described by quantitative, real data. Research shows that most large companies have built-in elements of knowledge management, some medium-sized companies are involved in this process, and most small companies have not developed management strategies in which knowledge management exists as an important factor. The research also proves that there is a positive correlation between knowledge management and economic indicators, i.e., in other words, the research shows that knowledge management has a positive impact on reducing indebtedness and increasing liquidity, activity, economic efficiency, and profitability.

Keywords: *knowledge management, organizational performance, economic indicators, revenue, profit, profitability ratio, economy ratio*

JEL Classification: *L2, M1, O30*

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1. Introductory considerations

Knowledge is today the most important resource through which companies gain a competitive advantage. Therefore, knowledge management in organizations has become imperative for their development and achieving the predefined organizational goals. In addition, the need for knowledge management is emphasized by its exponential growth in the environment of the organization, as well as the necessity of its contribution to the overall knowledge. The total human

knowledge created until the year 1900 has doubled by 1950, after which the doubling time was shortened to five to eight years (Jakupović and Grandov 2014). The specificity of knowledge as an organization's resource is certainly the fact that it is not consumed by use, and its economic value directly depends on the time of its appearance and is most valuable when it is inaccessible to others. Managing knowledge means ensuring access to knowledge, followed by its collection, storage, modification, transfer, and implication. A systematic and comprehensive approach to knowledge management has positive and immediate effects on organizational performance.

Knowledge management is becoming one of the main tasks of modern management, a factor in increasing its effectiveness. The most important thing to achieve is that the knowledge management in the company cannot be copied because it guarantees a long-term advantage and a better market position. The development of knowledge management in an organization is not an end in itself but has clear economic reasons that are manifested in increasing organizational performance. Organizational performance depends most on human resources and technology, the environment, and the knowledge management system. There should be a single goal of introducing and developing a knowledge management system in a company, and that is increasing organizational performance and business results. Therefore, the modern manager needs to see the connection between the knowledge management system and organizational performance and constantly ask himself the question: Can we increase the business results of the organization by further development of the knowledge management system?

There are numerous literary sources that investigate the connection between knowledge management and organizational performance (Acosta-Prado, Navarrete and Tafur-Mendoza 2021). Effective knowledge management enables cooperation between individuals and organizations, and they can quickly incorporate knowledge into their technologies and thus produce new products (Miković et al. 2020). Knowledge drives product and process innovation, and such dynamic results in improved organizational performance. In the process of knowledge management, the critical activities are the acquisition, storage, distribution (sharing) and application of knowledge. In researching the relationship between knowledge management and organizational performance, researchers most often use the structural equation model (Namdarian, Sajedinejad and Bahannesteh 2021), regression (Saied 2021) or based on interviews (qualitative approach) describe the connection between knowledge management and organizational performance.

In the paper, cluster analysis (algorithm k-means clustering) is used in hypothesis testing. The established null hypotheses claim that companies with better knowledge management and better organizational performance measured by coefficients of profitability, liquidity, economy, indebtedness and activity are in the same cluster and vice versa. Cluster analysis is important but not sufficient. Therefore, the paper also uses the method of multi-attribute decision-making to determine the position of the enterprise cluster for the organizational performance variable in relation to the ideal cluster. An Excel spreadsheet was used to store respondents' answers about the dimensions of knowledge management (processes, people, and information technology) and balance sheet end income statement of companies, while software packages of the programming language R were used to determine the optimal number of clusters, Cronbach's alpha test, multiattribute decision-making. R language showed excellent development and application research power.

2. Theoretical framework

Knowledge management systems (KMS) were classified (Centobelli, Cerchione and Esposito 2017) into two categories: knowledge management practices and knowledge management tools. Knowledge management practices support the organizational process of knowledge management, whereas knowledge management tools are IT-based solutions that support knowledge management practices. Based on data collected from a comprehensive survey of 223 businesses from various European countries and industries (Alexandru et al. 2019), they identified three clusters: companies exhibiting a relatively "unconscious" attention to knowledge management and implementing knowledge management practices without particular awareness, companies adopting a more conscious approach and employing a substantial number of knowledge management practices and companies with a marginal propensity towards knowledge management. In study (Song and Zhao 2019) examined the synergistic effects of three knowledge management strategy orientations on firm performance: external and internal, explicit and tacit and exploratory and exploitative. The authors present a framework for analyzing the synergistic effects of knowledge management strategy and organizational structure. In order to evaluate the framework, they surveyed 345 Chinese firms that had implemented a knowledge

management strategy. In one study (Centobelli, Cerchione and Esposito 2019) proposed a 3D fuzzy logic methodology for assessing the effectiveness and effectiveness of KMS adopted by small and medium-sized enterprises (SME). The analysis revealed a wide variety of behaviors associated with the nature of knowledge and KMS used. Four types of behavior were identified: the efficient and effective SME, the effective but inefficient SME, the efficient but ineffective SME and the inefficient and ineffective SME. Study about relationship between knowledge management orientation (KMO), its dimensions, competitive intensity and innovativeness of SME (Kmieciak and Michna 2018) employs survey data from 120 Polish SME and the method of partial least squares. The findings reveal a positive and statistically significant correlation between KMO and the innovativeness of SME. Each of these factors is significant, but individually insufficient to have a direct effect on innovativeness. The only way they can improve is if they come together and form KMO. Sourcing and leveraging knowledge from an external network is only half the battle for companies seeking greater success. A company's knowledge management orientation may facilitate knowledge acquisition, sharing, and transfer. Knowledge management significantly mediates the effects of external embeddedness on the firm's ambidexterity, according to data collected of 119 Italian SME in the ceramic tile industry (Dezi et al. 2021). Some authors conducted expert interviews to determine the barriers, practices, methodologies and technologies for knowledge management in start-ups. Based on the theoretical study (Oliva and Kotabe 2019), desk research and expert interviews, quantitative research was conducted with the top Sao Paulo start-up co-working spaces. In research (Zerbino et al. 2018) examine knowledge management from an interdisciplinary perspective, focusing on the barriers to knowledge management in a supply chain context.

The study about the relationship between knowledge management processes (KMP) and business performance (Dzenopoljac et al. 2018) surveyed 500 private and public sector employees in Kuwait and found that KMP have a positive impact on the perception of business performance and improve innovation performance. Holistic integrated knowledge management model was used in an Indian scenario (Payal, Ahmed and Debnath 2019) with success and found that a well-designed knowledge management strategy had a significant positive correlation with organizational performance. An organization's cultivation of knowledge management enablers had a positive effect on the knowledge management process and it mediated the association between the knowledge management strategy and organization's performance. Organizations must priorities knowledge management and decision making (Abubakar et al. 2019). In their study propose a relationship framework between knowledge management enabling factors (collaboration, T-shaped skills, learning and IT-support) and organizational performance. The relationship between knowledge creation and organization performance is moderated by intuitive and logical decision-making styles. Some authors (Soto-Acosta and Cegarra-Navarro 2016) highlight the potential of new information and communication technologies for knowledge management in organizations by presenting a variety of perspectives and approaches for the role of new information and communication technologies in knowledge management and by measuring the impact and diffusion of new information and communication technologies for knowledge management in organizations. The development of a company's competitive advantage is relying on knowledge management and dynamic capabilities. However, understanding of the effect of knowledge management on firm performance remains limited. Study (Santoro et al. 2019) examines the connection between knowledge management orientation, dynamic capabilities and ambidextrous entrepreneurial intensity. Using a dataset consisting of 181 Italian firms, this study examines whether and how this relationship affects the overall performance of firms. In one research (Zand et al. 2018) investigate how customer knowledge management enhances organizational performance. Based on process-oriented approach, infrastructures enhance customer knowledge management capabilities through customer knowledge management processes and consequently improve firm performance. Evaluation of the research framework is conducted via a questionnaire distributed to 51 software companies in Iran. The findings also indicate that customer knowledge management processes and customer knowledge management capabilities serve as mediators between customer knowledge management and organizational performance. It implies that organizations with enhanced customer knowledge management process capabilities enjoy superior organizational performance. Some authors (Muthuveloo, Shanmugam and Teoh 2017) determine whether organizations have tacit knowledge management strategies that have a tangible and intangible impact on organizational performance. They conclude that tacit knowledge has a significant impact on the performance of an organization. Only socialization and internalization, out of the four dimensions of socialization, internalization, externalization and combination, contribute to the significant effects of tacit knowledge

management on organizational performance. 200 individuals from five commercial companies surveyed to determine the impact of knowledge management on organizational performance (Namdarian and Sajedinejad 2020). The results demonstrate a direct relationship between knowledge management indices and organizational performance, indicating a positive and significant relationship between knowledge management and organizational performance dimensions such as financial performance, product quality, staff performance, innovation and customer satisfaction.

The productivity of knowledge workers is crucial not only for organizational innovation and competitiveness but also for sustainable development. In the context of knowledge-intensive firms, the implementation of knowledge management is likely to increase knowledge worker productivity. Data from 336 knowledge workers at five mobile network operator companies in Pakistan (Kianto et al. 2018) indicate that knowledge creation and knowledge utilization impact productivity positively and statistically significantly. Knowledge management could be a way to foster job satisfaction and investigate how it can increase the job satisfaction of individual employees. One study (Kianto et al. 2016) present a model of the relationships between five facets of knowledge management (knowledge acquisition, knowledge sharing, knowledge creation, knowledge codification, and knowledge retention) and job satisfaction in a Finnish municipal organization. They conclude that the presence of KMP in the workplace is significantly associated with high levels of job satisfaction. Particularly intra-organizational knowledge sharing appears to be a key KMP that increases employee job satisfaction across the board. Intriguingly, significant knowledge-based job satisfaction boosters vary according to job characteristics. KMP lead to sustainable competitive advantage (Mahdi, Nassar and Almsafir 2018). The introduction of structural equation modelling assisted in determining the deductive relationship between the study variables. This study surveyed 525 academic leaders in various roles from 44 private Iraqi universities. In a public university setting (Adeinat and Abdulfatah 2019), an organization's culture primarily influences the knowledge creation process, followed by knowledge exchange. Utilizing the organizational culture assessment instrument and structural equation modelling, the study determined the culture type and assessed the underlying relationships between knowledge management process and culture.

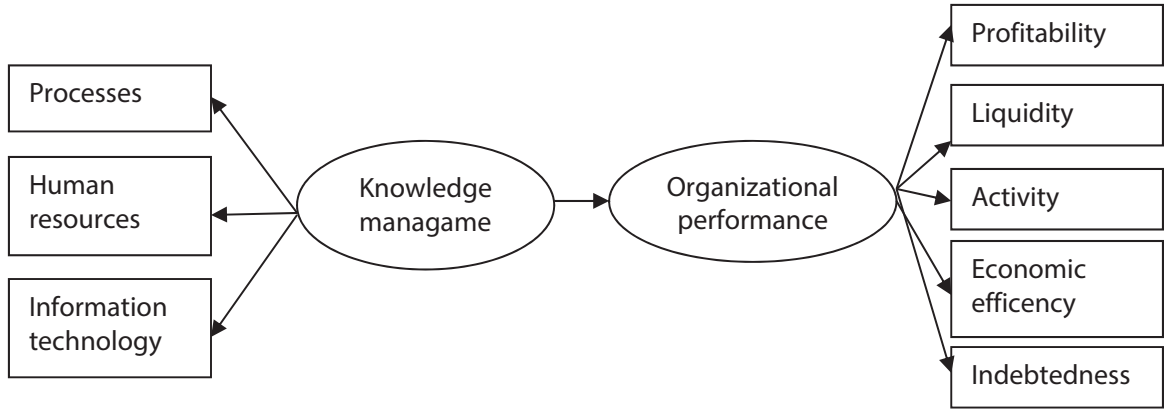
A special research task of investigating the impact of knowledge management on organizational performance is to define an algorithm applicable to any organizational system. Of course, the theoretical research framework defines a sufficiently abstract, general and applicable sequence of steps in generating concrete experimental results of the impact of knowledge management on organizational performance in small, medium and large companies, companies in different industries or some other criterion of their classification. The research framework is invariant in relation to the size of the organization, its organizational structure, core activity or some other classification criterion. The first step is to determine the determinants of knowledge management, which consist of processes, human resources and information technology. Then the indicators of organizational performance are determined: profitability, activity, liquidity, indebtedness and economic efficiency. The third step in the research framework is cluster analysis. It is twofold. The first allows the formation of a certain number of clusters for objects of analysis (enterprises) based on the value of organizational performance indicators. The second cluster analysis identifies the maturity of knowledge management based on respondents' responses in the survey questionnaire on the factors that determine its quality. Finally, in the construction of the conceptual model, a contingency table is formed, the columns of which are clusters based on the values of organizational performance indicators, and the rows are the "maturity" of knowledge management. The research framework has three parts: input variables (independent variables), output variables (dependent variables), and the environment, which consists of different methods of transforming inputs into outputs, as well as theoretical knowledge and hypotheses about the relationships between independent and dependent variables. Theories are always a systematic representation of a phenomenon that shows relationships (relationships) between variables using a set of interrelated constructs (variables), definitions and assumptions. The following figure clearly shows the conceptual framework of research into the impact of knowledge management on organizational performance.

Research on the impact of knowledge management on organizational performance focuses on the three most important factors for assessing the maturity of an organization in knowledge management:

a) Human resources,
b) Organization of business processes and
c) Information technology.

The second research variable in the conceptual framework is organizational performance. They need to be measured and are shown by several key groups of performance indicators: liquidity, indebtedness (leverage ratios), activity, economic efficiency and profitability (Markić 2016).

Figure 1. Conceptual framework with research variables



Source: made by authors

3. Research methodology

The research tests the following hypotheses:

H1: Companies in Bosnia and Herzegovina (BiH) that have established procedures and knowledge management systems generate significantly higher revenues and profits per employee.

H2: Companies in BiH that have established procedures and knowledge management systems have a significantly higher profitability ratio.

H3: Companies in BiH that have established procedures and knowledge management systems have a significantly higher coefficient of economic efficiency

In the study of the impact of knowledge management on organizational performance, a subset of possible hypotheses was selected and they were verified based on data from the survey questionnaire and the balance sheet of companies in BiH.

3.1. Data

After defining the conceptual framework of the research, goals and hypotheses, data collection on organizational performance and maturity of knowledge management in companies in BiH follows. Data collection is always a complex and demanding part of research. The data are structured in research dynamics so that they correspond with the set hypotheses. The paper will present a part of the research and obtain results from the doctoral dissertation of one of the co-authors.

The questionnaire was distributed to 352 companies of various sizes with regard to the number of employees, income, and business assets (according to the classification of the Agency for Statistics of BiH). The answers came from 1019 respondents, managers at different levels, employed in 124 companies in BiH for the observed period of the year 2018 and 2019. After that, the data were collected from current and publicly available analyzes of income and balance sheets to calculate business indicators for the observed 124 companies in BiH for the observed period of the year 2018 and 2019. The research covers companies with headquarters in five cantons of the Federation of BiH: Herzegovina-Neretva Canton, Herzegbosnian Canton, Posavina Canton, West Herzegovina Canton and Central Bosnian Canton. The first step of this research, which will be presented in abbreviated form due to limited space, is the selection of variables that identify maturity knowledge management in companies. The second step is to select variables that identify business indicators. The third step of the research process is the selection of clustering methods and finding the optimal number of clusters that identify the impact of knowledge management on the business indicators of the analyzed companies. The fourth step is to assign the company to a particular cluster, the cluster from which it is least distant in terms of human resources, processes, and the quality of information technology.

The survey questionnaire contains two groups of questions. The first refers to the socio-demographic characteristics of the respondents and is dominated by the nominal scale. The second group of questions is related to knowledge management using the Likert scale with five degrees. Business indicator data are quantitative data. These are real numbers that reflect

Table 1. Transformation of the survey questionnaire into a two-dimensional data set

		Human resources(V1)					Processes (V2)					Information technology (IT-V3)				
Num. examinee	ID. Comp.	V11	V12	V13	V14	V15	V21	V22	V23	V24	V25	V31	V32	V33	V34	V35
1	1	2	2	3	5	5	2	2	3	1	2	1	1	5	2	5
2	1	2	4	1	2	4	5	3	3	3	4	1	1	5	4	4
3	1	4	4	3	2	3	2	4	4	2	1	3	4	1	2	3
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
1016	124	4	4	2	2	2	5	3	3	2	4	3	4	5	4	4
1017	124	4	5	5	4	5	5	5	2	1	3	4	1	2	4	3
1018	124	2	3	2	1	3	3	4	2	5	1	3	3	4	3	4
1019	124	1	2	4	5	3	3	4	2	5	1	1	4	3	2	4

Source: made by authors

liquidity, indebtedness, business activity, economic efficiency, and profitability. They are calculated based on the balance sheets and income statements of the companies in which the respondents of the survey questionnaire are employed. The research uses the programming R language, its available functions, and software packages. In the data analysis, the internal consistency of the questions in the questionnaire is tested using Cronbach's alpha reliability coefficient. The obtained value of alpha is 0.84 which can be accepted as the confidence limit (Cronbach's alpha <0.5 is unacceptable). In other words, the internal questions in the survey questionnaire are consistent. A two-dimensional data model was formed from the respondents' answers to the survey questionnaire.

Numerical values in the table above reflect the awareness of the importance of knowledge management (V11), the intensity (strength) of employee cooperation in creating and implementing new knowledge (V12), the development of rewards and recognition for new ideas and their application in business (V13), communication and intensity of information exchange between employees on business processes in the company (V14) and systematic encouragement and stimulation of employees to learn by the organization (V15). If the average value is 5 then the organization has a strong awareness (element of organizational culture) about the importance of knowledge management, has a developed system of rewards and recognition for new ideas (innovations) and their application (inventiveness), has intensive communication and rapid dissemination of information among employees in various business functions and functional areas on the manner of execution of business processes (speed, quality, weaknesses, new solutions) and systematic encouragement and stimulation of employees to learn and improve in solving tasks in the workplace. An average value of 1 means that there is no awareness of the importance of knowledge, no incentive for employees to learn or value employee ideas, and the exchange of information among employees about business process operations is very rare. The second variable indicating the attitude of management towards knowledge management is the processes in the organization. The importance of process organization and ways of their execution for knowledge management derives from the strength of process integration (procurement process, sales, and production process) (V21) or integration of business functions (marketing, finance, and human resource management) (V22). Knowledge management is incorporated into every business function (V23). Knowledge management is part of the defined organizational strategy, i.e., the document on company strategy also contains a part on knowledge management (V24). The data generated by the business processes of the organization is continuously analyzed and these analyzes are used to create new knowledge about the market (customers, suppliers, products, and services) (V25). A value of 5 (data refers to the company and its processes) means that top management is strategically committed to analyzing the operations of each business process, their optimization, and integration into a system that results in the best quality products and services. If the value of process data for a particular company is 1 then knowledge management is not part of every business function, processes are not optimized, and management does not analyze key processes continuously. Knowledge management is not part of the defined organizational strategy, i.e.,

the document on company strategy does not contain a part on knowledge management. The third variable of the attitude of management towards knowledge management refers to the implemented information technology. Information technology is a combination of two technologies: unlimited data transmission technologies (communication technology) and data processing technologies (computer technology). Sometimes one can find works in literary sources that equate knowledge management with the quality of information systems in the organization. Such partial approaches to knowledge management neglect its broader, organizational, cultural, and social context. It is almost impossible to use all the potential of information technology within the organization. Those companies whose value of information technology data 5 means developed network infrastructure (V31), built and implemented decision support system at the strategic and tactical level of management (V32), developed business applications for management and document exchange (V33), systematic collection knowledge and development of own knowledge base (V34) and successfully integrated various technologies (V35). The value of data 1 in the information technology column refers to companies without a developed network infrastructure. Their information systems only record data generated by the operational level of management (transaction information system), and they do not have developed collaboration systems or built their own knowledge base. After clarifying the meaning of each data, the next step is to create a two-dimensional table with data for each company on the factors of each knowledge management system, i.e., people, processes, and information technology. The survey questionnaire also contains questions related to the respondents and with a similar procedure, this group of questions is transformed into the following table.

The third table is not the result of the answers from the survey questionnaire. Its data is filled by calculating the value of organizational performance indicators.

Table 3 shows the two-dimensional data structure with the performance indicator values of all companies, the size of the company and the number of respondents who answered the questions in the questionnaire.

3.2. Hypothesis testing

Testing of set hypotheses begins with the k-means clustering algorithm. The clustering of companies according to the answers of the respondents will be

Table 2. Transformation of the socio-demographic part of the survey questionnaire into a two-dimensional data set

I	II	III	IV	V	VI	VII	VIII	IX
1	1	M	21 – 30	High school and college	Complex jobs of the profession	1501-2000	HNC	Quality of human resources
1	2	F	41 – 50	High school and college	Complex jobs of the profession	1501-2000	HNC	Top management and its organizational skills
....	....	....	....	....	....	....	....	....
124	1019	M	31 – 40	High school	Complex jobs of the profession	1001-1500	HNC	Information technology

Source: made by authors

Table 3. Business indicators of the company

ID company	Number of Respondents	Size of the company	P1 liquidity	P2 indebtedness	P3 Activity	P4 Economic efficiency	P5 profitability
113	28	Big	0.43	0.65	3.37	1.04	0.09
117	27	Big	0.52	0.96	8	1.15	0.07
....	....	....	....	....	....	....	....
102	4	Big	0.45	0.79	7.37	1.06	0.06
62	3	Big	0.55	0.3	5.46	1.17	0.04

Source: made by authors

Table 4. Mean values of respondents' responses for the variables of people, processes and information technology

Company	Human resources	Processes	Information technology
1	4.14	4.17	4.14
2	4.94	5.00	4.90
3	4.94	4.93	4.87
.....	.....	.....	.....
123	4.93	4.89	4.85
124	4.40	4.40	4.20

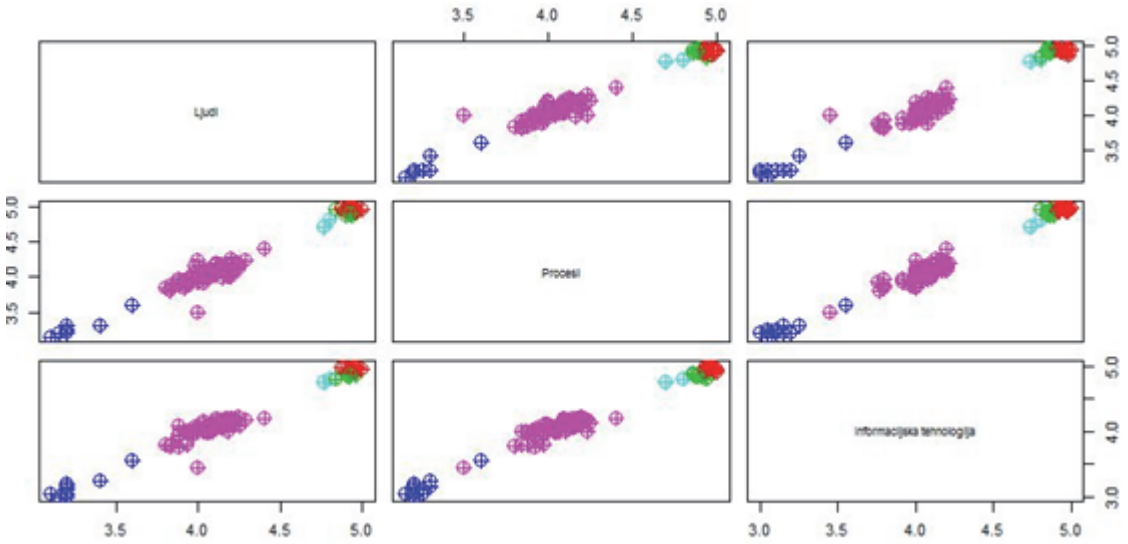
Source: made by authors

based on the average values of their answers about the organization's strategy according to the knowledge of human resources and the need for their development and improvement. After clarifying the meaning of each data, the next step is to create a two-dimensional table with data for each company on the factors of each knowledge management system, i.e., people, processes, and information technology.

In the next step, companies can be organized into several clusters. The goal of clustering is to divide a given set of data into clusters so that the distance between cluster elements is the smallest (cluster elements are companies) and the distance between clusters is the largest. Each cluster has common features that can be analyzed based on values in the center, the mean of the cluster (centroid). Therefore, the cluster represents the same level of company maturity in knowledge management with respect to research variables: people, processes, and information technology. A cluster is a set determined with these three variables and their values at the center of the cluster. Cluster center (center - cluster representative) are the average values of respondents' answers about the same company for the three variables. Of course, the question arises whether it is possible to determine the optimal number of clusters for a given data set? The answer is yes, but before determining the optimal number of clusters for the data set, companies will first be clustered into five clusters (124 companies). The partitive clustering algorithm k-means was applied. It was shown that the minimum and maximum values of all three variables do not differ from each other, that the attributes are equal and that the data do not need to be standardized before clustering.

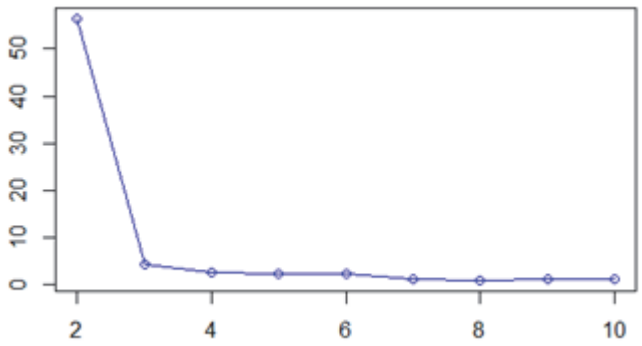
The next step is to ask a logical, but at the same time very complex and challenging question: is five clusters the optimal number given the data obtained?

Graph 1. Visualization of five clusters and assigning companies to clusters (color indicates cluster)



Source: made by authors

Graph 2. The optimal number of clusters



Source: made by authors

The analysis of Graph 2 shows two "elbows", one more pronounced for three clusters and the other for six clusters. The sum of the deviations of observations within a cluster decreases rapidly if the number of clusters is greater than 3. The optimal number of clusters for the observed data for people, processes, and information technology is three.

The clustering results further show that the whole set, 124 companies are grouped so that the first cluster comprises 13, the second 32 and the third 79 companies.

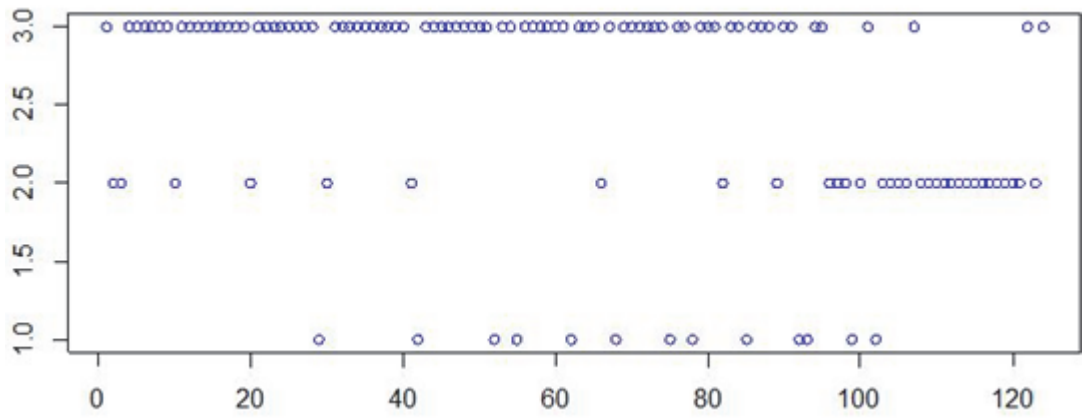
The highest values of centroids (centers) are in the second cluster, then in the third, and the lowest is in the first cluster. The next step is to visually assign each company to one of the cluster.

Table 5. Cluster centers for people, processes and information technology

Cluster	Human resources	Processes	Information technology	Number of companies
CKM1	3.234615	3.250000	3.126923	13
CKM2	4.925625	4.918750	4.896562	39
CKM3	4.047848	4.028987	4.027468	79

Source: made by authors

Graph 3. Assigning each company to one cluster



Source: made by authors

The basic characteristics of the cluster can be briefly described:

a) CKM1 - contains companies whose level of knowledge management is initial. Knowledge management is not part of the organization's strategy and knowledge of its importance is not a strategic commitment of managing structures. Managing structures are indifferent to knowledge management.
b) CKM2 - consists of companies that have incorporated knowledge management into the organizational strategy. Knowledge management is fully integrated into the organization and it is constantly being improved and perfected.
c) CKM3 - consists of companies whose management is aware of the importance of knowledge. They intend to manage organizational knowledge but do not yet know how to do so. They are at the very beginning of the provision of resources and basic infrastructure for knowledge management.

After clustering companies with regard to the maturity of knowledge management in the optimal number of clusters, a new, logical research step follows, and that is clustering companies in the optimal number of clusters with regard to their business indicators. Namely, it is to be expected that companies with better liquidity, economic efficiency, profitability, faster business activities, and lower indebtedness belong to a cluster with a developed culture of knowledge management where it is integrated into the organizational strategy.

The analysis of Graph 4 shows the optimal number of clusters for business indicators. After the fourth cluster, the sum of the squares of the deviation from the center for all clusters is acceptable (an "elbow" is visible).

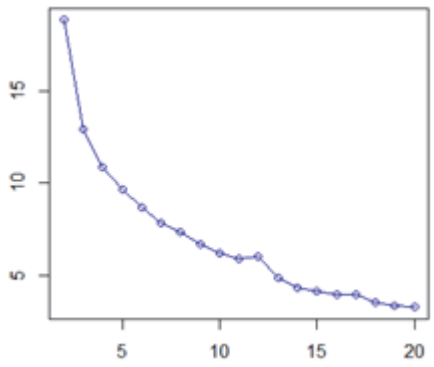
In the next step, the clusters are ranked in several iterations by first calculating the sum of each column in Table 6, then dividing each value in the table by that sum, and finally obtaining a normalized table of business indicator cluster centers.

Based on the value of business indicators, the cluster whose center for liquidity, asset turnover, economy, and gross margin is larger, and for indebtedness is less acceptable. It is this fact that allows the creation of an ideal cluster in the table below.

Since such a cluster does not exist, the next step is to find the distance of each cluster from the ideal by calculating the Euclidean distance of each cluster from the ideal.

The smallest distance from the ideal cluster is Cluster 4, then Cluster 3, Cluster 2 and finally Cluster 1. The next step in R language is to calculate the

Graph 4. The optimal number of clusters for business indicators of the company



Source: made by authors

Table 6. Center of clusters of business indicators of the company

Cluster	Size	P1_liquidity	P2_indebt	P3_activity	P4_economic efficiency	P5_profitability
1	10	0.7043776	0.7072468	0.7356769	1.795216	0.16433222
2	53	0.6418788	0.6573327	1.3741435	2.058225	0.11332419
3	29	0.6255537	0.6740149	1.3934919	1.505423	0.11090897
4	32	0.3967904	0.3028339	0.6257571	1.403931	0.08382869

Source: made by authors

Table 7. Normalized table of centers of clusters of business indicators of the company

P1_liquidity	P2_indebt	P3_activity	P4_economic efficiency	P5_profitability
0.297381344	0.302057851	0.178170147	0.265454742	0.347871048
0.270994961	0.280740051	0.332797385	0.304345319	0.239893337
0.264102663	0.287864847	0.337483284	0.222603672	0.234780614
0.167521032	0.129337251	0.151549184	0.207596268	0.177455001

Source: made by authors

Table 8. Ideal cluster

P1_liquidity	P2_indebt	P3_Activity	P4_Economic efficiency	P5_profitability
0.297381344	0.129337251	0.337483284	0.304345319	0.347871048

Source: made by authors

Table 9. Cluster order with respect to the distance from the ideal cluster

Distance from ideal cluster	Cluster ordinal number
3.246	Cluster 1
3.004	Cluster 2
2.103	Cluster 3
1.184	Cluster 4

Source: made by authors

Table 10. Matrix of frequencies of knowledge management clusters and business indicators of companies

	CKM1	CKM2	CKM3
COP1	f(1.1)	f(1.2)	f(1.3)
COP2	f(2.1)	f(2.2)	f(2.3)
COP3	f(3.1)	f(3.2)	f(3.3)
COP4	f(4.1)	f(4.2)	f(4.3)

Source: made by authors

elements of a matrix containing frequencies (number of occurrences of the same) of companies in clusters.

The next step is to further develop the matrix in Table 10 based on the respective clusters and the companies associated with those clusters. The algorithm for calculating company frequencies in clusters: CKM1, CKM2, CKM3 (knowledge management clusters) and clusters: COP1, COP2, COP3, COP4 (business indicator clusters) includes a selection of vectors representing clusters, determination of vector cross-sections (12 cross-sections in total), for each cross-section calculation of the number of members (companies) and based on that filling in the frequency table or contingency table.

The rows of the contingency table show the frequency (number of occurrences) of company clusters of the business indicators cluster in the knowledge management cluster. Thus, the cluster of companies that have the best strategies for managing people's knowledge, processes, and information technology (such are 32 such companies) is completely located in the cluster of companies that have the best business indicators (such are 79 companies).

Table 11. Contingency table

	CKM1	**CKM2**	CKM3	Row sum
COP1	f(1.1)=9	f(1.2)=0	f(1.3)=1	1
COP2	f(2.1)=3	f(2.2)=0	f(2.3)= 50	53
COP3	f(3.1)=1	f(3.2)=0	f(3.3)= 28	28
COP4	f(4.1)=0	**f(4.2)=32**	f(4.3)=0	79
Column sum	13	32	79	144

Source: made by authors

4. Analysis of research results

H1 hypothesis testing was based on collected data on revenues, expenditures, profits and the number of employees for the observed companies. The first step required calculating the average revenue of the knowledge management cluster.

Table 12 shows the order of average revenues of clusters CKM1, CKM2 and CKM3. The best cluster (CKM2) has the highest average income, followed by the CKM3 cluster and the CKM1 cluster. Looking only at the average income, a significantly higher average income per employee in the best cluster is visible. In addition to income, it is necessary to observe the average profit per employee of the company in knowledge management clusters, which was done in the second step.

Table 12. The average revenue of knowledge management clusters

Knowledge Management Cluster	Average income
CKM1	1 717 067.00
CKM2	173 890 396.00
CKM3	4 724 173.00

Source: made by authors

Table 13. Average profit per employee of the knowledge management cluster

Knowledge Management Cluster	Average profit per employee
CKM1	7 712.70
CKM2	19 418.60
CKM3	4 167.70

Source: made by authors

The companies in the best knowledge management cluster (CKM2) have the highest profit per employee, followed by the first and third clusters. Profit per employee reflects the established procedures and the quality of the knowledge management system. Therefore, hypothesis H1 can be accepted.

H2 hypothesis testing was based on the collected data on company profitability (measured by gross profit margin) with respect to three defined knowledge management quality clusters. Average business indicators for knowledge management clusters were calculated with special emphasis on the average profitability of companies in clusters CKM1, CKM2 and CKM3.

The results of the average profitability of the cluster do not show that the profitability of the cluster (measured by the gross profit margin) with the best knowledge management system is the highest. Namely, the average profitability for the best cluster is: CKM2 = 0.08383, for the cluster CKM1 = 0.16230 and for the cluster CKM3 = 0.11017. Therefore, hypothesis H2 cannot be accepted. However, it must be emphasized that a mathematical comparison of profitability only can lead to incomplete conclusions. Profitability is only one of the business indicators whose denominator is sales revenues, and sales revenues for companies in cluster 2 (CKM2) are the highest, so the absolute values of profit are higher (due to the law of the tendency of falling profit margin). Mathematically it cannot be accepted but economically yes. Therefore, the second step required the calculation of the standard gross margin deviation in knowledge management clusters.

Table 14. Knowledge management clusters and business indicators

Cluster	P1_liquidity	P2_indebt	P3_activity	P4_economic efficiency	P5_profitability
1	0.713826	0.935756	0.646328	1.755395	0.14565
2	0.364584	0.328658	0.567792	1.519671	0.078519
2	0.348301	0.185251	0.798742	1.289226	0.064309
3	0.730834	0.683801	1.265685	1.966166	0.064693
...	.....	.....	.....	.....	.....
2	0.383607	0.023122	0.751982	1.376588	0.092646
3	0.83596	0.533693	1.404574	1.985951	0.168717

Source: made by authors

Table 15. Values of average profitability for each of the clusters

Cluster	Average profitability of the cluster
CKM1	0.16230
CKM2	0.08383
CKM3	0.11017

Source: made by authors

Table 16. The standard deviation of gross margin in knowledge management clusters

Cluster	Standard deviation of gross margins
CKM1	0.03892028
CKM2	0.01471849
CKM3	0.03560589

Source: made by authors

The average square deviation of the gross margin in the best knowledge management cluster (CK2) is almost three times less than the remaining two clusters. The values are closer to the average, their dispersion around the mean value is significantly lower, i.e., the gross margin instability is lower in the cluster with the best knowledge management. This fact confirms the quality of the CKM2 cluster because the profitability is stable and it does not oscillate around the mean value as in the two worse clusters CKM1 and CKM3.

Hypothesis testing H3 is a comparison of the maturity of the knowledge management system and economic efficiency indicators. The first step in testing the H3 hypothesis was to calculate average economic efficiency coefficients for the three knowledge management clusters. Based on the value of the economic efficiency ratio for companies in a particular knowledge management cluster, the cluster economic efficiency ratio is calculated.

Comparing the coefficients of economic efficiency of the knowledge management cluster, it can be seen that the highest coefficient of economic efficiency is in the cluster of small companies, which are dominant in the cluster CKM1, and the lowest coefficient of economic efficiency in the cluster CKM2, where large companies are dominant. Therefore, the analysis shows that hypothesis H3 is not accepted.

Table 17. Cluster of economic efficiency coefficient

Knowledge Management Cluster	Economic efficiency of the cluster
CKM1	1.990067
CKM2	1.40393
CKM3	1.833221

Source: made by authors

Such a result of the coefficient of economic efficiency in individual clusters has a simple explanation, and it arises from the absolute size of expenditures. Namely, in the CKM2 cluster, there are large companies whose average expenses are in absolute amount and several hundred times higher than the expenses of companies in the third and first clusters. Therefore, the value of the coefficient of economic efficiency is lower for companies with higher expenses.

5. Concluding remarks

The impact of knowledge management on organizational performance measured through previously defined economic indicators explores the relationships between complex variables that include other variables and their values. The decomposition of the research task enabled the formation of clear ideas about knowledge management and organizational performance. The research confirms the well-known scientific research fact that the foundations of research are found in digits, numbers, in the "enormous power" hidden in them. Therefore, it was very important to find the right ways to release the trapped, hidden power in numbers using research methods. Research methods from the collected data of the questionnaire (for knowledge management in the company) and balance sheet and income statement (for the organizational performance of the company) release power, the power of data transforming them into the knowledge of the relationship between knowledge management and organizational performance. The research shows all the complexity of the concept of knowledge. It has different shapes, complexity and clarity of presentation. Tacit, explicit, declarative, procedural, technological, managerial, and other knowledge exist in the company. Knowledge management as a process of acquiring, creating, adapting, storing, and using knowledge is often a missing process in companies. Research shows that only large companies have built-in elements of knowledge management, medium-sized companies are involved in this process, and small companies have not developed management strategies in which there is knowledge management. Research shows that there is a strong positive association between knowledge management and organizational performance as measured by relevant economic indicators. Knowledge management has a positive and powerful impact on reducing

indebtedness, increasing liquidity, activity, economic efficiency, and profitability. Still, it is proving to be a missing process in SMEs. The research concentrates on generating knowledge from data and information generated by the business process of the company. The research focuses on two sources of structured data: databases and data warehouses. In addition to aggregated process data, the data warehouse also stores data from external sources such as customer, market, and supply chain data. Knowledge management for decision-making at different management levels can, by applying appropriate data mining methods, generate information and knowledge at the right time (before making decisions). The prerequisite for generating such knowledge is the existence of communication infrastructure (intranet, extranet), the building of information systems to support decision-making, but also human resources that know the information needs of different management levels in the company. Therefore, a new task is opened and set for the strategic level of management, and that is the design, construction, and implementation of a knowledge management system for each company. Companies that recognize the knowledge management system will be able to manage business processes and direct them towards the accepted vision.

For knowledge management, it is especially important to build a culture of distribution and exchange of knowledge, acceptance, i.e., not rejecting new ideas and stimulating their implementation. It is a culture in which all employees contribute to the realization of the vision and set goals of the company. Preparing an appropriate organizational culture is a complex task and often a serious problem and obstacle to knowledge management and improving organizational performance in the company. It requires the support of employees at all levels to realize all phases of knowledge management, improve processes and establish connections between employees, exchange knowledge, and embed the benefits of knowledge exchange and use in strengthening the organizational performance of the company.

The results of the research suggest the setting within the organizational structure of departments or sectors in large and medium-sized companies that would continuously and systematically improve the knowledge management system. The Knowledge Management Department would constantly collect information on the state of human resources, their motivation, incentives for innovation, awards for new ideas and process improvement, the development of lifelong learning programs, and communication among employees. The knowledge management department would collect information from all business functions (accounting, finance, marketing, human resources, production), and deliver the processed information in the form of proposed decisions to the highest, strategic level of management. Also, one such knowledge management department would certainly collect information on how to execute business processes (procurement, sales, distribution (logistics), document movements, etc.), which would allow managers to obtain information on processes that slow down business and then to propose measures to optimize business processes.

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PERCEPTIONS OF CORRUPTION AND INFORMALITY AMONG BUSINESSPEOPLE

Barbara Frey, Bruno Škrinjarić, Jelena Budak

Abstract

This research assesses perception of corruption in business-to-business and business-to-government interactions by using empirical evidence from Serbia. Based on the survey data, it captures the perceptions of corruption of business owners and managers of small and medium enterprises (SMEs) and examines their attitudes towards informal, licit, or illicit, business practices. The typology of SMEs according to their opinion on corruption- and institutional-related obstacles resulted in three different clusters, based on several variables. Moreover, empirical findings show that business is not much hindered by regulations but with a common lack of trust in institutions, crime, and perceived corruption. SMEs are perceived as particularly affected by a negative corrupt environment where large companies are seen as the source of corruption. The findings allow for the creation of lawful and incorruptible business policies, as well as ideas on preventing the common practice of illicit trading with job positions in the public sector.

Keywords*: corruption, informality, SMEs, B2B, B2G, cluster analysis, Serbia*

JEL classification*: D73, D22*

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1. Introduction

Serbia is regarded as a country with high levels of corruption in all spheres of public life. Corruption is thought to be omnipresent in politics, administration, and in business. According to the 2020 Corruption Perception Index (CPI), with a score of 38 out of 100 (score 100 denoting the least corrupt country) Serbia was placed high on the list of countries with widespread corruption (Transparency International 2021). Moreover, the perceived levels of corruption in Serbia did not change much in the last 10 years.

The previously installed anti-corruption policies in Serbia were completely or partially inapt to truly combat corruption, especially in the private sector (van Duyne 2013). In addition, the anti-corruption agenda in the transition societies focused mostly on the formal

institutions and not on the informal ones, which left the traditional social networks intact (Williams and Vorley 2015). These informal networks were established during socialism, and later during the 1990s conflicts and consequent recessions in the Balkan, as a substitute and/or as a complementary to formal institutions, which more often than not failed to regulate everyday life (Tonoyan et al. 2010; Estrin and Prevezer 2011). As such, informal institutions could not be qualified as negative or positive, but in those places where they would obstruct the implementation and adoption of new formal rules, they could be considered as problematic. Therefore, corruption and informal practices remain perceived as perpetual and as inseparable from political and economic life in Serbia (Resimić 2022). Given the historical circumstances, in particular the 1990s conflicts in the region, coupled with the socialist heritage in economic and political systems, and given its present efforts to join the European Union, Serbia presents a fine example of a transition economy in the EU accession process.

Corruption and informality in business are research topics that have previously received less attention among scholars when compared with the research on corruption in politics and government, especially in Southeast Europe. Further, the existing research was focused on corruption and large companies or 'big businesses' (Round and Williams 2010). Recently, a significant contribution was made by Efendić and Ledeneva in exploring and understanding informal institutions and informal networking and the costs of it for individuals in Southeast Europe (SEE) (2020; 2021; 2022), as well by Williams and Efendić (2021), however in relation to informal and undeclared employment. Nevertheless, in order to advance and deepen the understanding of everyday corruption and informality in business in a country like Serbia, it is necessary to explore and analyze the perceptions of the relevant stakeholders – businesspeople, who own informed views on the reality in which they partake. Individuals' opinions and their background characteristics shape corruption perception beyond what could be explained by their personal experience of corruption (Gutmann, Padovano and Voigt 2019).

The present study assesses private corruption in business-to-business (B2B) and business-to-government (B2G) interactions by using empirical evidence from Serbia. It aims to contribute to contemporary research on issues of corruption and informality in business in the following ways. Firstly, this research captures the perceptions of corruption of relevant business actors – business owners and high-level managers of small and medium enterprises (SMEs), which stand as the main wealth generators and the biggest employers in Serbia (OECD 2022). Secondly, the empirical research isolates the most pertinent manifestations of informal activities and describes the context that causes the informality to occur. Thirdly, this study is the first of its kind to collect and evaluate data on private corruption in Serbia between businesses, hence adding to the literature on the B2B type of corruption in the SEE region. Finally, clustering the surveyed firms according to the opinions and attitudes of their owners and managers regarding corruption- and institutional-related obstacles for business offers more in-depth insight into the problem and evidence-based ground for deriving policy measures.

After the introduction, this paper examines the theoretical framework and institutional context around the concept of corruption and informality in the private sector. Further, an overview of the literature is laid down to spot the research gaps and point out the existing findings that relate to this research. Then, the methodology and the survey data are explained. The cluster analysis and descriptive statistics results are discussed in order to identify the particular groups within the business population that share similar attitudes. The conclusion offers ideas for future research in this domain.

2. Research Framework and Literature Review

2.1. Theoretical framework

Corruption is a varied phenomenon, dependent on cultural and situational interpretations. Definitions used by scholars are usually broad, exactly due to the elusiveness and lack of universality. The most used definition, coined by the World Bank (2021), is that corruption is the abuse of public power for private gain. As pointed out by Cuervo-Cazzura (2016), this short and broad definition is well-suited for analyzing corruption beyond the public sector because the potential costs of this abuse would become a burden of the whole group (organization, company) rather than to be borne by the one individual. This critical point is the main argument why corruption is seen as predominantly harmful to organizations, and thus to society.

Following this definition, one can differentiate between public and private corruption. While public corruption can be defined as an illegal activity where public officials misuse office for private gains, private corruption is the type of corruption that occurs when a manager, or any employee with power, acts contrary to the duties and obligations of the position he or she occupies. Private corruption, or corporate corruption

(Castro, Phillips and Ansari 2020), thus occurs when managers, or any decision makers within a company, take actions for their personal benefit, to the detriment of the whole organization (Argandoña 2003). Likewise, they could misuse their authority not only for themselves but also for the organizational gain (Ashforth and Anand 2003). These illegal actions and activities may include, but are not limited to, "bribery, fraud, financial crime, abuse, falsification, favoritism, nepotism, manipulation, etc." (Bahoo, Alon and Paltrinieri 2020, p. 2). Despite labeling the forms of private corruption, evidence shows that individuals have difficulties in identifying private corruption as their perceptions usually depend only on their own experiences and ethical judgments (Gopinath 2008; Burduja and Zacharia 2019). Due to the nature of the managerial offenses, private corruption is often viewed and analyzed as a white-collar crime (Cuervo-Cazurra 2016), and unlike public corruption, private corruption is typically considered a company's internal problem that should be dealt with within the company (Argandoña 2003). Having said that, these two types of corruption frequently intertwine as private businesses are often a supply side in dealings with governments. Therefore, private corruption may exist within one company, or between two separate companies, or between a company and a public body (Cuervo-Cazurra 2016).

Comparably, Burduja and Zacharia (2019) differ between B2B corruption and B2G corruption. Yet, it is not entirely clear if the B2B corruption is as damaging to society as the B2G corruption is. Namely, the B2B corruption does not abuse public office, nor does it directly affect the society and general population. However, both Argandoña (2003) and Burduja and Zacharia (2019) argue that B2B corruption is harmful because the corrupt behaviors carry reputational and legal risks that can seriously damage the company, and thus its employees. Moreover, B2B corruption undermines the free-market rules and disrupts the competition. Sööt et al. (2016) point out that unethical behaviors lead to lower quality and higher prices of goods and services, as well as to potential environmental and health risks. These potential effects of B2B corruption, therefore, influence the entire society, which leads to the conclusion that B2B corruption is in fact a destructive phenomenon on a societal level.

But can corruption be of use to those doing business? Is corruption perceived as "grease in the wheels" or "sand in the wheels"? Literature provides evidence that both claims could be true, depending on the context. However, the majority of scholars agree that corruption has adverse effects on private businesses. Mauro (1997), for example, provides evidence that corruption diminishes willingness to invest, while Kaufmann (1997) argues that corruption causes additional economic costs that otherwise would not be necessary. Nonetheless, certain scholars argue that corruption can benefit businesspeople and their businesses, especially in those countries with weak administrative apparatus. These benefits present themselves mainly as shortcuts to overcome administrative and bureaucratic difficulties more efficiently (Méon and Sekkat 2005; Mendoza, Lim and Lopez 2015). The inefficient administrations create private and public deadweight losses and corruption then works as a market correction measure (Tonoyan et al. 2010). In some cases, larger companies with little competition and more resources also tend to view corruption as more favorable than smaller firms do (Sahakyan and Stiegert 2012). So, the size and firm's market position also play a role when it comes to perceiving corruption as favorable to business. However, more recent studies show evidence that corruption never actually helps businesses, it just makes less damage in those business climates that were not favorable for economic growth in the first place (Dutta and Sobel 2016).

There are many political and societal factors that influence the perception of the role of corruption and informality in doing business. While some countries may have inefficient administrative apparatus, businesspeople may still choose not to engage in corrupt and informal activities because of countries' cultural and societal contexts (Chavance 2008). Thus, to perceive corruption and informal practices as grease in the wheels, the inefficiency of the state must be coupled with other factors, such as the existence of strong informal networks, like elaborated kinships and mafia (Tanzi 1994). Additionally, corporate culture and high cultural esteem for money and success can lead to corrupt behaviors, especially in those environments where regulation is lacking, and conditions are competitive or constrained (Passas 1990; Vaughan 1983). In these circumstances, corrupt behaviors are hence not perceived as deviant or illicit, but rather as "innovation" or "non-conformity" to the situation (Passas 1990). Furthermore, businesspeople may be ambivalent towards corruption and perceive it simultaneously as both good and bad, depending on the situation (Denisova-Schmidt and Prytula 2018; Ledeneva and Efendić 2022 for SEE). Hence, when discussing corruption and business, the outside factors need to be considered – political, societal, and cultural (Lambsdorff 2007), and the context needs to be interpreted as well (Marquette and Peiffer 2015).

Moreover, it is exactly the context that establishes the differentiation between corruption and informality in business dealings. Informality is an essential part

of social life, present in all societies across the globe (Polese, Morris and Kovacs 2016). It exists as a supplement or substitute to formal rules and institutions, depending on the (lack of) confidence and reliance on the formal institutions (Efendić, Pugh and Adnett 2011). In relation-based societies, which operate on a high-context basis, business networks and connections are as important as the institutional framework regulated by governments (Šimić Banović 2015). In these societies, the public and private spheres are not distinctively separated, but in fact, they usually intertwine (Baez-Camargo and Ledeneva 2017). Thus, in Serbia, and in other countries of the former Yugoslavia, where in-group relations create the business context, informal practices are a regular occurrence, particularly among businesspeople (Efendić and Ledeneva 2020). Empirical research has shown that informal networking is predominantly present in institutionally impaired systems, and just like corruption, informal dealings principally serve as a remedy for failures of formal institutions and inadequate economic policies (Efendić, Pugh and Adnett 2011; Pasovic and Efendić 2018). However, these informal practices carry substantial costs in terms of time and money, which suggests they are not the best corrective solution to the faulty institutional framework (Efendić and Ledeneva 2020).

2.2. Institutional context and corruption in Serbia

Serbia has gone through a turbulent political and economic transition after the dissolution of the former socialist Yugoslav state. In the 1990s the newly formed country faced transition issues and additional misfortunes such as wars and international embargoes. This created an especially fertile ground for corruption (Bolčić 2014) since the business environment became lawless (Arandarenko in Krstić and Schneider 2015), with many individuals and businesses turning to the shadow (informal) economy (Andreas 2005).
Furthermore, even the Serbian government itself operated in the grey zone to circumvent the international embargo. This mainly was the case with foreign trade and customs - Serbia was illegally transferring money abroad, primarily via Cyprus, to buy food, oil and arms used in the ongoing wars ("patriotic smuggling", Antonić 2002, p. 371).

Since 1990-1991 the emergence of entrepreneurs and private owners made a deep impact on the structure of the Serbian economy (Bolčić 2003). However, given the political and economic instability, most of the privately owned companies did not significantly grow and remained small (Bolčić 1994, as cited in Trifunović 2015). Nevertheless, due to the economic isolation of the country, the local businesses played an important role in the Serbian transition (Uvalić 2001; Ristić 2004; Šabić et al. 2012).

Following the academic trends of the 1990s known as the "anti-corruption consensus" (Bukovansky 2006), or as the "corruption paradigm" (Ledeneva 2009), beginning the 2000s, there has been a surge in the literature on corruption in Serbia. However, this research on corruption perception largely focuses on the public sector and the corruption of public officials (Begović and Mijatović 2001; Ibid. 2007; Pešić 2007). Correspondingly, there are several studies that focus on citizens' perception and experience with corruption in society in general (e.g., UNODC 2011) or in specific sectors, e.g., police (Petrović, Đorđević and Savković 2013), healthcare (Vasiljević-Prodanović 2015), customs (Begović et al. 2002), education (Gredelj 2007) or judiciary (Begović, Mijatović and Hiber 2004). Likewise, corruption has often been examined in relation to the anti-corruption policies and administrative reforms made to fight corruption (e.g., Unijat 2006; BIRODI 2013; UNDP Serbia 2015).

On the contrary, even though it is widely discussed in the media and among Serbian political elites, corruption in Serbian business is an area that did not receive sufficient attention from scientists. This is comprehensibly due to the difficulty of data collecting. Business matters are usually kept secretive, and businesspeople are not an easy target group to be approached as they are often cautious and reserved when asked about the particularities of their dealings. Thus, there is only a limited number of studies on corruption in private business.

The first research on this topic was conducted by Begović and Mijatović (eds) (2001; 2007) exploring the corruption experiences of businesspeople in relations with public officials. Between two surveys during the five years period, corruption for the exercise of rights has decreased the most, whereas the levels of corruption for breaking the law and corruption for changing the law stagnated. Moreover, the lack of rule of law was perceived as the most important cause of corruption, which explained the businesspeople's significant lack of trust in the institutions. Another study on the bribery demands as experienced by the Serbian entrepreneurs in relation to public officials revealed that bribery of civil servants was omnipresent, and even viewed as an additional tax in every business undertaking (Vuković 2002). Relatedly, there is evidence of the importance of the institutional environment when doing business (Džunić and Golubović 2018; Dreher, Kotsogiannis and McCorriston 2009; Djankov et al. 2002). In a survey on the effects of corruption on the

establishment of new businesses in Serbia, the respondents were the owners of SMEs, and 60% of them admitted to engaging in corrupt behaviors when starting a business (Ivanović-Djukić et al. 2019). In a study of businesspeople's perspectives on corruption in the business sector, as well as on the governments' role in fighting corruption in the Western Balkans (Serbia included) the results showed that businesspeople from the whole region perceive corruption as a negative phenomenon that needs to be dealt with, firstly through government-led measures and actions, but also by the actions of individuals and private organizations (Budak and Rajh 2014). Also, evidence from this study showed a correlation between viewing corruption as "greasing the wheels" and businesspeople's involvement in corruption. This finding shows that attitudes influence business behavior, as well as the other way around. Similarly, an analysis of corruption perceptions of managers in three countries, Croatia, Serbia, and Slovenia, revealed that managers whose firms have contracts with the government, and those who are often met with petty corruption, perceive corruptive practices as a major obstacle to their business activities (Botrić 2020).

Existing literature predominantly examined views of businesspeople on corruption in relation to public officials and activities relating to the state bureaucracy and was focused on the whole private sector, independent of the firm size. Informal practices and corruption in everyday business, and among businesses themselves, remained largely unexplored. This research hence fills the gap by exploring the B2B and B2G aspects of corruption and informality among businesspeople in Serbian firms. As such, this research could (and should) have wider implications for the whole Western Balkan region in terms of understanding the business environment and potentially creating effective anti-corruption policies.

3. Data and Methodology

3.1. Questionnaire

Data were collected by conducting a survey in a form of an online questionnaire, which was administrated in the period from October 2020 until June 2021. The targeted sample was owners and managers of SMEs in Serbia. The SMEs were chosen for this study due to their importance for the Serbian economy: 99% of all enterprises in Serbia are SMEs and more than 65% of all labor force is employed in the SMEs (OECD 2022).

The questionnaire was divided into several thematic parts. In the first part, the respondents were asked about what behaviors they see as acceptable when doing business in Serbia, and what gifts between business partners are, in their opinion, a common practice. The second part consisted of questions addressing various hypothetical situations that may be construed as dubious or deviant, depending on the perception of the respondent. Respondents were offered an array of answers, ranging from being completely law-abiding to those that can be construed as corrupt, which all contain reactions to hypothetical situations. There were nuances between the presented reactions, which offer a grey zone between the two extremes. In these sections, respondents could choose from more than one answer because the hypothetical reactions and their reasons to choose a certain response may overlap. The last part of the questionnaire explored the perception of corruption, based on the Likert scale, in relation to public institutions.

3.2. Sample

The survey participants were chosen and contacted through personal connections of the author and through business associations. To additionally increase the sample the snowball technique (the chain referral sampling) was applied. This technique is usually used when surveying hidden or hard-to-reach targeted sample (Burduja and Zaharia 2019), which was the case with the Serbian businesspeople.

Invitation to fill out this online questionnaire was sent to 312 different e-mail addresses. 102 responses came back, giving a response rate of 32.7%. Those who did not fill out the questionnaire justified it with a lack of time, lack of interest and unfamiliarity with the research topic. The characteristics of respondents are presented in Table 1. A dominant respondent in the sample is a female director of a micro firm in the ICT sector in Belgrade, aged between 30-39 years, with post-graduate education.

3.3. Empirical Methodology

In the first step of the analysis, we cluster different business respondents based on their views on topics connected to corruption and informal behavior. The propensity to corrupt and to support informalities in doing business is related to (1) trust in the judiciary and police and (2) perceptions of institutional barriers hindering business (Budak and Rajh 2014). Further, perceptions of the negative impact of corruption and crime together with perceived sources of corruption might delineate the typology of SMEs and different groups of firms calling for different anti-corruption remedies to alleviate the corruption risk faced by businesses in Serbia.

Table 1. Summary statistics of sampled respondents

Variable	n	Mean	St. Dev.
Gender			
Female	64	0.63	0.49
Male	36	0.36	0.48
No information	1	0.01	0.10
Age categories			
20-29	7	0.07	0.25
30-39	55	0.54	0.50
40-49	16	0.16	0.37
50-59	16	0.16	0.37
60>	7	0.07	0.25
Education			
Secondary	17	0.17	0.37
Tertiary	42	0.41	0.49
Post-graduate	42	0.42	0.50
Size of respondents' firm			
Micro	51	0.51	0.50
Small	30	0.29	0.46
Medium	11	0.11	0.31
Large	9	0.09	0.29
Position of respondent within firm			
Owner or Director	74	0.73	0.44
Manager	17	0.17	0.37
Worker	10	0.10	0.30
Sector of respondents' firm			
Manufacturing	17	0.17	0.38
Utilities	7	0.07	0.26
Construction	4	0.04	0.20
Wholesale and retail	7	0.07	0.26
Transport and warehousing	7	0.07	0.26
Catering	5	0.05	0.22
ICT	22	0.22	0.41
Financial services	15	0.15	0.36
Legal services	4	0.04	0.20
Other services	12	0.13	0.34
Region of respondents' firm			
Belgrade	76	0.75	0.43
Southern and Eastern Serbia	11	0.11	0.30
Šumadija and Western Serbia	6	0.06	0.24
Vojvodina	8	0.08	0.26
Firm is multinational			
No	74	0.73	0.44
Yes	18	0.18	0.38
No info	9	0.09	0.29

Clustering was carried out using the K-means cluster method with Euclidean (L2) distance as a similarity measure. This method partitions *n* observations into *k* clusters in which each observation belongs to the cluster with the nearest mean (cluster centroid). Clustering was based on several variables: (1) Trust in institutions (TRUST); (2) Inspections as an obstacle for business (INSP); (3) Regulation as an obstacle for business (REG); (4) Crime as an obstacle for business (CRIME); (5) SMEs are more negatively affected by corruption (SME); and (6) Large businesses are a source of corruption (LARGE). Calinski and Harabasz pseudo-F index (Calinski and Harabasz 1974) and the Duda-Hart Je(2)/Je(1) index (Duda, Hart and Stork 2001) were used as a criterion for determining the optimal number of clusters in a dataset. For both rules, index values are calculated for several different number of clusters, and larger index values indicate more distinct clustering. Mean values were calculated for TRUST, INSP, REG, and CRIME variables, and these mean values were taken as input in the K-means cluster analysis (Appendix 1). Both SME and LARGE are measured using a single-item scale, so their original values were taken as input in the K-means cluster analysis.

4. Results

4.1 Cluster analysis

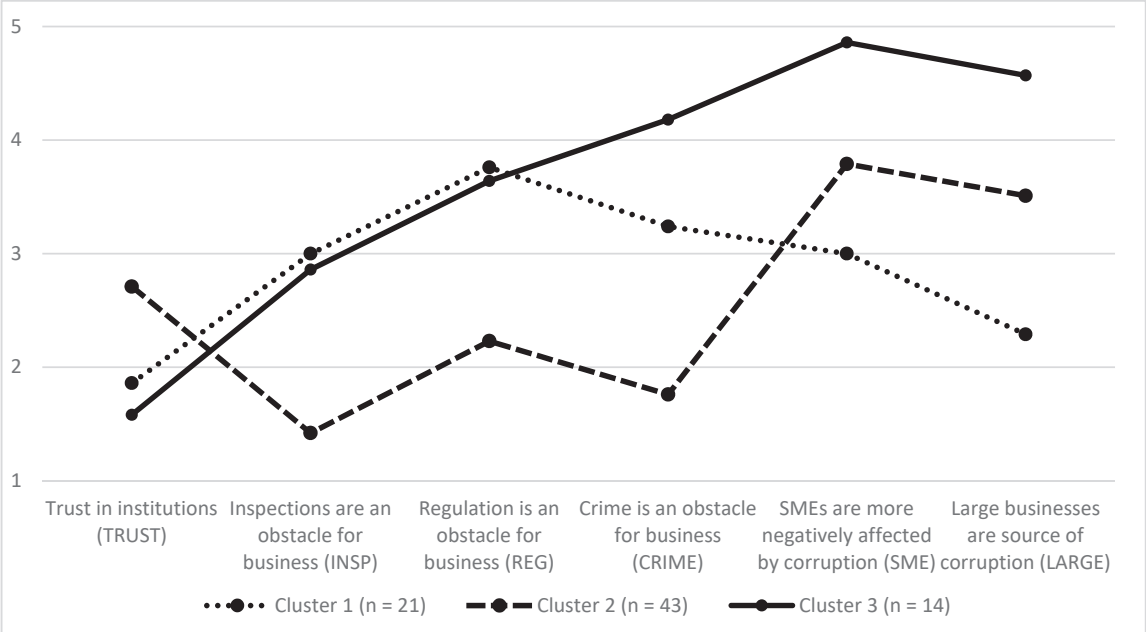
Results of the K-means cluster analysis differentiated three homogeneous segments of business respondents (Table 2 and Figure 1). Due to missing values (19 data entries are missing for CRIME, 11 for INSP, and 10 for REG – some of these missing values are overlapping), our sample was reduced to 78, which provides exogenous limitations for further investigation and

Table 2. K-means cluster analysis results

Values	Total sample (n = 78)	Cluster 1 (n = 21)	Cluster 2 (n = 43)	Cluster 3 (n = 14)	ANOVA F-statistics
Trust in institutions (TRUST)	2.34	1.86	2.71	1.58	14.7625***
Inspections are an obstacle for business (INSP)	2.08	3.00	1.42	2.86	32.2033***
Regulations are an obstacle for business (REG)	2.90	3.76	2.23	3.64	32.0029***
Crime is an obstacle for business (CRIME)	2.62	3.24	1.76	4.18	48.0582***
SMEs are more negatively affected by corruption (SME)	3.74	3.00	3.79	4.86	16.2812***
Large businesses are source of corruption (LARGE)	3.40	2.29	3.51	4.57	20.8102***

Notes: *** p<0.01. Apart from F-statistic, table contains means for all variables across total sample and different clusters.

Figure 1. K-means cluster analysis results



more demanding empirical econometric analysis. All three groups have low levels of trust in institutions and differ largely in corruption-related variables.

Members of Cluster 1 consider inspections as well as organized and petty crime as moderate obstacles for their firm business operations. According to their perception, a somewhat more serious obstacle to doing business is connected to regulations and legislation. However, firms in Cluster 1 do not see large businesses as a source of corruption, neither that SMEs are more affected by corruption.

The level of trust in institutions is the highest in Cluster 2, yet still rather weak. For Cluster 2 members, in distinction to other respondents, inspections present almost no obstacle to doing business, and enforced regulations are seen only as a small obstacle. The most interesting perception among Cluster 2 respondents is that crime is posing a minor obstacle to their firm's business operations. On the contrary, SMEs are seen as strongly affected by corruption and large companies as generators of corruption.

Cluster 3 members have the lowest trust in institutions and share the opinion of Cluster 1 members that inspections and regulations stand as moderate obstacles to doing business. Regarding the influence of crime and corruption on doing business, their view is rigorous: crime is the biggest obstacle for business if compared to administrative barriers such as inspections and regulations. Additionally, they decidedly view large companies as sources of corruption and strongly agree that SMEs are victims of corruption more than large-sized firms.

Next, we examine the differences among the identified clusters based on the respondents and their firm characteristics (Appendix 2).

Cluster 1 characteristics are in line with the sample average. A bit differing attribute is that the respondents are mostly in their 30s, representing firms operating in the manufacturing and service sector. Over half of the firms in Cluster 1 are operating in financial, legal, and other services.

Cluster 2 is prevalently and above the sample average consisting of women and well-educated postgraduate respondents. The cluster members are owners and managers of mostly micro firms and two-thirds of them are between the age of 30 to 39. This group is specific for the largest regional dispersion of firms outside of the Belgrade capital and for the largest share of multinationals. The leading business activity of firms in Cluster 2 is manufacturing. In line with other respondents' attributes and not surprisingly, firms operating in ICT and financial sectors represent an important share as well (19% each).

Cluster 3 differs mostly from the sample average. It has an equal gender structure, the higher proportions of older respondents aged over 50 and respondents with secondary education level attained. The vast majority of firms in Cluster 3 are micro and small firms, whereas there are only one large, and no medium companies present. In comparison to other clusters, firms are mostly operating in catering, wholesale and retail, transport, and warehousing sectors. A further distinction is that the large majority of firms in Cluster 3 (86%) are operating in national or regional markets.

4.2. Corruption and informal behavior between clusters

Once the typology of clusters has been determined, detailed analyses of attitudes and behavior follow to shed light on B2B and B2G corruption and informal practices in Serbia.

4.2.1. B2B Corruption and informal practices

When doing business in Serbia, non-monetary gifts to business partners, together with hospitable and friendly signs of appreciation, are regarded as acceptable and licit. On the other hand, only a small percentage of respondents see money as conventional and customary. It can be observed that taking business contact for a treat is a widely acceptable practice for Cluster 1 members. Businesspeople in Cluster 3 are against favoring business partners' or employees' friends and relatives but see accepting gifts in cash from business partners as tolerable practice (Figure 2).

Figure 3 depicts a somewhat contradicting situation – even though monetary gifts are perceived as illicit, the vast majority of respondents (74%) heard of it as being the most common gift in the Serbian business community. Here large differences in the opinion among clusters are observed. Members of Cluster 3 completely agree on the omnipresent practice of bribery in cash, distinctive to the opinion of Cluster 2 (65%). Cluster 3 respondents strongly believe that all types of gifts in the business community are common, including hiring in the public sector.

Attitudes towards morally acceptable practices in B2B relations might differ from firms' practices in relation to the corruption pressure. Firms would refuse to take expensive personal gifts to ensure future deals or stocks in a partner's company, or to do him a non-disclosed favor. However, when it comes to hiring, more consent reactions could be expected. Thus, over 70% of Cluster 3 members would by request gladly employ a business partner adult child (Figure 4).

Figure 2. What are acceptable behaviors and gifts in business?

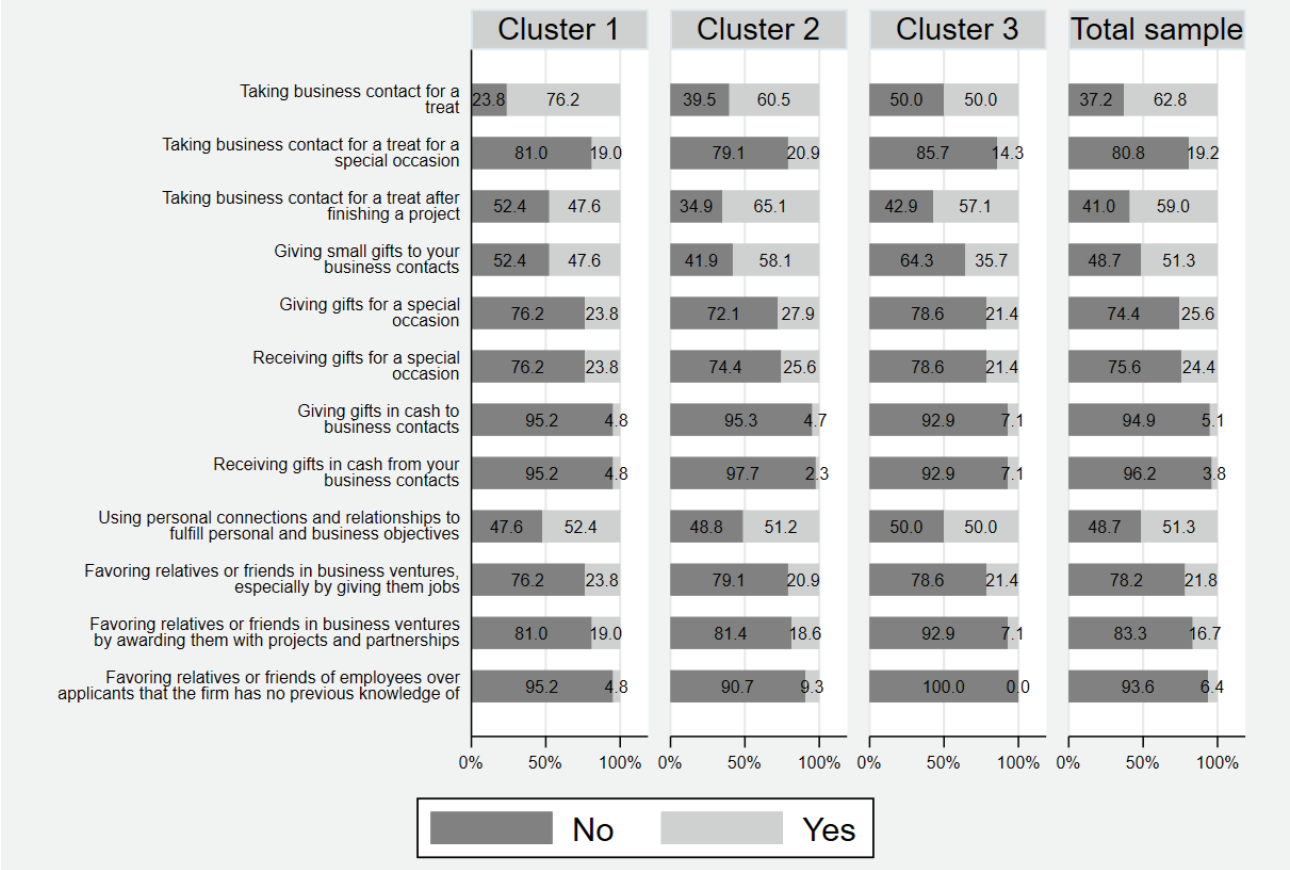


Figure 3. What are the most common gifts in the business community?

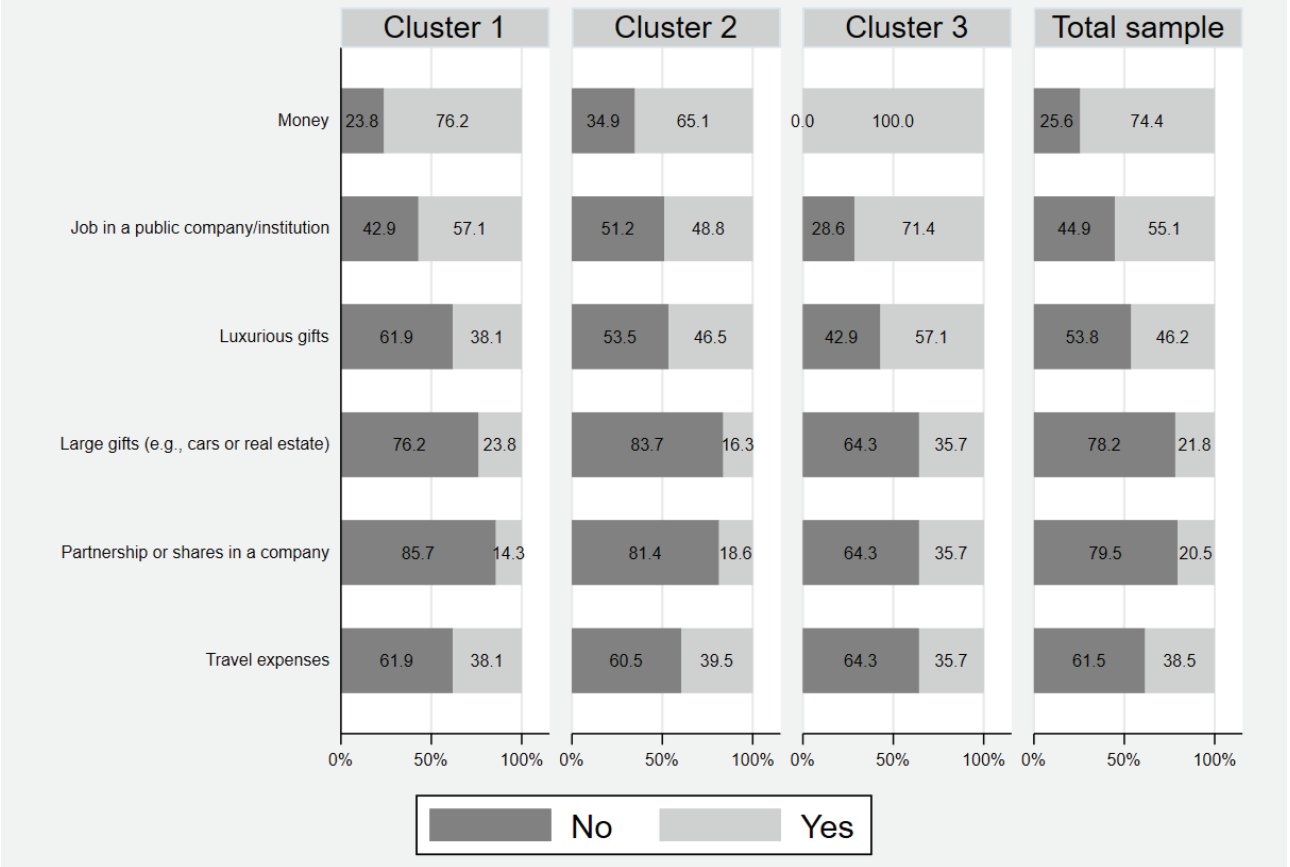


Figure 4. Propensity for B2B bribes

Notes: Different scenarios presented in Figure 4 include:

A. After successfully completing a joint project, your business partner gives you as a gift an expensive hand watch (2,000 EUR worth). He gives it to you and only says that he will count on you in his future dealings. Would you accept this gift?

B. Your business partner asks you for a favor: he will give you a block of stock in his company if you give him your storage for him to use. When you ask what he wants to store he doesn't want to disclose. Would you do him this favor?

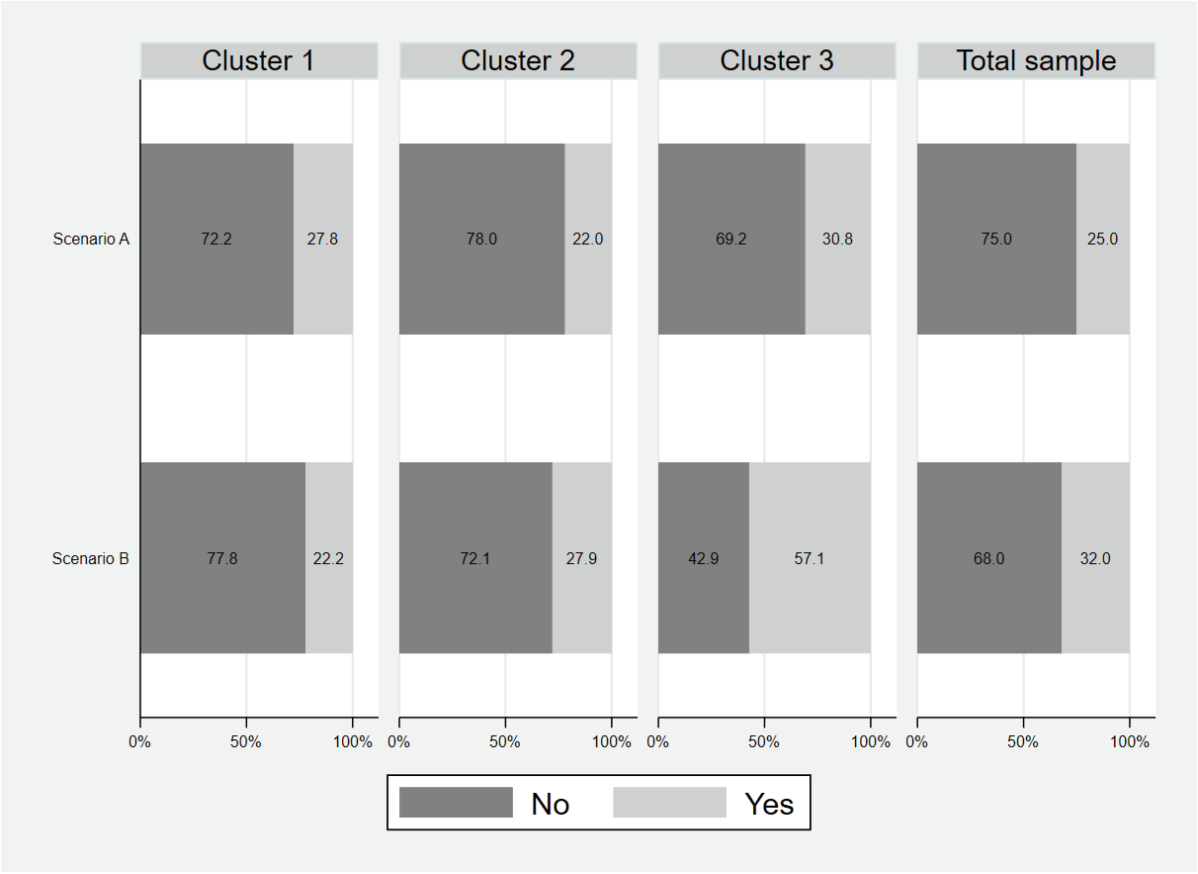
C. Your adult child cannot find work and you desperately want to help him/her. Would you ask your business partner to hire your adult child as a favor to you?

D. Your business contact asks you for a favor. He asks you to hire his cousin in your company. In exchange, he would offer you more favorable conditions in the contract between yours and his company. Would you hire his cousin?

4.2.2. B2G corruption

The propensity to bribe public officials is as assumed, in line with the perceived administrative obstacles for business. The majority of businesspeople would not turn to illegal practices of this kind to speed up administrative procedures or to ensure preferential treatment. However, over half of the firms in Cluster 3 would upon request hire a public official's family member in exchange for benefits (Figure 5).

Figure 5. B2G bribes in favors



Notes: Different scenarios presented in this figure include:

A. You are fulfilling administrative tasks for your company in your municipality. An official who oversees your file seems to be very slow and overall reluctant in giving you necessary information to finalize the procedure. Do you offer him something (cash or a gift) as a stimulus to execute his task as professionally as possible?

B. Public official asks you for a favor. He asks you to hire his family member in your company in exchange for preferential treatment of your company at the public institution where the official works. What do you do?

Different practice is observed in paying bribes in cash (Figure 6). Members of Cluster 3 would more than average bribe in cash, distinctive to the members of Cluster 2. Paying a requested small bribe to a local bureaucrat or tax officer is acceptable for almost one-third of firms in Cluster 1. When it comes to more serious amounts and business deals such as winning the public tender where bribing higher officials are requested, Cluster 2 again proves to be the 'cleanest' cluster.

Figure 6. B2G bribes in cash

Notes: Different scenarios presented in this figure include:

A. You are fulfilling administrative tasks for your company in your municipality. An official who oversees your file tells you that for **100 EUR** he would speed up the process and you would obtain a better service overall. Would you pay this price?

B. Your company is struggling financially, and your company has never been in a worse situation. You are therefore applying for a tax break. An official who oversees your file tells you that for **500 EUR** he can guarantee that you would indeed get this tax break. Would you pay this price?

C. Your company is competing at the local public tender which would be a significant financial opportunity for your company. During the process, an official in charge asks you for **1,000 EUR** in exchange for awarding your company on the tender. Would you pay this price?

D. Your company applied for the open call for the public procurement of certain goods for one ministry. A third party approaches you and informs you that for a fee of **5,000 EUR** your company would win the project. This person acts as an intermediary between companies that applied for the project and the Minister himself. Would you pay this price?

In B2G relations, managers are more reluctant to pay bribes and more likely to follow official procedures than owners. The ICT sector is the least likely to pay the bribe. Based on the example of hiring, in both B2B and B2G relations, businesspeople working in SMEs consider informal practices more acceptable than bribery and would employ them for the sake of keeping good business relations.

5. Discussion and Conclusions

This research contributes to the understanding of perceived obstacles, attitudes, and corruption-related behavior of businesspeople in Serbia. The generally very low level of trust in institutions is persistent and in line with previous findings of Begović and Mijatović (2001; 2007). Somewhat unexpected, though, inspections are not considered a major problem for SMEs in Serbia, and bribes are not commonly employed as grease in the wheels. When compared to the situation of 20 years ago (Vuković 2002), this finding indicates an improvement in the functioning of the Serbian public administration in terms of bribery. Everyday business is not much burdened with regulations either but hindered by crime and perceived corruption. The SMEs are more hit by the prevalent corrupt environment where large companies are seen as the source of corruption. Accompanied by no trust in institutions, this finding indicates a common perception of the existence of close ties between large corporate businesses and political structures, which generates the persistent and widespread prevalence of corruption in Serbia.

This research also points out that SMEs, which make up the dominant part of the Serbian economy, are not prone to corruption, but instead perceive themselves as the main victims of corruption in business. In line with this finding, different anti-corruption policies should be developed to address grand corruption and alleviate the burden on SMEs. Here the differences observed among groups of SMEs are instructive to derive measures to cease corruption pressure. Micro and small firms operating in dynamic and propulsive sectors such as ICT and financial services (and often beyond the national market) do not burden themselves with existing administrative and regulative system failures. Young and well-educated businesspeople are less prone to bribe and employ informal practices to achieve their business goals. Both these findings should be however explored further to understand the reasons why these populations are more prone than others to run "clean" businesses.

These findings give ground for promoting lawful and incorruptible internal business policies. Raising awareness that corrupt behavior encompasses not only bribes in cash or expensive gifts but includes favors as well in exchange for a preferential treatment, or just to keep good business relations, is one of the key anti-corruption policy targets. Similarly, the role of businesses in combating B2B corruption is a topic worth further exploring given the respondents' expressed (dis)trust in institutions and their (in)ability to fight corruption. Aimed research, especially with the objective to shape effective firms' anti-corruption policies, could thus contribute to finding potential internal and external solutions for preventing both the B2B and B2G corruption and blowing the whistle on corrupt activities. Additionally, educational system could also be used as a vehicle to promote "clean" business and as such serve as an impetus for changes in business practices. As far as it considers recommendations for public policies, the perceived common practice of illicit trading with job positions in the public sector needs to be carefully addressed by increased transparency of hiring procedures and monitoring.

The sum of all findings could be applied in the wider context of Southeast European countries and used for understanding business codes in the whole EU periphery region.

This research is not without limitations, primarily since it captures the situation at one point in time only and since the sample is small. Thus, we only investigate correlations and associations instead or causations, which would require a panel data set structure. Furthermore, we do not have a representative survey as the final sample of 78 respondents is insufficient to claim so, and the results would be more applicable for deriving specific policy measures if large companies would also be included, allowing for more detailed sectoral analysis in future studies. Finally, there is a limitation in the form of a possible cognitive bias, regarding the semantics used in the questionnaire. Corruption as a word usually subconsciously creates negative associations. To prevent cognitive bias, the questions in the survey did not contain obvious words like corruption, fraud, bribe, etc. However, throughout the questionnaire, the respondents could have perceived what the overall topic of the survey was and that could have influenced their responses in the form of self-censorship.

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Appendix 1. Items used for latent constructs

Latent construct	Items	Description	Mean	St. dev.	Min.	Max.
Trust in institutions (TRUST)	trust_GenCourts	Trust in courts of general jurisdiction	2.49	1.03	1	5
	trust_HighCourts	Trust in higher courts	2.49	1.08	1	5
	trust_CommCourts	Trust in commercial courts	2.56	1.07	1	5
	trust_StatePros	Trust in the state prosecutor	2.04	1.15	1	5
	trust_BasicPros	Trust in basic prosecutors	2.40	1.15	1	5
	trust_HighPros	Trust in higher prosecutors	2.35	1.14	1	5
	trust_CrimePros	Trust in special prosecutor for organized crime	2.06	1.20	1	5
	trust_CommPolice	Trust in communal police	2.00	1.16	1	5
	trust_LocalPolice	Trust in local police	2.46	1.18	1	5
	trust_FinPolice	Trust in the financial police	2.12	1.05	1	5
Inspections are an obstacle for business (INSP)	hinder_LocalWorkInsp	Local work inspection hinders business operations	1.96	1.17	1	5
	hinder_StateWorkInsp	State work inspectorate hinder business operations	1.84	1.16	1	5
	obst_StateInsp	Too many inspections are obstacles for business	2.28	1.18	1	5
Regulations are an obstacle for business (REG)	obst_Law	Unclear legislation is an obstacle for business	2.77	1.32	1	5
	obst_LawChange	Frequent legislative changes are an obstacle for business	2.94	1.38	1	5
	obst_LawWork	Complicated labor regulations are an obstacle for business	2.74	1.39	1	5
	obst_TaxSystem	A complex taxation system is an obstacle for business	3.39	1.37	1	5
	obst_LawProc	Complicated procedures when starting a business are an obstacle to business	2.57	1.35	1	5
Crime is an obstacle for business (CRIME)	obst_OrgCrime	Widespread organized crime is an obstacle for business	2.71	1.35	1	5
	obst_PettyCrime	Petty crime is an obstacle for business	2.52	1.40	1	5

Appendix 2. Clusters' characteristics

Variable	Values	Total sample (n = 78)	Cluster 1 (n = 21)	Cluster 2 (n = 43)	Cluster 3 (n = 14)	Chi-squared test statistic
Gender	Female	51 (65.4 %)	13 (61.9 %)	31 (72.1 %)	7 (50 %)	6.317
	Male	26 (33.3 %)	8 (38.1 %)	12 (27.9 %)	6 (42.9 %)	
	No information	1 (1.3 %)	0 (0 %)	0 (0 %)	1 (7.1 %)	
Age categories	20-29	3 (3.8 %)	1 (4.8 %)	2 (4.7 %)	0 (0 %)	5.059
	30-39	44 (56.4 %)	12 (57.1 %)	26 (60.5 %)	6 (42.9 %)	
	40-49	11 (14.1 %)	3 (14.3 %)	6 (14 %)	2 (14.3 %)	
	50-59	14 (17.9 %)	4 (19 %)	5 (11.6 %)	5 (35.7 %)	
	60>	6 (7.7 %)	1 (4.8 %)	4 (9.3 %)	1 (7.1 %)	
Education	Secondary	15 (19.2 %)	4 (19 %)	8 (18.6 %)	3 (21.4 %)	1.741
	Tertiary	33 (42.3 %)	11 (52.4 %)	16 (37.2 %)	6 (42.9 %)	
	Post-graduate	30 (38.5 %)	6 (28.6 %)	19 (44.2 %)	5 (35.7 %)	
Size of respondents' firm	Micro	40 (51.3 %)	11 (52.4 %)	22 (51.2 %)	7 (50 %)	3.22
	Small	23 (29.5 %)	5 (23.8 %)	12 (27.9 %)	6 (42.9 %)	
	Medium	9 (11.5 %)	3 (14.3 %)	6 (14 %)	0 (0 %)	
	Large	6 (7.7 %)	2 (9.5 %)	3 (7 %)	1 (7.1 %)	
Position of respondent within firm	Owner/Director	60 (76.9 %)	16 (76.2 %)	35 (81.4 %)	9 (64.3 %)	4.668
	Manager	14 (17.9 %)	5 (23.8 %)	6 (14 %)	3 (21.4 %)	
	Worker	4 (5.1 %)	0 (0 %)	2 (4.7 %)	2 (14.3 %)	
Sector of respondents' firm	Manufacturing	15 (19.2 %)	5 (23.8 %)	10 (23.3 %)	0 (0 %)	24.223
	Utilities	6 (7.7 %)	1 (4.8 %)	5 (11.6 %)	0 (0 %)	
	Construction	4 (5.1 %)	1 (4.8 %)	2 (4.7 %)	1 (7.1 %)	
	Wholesale and retail	5 (6.4 %)	1 (4.8 %)	2 (4.7 %)	2 (14.3 %)	
	Transport and warehousing	5 (6.4 %)	0 (0 %)	3 (7 %)	2 (14.3 %)	
	Catering	4 (5.1 %)	0 (0 %)	1 (2.3 %)	3 (21.4 %)	
	ICT	15 (19.2 %)	4 (19 %)	8 (18.6 %)	3 (21.4 %)	
	Financial services	12 (15.4 %)	4 (19 %)	8 (18.6 %)	0 (0 %)	
	Legal services	3 (3.8 %)	1 (4.8 %)	1 (2.3 %)	1 (7.1 %)	
	Other services	9 (11.5 %)	4 (19 %)	3 (7 %)	2 (14.3 %)	
Region of respondents' firm	Belgrade	57 (74 %)	15 (71.4 %)	29 (69 %)	13 (92.9 %)	3.971
	Southern and Eastern Serbia	9 (11.7 %)	2 (9.5 %)	6 (14.3 %)	1 (7.1 %)	
	Šumadija and Western Serbia	5 (6.5 %)	2 (9.5 %)	3 (7.1 %)	0 (0 %)	
	Vojvodina	6 (7.8 %)	2 (9.5 %)	4 (9.5 %)	0 (0 %)	
Firm is multinational	No	56 (71.8 %)	15 (71.4 %)	29 (67.4 %)	12 (85.7 %)	2.737
	Yes	14 (17.9 %)	3 (14.3 %)	10 (23.3 %)	1 (7.1 %)	
	No info	8 (10.3 %)	3 (14.3 %)	4 (9.3 %)	1 (7.1 %)	

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EVALUATING MONETARY POLICY EFFECTIVENESS IN NORTH MACEDONIA: EVIDENCE FROM A BAYESIAN FAVAR FRAMEWORK

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Abstract

This paper has adopted a Bayesian FAVAR approach to examine the monetary transmission mechanism in North Macedonia. The model is based on a broad data set that encompasses 140 monthly time series spanning between January 2010 and January 2019. In particular, the impact of policy on bank portfolio variables, and the impact of policy on economic activity variables have been evaluated. Our findings show that monetary tightening, causes a fall in output, inflation rate, employment, bank lending, the stock of government securities held by banks, and equity prices. On the other hand, it increases short-term money market rates, lending rates, deposits, and only in the immediate aftermath of the key policy rate rise, the share of non-performing loans in the loan portfolio. The study is expected to provide useful input to monetary policy implementation in North Macedonia. The study as well enriches the literature in this domain by discussing the challenges facing monetary authorities of small open economies with fixed exchange rate regimes in understanding how their policy instrument work through the economy.

JEL Classification: *E52, E47*

Keywords: *Monetary transmission mechanism, FAVAR, Bayesian estimation, Monetary policy*

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1. Introduction

Understanding the monetary transmission mechanism in developing countries is rather challenging.

A fundamental consideration in the conduct of monetary policy is for central banks to develop robust estimates of the speed, direction, and relative strength of transmission of their policy actions. This is a notably complex task in developing countries where financial markets are shallow and underdeveloped, the economy is undergoing structural change and macroeconomic data limitations in terms of their completeness, timeliness, and accuracy are widespread. Moreover, the more extensive reliance on the remittance inflow in the less developed economies can also influence monetary transmission channels, thus eventually affecting the macroeconomic implications of monetary policy reactions (for more insight on the role of remittances on economic growth in SEE countries please refer to Bucevska (2022).

North Macedonia's monetary policy framework is centered on managing the exchange rate, with price stability as the primary objective. The monetary authority stands ready to sell/purchase foreign exchange in the FX market to maintain the exchange rate at its pre-announced level. By modulating the interest rate policy, and hence the amount of liquidity in the banking system, as operational targets, the National Bank strives to defend the fixed parity. The exchange rate serves as the nominal anchor or intermediate target of monetary policy.

Monetary policy implementation under an exchange rate peg as a commitment mechanism to achieve price stability is, nonetheless, more complex than a simple reaction in conformity with a certain monetary policy rule: the authorities need to not only manage the interest rate differential and close the inflation gap with the anchor country. They also must take into account the level of international reserves that are considered supportive of the credibility of the peg exchange rate arrangement (El Hamiani Khatat et al. 2020). The exchange rate targeting countries may face some operational and policy challenges, including the necessity for supportive fiscal policy, and a strengthened and coherent monetary policy framework (see, for instance, Mance et al. 2015) for an in-depth discussion on this particular aspect for the case of Croatia), the optimal choice of monetary policy reaction function, development, and implementation of sound strategies on managing interest rate and exchange rate and selection of liquidity management framework (El Hamiani Khatat et al. 2020).

This paper aims at observing the monetary transmission mechanism through the link between monetary policy instruments under the direct control of the central bank—i.e. the key policy interest rate—and the ultimate economic outcomes it is seeking to influence, typically economic activity and inflation.

The interest rate channel of monetary transmission suggests that central banks use their leverage over nominal, short-term interest rates, to affect the cost of capital, and consequently, purchases of durable goods and firm investments. Assumed short-run price stickiness implies that short-term interest rate changes influence the real interest rate. In turn, changes in the real interest rate strike firm investment and household spending decisions on durable goods. As a consequence, the level of aggregate demand and final output are both affected.

Central banks actively monitor a large set of macroeconomic time series. Therefore, monetary policy decisions are based on the information contained in not only a few key variables but many economic aggregates. In other words, the central banks set interest rates in a "data-rich environment" (Mönch 2005).

Against this background, Bernanke, Boivin, and Eliasz (2005) suggest coupling the benefits of factor analysis and structural VAR analysis by estimating a joint vector-autoregression of factors extracted from a large set of time series and perfectly observable economic variables such as the policy rate. They find their approach, which they label "factor-augmented VAR (FAVAR)" to be a practical choice for adequately identifying the monetary policy transmission mechanism.

Not only do FAVARs allow the proper identification of monetary policy shocks, but they also have other advantages over standard VARs which, intending to maintain the degrees of freedom, usually contain only a small bunch of variables. Namely, although a given notion can be approximated by many variables, it is generally not completely obvious which variable exactly should be employed as a measure of, for instance, output or inflation. Hence, by applying factor analysis to numerous proxies one can eliminate measurement error. Moreover, impulse response functions can be calculated for any variable in the informational data set.

This study is the first to research the monetary transmission mechanism in North Macedonia using fully-fledged FAVAR. The employed data set encompasses almost all relevant macroeconomic indicators (for more details, please refer to Table A.1. in the Appendix). Ultimately, the estimated factors are a proxy for the macroeconomic fundamentals. Therefore, this paper is assessing the impact of monetary policy on a subset of selected variables, while considering the broader macroeconomic environment.

Our findings show that monetary tightening

causes a fall in output, inflation rate, employment, bank lending, the stock of government securities held by banks, and equity prices. On the other hand, it increases short-term money market rates, lending rates, deposits, and only in the immediate aftermath of the key policy rate rise, the share of non-performing loans in the loan portfolio.

The remainder of the paper is structured as follows. The Literature Review section offers a comprehensive analysis of relevant literature on the subject. The Data and Methodology sections provide a perspective on the used data set, as well as a brief intro to Bernanke, Boivin and Eliasz (2005) approach used in this research. Results are presented and discussed with reference to the aim of the study in the subsequent section. The robustness check section provides some insight related to the alternative model specifications. The last section concludes the paper with final remarks and policy implications.

2. Literature review

Monetary transmission materializes along multiple channels: directly through the effect of interest rates on private consumption and investment decisions; indirectly through the impact of exchange rates on import prices and external competitiveness; through the volume and price of credit from the financial system; through asset price adjustments and wealth effects; and inflation expectations of the private sector (Li et al. 2016).

The propagation of monetary policy signals via these channels depends upon various factors, including financial markets development, the coherence and credibility of the monetary policy regime, and the uncertainties in the domestic and external economic environment (Li et al. 2016)

In what follows, we briefly synthesize the findings of selected empirical studies, which employ VAR methodology and its variants, including FAVAR models, to assess the operation of the interest rate channel of monetary policy. The rationale behind this is to achieve broader insight into the macroeconomic implications of monetary policy tightening cycles.

The interest rate channel of monetary policy transmission in advanced, as well as in emerging and developing countries is a widely exploited topic. On a sample of Euro area member countries, Mandler et al. (2016) use Bayesian vector autoregression (BVAR) with endogenous prior selection to model the dynamics of output, prices, and financial variables to an exogenous increase in the Eurosystem's monetary policy interest rate. In particular, the authors examine the cross-country disparities in monetary transmission across the "big-four" Euro-area countries (France, Germany, Italy, and Spain). To this end, they show that real output responds less negatively in Spain to monetary policy tightening than in the other three countries, while the reduction in the price level is weaker in Germany. In parallel, the findings point out that the rise in bond yields is stronger and more persistent in France and Germany compared to Italy and Spain.

Based on the global vector autoregressive model (GVAR), Georgiadis (2015) reports the existence of asymmetries in euro-area monetary policy transmission across individual Euro-area countries, attributable to the structural features of the economies, such as labor market rigidities and different industrial structures. Specifically, Euro area economies with a bigger proportion of aggregate output linked to sectors with interest rate-sensitive demand display a stronger transmission of monetary policy to real activity. Analogously, euro-area countries with more real wages and/or fewer unemployment rigidities are as well associated with stronger transmission of monetary policy to real activity.

Focusing specifically on the monetary policy transmission during financial crises, Jannsen et al. (2019) use panel VAR for twenty advanced economies to find that monetary policy shocks through the interest rate channel have significantly larger effects on output and prices during financial crises than during normal times. Based on different samples of emerging and developing countries, the SVAR models developed by Cevik and Teksoz (2012), Jain-Chandra and Unsal (2014), and Anwar and Nguyen (2018) confirm the effectiveness of the interest rate channel in transmitting monetary policy shocks to the real economy.

By employing VAR and vector error correction mechanism (VECM) methodology, Besimi et al. (2007) evaluate the monetary transmission operating in North Macedonia. The authors offer evidence for the functioning of multiple channels of monetary policy transmission: the Denar-Euro exchange rate, interest rate, money supply channel as well as currency substitution channel. The results show a weaker impact of interest rate changes on domestic prices, compared to the effects of exchange rate and money supply changes. Moreover, the authors find that devaluation raises currency substitution, which in turn attenuates inflationary pressures, concluding that currency substitution should be factored into monetary policy design in small open economies with fixed exchange rate regimes.

FAVAR literature on monetary transmission for countries with a fixed exchange rate regime is rather scarce. For example, Ljubaj (2012) estimates a

factor-augmented vector error correction model (FAVEC) to determine the impact of monetary policy on household and corporate loans in Croatia, while taking into account the overall macroeconomic developments. The paper confirms the existence of a long-run relationship between household loans, the macroeconomic environment factor, and the monetary policy indicator. At the same time, no such relation was confirmed for corporate loans. Impulse response functions estimated based on the FAVEC model showed that a restrictive monetary policy shock leads to a decrease in household loans, while a positive shock in the macroeconomic environment factor, which generally represents an increase in overall economic activity, has a favorable impact on bank loans to households.

The study by Potjagailo (2016) implements FAVAR model to explore spillover effects from Euro area monetary policy over thirteen EU countries outside the Euro area. An expansionary Euro area monetary policy shock is found to raise production in most non-Euro area countries, whereas short-term interest rates and financial uncertainty decline. Spillovers on production are larger in non-Euro area economies with higher trade openness, whereas financial variables react to a higher extent in countries with higher financial integration. Regarding the exchange rate regime, countries with fixed exchange rates show stronger spillovers both in terms of production and interest rates.

Relatedly, our study contributes to thus far limited research on FAVAR analytical method that focuses on the interest rate channel of monetary policy in a small open economy with a fixed exchange rate regime like North Macedonia.

3. Data

Our data set consists of 140 monthly macroeconomic time series for North Macedonia. The data sources include the State Statistical Office, the National Bank of the Republic of North Macedonia, the Macedonian Stock Exchange, and the European Commission. The data spans from January 2010 to January 2019. The starting point of the data set reflects the time when a more pronounced structural transformation of the Macedonian economy began. Furthermore, the series that display seasonal variation were adequately adjusted. Also, when plausible, we performed a logarithmic transformation to the series to achieve linearity. Additionally, non-stationary series have been transformed by taking the first difference and thus making them stationary. Finally, all the series used to compute the factors were standardized to have mean zero and unit variance, since factor extraction might be impaired by the different units and scales.

Following Bernanke, Boivin and Eliasz (2005) procedure, the data set is divided into slow-moving and fast-moving variables. Slow-moving variables are those which respond with lags after a shock in monetary policy (like for instance, production, prices, etc.). On the other hand, fast-moving variables are contemporaneously responsive to monetary policy, (i.e. they are highly sensitive to policy shocks and news), and might be represented by interest rates, financial assets, and exchange rates. The classification of variables between each category is provided in Appendix A.

4. Methodology

The methodology discussed in this section is an adaptation from Bernanke, Boivin and Eliasz (2005). Our empirical application follows the so-called "one-step" (joint estimation) approach to the estimation of monetary FAVARs.

As was already discussed, in FAVAR models, the information contained in a large data set is summarized by a few variables called factors, which are incorporated into a VAR model. This enables us to enlarge the data set employed in standard VAR models, and generate the response of hundreds of variables to monetary policy innovations. Bernanke, Boivin, and Eliasz (2005) assume that the joint dynamics of (Ft, Yt) is given by the following equation:

$$\begin{bmatrix} F_t \\ Y_t \end{bmatrix} = \phi(L) \begin{bmatrix} F_{t-1} \\ Y_{t-1} \end{bmatrix} + \mu_t \quad (1)$$

where $\phi(L)$ is a conformable lag polynomial of finite order d and the error term, μ_t, is mean zero with covariance matrix Σ. The vector Y_t contains M observable economic variables and the vector F_t represents K unobserved factors that are supposed to influence the economic variables. The factors can be thought of as unobservable concepts such as economic activity or investment climate, which cannot be represented by any observable macroeconomic series but instead several series of economic indicators. Subsequently, should the terms of $\phi(L)$ that relate Y_t to F_{t-1} all be zero, then equation (1) would be reduced to a standard VAR in Y_t. If Y_t is related to the lagged factors then equation (1) will be referred to as a factor-augmented vector autoregression, or FAVAR.

Equation (1) cannot be estimated directly because the factors F_t are unobservable. However, if we interpret the factors as representing forces that potentially

affect many economic variables, we may hope to infer something about the factors from observations on a variety of economic time series. For concreteness, suppose that we have available a number of background, or "informational" time series, collectively denoted by the N × 1 vector Xt.

The number of time series N in Xt is thus supposed to be big, and may well be bigger than T, the number of periods. Bernanke, Boivin and Eliasz (2005) assume that the time series in Xt is linked to the unobservable factors Ft and the observable economic variables Yt by an equation in the following form:

$$X_t = \Lambda f F_t + \Lambda y Y_t + e_t \quad (2)$$

where Λf is a $N \times K$ matrix of factor loadings, Λy is $N \times M$ and e_t is a $N \times 1$ vector of error terms that are assumed to be mean zero but may display some small degree of cross-correlation depending on the estimation method (i.e. depending on whether estimation is by principal components or likelihood methods). Equation (2) express the idea that both Yt and Ft, which can be correlated, summarize the common forces that drive the dynamics of the noisy measures of Xt.

Furthermore, to estimate equations (1) and (2) jointly via likelihood methods, a transformation of the model into a state-space form is needed. Also, in this method, the factors are effectively identified by both the observation equation and the transition equation of the state-space model. The instrumental to identification here is to make an assumption that limits the channels by which the Y's contemporaneously affect the X's. To this end, the joint likelihood estimation only necessitates that the first K variables in the data set are chosen from the set of "slow-moving" variables and that the recursive structure is imposed in the transition equation. The employed identification scheme is elaborated by Bernanke, Boivin and Eliasz (2005) in a detailed manner.

Additionally, following Bernanke, Boivin and Eliasz (2005) we assume that the policy rate is the only observable factor, i.e. the only variable included in Y_t. In doing so, we treat the policy rate as a factor and interpret it as the monetary policy instrument. This is based on the presumption that monetary policy has a pervasive effect on the economy.

The likelihood-based method used by Bernanke, Boivin and Eliasz (2005) is fully parametric and computationally more demanding. Although in principle the estimation of equations (1) and (2) jointly by ML is possible, assuming independent normal errors, Bernanke, Boivin and Eliasz (2005) argue that it is infeasible in practice due to the irregular nature of the likelihood function and the very large dimensions of this model.

The method they instead propose was developed by Geman and Geman (1984), Gelman and Rubin (1992), and Carter and Kohn (1994), and its application to large dynamic factor models is discussed in Eliasz (2002). Bernanke, Boivin and Eliasz (2005) implement a multi-move version of the Gibbs sampler in which factors are sampled conditional on the most recent draws of the factors. This Bayesian approach is undertaken to circumvent the high-dimensionality problem of the model by approximating marginal likelihoods by empirical densities. More details about the estimation procedure can be found in the appendix of the working paper version of Bernanke, Boivin and Eliasz (2005).

5. Results and discussion

Our FAVAR model aims at examining how far-reaching the effects of monetary policy are. Figure 1 shows the responses of a selection of macroeconomic variables to an increase of 0.25 p.p. in the key policy rate and the corresponding 90% confidence intervals.

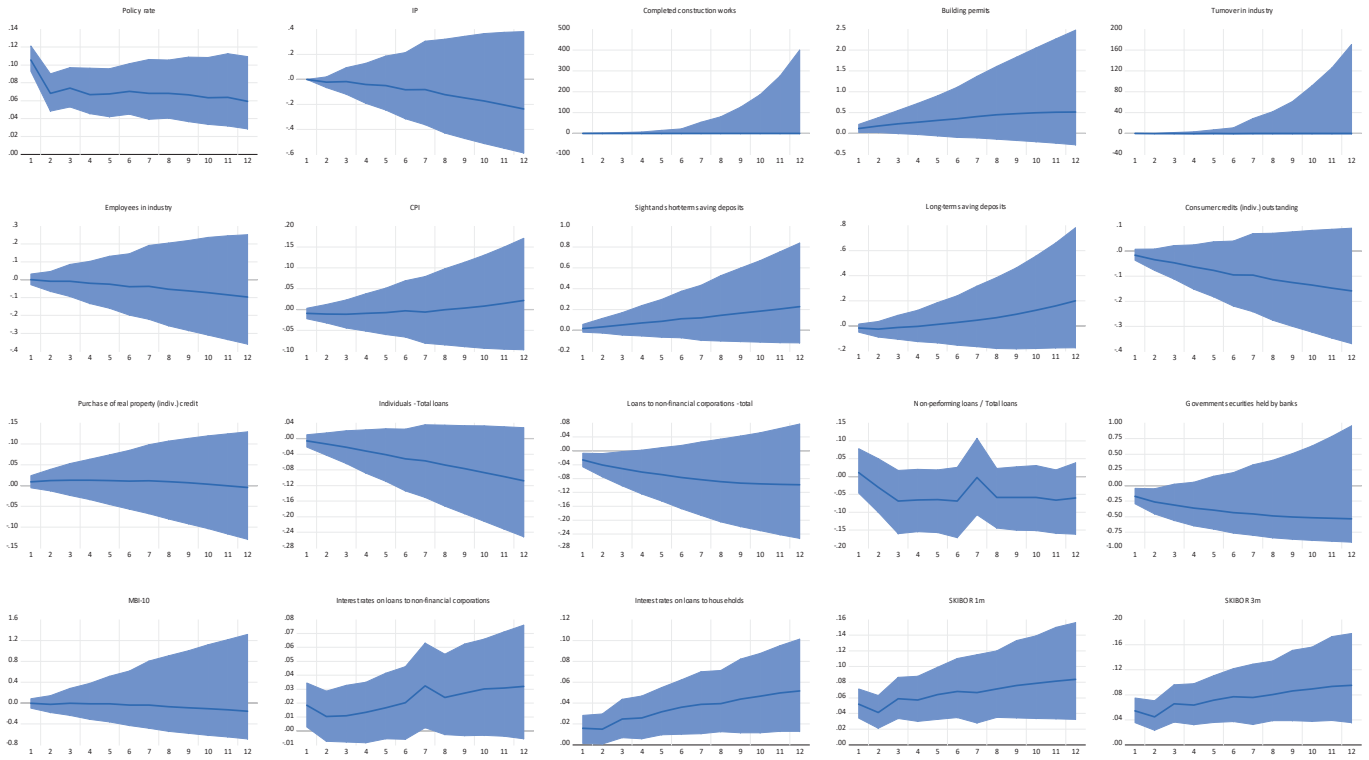
Briefly summarized, our results suggest that a tightening of monetary policy causes a fall in economic activity, employment, inflation rate, lending, the stock of government securities held by banks, and equity prices. On the other hand, the following increase: short-term money market rates (1M and 3M SKIBOR), lending rates, deposits, and only in the immediate aftermath of a monetary tightening, the share of non-performing loans in the loan portfolio.

To this end, apart from building permits, which follow a counter-intuitive pattern[1], impulse responses related to all other variables indicative of economic activity (i.e. industrial production; completed construction works; employment, and turnover in the industry) are not statistically significant, although they have signs in line with economic theory. Statistically, insignificant impulse responses could be a particular sample issue, especially having in mind the structural changes in the period under review and the underlying instability of factor loadings, which makes it difficult to come to more sound conclusions.

Next, the price puzzle is not present in our FAVAR model (meaning, it tends to produce results consistent with conventional wisdom). However, the impulse response function for the CPI inflation is not statistically significant, as well.

Proceeding further, Figure 1 provides the following explanations. For instance, the NPL ratio - its increase in the immediate aftermath of monetary tightening,

Figure 1. Impulse response functions of a bunch of economic activity and bank portfolio variables to a contractionary monetary policy shock (measured by a 0.25 p.p. increase in the 28-day CB bills interest rate), generated from the FAVAR model. The shaded area represents a 90% confidence band around the impulse response functions



in fact, a mathematical factuality, as the ratio itself is measured by non-performing loans (numerator) to total loans (denominator). As the latter decreases due to the subdued credit growth, the ratio levels up. But soon afterward, this ratio plunges into negative territory (i.e. after the initial worsening, it starts improving to some extent), suggesting the agent's ability to adjust their balance sheets.

Our findings show that promptly after the initial worsening of the NPL ratio, monetary tightening starts to work as a countercyclical tool to prevent the build-up of NPLs. This implies that across monetary tightening episodes, banks more credibly assess the quality of their assets. In other words, if anything, monetary tightening may be associated with reductions in NPLs as banks eventually become more inclined to consider a variety of options for refinancing and restructuring existing exposures. In parallel, the observed improvement of the NPL ratio, soon after its initial deterioration, might also be an indication that households and firms start rebalancing their balance sheets as well. In particular, higher borrowing costs might induce households and firms to gradually reduce leverage through the conventional intertemporal substitution effect. However, we must point out that the NPL ratio's reaction to monetary tightening is statistically insignificant.

Further, we find evidence that a tightening of monetary policy reduces the supply of bank credit (suggesting that the tightening of credit conditions—through higher rejection of loan applications, reduces the volume of new loans). However, statistically significant is solely the reaction of the total credits to non-financial corporations. In parallel, our results reveal an interesting dichotomy, firstly between, sight and short-term saving deposits on one hand and long-term saving deposits, on the other hand, and secondly between consumer loans on one hand and real estate loans for individuals, on the other hand. Hence, sight and short-term saving deposits increase immediately following monetary contraction, unlike long-term saving deposits that initially decrease as a reaction to a policy rate hike. Additionally, consumer loans decrease in response to monetary tightening, unlike the real estate loans for individuals that increase at first and then decline. However, none of these impulse-response functions are statistically significant.

Such seemingly counter-intuitive reactions observed in financial vehicles with longer maturities (i.e. long-term saving deposits and real estate loans

for individuals), is most probably an indication for separate dynamics of interest rates across the maturity spectrum. Namely, the dynamics of interest rates across different contract lengths depend on various other underlying factors such as prospects of economic growth, expectations regarding inflation and monetary policy, as well as risk preferences.

Another possible reason behind this could be the following. In the period under review, a massive shift towards both, longer-term saving and lending with fixed-interest rate arrangements are observed in banks' business practices in North Macedonia. Namely, in order to split the risk of monetary policy change with their customers, credit institutions offer implicit interest rate insurance to risk-averse borrowers. Hence, banks provide borrowers with fixed below-market rates during times of high market rates and get compensated when market rates fall below the initially provided fixed-rate (Gambacorta, 2004). Fixed below-market interest rates in the analyzed period are getting increasingly popular notably among the real estate loans to individuals in North Macedonia. Moreover, fixed interest rate deposits are also perceived by risk-averse individuals as an attractive investment avenue. To this end, the fixed interest rates guaranteed with certain long-term saving deposits, tend to be smaller compared with the variable returns of other financial vehicles. All these underlying factors (i.e. banks increasing orientation towards long-term businesses with households and firms) most probably make banks change these instruments' prices less frequently thus making the interest rate channel of the monetary policy less operational at the longer end of the maturity spectrum.

Furthermore, equities underperform during tight monetary policy periods. Namely, a monetary tightening lowers stock market valuation (Jarociński and Karadi 2018). The reasons are twofold: first, the present value of future cash flows declines due to the higher discount rate, which increases with both the higher real interest rates and the rising risk premia, and, second, a decline in the expected cash flows caused by the deteriorating outlook as a result of monetary tightening (Jarociński and Karadi 2018). Moreover, the unfaltering downward-sloping impulse response function of the MBI-10[2] might be an indication that investors have no confidence that the corporate earnings can absorb the impact of higher interest rates for a prolonged period around the policy announcement. However, this impulse response as well is not statistically significant.

Analogously, a drop in banks' holdings of government securities as a response to unexpected monetary tightening might to a large extent be perceived as a valuation/accounting effect, consistent with the finance theory. Namely, debt securities are inversely related to interest rates. Bond prices fall when the cost of borrowing money rises, and vice-versa. In North Macedonia, government securities pay a fixed interest rate. If interest rates rise, investors will no longer favor the lower fixed interest rate paid by a government bond, producing a decline in its price on a secondary market as a result. When interest rates rise, investors can obtain a better rate of return in other places, so the price of original bonds adjusts downward to yield at the current rate (i.e. investors would be prepared to buy on a secondary market a previously issued fixed coupon bond only if compensated by a higher yield/lower bond price). Therefore, monetary tightening reduces the market value of government securities, consequently reducing the nominal stock value of government securities held by banks. However, we must also point out that in general, the government securities holdings of commercial banks are subject to many other factors. Primarily it is banks' loan-government securities interest spread that largely accounts for the entire portfolio shift. Furthermore, the steepness in the term structure of the government securities could also have played some role. Also, the risk-weighted capital requirements may have influenced some banks' decisions to increase their holding of government securities. This impulse response function is statistically significant, but it should be taken with a reserve given that this particular channel of transmission is not that straightforward, i.e. a mix of possible factors is at play.

Finally, the employed interest rate variables (short-term money market rates as well as lending rates for both, non-financial institutions and households) display, with no exception, statistically significant, logical, and theory-implied impulse response paths.

6. Robustness check and limitations

A prominent practical issue to consider when using the FAVAR methodology is how many factors are needed to capture the information necessary to adequately model the effects of monetary policy (Bernanke, Boivin and Eliasz 2005). Therefore, we explored the sensitivity of the impulse response functions to an alternative number of factors. Hence, we estimated the corresponding FAVAR model with different number of factors to demonstrate how the inclusion of factors (i.e. information) can improve the results. To this end, we found that results are not robust to the use of more than three factors. Moreover, the FAVAR with one or two factors provides insensible

results too. We were experimenting with the number of lags included in the model, as well. With this regard, FAVAR with 7 lags produces economically and statistically the most reasonable impulse responses.

Regarding the number of lags, we employed lag orders of four to eight. We observed smaller overall scope of changes when the number of lags shifts from seven to eight as well as from seven to six as few impulse responses lose their significance. Next, we proceeded by increasing the number of factors up to five. Changing the number of factors to 4 or 5 does appear to change our results or interpretation qualitatively. This also applies to choosing 1 or 2 factors. So, the most crucial step of our analysis is to determine the number of factors to be included in our model. In general, the empirical literature does not (yet) generate a final solution to the determination of the number of factors. Therefore, as documented in Belke and Osowski. (2017), the ad hoc approach is most widely adopted by authors in choosing the number of factors (see, for example, Bernanke, Boivin and Eliasz (2005); Shibamoto, (2007), McCallum and Smets, (2007).

Overall, our benchmark specification (i.e. FAVAR with 3 factors and 7 lags) seems to provide a consistent and sensible measure of the effect of monetary policy. However, the sensitivity analysis introduced as a tool in the model validation process, suggests that the qualitative conclusions on the effect of monetary policy are altered by the use of both, the different number of factors, and the different number of lags.

In addition, in the period under review, the Macedonian economy has undergone a structural change. To this end, there is good reason to believe that particular methodological extensions to the employed approach that would allow for time variation in the coefficients and the variances of the shocks could be more suitable. However, even some more flexible specification for the transition equation (see. Mumtaz 2010) that accounts for the possibility of structural breaks in the dynamics that characterize the economy, may still not directly capture instability in the factor loadings. With these limitations in mind, the results should be taken as indicative, rather than precisely predictive.

Moreover, in this paper, we do not conduct the two-step estimation process, which could serve as an additional measure of robustness. It is important to note, that Bernanke, Boivin and Eliasz (2005) argue that although the two-step and one-step estimation methods yield slightly different responses for money aggregates and consumer price indexes, the overall point estimates of the responses are quite similar.

Lastly, although most studies argue that the FAVAR approach leads to better empirical estimates (Bernanke, Boivin and Eliasz 2005; Lombardi, Osbat and Schnatz 2010; Fernald, Spiegel and Swanson 2014) we still cannot exclude the possibility of a potential mismeasurement due to exclusion of certain series. In today's highly globalized World, central banks rely both on the country's economic state and on what is happening abroad. Variables such as the commodity price indices as well as the foreign interest rates may have a potential effect on monetary policy transmission. It may be particularly interesting to introduce foreign interest rates as exogenous policy shocks. This may constitute the object of future studies.

Against this backdrop, the current version of the FAVAR framework might be extended by the ECB key interest rate and the overall size of FX flows—related to current and capital account transactions, since the latter is the driver for arbitrage between the money and FX markets, in turn shaping the nature of monetary transmission (El Hamiani Khatat et al. 2020). By adding the FX flow to the framework, but also by adding certain global variables, such as the prices of food and energy commodities, the framework would become economically more consistent and flexible. Such an upgrade would enable the framework to cover a number of sources of shocks. Moreover, this type of extension will allow us to test the effect of the potential shocks on the FX flows, for example. FX flow is certainly part of the monetary policy reaction function in countries with a fixed exchange rate. The ability of the central bank to calibrate the interest rate to domestic conditions may be challenging, especially when FX reserves are low, and the economy is exposed to sizeable terms-of-trade shocks (El Hamiani Khatat et al. 2020).

Analogously, including especially the FX flow would be a great asset of this framework. With this regard, the current version of our research work corroborates with Potjagailo (2016), who analyzed the spillover effects from Euro area monetary policy across the EU, including the countries with fixed exchange rate regimes. Both studies lack the FX flow as a variable in the respective data set, so to this end, they share the same limitation.

In addition, when it comes to the prices of primary commodities, they are not explicitly included in the current version of the framework, but still, their impact is implicitly embedded through the movement of both, consumer and producer prices.

7. Conclusion

This study investigates the effectiveness of the transmission mechanism of interest rate policy in North Macedonia using the Bayesian Factor-Augmented Vector Autoregressive (FAVAR) approach launched by Bernanke, Boivin and Eliasz (2005). Moreover, this study fills the gap in the literature for North Macedonia as it assesses the effects of monetary policy conditioned on a richer information set. In parallel, the paper discusses the challenges facing monetary authorities of small open economies with fixed exchange rate regimes in understanding how their policy instruments work through the economy, thus contributing to the general knowledge base in this area.

The employed FAVAR generates responses of an extensive set of variables to monetary policy innovations, thus allowing for a more broad-based examination of the empirical plausibility of the model specification.

Our empirical application of the FAVAR methodology shows that a monetary tightening induces a fall in economic activity, inflation rate, employment, lending, the stock of government securities held by banks, and equity prices. On the other hand, the following increase: short-term money market rates, lending rates, deposits, and only in the immediate aftermath of a monetary tightening, the share of non-performing loans in the loan portfolio.

However, sensitivity analysis suggests that the qualitative conclusions on the effect of monetary policy are altered by the use of a different number of factors and lags. Moreover, some of the impulse responses are statistically insignificant. This might be a particular sample issue, notably having in mind the structural changes that occurred in the analyzed period and the underlying instability of factor loadings, which makes it unfeasible to come to more sound conclusions. Therefore, these results should be taken as indicative, rather than absolute and comprehensive.

In addition, we still cannot eliminate the possibility of a potential mismeasurement due to exclusion of certain series.

The findings corroborate with the empirical literature and economic logic, thus offering a more comprehensive view of the transmission mechanism and the effect of monetary policy on the economy of North Macedonia. Hence, the results could be of particular use and interest to the monetary policy authorities, during the creation and conduct of monetary policy.

Endnotes

1 The non-intuitive and statistically insignificant response of the number of building permits can be associated with the dominance of some discretionary factors. Namely, several big city councils introduced a temporary moratorium on the approval of new construction works. The purpose of the moratorium (which in some cases exceeds 2 years period) is to allow the cities time to further study the issues surrounding the soundness of the urban design.

2 Macedonian market capitalization-weighted stock market index that includes the 10 most actively traded shares.

Notes

* The views expressed in this paper are those of the authors and do not necessarily represent the views of the National Bank of the Republic of North Macedonia

* Jasna Tonovska is former National Bank of the Republic of North Macedonia employee

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APPENDIX

The Appendix provides a brief description of the data, whether it is assumed to be a slow (S) or a fast (F) moving variable and the transformations taken to induce stationarity. The transformation codes are 1 – no transformation; 2 – first difference; 4 – logarithm; 5 – first difference of logarithm.

Table A.1. Data Description

	Economic Activity	Fast or Slow	Transformation	Data Source
1.	The industrial production index, 2015=100 – Total	S	5	SSO
2.	The industrial production index, 2015=100 – Energy	S	5	SSO
3.	The industrial production index, 2015=100 – Intermediate goods, except energy	S	5	SSO
4.	The industrial production index, 2015=100 – Capital goods	S	5	SSO
5.	The industrial production index, 2015=100 – Durable consumer goods	S	5	SSO
6.	The industrial production index, 2015=100 – Non–durable consumer goods	S	5	SSO
7.	The industrial production index, 2015=100 – Mining and quarrying	S	5	SSO
8.	The industrial production index, 2015=100 – Manufacturing	S	5	SSO
9.	The industrial production index, 2015=100 – Electricity, gas, steam, and air conditioning supply	S	5	SSO
10.	The real index of completed construction works –Total	S	5	SSO
11.	The real index of completed construction works –Buildings	S	5	SSO
12.	The real index of completed construction works –Civil Engineerings	S	5	SSO
13.	Number of dwellings for which building permits are issued – North Macedonia	S	5	SSO
14.	Number of dwellings for which building permits are issued – Vardar	S	5	SSO
15.	Number of dwellings for which building permits are issued – East	S	5	SSO
16.	Number of dwellings for which building permits are issued – South-West	S	5	SSO
17.	Number of dwellings for which building permits are issued – South-East	S	5	SSO
18.	Number of dwellings for which building permits are issued – Pelagonija	S	5	SSO
19.	Number of dwellings for which building permits are issued – Polog	S	5	SSO
20.	Number of dwellings for which building permits are issued – North-East	S	5	SSO
21.	Number of dwellings for which building permits are issued – Skopje	S	5	SSO
22.	Turnover indices in the industry – Total	S	5	SSO
23.	Turnover indices in the industry – Intermediate goods, except energy	S	5	SSO
24.	Turnover indices in the industry – Capital goods	S	5	SSO
25.	Turnover indices in the industry – Durable consumer goods	S	5	SSO
26.	Turnover indices in the industry – Non-durable consumer goods	S	5	SSO
27.	Turnover indices in the industry – Mining and quarrying	S	5	SSO
28.	Turnover indices in the industry – Manufacturing	S	5	SSO
29.	Turnover indices in the industry on the non-domestic market – Total	S	5	SSO
30.	Turnover indices in the industry on the non-domestic market – Intermediate goods industries, except energy	S	5	SSO
31.	Turnover indices in the industry on the non-domestic market – Capital goods	S	5	SSO
32.	Turnover indices in the industry on the non-domestic market – Durable consumer goods	S	5	SSO

33.	Turnover indices in the industry on the non-domestic market – Non-durable consumer goods	S	5	SSO
34.	Turnover indices in the industry on the non-domestic market – Mining and quarrying	S	5	SSO
35.	Turnover indices in the industry on the non-domestic market – Manufacturing	S	5	SSO
36.	Indices of employees in industry, 2015=100 – Total	S	5	SSO
37.	Indices of employees in the industry, 2015=100 – Energy	S	5	SSO
38.	Indices of employees in the industry, 2015=100 – Intermediate goods, except energy	S	5	SSO
39.	Indices of employees in industry, 2015=100 – Capital goods	S	5	SSO
40.	Indices of employees in the industry, 2015=100 – Durable consumer goods	S	5	SSO
41.	Indices of employees in the industry, 2015=100 – Non-durable consumer goods	S	5	SSO
42.	Indices of employees in industry, 2015=100 – Mining and quarrying	S	5	SSO
43.	Indices of employees in the industry, 2015=100 – Manufacturing	S	5	SSO
44.	Indices of employees in the industry, 2015=100 – Electricity, gas, steam, and air conditioning supply	S	5	SSO
45.	Tourist arrivals – Total	S	5	SSO
46.	Tourist nights – Total	S	5	SSO
47.	Average monthly gross wage – Total	S	5	SSO
48.	Average monthly gross wage – Agriculture, forestry, and fishing	S	5	SSO
49.	Average monthly gross wage – Mining and quarrying	S	5	SSO
50.	Average monthly gross wage – Manufacturing	S	5	SSO
51.	Average monthly gross wage – Electricity, gas, steam, and air conditioning supply	S	5	SSO
52.	Average monthly gross wage – Water supply; sewerage, waste management, and remediation activities	S	5	SSO
53.	Average monthly gross wage – Construction	S	5	SSO
54.	Average monthly gross wage – Wholesale and retail trade; repair of motor vehicles and motorcycles	S	5	SSO
55.	Average monthly gross wage – Transportation and storage	S	5	SSO
56.	Average monthly gross wage – Accommodation and food service activities	S	5	SSO
57.	Average monthly gross wage – Information and communication	S	5	SSO
58.	Average monthly gross wage – Financial and insurance activities	S	5	SSO
59.	Average monthly gross wage – Real estate activities	S	5	SSO
60.	Average monthly gross wage – Professional, scientific and technical activities	S	5	SSO
61.	Average monthly gross wage – Administrative and support service activities	S	5	SSO
62.	Average monthly gross wage – Public administration and defense; compulsory social security	S	5	SSO
63.	Average monthly gross wage – Education	S	5	SSO
64.	Average monthly gross wage – Human health and social work activities	S	5	SSO
65.	Average monthly gross wage – Arts, entertainment, and recreation	S	5	SSO
66.	Average monthly gross wage – Other service activities	S	5	SSO
	Price			
67.	Consumer Price Index, 2010=100 – Total	S	5	SSO
68.	Consumer Price Index, 2010=100 – Food and non-alcoholic beverages	S	5	SSO
69.	Consumer Price Index, 2010=100 – Alcoholic beverages and tobacco	S	5	SSO

70.	Consumer Price Index, 2010=100 – Clothing and footwear	S	5	SSO
71.	Consumer Price Index, 2010=100 – Housing, water, electricity, gas, and other fuels	S	5	SSO
72.	Consumer Price Index, 2010=100 – Furnishings, household equipment, and routine maintenance of the house	S	5	SSO
73.	Consumer Price Index, 2010=100 – Health	S	5	SSO
74.	Consumer Price Index, 2010=100 – Transport	S	5	SSO
75.	Consumer Price Index, 2010=100 – Communication	S	5	SSO
76.	Consumer Price Index, 2010=100 – Recreation and culture	S	5	SSO
77.	Consumer Price Index, 2010=100 – Education	S	5	SSO
78.	Consumer Price Index, 2010=100 – Restaurants and hotels	S	5	SSO
79.	Consumer Price Index, 2010=100 – Miscellaneous goods and services	S	5	SSO
80.	Consumer Price Index, 2010=100 – Overall index excluding energy, liquid fuels and lubricants, and food	S	5	SSO
81.	Consumer Price Index, 2010=100 – Overall index excluding energy, liquid fuels and lubricants, and unprocessed food	S	5	SSO
82.	Consumer Price Index, 2010=100 – Overall index excluding energy, liquid fuels and lubricants, unprocessed food, tobacco, and alcoholic beverages	S	5	SSO
83.	Industrial producer price indices on the domestic market, 2015=100 – Total	F	5	SSO
84.	Industrial producer price indices on the domestic market, 2015=100 – Energy	F	5	SSO
85.	Industrial producer price indices on the domestic market, 2015=100 – Intermediate goods, except energy	F	5	SSO
86.	Industrial producer price indices on the domestic market, 2015=100 – Capital goods	F	5	SSO
87.	Industrial producer price indices on the domestic market, 2015=100 – Consumer goods	F	5	SSO
88.	Industrial producer price indices on the domestic market, 2015=100 – Durable goods	F	5	SSO
89.	Industrial producer price indices on the domestic market, 2015=100 – Non-Durable goods	F	5	SSO
90.	Industrial producer price indices on the foreign market, 2015=100, Total	F	5	SSO
91.	Industrial producer price indices on the foreign market, 2015=100, Intermediate goods, except energy	F	5	SSO
92.	Industrial producer price indices on the foreign market, 2015=100, Capital goods	F	5	SSO
93.	Industrial producer price indices on the foreign market, 2015=100, Consumer goods	F	5	SSO
94.	Industrial producer price indices on the foreign market, 2015=100, Durable goods	F	5	SSO
95.	Industrial producer price indices on the foreign market, 2015=100, Non-Durable goods	F	5	SSO
	Money			
96.	Monetary aggregate: M1	F	5	NBRNM
97.	Monetary aggregate: M2	F	5	NBRNM
98.	Monetary aggregate: M4	F	5	NBRNM
99.	Sight and short-term saving deposits (M2-M1)	F	5	NBRNM
100.	Long-term saving deposits (M4-M2)	F	5	NBRNM
	Credit			
101.	Individuals – Total loans – domestic currency	F	5	NBRNM
102.	Individuals – Consumer loans – domestic currency	F	5	NBRNM

103.	Individuals – Purchase of real property – domestic currency	F	5	NBRNM
104.	Individuals – Purchase of cars – domestic currency	F	5	NBRNM
105.	Individuals – credit cards; overdrafts; other loans – domestic currency	F	5	NBRNM
106.	Individuals – Total loans – foreign currency	F	5	NBRNM
107.	Individuals – Consumer loans – foreign currency	F	5	NBRNM
108.	Individuals – Purchase of real property – foreign currency	F	5	NBRNM
109.	Individuals – Purchase of cars – foreign currency	F	5	NBRNM
110.	Individuals – credit cards; overdrafts; other loans – foreign currency	F	5	NBRNM
111.	Consumer credit (individuals) Outstanding	F	5	NBRNM
112.	Individuals – Purchase of real property – Total	F	5	NBRNM
113.	Individuals – Total loans	F	5	NBRNM
114.	Loans to non-financial corporations – short-term, outstanding	F	5	NBRNM
115.	Loans to non-financial corporations – long-term, outstanding	F	5	NBRNM
116.	Loans to non-financial corporations –Total	F	5	NBRNM
117.	Total loans	F	5	NBRNM
118.	Non-performing loans/Total loans	F	1	NBRNM
119.	Government securities held by banks	F	5	NBRNM
	Financial Market			
120.	Macedonian stock exchange index – MBI-10	F	5	MSE
	Interest Rates			
121.	Interest rates on loans to non-financial corporations	F	2	NBRNM
122.	Interest rates on loans to households	F	2	NBRNM
123.	SKIBOR ON	F	2	NBRNM
124.	SKIBOR 1M	F	2	NBRNM
125.	SKIBOR 3M	F	2	NBRNM
	Exchange Rate			
126.	Foreign Exchange Rate: Switzerland (Denars per 1 Swiss Franc)	F	5	NBRNM
127.	Foreign Exchange Rate: USA (Denars per 1 US$)	F	5	NBRNM
128.	Foreign Exchange Rate: UK (Denars per 1 GB pound)	F	5	NBRNM
129.	NEER	F	5	NBRNM
130.	REER	F	5	NBRNM
	Expectations			
131.	SKIBOR 1M-SKIBOR ON	F	1	NBRNM
132.	SKIBOR 3M-SKIBOR ON	F	1	NBRNM
133.	Assessment of order-book levels – ind.	F	1	EC
134.	Assessment of export order-book levels – ind.	F	1	EC
135.	Assessment of stocks of finished products – ind.	F	1	EC
136.	Production expectations for the months ahead – ind.	F	1	EC
137.	Selling price expectations for the months ahead – ind.	F	1	EC
138.	Employment expectations for the months ahead – ind.	F	1	EC
139.	The Economic sentiment indicator (average = 100)	F	1	EC
	Key Policy Rate			
140.	28-Day CB Bills rate	F	1	NBRNM

The data sources include the State Statistical Office (SSO), the National Bank of the Republic of North Macedonia (NBRNM), the Macedonian Stock Exchange (MSE), and European Commission (EC).

Table A.2. Descriptive statistics

	Selected Variables	Mean	Median	Max	Min	JB	Prob.
1.	The industrial production index, 2015=100 - Total	96.2	96.8	120.9	68.8	1.2	0.5
2.	The real index of completed construction works - Total	70.6	66.2	184.1	14.7	12.3	0.0
3.	Number of dwellings for which building permits are issued – North Macedonia	544.9	501.0	1,591.0	165.0	68.6	0.0
4.	Turnover indices in the industry - Total	93.4	91.4	146.1	45.9	3.8	0.1
5.	Indices of employees in industry, 2015=100 - Total	97.7	98.7	110.0	88.1	4.2	0.1
6.	Consumer Price Index by COICOP, 2010=100 - Total	108.3	109.6	113.2	99.1	22.0	0.0
7.	Sight and short-term saving deposits	150,186.2	150,012.0	165,543.1	135,063.6	1.6	0.5
8.	Long-term saving deposits	64,216.6	69,370.2	103,614.4	22,028.8	8.0	0.0
9.	Credit to individuals - Purchase of real property - domestic currency	1,223.6	1,317.5	2,104.1	651.4	2.3	0.3
10.	Consumer credit (indiv.) outstanding	47,898.0	46,109.3	80,632.5	22,197.4	8.4	0.0
11.	Individuals - total loans	104,040.4	100,137.6	154,658.1	67,740.3	8.5	0.0
12.	Loans to non.fin.corp. - Total	140,699.9	144,712,4	167,764.6	109,701.5	7.7	0.0
13.	Non-performing loans/Loans	9.2	9.8	12.1	4.9	12.6	0.0
14.	Government securities held by banks	30,063.2	34,226.5	42,471.1	12,777.9	16.0	0.0
15.	MBI-10	2,175.2	1,981,5	5,617.8	1,583.7	22.3	0.0
16.	Interest rates on loans to non-financial corporations	6.8	6.9	8.8	4.6	5.6	0.1
17.	Interest rates on loans to households	7.7	7.5	10.9	6.0	7.0	0.0
18.	SKIBOR 1M	2.9	2.6	8.5	1.2	31.2	0.0
19.	SKIBOR 3M	3.4	3.1	9.3	1.5	20.6	0.0
20.	28-Day CB Bills rate	3.7	3.3	8.0	2.5	498.5	0.0

Note: The remaining variables are not reported for space reasons but are available from the authors upon any request.

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FORMAL INSTITUTIONAL FAILINGS AND INFORMAL EMPLOYMENT: EVIDENCE FROM THE WESTERN BALKANS

Colin C. Williams, Ardiana Gashi

Abstract

Institutional theory has explained informal employment to result from formal institutional failings. The aim of this paper is to identify the formal institutional failings associated with informal employment so that action can be taken by governments. Using the Tobit model for econometric analysis and reporting conditional and unconditional marginal effects of the 2021 Balkans Business Barometer survey conducted in six Western Balkan economies (Albania, Bosnia and Herzegovina, Kosovo, North Macedonia, Montenegro and Serbia), the contribution of this paper is to reveal that the perceived incidence and share of informal employment is significantly associated with businesses perceiving governance, public integrity and corruption as very negative or negative, the perception that the government does not consider business concerns and business dissatisfaction with public services. However, the perceived incidence and share of informal employment is not significantly associated with the views of business on tax rates and tax administration, or the perceived instability and lack of predictability of government. The theoretical and policy implications are then discussed.

Keywords: *informal economy; undeclared work; shadow economy; tax evasion; institutional theory; public policy.*

JEL classification*: H26, J46, K34, O17, P2*

1. Introduction

Over the past decade or so, informal employment has been predominantly explained using institutional theory as resulting from formal institutional failings. Until now, however, the specific formal institutional failings that result in businesses turning to informal employment has been seldom investigated empirically. The aim of this paper is to start to fill this gap. Reporting the results of the 2021 Balkans Business Barometer survey, this paper will evaluate in a Western Balkans context the validity of various formal institutional failings that institutional theory has proposed as being significantly associated with the incidence and share of informal employment.

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This will advance understanding of informal employment in three ways. Theoretically, although institutional theory has proposed various formal institutional failings that result in informal employment, these are often theoretical propositions and empirical evaluations in specific contexts are rare. This paper in the contemporary Western Balkans context evaluates which formal institutional failings are valid as determinants of informal employment in this context and which are not. Empirically, meanwhile, this paper reports a new data set, namely the Balkans Barometer survey, to explore which formal institutional failings are relevant. The novelty of this dataset is that whereas most studies are based on workers' views, this survey examines the views of business, who are the major instigators of informal employment. And third and finally, and in terms of policy, this paper begins to unpack the specific formal institutional failings that will need to be addressed by governments to tackle informal employment and how this can be done.

To commence, a literature review is provided of how institutional theory has explained informal employment along with hypotheses to test the various formal institutional failings that have been theoretically proposed as resulting in informal employment. This will be followed by a discussion of the data and methodology here used to evaluate these hypotheses in the Western Balkans. The third section then reports the results on which formal institutional failings are relevant and which are not in this context, followed by a discussion in the fourth and final section of the theoretical and policy implications of the findings.

At the outset, a brief definition of informal employment is required. Throughout this paper, and reflecting the consensus in both academe and practice, informal employment refers to employees not registered with the state for tax, social security and/or labour law purposes, when they should be registered (Gashi and Williams 2019; Krasniqi and Williams 2017). The result is that employees often have no written contracts or terms of employment.

2. Literature review

Previous reviews of the theoretical explanations of informal employment have revealed how the dominant theorisation has altered over time (Williams 2017, 2019). In the mid-twentieth century, modernisation theory dominated, representing informal employment as resulting from economic under-development and a lack of modernisation of governance. From the 1970s until the early twenty-first century, neo-liberal and political economy theories then competed for dominance, which respectively viewed the informal economy and informal employment as resulting from over- and under-intervention in formal work and welfare provision (see Williams 2012). From early in the twenty-first century until the present-day, institutional theory has become the dominant explanation, not least because it synthesises and incorporates the core tenets of these previous theorisations.

For institutional theorists, economies and societies are composed of both formal institutions that provide the legal rules of the game as well as informal institutions that provide the socially shared norms, values and beliefs (Baumol and Blinder 2008; Helmke and Levitsky 2004; North 1990). Informal employment takes place outside the formal rules but inside the rules of the informal institutions (Godfrey 2011; Kistruck et al. 2015; Siqueira et al. 2016; Webb et al. 2009; Welter et al. 2015). If there is symmetry between the formal and informal rules, then participation in informal employment would occur only unintentionally when businesses and employers are not aware of the formal rules. However, if there is an asymmetry between the formal and informal rules, participation in informal employment arises (Godfrey 2011; 2015; London et al. 2014; Webb and Ireland 2015; Webb et al. 2009, 2019; Williams and Shahid 2016; Williams et al. 2015; Windebank and Horodnic 2017). Indeed, the greater is the asymmetry between the formal and informal rules, the greater is the incidence and share of informal employment (Arendt et al. 2020; Horodnic and Williams 2022; Shahid et al. 2022; Williams and Franic 2015, Williams and Shahid 2016; Williams et al. 2014, 2015).

In recent years, there has been an emphasis in the institutionalist literature on this asymmetry. Less attention has been paid to the formal institutional failings. However, this asymmetry between the formal and informal rules is seen in institutional theory to be caused by formal institutional failings. Therefore, it is important to understand what formal institutional failings lead to this asymmetry and consequently informal employment. To identify these formal institutional failings, institutional theory has incorporated the determinants identified in the previous modernisation, neo-liberal and political economy theories and grouped them into four types of formal institutional failure (see Williams 2017, 2019):

(i) formal institutional resource misallocations and inefficiencies comprising indicators measuring the lack of modernisation of government and corruption.
(ii) formal institutional voids and weaknesses including measures of state intervention in work and welfare.

(iii) formal institutional powerlessness measuring the capacity to enforce law and regulations and the ability to provide incentives to encourage compliance.
(iv) formal institutional instability and uncertainty measuring the frequency of changing the laws and regulations.

Each is here considered in turn.

2.1. Formal institutional resource misallocations and inefficiencies

The formal institutional resource misallocations and inefficiencies discussed reflect the core tenets of modernisation theory. They involve the quality of public authorities and public sector corruption. The lack of modernisation of public authorities is seen to take at least three forms which lead businesses to believe that government does not at all consider business concerns. First, there is a perceived and/or actual lack of redistributive justice in relation to public services. Businesses do not perceive themselves as receiving the public goods and services they deserve given the level of tax and social contributions they make (Kinsey and Gramsick 1993; Richardson and Sawyer 2001; Thurman et al. 1984). This makes them more likely to use informal employment. Second, businesses do not perceive public services to treat them in an impartial, respectful, and responsible way (Braithwaite and Reinhart 2000, Murphy 2005). This again increases the likelihood of them using informal employment (Hartner et al. 2008; Murphy 2003; Murphy et al. 2009). Third, and finally, businesses do not view themselves as being treated in a fair manner relative to others (Kinsey and Gramsick 1993), which again increases the likelihood of using informal employment (Bird et al. 2006; McGee et al. 2008; Molero and Pujol 2012).

Resource misallocations and inefficiencies also arise when there is public sector corruption (Aidis and Van Praag 2007; Khan and Quaddus 2015; Qian and Strahan 2007; Round et al. 2008; Tonoyan et al. 2010; Williams et al., 2017). Here, three kinds of corruption are relevant. First is the misuse of public office for private gain (Bardhan 1997; Pope 2000; Shleifer and Vishny 1993; Svensson 2005). This is where public officials request or receive bribes, gifts, and other kinds of payment (e.g., a portion of a given contract) for a service provided. For businesses, this might produce the quicker provision of a public service, such as an operating license, or construction permit. This leads to resource misallocations and inefficiencies. Although businesses paying bribes to public officials have higher subsequent firm performance levels than those not doing so, the net impact on the overall economy is negative (Williams and Kedir 2016; Williams and Martinez-Perez 2016; Williams et al. 2016). A second kind of corruption, which is less researched, is state capture, where businesses influence the formulation of laws and policies to their advantage using illicit or non-transparent means (Fries et al. 2003). The result is their preferential treatment by the state, such as public resources being allocated to them. For those outside of this powerful elite, the outcome is frequently higher taxes, burdensome registration and licensing regulations and costs, thus providing a barrier to entry into the formal economy, and fewer state resources provided for the taxes and social contributions paid (De Soto 1989; Siqueira et al. 2016; Williams et al. 2016). The third and final type of corruption, again less studied, is when personal connections are used to circumvent formal procedures and/or gain preferential access to public goods and services (Efendic and Ledeneva, 2020; Ledeneva and Efendic, 2022). This is often termed *veze* in Serbia, Croatia, and Bosnia and Herzegovina, *vrski* in North Macedonia (Williams and Bezeredi 2017), and *vruzki* in Bulgaria (Williams and Yang 2017).

To evaluate formal institutional resource misallocations and inefficiencies as explanations for informal employment, the following hypothesis can be tested:

> *Resource misallocations and inefficiencies hypothesis* (H1): the perception that governance is poor and corruption exists, and that government does not at all consider business concerns, is associated with a higher perceived incidence and share of informal employment.
>
> *H1a:* the perception that governance is poor and corruption exists, is associated with a higher perceived incidence and share of informal employment.
>
> *H1b:* the perception that government does not at all consider business concerns is associated with a higher perceived incidence and share of informal employment.

2.2. Formal institutional voids and weaknesses

Another formal institutional failing seen to drive businesses to use informal employment are formal institutional voids and weaknesses. The earlier theoretical debate between the neo-liberal and political economy theories is essentially about which institutional voids and weaknesses produce larger informal economies.

Therefore, institutional voids viewed as weaknesses by some scholars are strengths for others. The core debate is whether informal employment results from too little state intervention, as political economy theorists state, or too much state interference, as neo-liberal theorists believe. Institutional theory positions this debate as being over the formal institutional voids and weaknesses that result in informal employment. Tax rates and the power of the tax administration are classic examples. Neo-liberals seek lower rates and involvement (De Soto 1989; Nwabuzor 2005) and political economy theorists higher rates and involvement (Castells and Portes 1989; Fernandez-Kelly 2006; Slavnic 2010) to reduce informal employment. To evaluate whether such formal institutional voids and weaknesses are associated with greater informal employment, the following hypothesis can be tested:

> *Formal institutional voids and weaknesses hypothesis* (H2): businesses viewing tax administration and tax rates as an obstacle are more likely to perceive the incidence and share of informal employment as higher.

2.3. Formal institutional powerlessness

A third formal institutional failing argued by institutional theory to result in informal employment is formal institutional powerlessness. Powerlessness here refers to the lack of capacity of public authorities to provide benefits of formality and prevent informality, so that businesses have a reason to comply. The outcome of powerlessness is thus low costs and high benefits of informality, along with low benefits and high costs of formality. For businesses, the benefits of formality might include property rights, access to credit, training, contracts with larger companies, access to public sector procurement contracts, and the ability to become more capital-intensive (Fajnzylber et al. 2011; Skousen and Mahoney 2015). When underdeveloped, the benefits of formality are outweighed by the costs of formality and benefits of informality. The result is the dissatisfaction of businesses with public services since they receive neither benefits from formality and a lowering of the costs of formality, nor action by the state to increase the costs of informality and lower its benefits. To evaluate the association between formal institutional powerlessness and informal employment, the following hypothesis can be tested:

> *Formal institutional powerlessness hypothesis* (H3): dissatisfaction with public services for businesses is positively associated with a higher perceived incidence and share of informal employment.

2.4. Formal institutional instability and uncertainty

The fourth formal institutional failing concerns the perceived and/or actual instability and uncertainty of the formal rules. Formal institutional instability and uncertainty results from continuous changes in laws and regulations (Levitsky and Murillo 2009; Williams and Shahid 2016). Both political and government instability have been revealed as strongly associated with the use of informal employment (Torgler and Schneider 2007, 2009). Businesses are confronted with constant changes in the formal rules, meaning that they do not expect today's rules to exist in the future (Hitt and Xu 2019; Urbano et al. 2019; Zhao and Li 2019). In these contexts when the formal rules continuously change and are unpredictable, businesses look elsewhere for a more permanent set of values, norms, and understandings about what is acceptable, namely informal institutions, which are seen as more enduring (Urbano et al. 2019). To evaluate the association between formal institutional instability and uncertainty and informal employment, the following hypothesis can be tested:

> *Formal institutional instability and uncertainty hypothesis* (H4): the perceived instability and lack of predictability of the government is positively associated with a higher perceived incidence and share of informal employment.

3. Data and methodology

3.1. Data

To evaluate these hypotheses regarding which formal institutional failings are associated with informal employment, a study of the Western Balkans is here undertaken. To do so, data is extracted from the 2021 Balkan Barometer Business Opinion survey conducted in six Western Balkan countries, namely Albania, Bosnia and Herzegovina, Kosovo, North Macedonia, Montenegro and Serbia. Some 1,200 enterprises were surveyed between December 2020 and February 2021. The sample is representative, extracted from the latest official data of the National Business Centre, in each of the economies. The survey was carried out on a face to face basis, information collected from a member of a company's management board/team, decision takers in the respective enterprises.

3.2. Variables

In the Balkan Barometer Business Opinion survey, no direct question was asked about their use of informal employment, doubtless due to a belief that businesses would not answer such a question. Instead, an indirect question was asked from which the dependent variable is here constructed, namely "what percentage of the total number of employees would you estimate a typical company in your area of business registers with the relevant authorities?". The compliance of businesses has been widely shown to be conditional on their perceptions of the behaviour of their peers (Alm et al. 1999; Chang and Lai 2004; Horodnic and Williams 2022; Lefebvre et al. 2015; Levenko and Staehr 2021; Mendoza Rodriguez and Wielhouwer 2015; Narsa et al. 2016; Traxler 2010; Williams and Horodnic 2021). If businesses believe that compliance is widespread, they too adhere to the rules (Alm 1999, 2012). However, if they believe non-compliance is widespread, they too are more likely to be non-compliant (Hallsworth et al. 2017). Therefore, this question on their perceptions of the degree to which peers register their employees with the relevant authorities is an excellent proxy indicator of their own use of informal employment.

Of the 1,200 enterprises interviewed, 436 did not respond to this question. Of the 756 responses, 151 are from Albania, 126 from Bosnia and Herzegovina, 105 from Kosovo, 164 from North Macedonia, 90 from Montenegro and 120 from Serbia. For the dependent variable, a continuous variable is constructed to measure whether they state there is informal employment in typical companies in their area and the percentage of the total number of employees they estimate a typical company in their area registers with the relevant authorities. This constructed dependent variable consists of 57% of responses with zero (due to non-response) and the rest with the proportion they report as unregistered ranging from 1 to 100%. The mean proportion of employees that businesses state is not reported by a typical company in their area to the relevant authorities is 39.7%. There are differences across countries: the highest share of enterprises that perceive that their competitors in their field of operation is found in Kosovo (74%), followed by Albania (44%), Serbia and North Macedonia (38% of respondents) with the lowest share found in Bosnia and Herzegovina and Montenegro (33%). Among those that perceived informal employment among their competitors, the highest share was found in Montenegro estimated as 49% of employees, followed by North Macedonia (47%), Kosovo with 45%, Bosnia and Herzegovina with 42% and lowest share is found in Albania with 28% of employees and Serbia with 30% of employees.

To examine determinants of the perceived incidence and share of informal employment in these Western Balkan economies, which has been shown above to be also a good proxy indicator of their own use of informal employment, a first set of explanatory variables relates to the formal institutional failings discussed above in the literature review. First, to test the resource misallocations and inefficiencies hypothesis (H1), a dichotomous variable is used equal to 1 for businesses that perceive government governance, public integrity and corruption as very negative or negative, or 0 otherwise (H1a) and a dummy variable equal to 1 for business that state that government does not take at all into account business concerns and 0 otherwise (H1b). Second, to test the formal institutional voids and weaknesses hypothesis (H2), a dummy variable equal to 1 for businesses that stated that taxes administration and tax rates are a major or moderate obstacle for the operation and growth of the business and 0 for those that do not consider them as barriers. Third, to test the formal institutional powerlessness hypothesis (H3), a binary variable is used to measure the role of quality of public business services which is 1 if businesses are dissatisfied with public services and 0 otherwise. Fourth and finally, and to test the formal institutional instability and uncertainty hypothesis (H4), a dummy variable is used equal to 1 for businesses that the instability and lack of predictability of government is a major or moderate obstacle for the operation and growth of the business and 0 for those that do not consider them as barriers.

A second set of explanatory variables relates to the characteristics of businesses previously identified as significantly associated with the incidence and share of informal employment in previous studies (Arendt et al. 2020; Horodnic and Williams 2022; Shahid et al. 2022; Williams and Shahid 2016; Williams et al. 2015). These include: the size of businesses with a dummy variable equal to 1 for businesses that have up to 9 employees and zero otherwise; the age of the businesses using a dichotomous variable equal to 1 one for business established after year 2000 and zero for those established up to year 2000; the gender of the owner with 1 is the owner/manager is a woman and 0 otherwise; and four sector dummies for agriculture, construction, manufacturing and trade.

The third and final set of explanatory variables relate to the economic conditions, using the two Balkan Business Sentiment Indices (BBSI) for the present

and expected situation, calculated by the Regional Cooperation Council who conducted the survey. Each Index is constructed from responses of respondents' experience with the general economic situation and the situation in their business with regards to development and demand for products or services over the past 12 months and those related to the respondents' expectations for the coming 12 months, again in terms of anticipated and the general economic situation in their place of living. The index can range from 0 that is worse, to 50 no change and 100 indicating a better perception. Given the pandemic context at the time of the survey and its potential influence on informal employment (Williams and Kayaoglu 2020), an additional variable related to the COVID-19 crisis was included whereby businesses were asked if the pandemic is an obstacle for their business operation and a dummy is defined set to 1 for those that responded positively to the question, and 0 otherwise. Finally, and to measure the hiring practices and the availability of labour, a binary variable is constructed equalling 1 for businesses that state that they would not hire a new graduate without a working experience and 0 otherwise.

Table 1 presents the descriptive findings. It displays that 57% of enterprises in the survey were micro enterprises, 72% were established after 2000, and 19% were managed by women. The Balkan Business present situation Index was 43 (that is far from good) while a higher score is found regarding future expectations. 7% would not hire a young new graduate without work experience and finally and 81% reported that COVID-19 is a major or moderate obstacle for the operation and growth of their business. Regarding the institutional explanatory variables, 58% of businesses

Table 1. Descriptive statistics

Variables	Mean, % survey sample	Regression sample	Firms perceiving informal employment
Business characteristics			
DV=1 if it is a Micro enterprises; =0 for small, medium and large enterprises	57%	54%	58%
DV=1 if enterprise established after year 2000;= 0 if established prior to year 2020	72%	73%	73%
DV=1 if Women is a manager of an enterprise; =0 if owned by a men	19%	18%	14%
4 industry dummies: Agriculture; Manufacturing; Construction and Trade DV			
Economic conditions			
Balkan Business Sentiment Index, present situation index	43	43	41
Balkan Business Sentiment Index, expectation index	51	51	53
DV=1 if COVID-19 a major or moderate obstacle for the operation and growth of the business; 0 if COVID-19 is a minor or not an obstacle	81%	80%	83%
DV=1 if enterprise Unlikely to hire a newly hired a graduate without work experience; =0 if likely to hire a graduate without a working experience	29.2%	29.5%	27.8%
The role of institutions			
DV=1 if Tax administration and tax rates are a major or moderate obstacle for the operation and growth of the business; =0 if tax administration and tax rates are a minor or not an obstacle for the operation and growth of the business	58%	57%	57%
DV=1 if Government governance, public integrity and corruption perceived as very negative or negative; -0 if government governance, public integrity and corruption perceived as neutral or positive	37%	37%	44%
DV=1 if Government does not take at all into account business concerns; =0 if government takes into account business concerns	25%	25%	27%
DV=1 if enterprise is Dissatisfied with public services for businesses; =0 if satisfied with public services for businesses	26%	25%	33%

Note: DV=Dummy variable

stated that tax administration and tax rates are a major or moderate obstacle for the operation and growth of the business; 37% rated as negative government governance, public integrity and corruption; 25% stated that government does not take at all into account business concerns, and 26% reported dissatisfaction with public business services.

Table 1 also shows the descriptive statistics for the regression analysis sample and for the sample of businesses that reported that their competitors use informal employment (and are thus likely to use informal employment themselves, as shown above). The descriptive statistics reveal that a higher share of businesses that perceive informal employment among their competitors are micro-enterprises, have been established after year 2000 but fewer are managed by women. A worse present situation is observed among businesses reporting the use of informal employment, but a better promising future business situation is observed. A higher share of businesses that report informal employment is used stated that COVID-19 is an obstacle, and a lower share of businesses were reluctant to hire a young unexperienced graduate. Regarding variables measuring the quality of institutions, among businesses that reported the use of informal employment, a higher share reported a negative assessment of government governance, a higher share considered that the government does not take business concerns into account, and a higher share were dissatisfied with public business services.

Overall, the Business Sentiment present and expectation indices are similar across economies but there are differences across other variables. COVID-19 is found to be an obstacle for a larger share of enterprises in Montenegro (91%) and among lower share of enterprises in Bosnia and Herzegovina (74%). With regards to the role of institutions set of variables, there are differences across countries: the highest share of enterprises considering tax administration and tax rates as an obstacle are found in Montenegro (76%) and lowest in Albania (49%). The highest share of enterprises perceiving government governance, public integrity and corruption as very negative or negative if found in Kosovo (52%) while the lowest in Serbia (18% of respondents). About half of enterprises in Kosovo consider that government does not take at all into account business concerns compared to 13% in Serbia. The share of enterprises not satisfied with public services for businesses ranges from 15% in Serbia to 35% in Kosovo.

3.3. Econometric methodology

To analyse the data, firstly, descriptive statistics have been used followed by an econometric methodology here described. The dependent variable consists of zero values for firms that do not report informal employment among competitors at all and continuous positive values for those that assert that informal employment is used. Given the presence of zero values for the dependent variable, using Ordinary Least Squares (OLS) would lead to negative fitted values (i.e., negative predictions for the dependent variable). Moreover, because the distribution of the dependent variable is "left-censored" at zero, y clearly cannot have a conditional normal distribution (Wooldridge 2002, p. 596). Even if the sample is restricted to only those observations with positive values of the dependent variable, the expected value of the dependent variable cannot have a linear relationship with the independent variables (Wooldridge 2002, p. 518). Coefficients should not be estimated by the sub-sample of observations with $y_i>0$, for two reasons. First, the observations with $y_i=0$ contain relevant information on the parameters and standard errors; and second, because in the sub-sample of observations with $y_i>0$ the error terms do not have a zero mean as they come from a truncated distribution (Heij et al. 2004, p. 495). Consequently, OLS – or any kind of linear regression – is not appropriate with a dependent variable of this type, because the coefficient estimates will be biased and inconsistent.

Therefore, we require a "corner solution model", of which the tobit model is the "canonical form" (Greene 2003, p. 778; Wooldridge 2002, pp. 518-19). The maximum likelihood (ML) estimation for tobit model involves dividing observations into two sets. The first set contains uncensored observations, which ML treats in the same way as any linear regression model (LRM); and the second set contains censored observations.

The tobit model provides unconditional marginal effects explaining two effects: first, the probability of a positive response (i.e., the probability of firms using informal employment based on the proxy indicator of whether they view competitors as doing so, as explained above); and second, for positive responses the impact of explanatory variables on, in our case, the share of informal workers. Tobin (1958, p.25) who developed the tobit model argued that because an explanatory variable may be expected to influence both the probability of a positive response and the observed value, it would be inefficient to throw away

information on the value of the dependent variable. Since both effects can be considered with the tobit model, this model will be used for the empirical analysis.

4. Findings

Interpreting tobit estimates is more difficult than interpreting linear regression coefficients because these do not directly measure the effects of interest (Wooldridge 2006, pp.597-598). The interest here is in explaining variations in observed informal employment. In the tobit model, estimated coefficients reveal the qualitative nature of the relationships (i.e., whether they are positive or negative) between changes in the independent variables and observed variations in the dependent variable. However, these relationships are best quantified by two marginal effects, namely the "conditional" effects that estimate changes in the expected (or predicted) prevalence of informal employment for those workplaces in which informal employment is reported; and "unconditional" effects that account in addition for the effect of changing values of the independent variables on the probability that workplaces engage in informal employment (i.e., will change from zero to positive and thus observable). Table 2 provides the findings from the main tobit model and separately the conditional and unconditional ones.

Table 2. Empirical results, tobit model

	Main Tobit model			Unconditional MFX			Conditional MFX		
	Coef.	St.error		Coef.	St.error		Coef.	St.error	
Business characteristics									
Micro enterprise	6.34	1.40		2.78	1.99		2.10	1.50	
Established after year 2000	-2.81	-0.55		-1.23	2.23		-0.93	1.68	
Managed by women	-17.33	-3.00	***	-7.61	2.52	***	-5.74	1.90	***
Agriculture sector	-9.09	-0.61		-3.99	6.54		-3.01	4.93	
Manufacturing sector	8.40	1.32		3.69	2.78		2.78	2.10	
Construction sector	11.82	1.71		5.19	3.03		3.92	2.29	
Trade sector	1.58	0.29		0.69	2.41		0.52	1.82	
Economic conditions									
Business Sentiment Index-Present situation	-0.22	-1.52		-0.09	0.06		-0.07	0.05	
Business Sentiment Index-Expectation index	0.14	1.29		0.06	0.05		0.05	0.04	
COVID-19 *a major or moderate* obstacle for the operation and growth of the business DV	1.55	0.25		0.68	2.73		0.51	2.06	
Unlikely to hire a newly hired a graduate without work experience DV	-9.91	-1.95	*	-4.35	2.23	*	-3.28	1.68	**
The role of institutions									
Government governance, public integrity and corruption perceived *as very negative or negative*	11.07	1.99	**	4.86	2.44	**	3.67	1.84	*
Government *does not take at all* into account business concerns	9.42	1.64	*	4.14	2.52		3.12	1.90	*
Taxes administration and tax rates are *a major or moderate obstacle* for the operation and growth of the business DV	-6.01	-1.23		-2.64	2.14		-1.99	1.62	
Instability and lack of predictability of the government	-6.69	-1.26		-2.94	2.34		-2.22	1.76	
Dissatisfied with public services for businesses DV	9.46	1.76	*	4.16	2.36	*	3.14	1.78	*
Number of observations	518			518			518		

Note: *, **, *** significant at 10, 5 and 1% level.

The tobit model relies crucially on normality and homoscedasticity in the underlying latent variable model. If any of the assumptions fail, then it is unclear what the tobit MLE is estimating (Wooldridge 2006, p.602; Verbeek 2004, p.225). Since the data are left and right-censored, the conditional moment test used for tobit model to test the null hypothesis that the disturbances have normal distribution cannot be applied. As for the homoscedastacity assumption, Greene (2003, p.768) states that marginal effects in the heteroscedasticity model will generally be very similar to those computed from the model which assumes heteroscedasticity. Wooldridge (2002, p.534) argues the same; namely that the partial effects could be similar even though the estimates of coefficients might be very different. To avoid inconsistent parameter estimates resulting from heteroscedasticity, Beckmann (2002) computed the White's asymptotic covariance matrix for the tobit model. However, Greene (2002, E21-12) states that "the specification of the censored normal regression model is fragile, and robust estimation of the asymptotic covariance is essentially a moot point". Following this discussion, since we are interested in the marginal effects, heteroscedasticity is not a major concern.

Table 2 reports the findings. Among business characteristics, it is found that businesses managed by women report a significantly lower incidence and share of informal employment in the field they operate. There is no statistically significant difference in relation to either firm size, age of business or the sector of the businesses. Economic conditions measured through the Business Sentiment present and expectation index do not have an impact on informal employment perceived by enterprises in the field they operate, and neither does whether COVID-19 is seen as a major or moderate obstacle for the operation and growth of the business. An interesting finding regards the variable included to measure the relevance of the perceived quality of education. It is found that firms that would not hire a graduate without work experience (i.e., interpreted as a measure of lack of education system to prepare graduates for real world of work) are expected to have a lower probability and share of informal workers. Having difficulties finding skilled workers from the education system, businesses provide good working conditions in this case a contract to maintain their workers.

Turning to the hypotheses, Table 2 reveals that some formal institutional failings are significantly associated with the incidence and share of informal employment perceived by enterprises in the field they operate and others are not. Businesses that perceive government governance, public integrity and corruption perceived as very negative or negative are significantly more likely to perceive the incidence and share of informal employment as higher (confirming H1a). Businesses that consider that the government does not consider business concerns are also significantly more likely to perceive the incidence and share of informal employment as higher. However, there is no significant association between businesses viewing tax administration and tax rates as an obstacle and their perceptions of the incidence and share of informal employment (refuting H2). Businesses dissatisfied with public services are nevertheless significantly more likely to perceive the incidence and share of informal employment as higher (confirming H3) but there is no significant probability of perceiving the incidence and share of informal employment as higher among businesses viewing the instability and unpredictability of government as a problem (refuting H4).

5. Discussion and Conclusions

This paper has evaluated in a Western Balkans context the validity of various formal institutional failings that institutional theory has proposed as being significantly associated with the incidence and share of informal employment. It has revealed that the perceived incidence and share of informal employment in these Western Balkan economies is significantly associated with some formal institutional failings but not others. The perceived incidence and share of informal employment are significantly associated with resource misallocations and inefficiencies, namely the perception that government governance, public integrity and corruption perceived is very negative or negative, and the perception that the government does not consider business concerns. The incidence and share of informal employment are also significantly associated with formal institutional powerlessness expressed in business dissatisfaction with public services. However, the perceived incidence and share of informal employment are not significantly associated with either the formal institutional voids and weaknesses measured in terms of their views of tax rates and tax administration, or the instability and lack of predictability of government.

Theoretically, the implication is that not all formal institutional failings used by institutional theory to explain the perceived incidence and share of informal employment are relevant in all contexts. In the Western Balkans, only formal resource misallocations and inefficiencies and formal institutional powerlessness are valid, and not formal institutional voids and

weaknesses, or the instability and lack of predictability of government. Whether this is similarly the case in other contexts now needs to be evaluated. It also needs to be evaluated whether the same findings apply when a wider range of measures are used to evaluate each of these formal institutional failings.

Turning to the policy implications, the tentative finding is that not all formal institutional failings require action in the Western Balkans, but only formal resource misallocations and inefficiencies and formal institutional powerlessness. To improve formal resource misallocations and inefficiencies in the form of governance, public integrity and corruption, as well as the perception that the government does not consider business concerns, at least three institutional reforms can be pursued:

1. Procedural justice can be improved, meaning that businesses, employers, workers, and citizens are treated in an impartial, respectful, and responsible way by public authorities, thus marking a paradigm shift from a "cops and robbers" mentality to a service-oriented perspective.
2. Procedural fairness can be enhanced, meaning that businesses, employers, workers, and citizens view the social contributions they make as fair compared with what others pay.
3. Redistributive justice can be improved, meaning that businesses, employers, workers, and citizens view the public goods and services received as appropriate for the social contributions made.

When doing so, it is important to differentiate between the reform of input public authorities, which cover the legislative and executive branches of government and produce policies, and the reform of output public authorities, which deliver public goods and services decided on the input side, such as tax administrations, labour inspectorates, and courts (Rothstein 2005). Examining 92 countries between 1981 and 2014, Koumpias et al. (2020) find that trust in output authorities (e.g., tax administrations, labour inspectorates) has a significantly larger impact on compliance. Therefore, these should be the focus of attention. This reinforces the wider finding that when output authorities (e.g., tax administrations) treat businesses more as partners and are customer-friendly, and build a relationship of trust, the result is greater voluntary compliance (e.g., Kirchler et al. 2008; Kogler et al. 2016).

There is also a need to address formal institutional powerlessness which involves changing the low costs and high benefits of informality, along with the low benefits and high costs of formality. There is now a large literature on the Western Balkans highlights how this involves public authorities increasing the perceived and actual effectiveness of deterrence measures such as penalties and the risk of detection and using preventative policy measures to make formality easier and more beneficial. For in-depth reviews on how this can be achieved in each Western Balkan economy, see Efendic and Williams (2018) on Bosnia and Herzegovina, Gashi and Williams (2018) on Kosovo, Katnic and Williams (2018) on Montenegro, Kosta and Williams (2018) on Albania, Radulovic and Williams (2018) on Serbia and Mojsoska Blazevski and Williams (2018) on North Macedonia.

If this paper encourages similar research on identifying which formal institutional failings are significantly associated with the incidence and share of informal employment in other regions, and which are not, to build up a better model of the contexts in which different formal institutional failings are valid determinants, then this paper will have achieved one of its objectives. If this paper also encourages public authorities to focus their attention on correcting the formal institutional failings which are significant in determining informal employment, then it will have achieved its wider intention.

Finally, it is important to note a limitation of this analysis is that the dependent variable is a proxy of participation to informal economy, measured by the perception of the managers about the share of informal employment for companies similar to their, hence the variable is not the direct participation of that specific business to the informal economy. Another limitation is related to sample size, with only 200 companies in each economy.

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AN UP-TO-DATE OVERVIEW OF THE MOTIVATION-PERFORMANCE RELATIONSHIP: A STUDY ON THE BOSNIAN BANKING SECTOR

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Abstract

This study aimed to examine the effect of motivation on work performance. A quantitative research was conducted with the participation of 188 employees working at Ziraat Bank of Bosnia-Herzegovina through a questionnaire consisting of demographic information form, performance, and motivation scales.
The study concluded that gender, age, and duration of service in the current institution did not significantly affect performance and motivation. However, education level, marital status, income level, and total work experience made a significant difference in task performance, motivation, intrinsic motivation, and extrinsic motivation, respectively.
Moreover, while a moderately positive relationship was found between task performance and intrinsic motivation, contextual performance was determined to be associated with intrinsic and extrinsic motivation moderately and weakly, respectively. On the other hand, work performance had a moderate positive relationship with job motivation. According to the result of regression analysis, job performance is affected positively by intrinsic and negatively by extrinsic motivation.

Keywords: *Bosnia and Herzegovina, Ziraat Bank, Motivation, Work Performance, Intrinsic Motivation, Extrinsic Motivation*

JEL Classification Code*: D23*

1. Introduction

In today's competitive business environment, organizations develop various strategies in order to survive and get ahead of their competitors. In this context, regardless of size and market, all companies try to establish a strong and positive relationship with their employees and encourage them to fulfill their duties with high performance. One of the common features of successful companies is their consideration of employees as their primary asset and their continuous attempt to maximize employee performance. "After all, the performance of an entire organization depends on the behavior of each employee" (Bieńkowska and Ignacek-Kuźnicka 2020).

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For this reason, it is vital to have a good grasp of factors affecting employee performance. Motivation ranks high among these factors for any type of organization (governmental, for-profit, or non-governmental) (Aarabi et al. 2013). Until very recently, managers focused on analyzing the technological and mechanical capacities of their organizations in-depth but neglected their human capital (Brown 2011). However, it has been observed that increasing employee motivation over time can increase creativity, innovation (Fischer, Malycha, and Schafmann 2019), employee commitment, involvement, and performance, as well as the performance of the organization as a whole (Cerasoli et al. 2014). Motivation could be seen as "the heart of organizational behavior" (Gagné, Deci, and Ryan 2018) because it initiates the direction, intensity, and persistence of human behavior (Deci et al. 2017).

Thus, the motivation-performance relationship has come to the fore as a research problem. It is argued that employee motivation is an important internal control tool and must be maintained in order to increase employee loyalty, productivity, and efficiency. It functions as an important component of outcome-oriented management in an enterprise and contributes to the achievement of organizational goals (Koontz 2010). Although the effect of motivation on performance could be positive, the magnitude of the effect also appears as another critical research question.

In this study, it was aimed to examine the effect of motivation on employee performance. The main question of the research is how motivation (with its intrinsic and extrinsic dimensions) affects work performance (with its contextual and task dimensions) and the magnitude of this effect. In the conceptual part of the study, the concept of motivation, types of motivation and motivational tools were introduced; later previous studies on the relationship between motivation and performance were presented to the reader. In the application part of the study, a quantitative research was conducted with the participation of 188 employees working in Ziraat Bank branches in Bosnia-Herzegovina. A questionnaire consisting of demographic information form, performance, and motivation scales was applied to the employees. The collected data was analyzed with the help of SPSS software. The results were explained in the findings section of the study, and in the conclusion section, they were compared with similar studies in the literature. The conclusion part was enriched with implications and research suggestions.

There are many studies in the literature examining the relationship between motivation and job performance (Örücü and Kambur 2008; Onay and Ergüden 2011; Abdulsalam and Mawoli 2012; Muogbo 2013; Altındağ and Akgün 2015; Öztürk 2019; Bieńkowska and Ignacek-Kuźnicka 2020; Uka and Prendi 2021; Kargün and Koç 2021). These studies have been carried out in various regions of the world and various sectors. However, this study aims to contribute to the literature as a specific study conducted in Bosnia-Herzegovina in the financial sector. To our knowledge, plenty of studies exist on employee motivation or job performance of businesses operating in Bosnia and Herzegovina. On the other hand, a single study aiming to understand the relationship between motivation (including intrinsic and extrinsic sides of motivation) and performance (including contextual and task performance) is not available. Moreover, existing studies are conducted in many other sectors yet financial institutions.

Accordingly, this research tries to answer two main questions:

1. What is the impact of employee motivation (with intrinsic and extrinsic motivation dimensions) on job performance (with contextual and task performance dimensions)?
2. Does employee motivation (with intrinsic and extrinsic motivation dimensions) and job performance (with contextual and task performance dimensions) differ based on demographic variables?

2. Theoretical Background and Literature Review

2.1. The Concept of Motivation

The term motivation was firstly used by psychologists in the early 1880s. Derived from the Latin word "movare," it refers to both motive and movement. The word "motivation" is also used in the meaning of "directing, activating, encouraging, and desire" (Ruthankoon and Ogunlana 2003, p. 333). The concept of motivation has been a research subject by psychologists as well as social theorists in the later periods (Forgas et al. 2005).

Motivation is extremely difficult to define, as many researchers from different disciplines have investigated it. Motivation can be defined as taking action to meet a psychologically or physiologically unsatisfied need (Luthans 1992). It is the driving force needed for a movement. When the definitions are examined, it is revealed that there are three main factors underlying motivation (Tınaz 2005):

i. The activation of some forces in the inner world of the individual with an external effect and display of the desired behavior,

ii. Directing the behavior in order to reach a particular goal and purpose,
iii. Continuation of the behavior by the individual towards the goal.

There are four stages of the motivation process: need, stimulation, behavior, and satisfaction (Sabuncuoğlu and Tuz 2005). Being individual-specific is one of the essential features of motivation. The factors that motivate each individual may not be the same. On the other hand, there is a strong relationship between positive attitudes, performance, and motivation (Özer and Topaloğlu 2008).

2.2. Types of Motivation

Thanks to motivation, the process required for behavior in line with the goal is initiated, and this process is maintained (Selen 2012). Factors that provide and maintain motivation are called motives or motivators. The types of motives argued in the literature are listed below:

Internal Motives: Unconscious behaviors that are not based on learning processes and arise from the natural needs of the individual are called internal motives.

Physiological Motives: Physiological motives are also called organic motives. They arise due to the basic needs of the organism, which have to be met in order to continue living.

Social Motives: The most important and distinctive characteristic that makes people different from animals is the social life that emerges from conscious relationships. Social motives are expressed as motives considering other people.

Psychological Motives: While physiological motives are inborn, psychological motives are learned and gained by experience. Besides, they are more challenging to detect than social and physiological motives.

2.3. Intrinsic vs. Extrinsic Motivation

Motivational forces could be classified as either extrinsic or intrinsic (Pinder 2011). While behaviors motivated extrinsically are rooted in the availability of incentives referring to an instrumental gain or loss, intrinsically motivated behaviors are based on embedded satisfaction, fun, or challenge rather than some consequences. Self-Determination Theory, introduced by Ryan and Deci (2000), discusses the advantages of intrinsic motivation and the side effects of extrinsic motivation. According to the SDT, the use of extrinsic rewards is efficient yet not sufficient for the purpose of sustainable motivation. Furthermore, while intrinsic motivation contributes to the quality of work, incentives contribute to the quantity of work.

Thus, we hypothesize the following:

Employee motivation (with intrinsic and extrinsic motivation dimensions) varies based on demographic factors such as age, gender, educational background, etc.

2.4. Motivational Tools

Maintaining the effectiveness and willingness of employees in a workplace could be the primary goal of motivation. Motivation could emerge and sustain by many motivational tools that are not in competition but complementary to each other (Robbins and Judge, 2012). However, these tools do not always show the same effect. A tool that is important to one may not be necessary to another. Furthermore, the value attributed to the tools differs with respect to the individual's values, educational status, or social and environmental factors. Although it is accepted that there are a number of universal factors related to motivation, it is not easy to create business-specific, community-specific, and individual-specific motivational tools. Motivational tools, which are determined by different studies and differ in terms of their importance, are categorized into three: organizational/managerial tools, psychosocial tools, and economic tools (Şimşek et al. 2014; Tüz and Sabuncuoğlu 2005).

2.5. Functions of Motivation

Motivation is closely related to many organizational goals. The most important ones of these goals are to ensure the enterprise's continuity, reduce labor turnover, and provide productivity, profitability, and efficiency.

Firstly, employee motivation is a critical tool in the continuity of an enterprise. When employees are motivated to work, they are likely to be more determined, productive, and innovative. On the other hand, unmotivated employees spend less time and effort and avoid work as much as possible (Wigfield et al. 2004). Michael and Crispen (2009) stated that having a motivated workforce provides the organization with a strong competitive advantage.

The turnover rate is among the most important indicators of the success of a company's human resources strategies and policies. A high ratio means

that the company loses its knowledge and experience resource and, therefore, its competitive power day by day. Understanding the turnover rate and taking the proper measures will not only increase the satisfaction and loyalty of the employees but also provide permanent and significant financial benefits to the business in the long term. (Akyazı and Ertör 2010). Musah and Nkuah (2013) found that employees' dissatisfaction with the motivational factors in the workplace leads to a high turnover. Vnoučková and Klupáková (2013) determined that the implementations directed to increase satisfaction and motivation are affecting employees' decision to remain in their current job position.

The ratio of output to the amount of the factors consumed for the occurrence of this output is called productivity. Michie, Oughton, and Bennion (2002) argue that increasing motivation will directly affect productivity through more effort and innovation. In addition, motivation leads to productivity due to a high-performing employee who does the best at his job, saves time and effort, and is willing to do more than needed.

Profitability indicates the net profit ratio obtained to the amount of capital expended. It shows the utilization level of capital as a percentage (Yazıcı 2009). The primary goal of all businesses is profitability. Unprofitable businesses cannot continue their activities. Whether it is a small or large manufacturing or commercial enterprise, managers need to benefit from their employees efficiently and effectively to achieve business goals. This could be generated by increasing the motivation of the employees (Genç 2007).

Since organizations include individuals and groups, organizational activity includes individual and group activities. However, organizational activity is more than the sum of group activity and individual activity. This is because organizations exhibit a higher level of performance than the sum of their components' performances due to synergistic effects (Ekinci and Yılmaz 2002). In this context, it can be expected that efficiency will be high in organizations consisting of individuals with high motivation.

2.6. The Concept of Performance

Performance could be expressed as the level of completion of a planned task and the employee's behavior. It is defined as "the qualitative or quantitative results of the actions and efforts shown by the individual or the group in a certain period of time" (Uysal 2015, p. 33). From a more comprehensive point of view, performance is the utilization of goods, services, or thoughts in line with the fulfillment of the task and the achievement of the goal in order to reach the criteria previously set (Helvacı 2002).

Organizations need high-performance employees in order to provide services and products, reach their goals, and ultimately gain a competitive advantage. Moreover, a high level of performance leads individuals to a higher level of satisfaction (Sonnentag and Frese 2003).

While employee performance deals with the goal attainment of an individual in an organization, the organizational performance includes subjects related to general management, such as efficiency, quality, and market results, such as consumer satisfaction, market share, sales, profit, and financial returns (Uysal 2015).

2.7. Task vs. Contextual Performance

Borman and Motowidlo (1993) defined a two-factor theory of job performance, including task and contextual performance dimensions. Task performance has been defined as the behavior directly linked to the completion of the job. Task-related behaviors contribute to the organization's technical core activities. It is often considered a formal requirement of an individual's job described by the job description. On the other hand, contextual performance refers to an employee's individual performance. It maintains and enhances an institution's social network and the psychological environment that supports technical tasks. Although it significantly contributes to the organization's effectiveness, it includes activities out of formal job duties written in the job description.

Thus, we hypothesize the following:

Job performance (with contextual and task performance dimensions) varies based on demographic factors such as age, gender, educational background, etc.

2.8. Literature Review

In the literature, there exist many studies on how employee motivation affects job performance. Some of these will be discussed within the scope of our research.

Tanrıverdi and Oktay (2001) studied participative decision-making in hotel management, one of the organizational-managerial motivation factors. The researchers found that participation in decision-making positively affects employee motivation.

Nicholson (2003) discovered that the lack of work-related goals and employees' disappointment negatively affected their motivation. On the other hand, managers valuing their employees give them responsibility, which leads to higher motivation.

According to the result of the study conducted by Örücü and Kambur (2008), it was concluded that organizational motivation practices have an impact on productivity in the production and service businesses. However, there was no such effect on performance.

Fabusoro et al. (2008) investigated the relationship between employee motivation and job performance and found that financial incentives, salary, and mobility are the most important motivational factors. It was also determined that "the interaction between the superior and the subordinate" among the motivating factors was a significant component of job performance and had a negative effect on it.

Dysvik and Kuvaas (2011) examined the relationship between job autonomy and employee performance. It has been determined that perceived job autonomy positively impacts employees' performance and job quality, in which intrinsic motivation plays a mediator role.

A study conducted by Onay and Ergüden (2011) among the employees of the Social Security Institution determined that organizational-managerial motivation practices play a significant role in both productivity and performance increase.

Abdulsalam and Mawoli (2012) conducted a study among academic staff working at public universities in Nigeria. It was revealed that performance is correlated with motivation positively yet, moderately.

Muogbo (2013) investigated the effect of extrinsic and intrinsic motivation on the performance of employees working for manufacturing companies. While there is a significant relationship between external motivation and employee performance, there is no relationship between internal motivation and performance.

Yıldız et al. (2014) examined the effect of motivating factors on the intention to quit and job performance in a public company privatized in Turkey. While cooperation among the employees, working conditions, and wages negatively influence the intention to leave, wage and working conditions positively affect performance. The motivators from the least effective to the strongest are rewards, promotion opportunities, relations with the supervisor, wage and working conditions, cooperation, and the job itself.

According to Altındağ and Akgün (2015), motivation and rewards play a significant role in employee performance. Similarly, Özsoy (2016) determined that economic motivational tools significantly increase organizational commitment and employee performance. In a more detailed study, Öztürk (2019) discovered a statistically positive relationship between organizational-managerial, economic, and psychosocial

Table 1. Literature Review

Authors	Main Results
Tanrıverdi and Oktay (2001)	Participation in decision-making increases motivation and performance.
Nicholson (2003)	Increasing responsibility increases motivation.
Örücü and Kambur (2008)	Motivation increases efficiency but does not affect performance.
Fabusoro et al. (2008)	Subordinate-superior relationship negatively affects performance.
Onay and Ergüden (2011)	Motivation increases efficiency and performance.
Dysvik and Kuvaas (2011)	Job autonomy contributes positively to employee performance.
Abdulsalam and Mawoli (2012)	Performance and motivation are moderately and positively related.
Muogbo (2013)	While extrinsic motivation has a significant relationship with employee performance, internal motivation is not correlated with performance.
Yıldız et al. (2014)	Collaboration between employees, working conditions, and wages have a negative effect on the intention to leave the job. Besides, wages and working conditions have a positive effect on job performance.
Altındağ and Akgün (2015)	Motivation and rewards have a positive impact on employee performance.
Özsoy (2016)	Economic motivation tools provide a positive effect on performance.
Öztürk (2019)	There is a positive relationship between motivation and performance.
Kargün and Koç (2021)	There is a positive and strong relationship between motivation and performance.

motivators and employee performance. However, this relationship was moderate in terms of economic and psychosocial motivators and weak in terms of organizational-managerial motivators. Moreover, there was no significant difference between motivation factors based on demographic variables.

A very recent study conducted by Kargün and Koç (2021) involving 401 employees from hospitality businesses operating in the province of Ankara proved a strong relationship between motivation and performance. Moreover, demographic factors such as age, gender, and educational background did not cause statistically significant differences in employee motivation and performance.

Table 1 summarizes the studies discussed in detail above. Studies found that motivation has a positive impact on performance in general. However, it is also among the findings that some motivational tools have a negative or weak effect on performance.

Thus, we hypothesize the following:

What is the impact of employee motivation (with intrinsic and extrinsic motivation dimensions) on job performance (with contextual and task performance dimensions)?

3. Methodology

3.1 Research Model

This study aims to examine the relationship between employee motivation and job performance. It is a quantitative study using a correlational survey model. The model aims to reveal whether there is a correlation between two or more variables and the level of the correlation, if any (Karasar 2013). In this study, as visualized in Figure 1, the existence and level of employees' internal and external motivations, their effect on job performance, and whether the two variables vary by demographic factors were investigated.

Hypotheses to be tested in this context are presented below:

H1: Employee motivation (with intrinsic and extrinsic motivation dimensions) and job performance (with contextual and task performance dimensions) differ by gender.

H2: Employee motivation (with intrinsic and extrinsic motivation dimensions) and job performance (with contextual and task performance dimensions) vary based on education level.

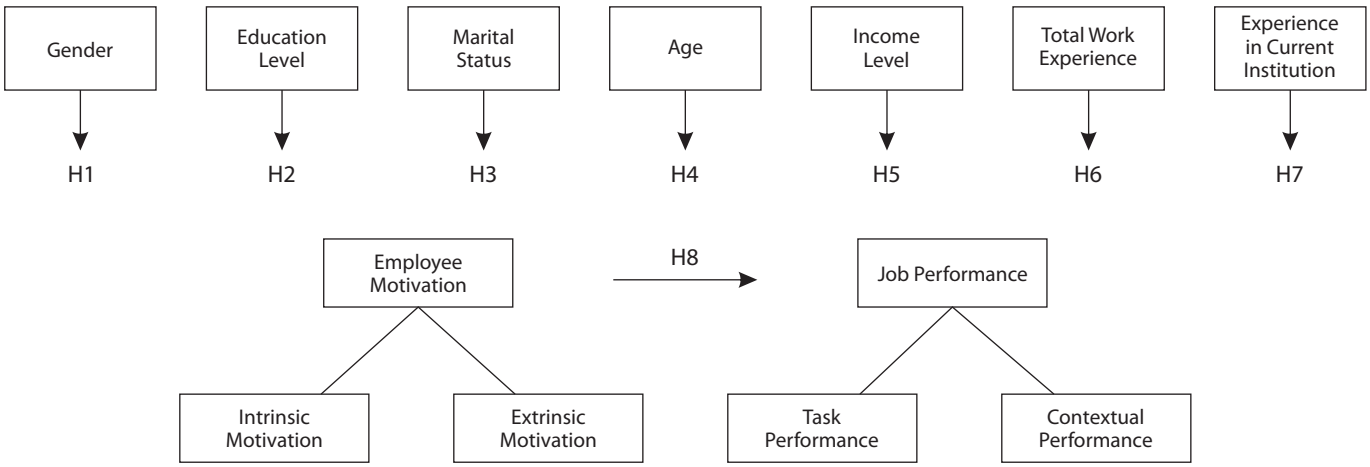
H3: Employee motivation (with intrinsic and extrinsic motivation dimensions) and job performance (with contextual and task performance dimensions) vary based on marital status.

H4: Employee motivation (with intrinsic and extrinsic motivation dimensions) and job performance (with contextual and task performance dimensions) vary by age.

H5: Employee motivation (with intrinsic and extrinsic motivation dimensions) and job performance (with contextual and task performance dimensions) vary based on monthly average income.

H6: Employee motivation (with intrinsic and extrinsic motivation dimensions) and job performance (with contextual and task performance dimensions) differ based on the total working experience.

Figure 1. Conceptual Model



H7: Employee motivation (with intrinsic and extrinsic motivation dimensions) and job performance (with contextual and task performance dimensions) vary based on the experience in the current institution.

H8: Employee motivation (with intrinsic and extrinsic motivation dimensions) has a statistically significant impact on job performance (with contextual and task performance dimensions).

3.2. Population and Sample

The population of the study is those who work in the financial sector in Bosnia-Herzegovina. In the study, the convenience sampling approach was used. All individuals responding to the questionnaire were included in the sampling until the desired sample size was reached. That sampling clearly provides advantages in terms of both cost and time (Altunışık et al. 2012). In line with the basic rule that the sample size should not be less than 100 in correlational studies (Gall et al. 2003), the study consisted of 188 people (83 male and 105 female) working in Ziraat Bank branches operating in Bosnia-Herzegovina.

3.3. Data Collection

A questionnaire consisting of a form including demographic characteristics of the participants, a performance scale, and a motivation scale was used to collect the data. The form was applied to determine the participants' demographic characteristics, such as gender, age, marital status, income, and educational status.

The work performance scale was used to evaluate the performance of the employees. The scale developed by Borman and Motowidlo (1993) consists of 24 questions based on 5-point Likert (1: Strongly Disagree, 2: Disagree, 3: Undecided, 4: Agree, 5: Strongly Agree). While the first four questions are used to measure task performance, the rest 20 questions are designed to measure contextual performance.

In order to evaluate the motivation levels of the participants, the scale developed by Mottaz (1985) was utilized. The scale consists of 24 questions designed in a 5-point Likert type that examine both intrinsic and extrinsic motivation (1: Strongly Disagree, 2: Disagree, 3: Undecided, 4: Agree, 5: Strongly Agree). While the low scores given by the participants indicate a low motivation level, high scores show a high level of motivation.

The survey was applied to the employees of Ziraat Bank between September and December 2017. The questionnaires were filled in by e-mail or face-to-face interviews with the participants. Each questionnaire took approximately 20 minutes to complete. Participation in the survey was on a voluntary basis. Before the survey, participants were informed about the purpose of the study, how the forms would be filled in, and that the personal information and answers were kept confidential. Therefore, the study was not affected by non-response bias.

3.4. Validity and Reliability of the Scales

While Cronbach's alpha reliability coefficients were calculated in order to determine the reliability, exploratory factor analysis (EFA) was performed to determine the validity of the scales used. First, KMO and Bartlett tests were applied to determine the suitability of the scale for the factor analysis. It is necessary to obtain a value of 0.50 and above in KMO, and Bartlett's sphericity test result should be statistically significant (Jeong 2004). KMO values for both scales were found to be above 0.8, and the Barlett test was significant.

In order to detect common method bias, Harman's single factor test was run, and explained variance was calculated as 28.62%, which is clearly less than 50%. Hence, it can be concluded that there is no common method bias in the study.

In the factor analysis, factor loading should be taken as a basis to match the item to a factor or to remove it from the scale content. Factor loading is a coefficient

Table 2. The Research Details

Sample	188 people (83 male and 105 female)
Scope	The finance sector in BIH
Data collection	A survey questionnaire including two scales (44 questions in total)
Time period	September & October 2017
Analyses	Confirmatory Factor Analysis Mean Difference Tests Regression Analysis

that predicts the relationship between items and factors and is expected to be high. If the factor loading is less than 0.30 or the difference between the loadings to two different factors is less than 0.10, the item should be removed before continuing the analysis.

The distribution of the performance and motivation scales items to the factors and the factor loadings were determined as shown in Table 3. Accordingly, items 8 and 22 in the performance scale and items 6, 11, 13, and 16 in the motivation scale were removed from the study.

Table 3. Exploratory Factor Analysis

Scale	Factor	Proposition	Factor Loading	Variance	Cronbach's Alfa
Performance	Factor 1	P17	0.795	33.679	**0.945**
		P19	0.790		
		P15	0.762		
		P18	0.759		
		P11	0.690		
		P13	0.664		
		P24	0.662		
		P12	0.659		
		P23	0.642		
		P5	0.637		
		P10	0.626		
		P9	0.600		
		P20	0.579		
		P7	0.571		
		P14	0.519		
		P16	0.507		
	Factor 2	P3	0.895	15.962	**0.798**
		P1	0.803		
		P2	0.659		
		P4	0.528		
	Factor 3	P6	0.834	13.036	**0.513**
		P21	0.530		
Motivation	Factor 1	M21	0.753	25.334	**0.863**
		M19	0.739		
		M18	0.737		
		M9	0.685		
		M20	0.669		
		M15	0.628		
		M22	0.588		
		M24	0.548		
		M3	0.546		
		M10	0.538		
		M23	0.533		
		M12	0.451		
	Factor 2	M2	0.748	17.506	**0.760**
		M1	0.701		
		M4	0.688		
		M17	0.660		
		M7	0.631		
		M14	0.623		
		M8	0.441		
		M5	0.338		

3.5. Data Analysis

For the process of data analysis, SPSS 22 software was used, and analyses were made at a 95% confidence level. In addition, the following non-parametric tests were carried out:

1. The results of the Shapiro-Wilk normality test performed for work performance and motivation scales and sub-dimensions concluded that a normal distribution could not be obtained. Accordingly, the difference in means was examined with the Mann-Whitney test. Moreover, the Kruskal-Wallis test was utilized for the categorical variables with more than two categories.
2. The relationship between employee motivation and work performance was examined with regression analysis to reveal whether the dependent variable is affected by the independent variable.

4. Findings

4.1. Demographics

Initially, the demographic data of the participants were analyzed, and the results are shown in Table 4 in detail.

Table 4. Demographic Information

		n	%
Gender	Male	83	44.1
	Female	105	55.9
Education Level	High School	28	15.0
	Two-year Degree	3	1.6
	Undergraduate	128	68.4
	Graduate	28	15.0
Marital Status	Married	71	68.9
	Single	30	29.1
	Divorced/Widow	2	1.9
Age	Below 30	36	22.9
	31-35	54	34.4
	36 and above	67	42.7
Income Level	210-440 €	5	2.7
	440-614 €	35	18.8
	614-1279 €	101	54.3
	1279-2047 €	38	20.4
	Above 2047 €	7	3.8
Total Work Experience	1-5 years	59	31.6
	6-10 years	53	28.3
	11-15 years	61	32.6
	16-20 years	12	6.4
	21 years and above	2	1.1
Experience in Current Institution	1-3 years	52	27.7
	4-6 years	38	20.2
	7-9 years	22	11.7
	10-12 years	46	24.5
	13 years and above	30	16.0

4.2. Descriptive Statistics and Normality Test

While the mean score for task performance is 4.14 ± 0.65, for contextual performance it is 4.39 ± 0.48. The average score for job performance is 4.35 ± 0.48. In addition, it was determined that the mean scores of intrinsic, extrinsic, and work motivation are 3.95 ± 0.51, 3.60 ± 0.56, and 3.73 ± 0.48, respectively.

As previously mentioned, it was found that the scores were not in a normal distribution ($p < 0.05$). As a result, non-parametric techniques such as Mann Whitney and Kruskal Wallis tests were used to determine the difference in means of performance and motivation scales based on demographic variables.

4.3. The Test of Difference in Means

As shown in Table 5, employee motivation and job performance do not differ by gender, age, and work experience in the current institution.

However, a statistically significant difference in task performances between the groups based on education level was found. Namely, task performance increases with the increase in education level. On the other hand, education level did not cause a significant difference in other scales.

While marital status did not cause a statistically significant difference in performance and its sub-dimensions, it was found that motivation and its sub-dimensions differ between married and single participants. Single employees scored higher than married employees on both intrinsic, extrinsic, and work motivation scales.

It has been determined that there is a statistically significant difference only in terms of intrinsic motivation between the groups of different incomes. The average scores of those with an income level of 210-614 €, 614-1279 €, 1279-2047 €, and more than 2047 € are 107.48, 87.34, 87.39, and 135.71, respectively. So then, internal motivation is the highest in those with an income of more than 2047 €, while it is the lowest in those with an income level of 614-1279 €.

Besides, solely extrinsic motivation showed a statistically significant difference between the groups with different total working experiences ($p < 0.05$). For example, the average scores of those with an experience of 1-5 years, 6-10 years, 11-15 years, and more than 16 years are 87.64, 81.67, 107.49, and 108.71, respectively. Accordingly, extrinsic motivation is the highest in those with a total working experience of 16 years or more, while it is the lowest in those between 6-10 years.

4.4. Correlation Test

The results of the correlation analysis of employee motivation, job performance, and their sub-dimensions were obtained as follows:

1. Task performance is positively correlated with contextual performance, work performance, and intrinsic motivation. However, the correlations are moderate, strong, and moderate, respectively.
2. While contextual performance has a moderate positive relationship with intrinsic motivation, it has a weak positive relationship with extrinsic motivation.
3. Job performance has a moderate positive relationship with both intrinsic and employee motivation.
4. While there is a moderate positive relationship between intrinsic and extrinsic motivation, intrinsic motivation strongly correlates with employee motivation.
5. There is a very strong positive relationship between extrinsic motivation and employee motivation.

Table 5. Mean Differences

p-value	Gender	Education Level	Marital Status	Age	Income Level	Experience	Experience in Current
Task Performance	0.401	**0.011**	0.856	0.119	0.328	0.249	0.475
Contextual Performance	0.251	0.611	0.092	0.361	0.115	0.258	0.898
Job Performance	0.178	0.491	0.114	0.235	0.076	0.162	0.878
Intrinsic Motivation	0.674	0.845	**0.037**	0.260	**0.031**	0.638	0.456
Extrinsic Motivation	0.686	0.663	**0.048**	0.886	0.708	**0.038**	0.280
Employee Motivation	0.856	0.853	**0.022**	0.745	0.433	0.144	0.298

Table 6. Correlation Analysis

		1	2	3	4	5	6
Task Performance	rho	1.000	0.519**	0.702**	0.347**	-0.069	0.099
	p		0.000	0.000	0.000	0.345	0.176
	n	188	188	188	188	188	188
Contextual Performance	rho		1.000	0.969**	0.484**	0.194**	0.348**
	p			0.000	0.000	0.008	0.000
	n		188	188	188	188	188
Job Performance	rho			1.000	0.492**	0.139	0.309**
	p				0.000	0.058	0.000
	n			188	188	188	188
Intrinsic Motivation	rho				1.000	0.519**	0.788**
	p					0.000	0.000
	n				188	188	188
Extrinsic Motivation	rho					1.000	0.917**
	p						0.000
	n					188	188
Employee Motivation	rho						1.000
	p						
	n						188

Table 7. Regression Analysis

Dependent Variable	Independent Variable	F	p	B	t	p	R^2
Work Performance	Intrinsic Motivation	28.431	0.000	.520	7.253	0.000	0.235
	Extrinsic Motivation			-0.145	-2.224	0.027	

4.5. Regression Analysis

The results of the regression analysis are shown in Table 7. It was observed that the regression model established between employee motivation and performance is statistically significant ($p < 0.05$). Results shows that intrinsic motivation positively affects the job performance ($B = .520$; $p < 0.05$); while extrinsic motivation affects it negatively ($B = -.145$; $p < 0.05$). 24% of the change in job performance is explained by internal and external motivation.

5. Discussion

In this study, the effect of employee motivation on job performance was examined in the case of Ziraat Bank in Bosnia-Herzegovina. In the following section, the findings summarized in Table 8 will be compared with the results of previous studies in the literature, and they will be discussed in detail.

Table 8. Results of Hypothesis

H1: There is a statistically significant difference between males and females	
H1(a): Intrinsic Motivation	Rejected
H1(b): Extrinsic Motivation	Rejected
H1(c): Work Motivation	Rejected
H1(d): Task Performance	Rejected
H1(e): Contextual Performance	Rejected
H1(f): Work Performance	Rejected
H2: Education Level causes a significant difference in	
H2(a): Intrinsic Motivation	Rejected
H2(b): Extrinsic Motivation	Rejected
H2(c): Work Motivation	Rejected
H2(d): Task Performance	Accepted
H2(e): Contextual Performance	Rejected
H2(f): Work Performance	Rejected
H3: Marital status causes a significant difference in	
H3(a): Intrinsic Motivation	Accepted
H3(b): Extrinsic Motivation	Accepted
H3(c): Work Motivation	Accepted
H3(d): Task Performance	Rejected
H3(e): Contextual Performance	Rejected
H3(f): Work Performance	Rejected
H4: Age causes a significant difference in	
H4(a): Intrinsic Motivation	Rejected
H4(b): Extrinsic Motivation	Rejected
H4(c): Work Motivation	Rejected
H4(d): Task Performance	Rejected
H4(e): Contextual Performance	Rejected
H4(f): Work Performance	Rejected
H5: Income Level causes a significant difference in	
H5(a): Intrinsic Motivation	Accepted
H5(b): Extrinsic Motivation	Rejected
H5(c): Work Motivation	Rejected
H5(d): Task Performance	Rejected
H5(e): Contextual Performance	Rejected
H5(f): Work Performance	Rejected
H6: The experience causes a significant difference in	
H6(a): Intrinsic Motivation	Rejected
H6(b): Extrinsic Motivation	Accepted
H6(c): Work Motivation	Rejected
H6(d): Task Performance	Rejected
H6(e): Contextual Performance	Rejected
H6(f): Work Performance	Rejected
H7: Experience in the current organization causes a significant difference in	
H7(a): Intrinsic Motivation	Rejected
H7(b): Extrinsic Motivation	Rejected
H7(c): Work Motivation	Rejected
H7(d): Task Performance	Rejected
H7(e): Contextual Performance	Rejected
H7(f): Work Performance	Rejected
H8 (a): Intrinsic M. has a statistically significant impact on performance.	Accepted
H8 (b): Extrinsic M. has a statistically significant impact on performance.	Rejected
H8 (c): Motivation has a statistically significant impact on performance.	Accepted

Öztürk (2019) found that motivational factors do not change by demographic variables. On the other hand, Dündar et al. (2014) argued that factors such as age, working time, and gender do not influence employees' motivation. Kovach (1987) and Brislin et al. (2005) also reached a similar result in their studies. They found that the intrinsic and extrinsic motivation tools did not show a statistically significant difference in job motivation by gender. Accordingly, this study found no statistically significant difference between male and female employees in performance and motivation.

It was observed that task performance increases as the level of education increases, while contextual performance and job performance do not change. Besides, there is no difference in motivation due to the education level. However, Kuvaas (2006) stated that the higher the education level, the higher the intrinsic motivation due to the fact that educated employees love their work more and do it with fun.

In terms of marital status, it has been determined that singles' intrinsic and extrinsic motivation and job performance are higher than married ones. However, no difference was found in terms of performance and motivation by age. In the analysis made by income level, it was found that intrinsic motivation was the highest in those with the highest income and the lowest in the middle-income level. It has been observed that middle-income individuals have less intrinsic motivation than those at the lowest income level.

In terms of professional experience, it was observed that extrinsic motivation was the highest in those with a total working experience of 16 years or more, while it was the lowest in those with 6-10 years. In short, it was found that the extrinsic motivation of those with the highest level of experience was high, while the extrinsic motivation of the middle-level experienced employees was found to be low. When the experience in the current institution is examined, no difference was found in terms of performance and motivation.

According to the result, it was determined that task performance was positively associated with contextual performance. In addition, task performance was found to be highly correlated with job performance. Likewise, Motowidlo and Van Scotter (1994) found a positive relationship between task performance and job performance. In this study, task performance was found to be positively and moderately correlated with intrinsic motivation.

Contextual performance was found to be highly correlated with job performance. Similarly, Van Scotter, Motowidlo, and Cross (2000) found that contextual performance positively affects job performance. This study determined that contextual performance is positively associated with intrinsic motivation, has a weak positive relationship with extrinsic motivation, and has a moderate positive relationship with work motivation.

It was determined that there is a moderate positive correlation between job performance and intrinsic motivation. Similarly, Mottaz (1985) and Kuvaas (2006) found that intrinsic motivation has a positive effect on job performance. Especially in his study, Kuvaas (2006) found that intrinsic motivation may be more meaningful than extrinsic rewards and instrumentality perceptions in understanding employees' attitudes and behaviors. There is a positive relationship between intrinsic motivation, job performance, and emotional commitment to the organization. Chaudhry (2008) found that intrinsic motivation contributes positively to employees' job performance. Likewise, Yousaf et al. (2015) found that intrinsic motivation has a higher positive relationship with task performance than extrinsic motivation. Callahan et al. (2003) also found that intrinsic motivation has a higher positive effect on job performance than extrinsic motivation. Rogstadius et al. (2011) argued that intrinsic motivation has a higher effect on job performance than extrinsic motivation. However, Muogbo (2013) discussed in his study that extrinsic motivation has a higher level of positive effect on employees' task performance compared to intrinsic motivation. Similarly, Ayan (2015) found that the higher the intrinsic motivation, the higher the job performance.

According to the study results, there is a moderate positive correlation between job performance and work motivation. Similarly, in his study, Öler (2005) found that work motivation has a positive effect on job performance. In addition, Köroğlu and Avcıkurt (2014) also revealed a positive relationship between job motivation and job performance in their study.

It was found that intrinsic and extrinsic motivation have a moderate positive relationship. Similarly, Neshat and Fakhri (2011) found a high level of correlation between intrinsic and extrinsic motivation. Chaudhry (2008) also claimed that intrinsic motivation is positively associated with extrinsic motivation and that managers' use of extrinsic motivation tools increases employees' intrinsic motivation. Markova and Ford (2011) suggested that extrinsic motivation tools positively affect intrinsic motivation. Eisenberger and Shanock (2003) found that rewards, which are extrinsic motivation sources, contribute positively to intrinsic motivation. In summary, it can be stated that the use of extrinsic motivation factors in enterprises also increases the intrinsic motivation of the employees.

Within the scope of the research, it was observed

Table 9. Comparison with the Results of Previous Studies

Results	Supporting Studies	Contradicting Studies
Task performance is moderately and positively correlated with contextual performance.	Motowidlo and Van Scotter (1994)	-
Work and contextual performance are positively and highly correlated.	Motowidlo and Van Scotter (1994)	-
There is a moderate positive relationship between job performance and intrinsic motivation.	Mottaz (1985) Callahan et al. (2003) Kuvaas (2006) Chaudhry (2008) Rogstadius et al. (2011) Muogbo (2013) Ayan (2015) Yousaf et al. (2015)	-
Performance and motivation are positively associated at a medium level.	Ölçer (2005) Köroğlu and Avcıkurt (2014)	-
Intrinsic and extrinsic motivation are positively and moderately related.	Neshat and Fakhri (2011) Markova and Ford (2011) Eisenberger and Shanock (2003)	-
Extrinsic motivation has a more negligible effect on work motivation than intrinsic motivation.	Dündar et al. (2007)	Mottaz (1985) Wiley (1997) DeVoe and Iyengar (2004) Brislin et al. (2005)

that there is a strong positive relationship between intrinsic motivation and work motivation. It was determined that there is a very strong positive relationship between extrinsic motivation and work motivation. However, Mottaz (1985), DeVoe and Iyengar (2004), and Brislin et al. (2005) found that intrinsic motivation had a more substantial effect on work motivation than extrinsic motivation. Furthermore, Dündar et al. (2007) found that intrinsic motivation is more effective in work motivation than extrinsic motivation. On the other hand, Wiley (1997) found in his study that intrinsic and extrinsic motivation tools do not differentiate employees' motivation.

6. Conclusion

As a result, it was observed that both intrinsic and extrinsic motivation factors are essential for the performance of employees. In particular, it has been determined that intrinsic motivation factors are more effective than extrinsic motivation factors. In this context, it can be argued that it is crucial to provide employees with the support that will increase their intrinsic motivation. In addition, considering that intrinsic motivation has an effect on contextual performance, increasing the quality of the work employees do in order to increase the intrinsic motivation of the employees, such as ensuring that the work done is respected, giving authority and responsibility, and providing a positive organizational climate will contribute positively to the job performance of the employees.

It has been observed that extrinsic motivation factors also positively affect employee performance and, at the same time, increase intrinsic motivation. Thus, it is possible and even necessary to increase external motivation by offering sufficient wages and rewards, being reliable and equal, maintaining job security, improving physical conditions, and providing sufficient equipment.

Since task performance increases with the increase in education level, opportunities for increasing the education level of employees should be increased, and training programs should be initiated for employees. On the other hand, considering that motivation and performance do not vary by gender, it is scientifically unnecessary to distinguish between males and females in working life. For this reason, managers should treat their employees equally in terms of motivation and performance to ensure justice and avoid gender inequality.

Moreover, there is no difference between the motivation levels of various age groups. Therefore, organizations do not need to design differentiated motivational tools for young, middle-aged, and elderly employees. It is noteworthy that age does not cause a

difference in performance either.

While marital status does not lead to different work performances, motivation levels of single employees are significantly higher than married ones. Therefore, managers should separately investigate the factors motivating single and married employees. Besides, it seems necessary to develop alternative solutions for the married workforce in order to increase their motivation level.

This study was conducted in a single bank operating in Bosnia-Herzegovina. Therefore, the results should be interpreted considering these limitations. Accordingly, the relationship between performance and motivation may differ in different cultures, sectors, and even financial institutions in the same region. For this reason, conducting similar studies among employees in different cultural regions and sectors would be beneficial. For example, the motivation and performance relationship in the tourism sector might be different from the banking sector. On the other hand, considering that motivational tools may affect performance differently in a country with a high per capita income level, it would be beneficial to conduct studies in regions with different socio-economic levels.

It should be admitted that there are numerous studies on employee motivation and job performance. Even though a positive relationship is expected, situational factors can bring unpredictable results. Global problems such as a pandemic, increasing tension worldwide, and severe digitalization can easily upset the balance. Shifting to remote working, discussions around work-life balance and depressed economic conditions require further studies on motivation and performance.

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THE LINKAGE BETWEEN FISCAL POLICY AND NON-PERFORMING HOUSEHOLD LOANS IN TURKEY

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Abstract

Frequent changes in fiscal policies are the main cause of credit risk. To prevent households from increasing their non-performing loans, the government can use various policies and instruments. One of these tools is tax regulations, with a particular focus on the value-added tax. This paper examines whether tax policies have affected non-performing household loans in Turkey over the period from 2017 to 2021. To acquire meaningful empirical results, the Autoregressive Distributed Lag (ARDL) cointegration model have been applied. The results of analysis indicated that the effect of tax regulations on non-performing household loans is quite strong. It can be demonstrated that the strength of the income effect generated by tax cuts might be robust.

Keywords: *non-performing loans, household finance, fiscal policy, Turkey*

JEL classification: *D14, G10, H31*

1. Introduction

There are various definitions of non-performing loans (NPLs) in the economic literature, but the most commonly used is that it is a loan made because of the risk of nonpayment of loan principal and interest. For example, the European Central Bank (2016) describes an NPL as follows: "a bank loan is considered nonperforming when more than 90 days pass without the borrower paying the agreed installments or interest." On the other hand, the IMF (2004) describes an NPL as follows: "a loan is nonperforming when payments of interest and/or principal are past due by 90 days or more, or interest payments equal to 90 days or more have been capitalized, refinanced, or delayed by agreement, or payments are less than 90 days overdue, but there are other good reasons—such as a debtor filing for bankruptcy—to doubt that payments will be made in full" (p. 57). Following

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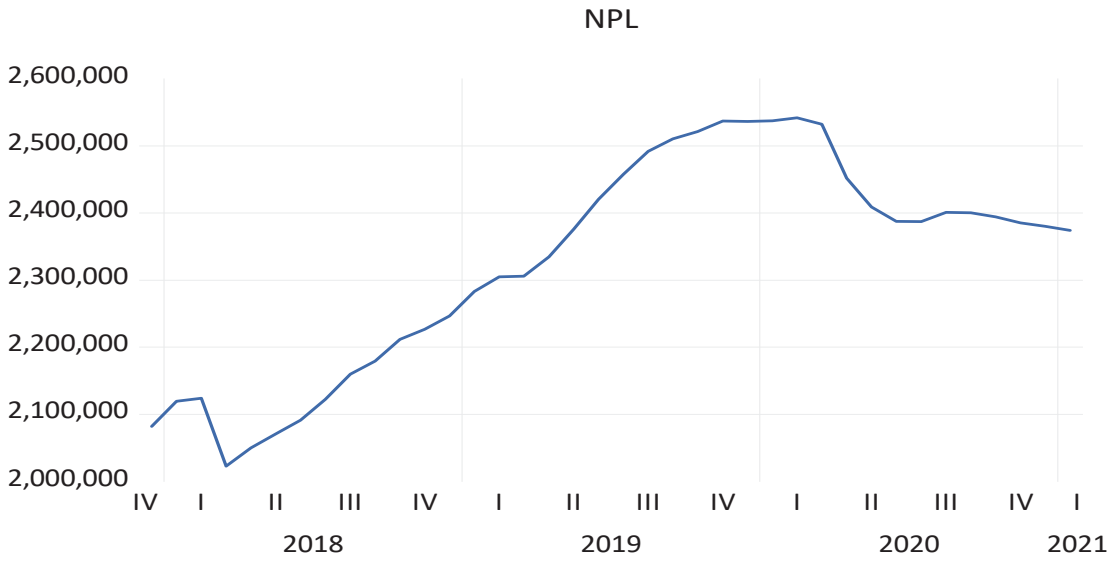
all the definitions, NPLs are called 'bad debt'. They are problematic for both banks and the national economy, especially with respect to monetary policy. For the banks, the "bad debt" is problematic, profitability suffers because they no longer earn enough money with the credit business. Hence, in this case, they cannot lend as much, so this mechanism to influence interest rates in the private sector is less effective. According to Yurttadur, Celiktas, and Celiktas (2019), they can be "problematic by several reasons such as occurring loss risk; postponement of payment by major infringement of the contract; being experienced problems in loan repayment by company or individuals" (p. 767). There are also some other arguments that deal with the recognition of NPLs. Bar, Seiford and Siems (1994) and Demirguç-Kunt and Detragiache (1998) concluded that an increase in NPLs in most cases indicates banking crises. This is consistent with a study by Reinhart and Rogoff (2011), while Sorge (2004) considers NPL as a test of financial system vulnerability. In general, the characteristic of NPLs is that they indicate the ability of households, as well as decision makers, to reimburse their debts. Following the financial privatization of 1989, the Turkish economy opened entirely to foreign investors in both direct investment and financial investment. In the 1990s, there were numerous crises in the Turkish financial system due to financial fluctuations. The crisis of 1999 was the most hard-hitting and permanent one and also deeply damaged the banking sector, and the crisis of 2001 was recorded as the biggest banking sector crisis to ever hit Turkey. The banking sector crisis of 2001 was a critical turning point for the Turkish economy. Worsening financial and economic conditions during the 1990s, which suffered from high inflation and a bad budget balance, made it impossible for the business sector to take advantage of new credit opportunities. Nowadays, the financial sector mostly consists of commercial banks, which accounted for 91% of the total financial sector assets as of the end of 2020. Due to large state participation in state-owned banks, i.e. more than 40% of the total banking sector assets, three of the four largest banks in Turkey are now state-owned. The explanation lies in two features. The first is the establishment of the Banking Regulation and Supervision Agency (BRSA), and the second is an autonomy of the Central Bank of the Republic of Turkey (CBRT). Regarding the economic situation in Turkey, the highest percentage of non-performing loans was recorded in January 2020 (5.4%) due to the foreign exchange crisis in 2018. The change in NPLs in Turkey over time is shown in Figure 1. The classification of loans in Turkey is presented in the Appendix (Table 1). The classification is undertaken by the CBRT and the banks pursuant to the implementation of the Regulation on Loan Loss Provisioning, which was announced in the Official Gazette No. 26333 (Official Gazette 2006). The common feature of all five loan groups is that they refer to individuals and legal entities with a creditworthy financial structure.

Figure 1. The change in NPLs in Turkey between 12/2017 and 01/2021



Source: Authors' calculation.

As already mentioned, the high NPL ratios not only have a negative impact on the banking sector, but also on the national economy. First, "they reduce bank profits because they require higher provisions, they lead to lower interest income, generate higher expenses associated with their monitoring and management and lead to an increase in funding costs, as risk adverse investors are less willing to lend to institutions with a low credit quality" (European Central Bank 2020, p. 4). Second, NPLs have progressive risk weights, which leads to progressive capital requirements. Third, they may divert important management resources from more profitable activities. Besides banks, NPLs also affect businesses. This can be seen in the accumulated costs that corporate insolvencies cause, leading to lost sales, rising borrowing costs and declining profitability. Therefore, it is important to keep NPLs under control in the banking sector. In addition, debtors must be subject to fiscal discipline and act lawfully. The effects of NPLs can be noticed in the banking sector, capital adequacy, real sector, asset quality and profitability. For example, high NPLs require higher provisioning, which leads to lower interest income and higher expenses for monitoring them. In addition, this means a decline in lending to companies and households. From fiscal policies perspective, as government regulation increases value-added tax (VAT), the paying ability of households becomes weaker, since they have to increase the obligatory payment, which might affect their debt-to-income ratio, and as such increase the NPLs of banks.

The hypothesis of this paper is that *there is an accelerating effect of value-added tax on NPLs and alternatively there is not any effect*. Thus, the Turkish government must consider these effects when deciding fiscal policies. Based on this hypothesis, this paper aims to investigate whether fiscal policy affects nonperforming budget loans in Turkey in the period from 2017 to 2021. The main instrument within fiscal policy is value-added tax. The main motivation of the paper is the examination of whether there is an impact of value-added tax on non-performing loans. Does value-added tax matter for NPLs? The contribution of the paper is twofold. This is most likely the first paper which provides empirical results on the linkage between NPLs and value-added tax in Turkey over the 2017 – 2021 period using the ARDL model. The second contribution is to overcome the lack of studies, especially in Turkey, which will provide important empirical evidence and policy recommendations for the Turkish economy.

The remainder of the paper is organized as follows. After a brief introduction, Section 2 presents the relevant literature on the main determinants of NPL. The model, methodology, and data sample are described in Section 3. The empirical results and discussion of the findings are outlined in Section 4, albeit Section 5 outlines conclusions and recommendations for further research.

2. Related literature review

From the analysis of the academic literature, it can be concluded that various studies and papers have examined the impact of NPLs on bank lending (Salas and Saurina 2002; Espinoza and Prasad 2010; Bofondi and Ropele 2011; Louzis, Vouldis, and Vasilios 2012; Abid, Nejib-Ouertani, and Zouari-Ghorbel 2014; Bijsterbosch and Falagiarda 2015; Kjosevski, Petkovski, and Naumovska 2019; Gaur and Mohapatra 2020) and economic activity (Babouček and Jančar 2005; Saurina and Jimenez 2006; Rinaldi and Sanchis-Arellano 2006; Kauko 2012; Klein 2013; Škarica 2014; Beck, Jakubik, and Piloiu 2015; Khan, Siddique, and Sarwar 2020; Kucuk, Ozlu, and Yunculer, 2021). The gap in the literature is that there are not so many papers investigating the linkage between NPLs and fiscal policy (Nurja and Kufo 2016; Dimitrios, Louri, and Tsionas 2016), so this gap was covered.

Gilchrist and Zakrajsek (2011) examined the relationship between credit supply and bank lending conditions in the U.S. economy over the data period from January 1952 to April 2010 using a VAR data analysis. To acquire empirical results, the following variables were used: unemployment rate, industrial production index, inflation, bond premiums, consumer credit, corporate credit, ten-year nominal treasury yields, and nominal federal funds rate. Financial market disruptions are measured by the increase in bond premiums. The results show that rejecting loan applications and reducing the volume of loans on their balance sheets was banks' initial response to financial problems. A cyclical decline in corporate credit after a certain delay proves to be the main feature of fluctuation. Škarica (2014) analyzed the factors of the NPL ratio in several Central and Eastern European countries between 2007 and 2012. He used the same variables as Gilchrist and Zakrajsek (2011), with additional variables-real GDP growth rate, harmonized consumer price index, three-month money market interest rate, NPLs, and stock price indexes. The empirical result shows that the key determinant of the increase in the NPL proportion in the analyzed countries is real GDP growth. Nkusu (2011) examined the relationship between NPLs and the macroeconomic performance of advanced economies over the period 1998 to 2009. The variables used in his analysis were very similar as in a study of Gilchrist

and Zakrajsek (2011) and Škarica (2014). The result of the analysis indicated that slower GDP growth, higher unemployment, or declining asset prices are associated with an increase in NPLs in advanced economies. The NPL problem at the Eurozone was investigated by Rinaldi and Sanchis-Arellano (2006). Their focus were sectoral household NPLs based on a case of several Eurozone countries from 1989/Q3 to 2004/Q2. The results indicated that household disposable income, household financial assets, and nominal lending rates exert significant explanatory power on household NPLs. Makri, Tsagkanos, and Bellas (2014) investigated which factors determined NPLs on an aggregate level in the Eurozone for the period 2000 – 2008. In the empirical analysis they included annual percentage growth rate of GDP, public debt as a percentage of GDP, unemployment as macro-variables, and micro-variables such as loans-to-deposits ratio, return on assets, return on equity. According to the results, there is a strong linkeness between NPLs and macroeconomic and bank-specific factors. Based on an investigation of a specific Italian banking system, Foglia (2022) also found interesting results. In the analysis Foglia (2022) employed an ARDL cointegration model to investigate the short and long-run effects of macroeconomics determinants on NPLs over the period 2008/Q3-2020/Q4. The results show that GDP, government debt, unemployment, and domestic credit have a short- and long-term impact on NPLs. In addition, GDP and government debt have a negative impact on the level of NPLs. Inaba et al. (2005) found that during a recession, as unemployment and wealth losses increase, NPLs also increase. Using a sample of Turkey, Kucuk, Ozlu, and Yunculer (2021) examined the relationship between credit and economic activity with particular attention to the factors of credit by borrower (households/businesses) and the factors of GDP by expenditure. They also divide loans to households into housing loans, personal loans, and business loans by type of currency-domestic and foreign loans. To acquire empirical results, vector autoregressive models were applied for the period 2009Q1-2018Q4. The results indicated that credit shocks have statistically meaningful effects on economic activity. Moreover, shocks that lead to an expansion of credit to households and domestic firms by the same percentage have quite similar effects on private consumption. On the other hand, the impact on investment is different, as consumer credit has a much smaller impact. Hence, the shocks to foreign currency-denominated corporate loans have a meaningful impact on aggregate investment. Thus, they have surprisingly weaker effects on equipment investment as well as on consumption and GDP. The authors contributed to the scientific literature by furnishing evidence on the differential impact of credit across different components of economic activity.

3. Model, methodology and data

This paper analyzes the linkage between NPLs, VAT and some control variables. The paper mainly explores the impact of value-added tax on NPLs in the long term in the Turkish economy during the period between 12/2017 and 01/2021. The reference model that was used in the analysis can be summarized as follows:

$$npl = f(vat, u, cpi, y) \tag{1}$$

Where:

npl: non-performing loans
vat: value-added tax
u: unemployment rate
cpi: consumer price index
y: industrial production index

The dependent variable are non-performing loans, while the value-added tax, unemployment rate, consumer price index and industrial production index are the independent variables. The variables are used in the analysis in logarithmic form to acquire more interpretable results in the estimation. Moreover, the logarithmic form of the variables allows us to explain the results as elasticities. Thus, the long-term linkage between the variables can be transformed into a linear logarithmic form as:

$$lnnpl_t = \beta_0 + \beta_1 lnvat_t + \beta_2 lnu_t + \beta_3 lncpi_t + \beta_4 lny_t + \varepsilon_t \tag{2}$$

β_0 represents the constant term and ε_t represents the error term, and β_1, β_2, β_3, β_4 indicate the elasticity parameters in the long term. Except for the β_4 coefficient, the remaining parameters are expected to be positive in parallel to the main arguments of the paper. In general, value-added tax may play a critical role on households' disposable income. An increase in value-added tax may lead to a higher expense in their income and vice versa. Therefore, if value-added tax increases, the paying ability of borrowing in credit mechanism can be affected negatively and non-performing loans will increase, and β_1 is positive. When the unemployment rate increases, because of a decrease in the income level, NPLs will also increase, and β_2 is also positive. In this paper, the industrial production index is used as

a proxy variable for the income level. Thus, when the income level increases, NPLs will decrease.

In this paper, we use the widely used ARDL cointegration model (Pesaran, Shin, and Smith 2001) to investigate whether there is a long-run association between variables in Turkey. Compared to conventional cointegration tests, this method has several advantages. The ARDL methodology can decide the long-term linkage depending on the result of the F-test, which is used in the bound test of the ARDL methodology process. Therefore, the ARDL bound test (Pesaran and Shin 1999) also works better in the case or limited observations. The sample size of the data of this paper is only 36, thus, the ARDL bound test can be used for the empirical analysis. The ARDL approach can be used with the variables that of at I(0) or I(1) process, but not be at I(2) or more. The other advantage is that this methodology can estimate the long and short-term coefficients simultaneously. However, to estimate the empirical linkage between variables with the ARDL method, this study utilizes the following equation:

$$\Delta lnnpl = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta lnnpl_{t-i} + \sum_{i=1}^{p} \beta_2 \Delta lnvat_{t-i} + \sum_{i=1}^{p} \beta_3 \Delta lnu_{t-i} + \sum_{i=1}^{p} \beta_4 \Delta lncpi_{t-i} + \sum_{i=1}^{p} \beta_5 \Delta lny_{t-i} + \lambda_1 lnnpl_{t-1} + \lambda_2 lnvat_{t-1} + \lambda_3 lnu_{t-1} + \lambda_4 lncpi_{t-1} + \lambda_5 lny_{t-1} + \varepsilon_t \quad (3)$$

where Δ denotes the difference term, β_0 indicates the constant term and ε_t denotes the error term. Also, β_1, β_2, β_3 and β_4 indicate the short-term coefficients, while λ_1, λ_2, λ_3 and λ_4 are the long-term coefficients in the estimated model. p shows the optimal lag length, which is determined in the model selection criteria by Akaike Information Criteria (AIC), Schwarz Information Criteria (SIC) or Hannan-Quinn Information Criteria (HQ). The ARDL method runs in two important steps.

There is a hypothesis test for the determination of a cointegration linkage between the variables. Therefore, the null and alternative hypotheses to be tested by the F-test are as follows:

H_0: $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = 0$
H_1: $\lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq 0$

The null hypothesis states that there is no cointegration linkage between the variables. If the null hypothesis is rejected, it means that there is a cointegration linkage between the variables. For any cointegration linkage, the unrestricted error correction model (UECM) (Pesaran and Shin 1999) can be estimated as in the following equation:

$$\Delta lnnpl = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta lnnpl_{t-i} + \sum_{i=1}^{p} \beta_2 \Delta lnvat_{t-i} + \sum_{i=1}^{p} \beta_3 \Delta lnu_{t-i} + \sum_{i=1}^{p} \beta_4 \Delta lncpi_{t-i} + \sum_{i=1}^{p} \beta_5 \Delta lny_{t-i} + \theta ECT_{t-1} + \varepsilon_t \quad (4)$$

Table 2. The Summary Statistics

Variables	Notation	Source	Obs.	Mean	Min.	Max.	St. Dev.
Non-performing Loans	npl	Banking Association of Turkey	38	2325397	2022478	2542040	161114.3
Value-added Tax	vat	Strategy and Budget Association	38	16544605	4730000	27427000	4798448
Unemployment Rate	u	CBRT	38	12.51842	9.800000	14.10000	1.377200
Consumer Price Index	cpi	CBRT	38	417.1613	327.4100	513.3000	51.84727
Industrial Production Index	y	CBRT	38	11484.47	7822.000	14469.00	1314.639

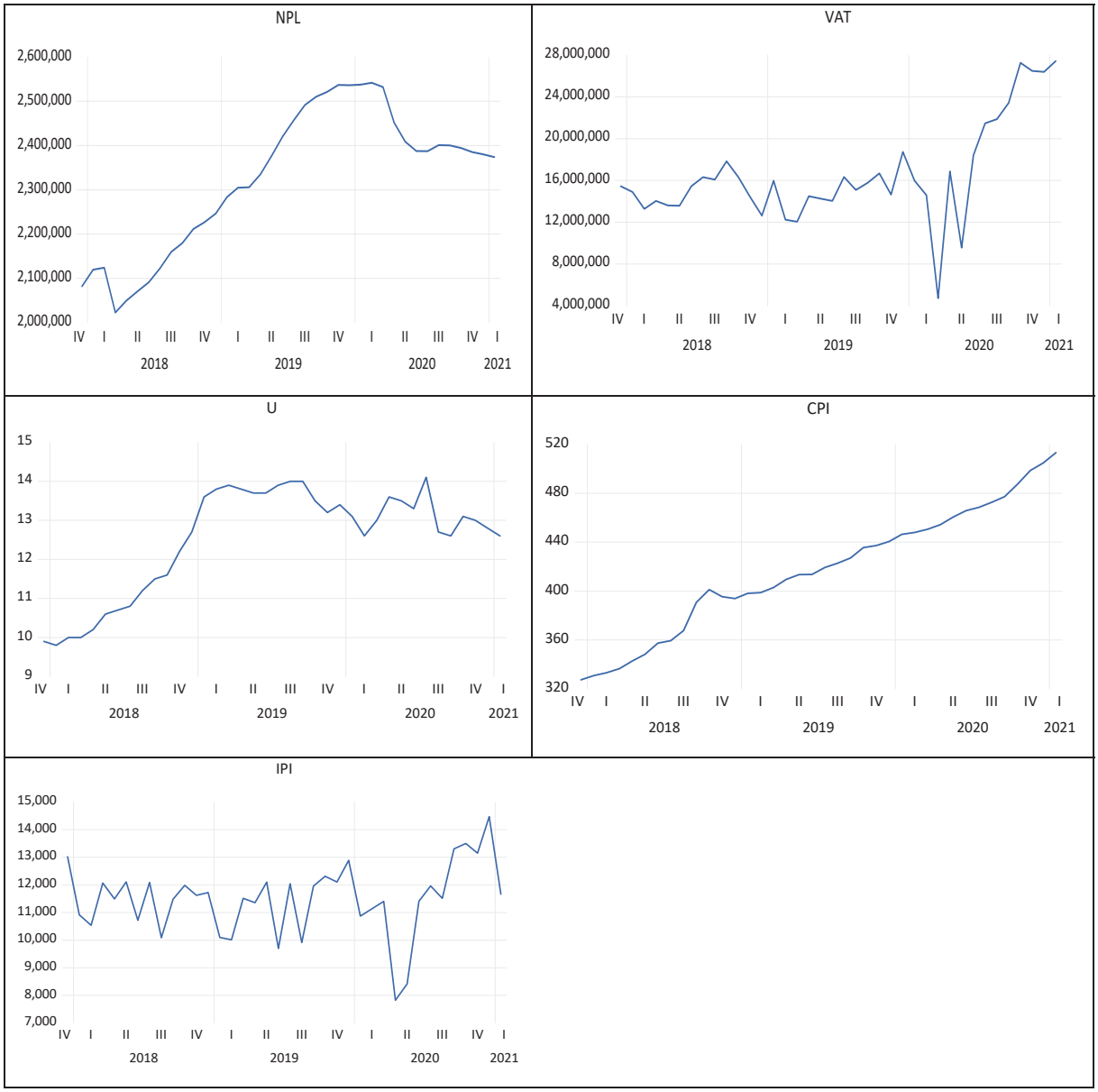
Source: Authors' calculation.

where θ indicates the coefficient of the error correction term (ECT_{t-1}) and provides information about the speed of adjustment on the correction mechanism after a deviation in the long-term equilibrium. The error correction model distinguishes between short-term and long-term effects. Additionally, the expectation of the coefficient of the error correction term is negative and statistically significant, i.e. between 0 and -1, to get a smooth correction to the long-term equilibrium.

The analysis uses monthly data covering period between 12/2017 and 01/2021. As the value-added tax data is available from the end of 2017 as a monthly figure, the data period does not include data before this time span. For the structural change in March 2020, a dummy variable has been included, which represents the starting date of the COVID-19 pandemic. The NPL data represents the number of people with unpaid personal loans and credit card borrowing for a period of time – usually 90 or 180 days – and was retrieved from the Banking Association of Turkey's databases. Monthly data for VAT are from the Strategy and Budget Association database; other data are from the CBRT database. E-views 12 package program were used to estimate the linkage between the variables.

Figure 2 displays the trends of those variables that were used in the analysis. It can be clearly seen that the NPLs in Turkey significantly increased starting in early 2018. The value-added tax also increased in the second half of 2020. The remaining variables also have an increasing trend over that period.

Figure 2: The trends of analyzed variables in Turkey over the period 12/2017 – 01/2021



Source: Authors' calculation.

4. Empirical result discussions

This section presents the results of the empirical estimation for Equations (3) and (4), in turn. The results of unit root test are indicated in Table 3. Except for the industrial production index, which is in *I (0)* process, all the variables are in *I (1)* process. The null hypothesis of unit root for the variables that are in *I (1)* process cannot be rejected in their level values. Therefore, as all the variables provide the necessary condition for the ARDL estimation, the long-term cointegration linkage between the variables can be estimated.

Table 4 shows the results of the bound test, and according to the calculated F-statistic value, which is higher than the upper value, there is a cointegration linkage between the variables because the null hypothesis is rejected. Thus, there is a long-term linkage between the dependent variable, the logarithm of nonperforming loans, and the independent variables, the logarithm of VAT, unemployment, the consumer price index and the index of industrial production.

Table 5 gives the ARDL estimation results in the long and short term. According to the results, a positive and significant association was found between VAT and NPLS in the long term, which is in line with expectations. Also, there is a negative and significant association between the industrial production index, which represents the income level, and NPLs in the long term. The unemployment rate has a significant and positive impact on the NPL in the long run, while the consumer price index has no significant impact on the NPL in this period. In this paper, the potential effect of value-added tax on NPLs was the main focus, so the long-term estimation results indicate that the value-added tax variable's coefficient corresponds to the preliminary expectations and proposed hypothesis.

The estimation of Equation (3) indicates that the value-added tax coefficient was estimated at about 0.46. This result means that a one-percent increase in value-added tax leads to an increase in NPLs by 0.46%. Also, a one-percent increase in the unemployment rate increases NPLs by about 1.03%. Moreover, the results show that a one-percent increase in the

Table 3. Results of Unit Root Test

Test Type	Variable	At Level		At 1st Difference	
ADF		Cons.	Cons. and Trend	Cons.	Cons. and Trend
lnnpl		-1.27 (0.63)	-0.66 (0.97)	-4.13 (0.00)***	-4.27 (0.00)***
	lnvat	-1.41 (0.56)	-1.94 (0.61)	-11.81 (0.00)***	-11.80 (0.00)***
	lnu	-2.09 (0.25)	-0.84 (0.95)	-5.53 (0.00)***	-6.32 (0.00)***
	lncpi	-1.07 (0.72)	-2.96 (0.16)	-3.04 (0.04)**	-5.19 (0.00)***
	lny	-4.30 (0.00)***	-4.36 (0.00)***	-8.61 (0.00)***	-8.45 (0.00)***
PP	lnnpl	-1.52 (0.51)	-0.46 (0.98)	-4.18 (0.00)***	-4.29 (0.00)***
	lnvat	-3.69 (0.00)***	-4.26 (0.00)***	-11.89 (0.00)***	-12.09 (0.00)***
	lnu	-2.09 (0.25)	-0.72 (0.96)	-5.56 (0.00)***	-6.32 (0.00)***
	lncpi	-0.79 (0.81)	-2.03 (0.56)	-4.15 (0.00)***	-4.08 (0.01)**
	lny	-4.30 (0.00)***	-4.36 (0.00)***	-10.62 (0.00)***	-10.58 (0.00)***

Note: ***,** represents significance at the 1% and 5% level, respectively.

Source: Authors' calculation.

Table 4. Bound Test Results

Model	F-statistic	Critical Values	
		I (0)	I (1)
npl=f(vat, u, cpi, y, dummy)			
Lag Length Structure (1,1,4,3,0,1)	21.23***	3.93	5.23

Note: The critical values are from Kripfganz and Schneider (2020). *** means statistically significant at 1 %.

Source: Authors' calculation.

Table 5. The ARDL Estimation Results

Variables	
	Long Run
lnvat	0.457 (0.06)*
lnu	1.026 (0.02)**
lncpi	0.903 (0.18)
lny	-0.288 (0.07)*
dummy	0.178 (0.17)
	Short Run
Δlnvat	0.027 (0.00)***
Δlnu	-0.045 (0.02)**
lnu (-1)	-0.111 (0.00)***
lnu (-2)	-0.077 (0.00)***
lnu (-3)	-0.042 (0.03)**
Δlncpi	-0.170 (0.00)***
lncpi (-1)	0.002 (0.96)
lncpi (-2)	-0.144 (0.01)**
Δdummy	0.036 (0.00)***
Error Correction Term (-1)	-0.08 (0.00)
Constant	0.190 (0.00)***
R-squared	0.95
N	38
	Diagnostic Tests
Breusch-Godfrey Serial LM	0.919 (0.826)
Breusch-Pagan-Godfrey Heteroscedasticity	0.349 (0.317)
J-B Normality	0.499 (0.778)
Ramsey RESET	0.777 (0.676)
Durbin-Watson	2.11
Cusum	Stable
CusumSQ	Stable

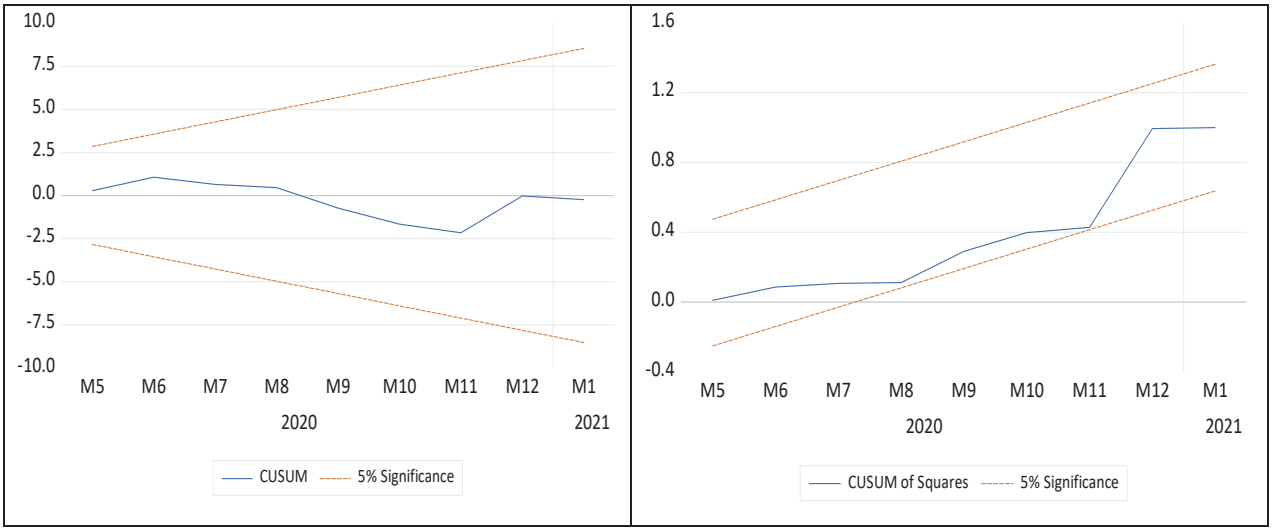
Source: Authors' calculation.

industrial production index reduces NPLs by about 0.29%. The consumer price index shows a positive effect on NPLs, but this effect is not statistically significant at 10%. Table 5 also shows the short-term results. The short-term results seem to show that most of the coefficients are statistically meaningful at the 1 and 5 % levels.

The long-term results summarize the fact that the use of a fiscal policy tool is a very critical factor for the Turkish banking sector. As stated in the introduction, as a regulatory tool for the market in the Turkish economy, value-added taxes have a damaging effect on the level of NPLs in the banking system. However, the effect of the unemployment level on the NPL level is more than twice as strong as the effect of value-added tax. This is also another important indicator for the Turkish economy. Policymakers should consider value-added tax as a critical factor for taking action related to fiscal and monetary policy. Therefore, fiscal policy may have a damaging impact on monetary policy in the Turkish economy. Also, as expected, the industrial production index may provide a payment power to households.

Finally, both the error correction mechanism and some diagnostic tests after estimation are shown in Table 5. Accordingly, as expected, the error correction

Figure 3. The CUSUM and the CUSUM Square Test Results



Source: Authors' calculation.

term is negative and statistically significant. The ECT coefficient is about 0.08 in the model. It means that a bit of the short-run deviation would disappear in the long run in the model. Moreover, the post-estimation diagnostic tests indicated that there is not any auto-correlation, heteroscedasticity or normality problem. The Jarque-Bera test result also provides the normality condition. Finally, Figure 3 shows the CUSUM test and the CUSUMSq test results. Accordingly, there is not any stability problem in the coefficients due to the test statistics being between the critical levels.

Similar research was done by Nurja and Kufo (2016), where they investigated the impact of NPLs on certain macroeconomic factors, specifically corporate income tax for the period of Q4/2008 - Q4/2014. Their results show that the tax rate affects NPLs, which is also in line with empirical results of this paper.

5. Conclusion

NPLs as an indicator of an economic crisis were more volatile during the banking crisis which affected Turkey in 2001. As a consequence of this crisis and to maintain central budget stability, VAT rates were increased. In Turkey, VAT was established in 1985 to replace production tax. Besides budgetary stability in terms of revenue, the objective of implementing VAT was to harmonize the tax structure with the EU members. The rates are: 18% standard rate, 8% reduced rate, and super-reduced rate of 1%. Although it can be concluded that VAT rates are stable, frequent changes in fiscal policies will head to a higher credit risk. Thus, this paper examined the long-term impact of VAT on NPLs in the Turkish economy during 12/2017 and 01/2021. In order to acquire empirical results, an ARDL cointegration model analysis was performed, to show how the dependent and independent variables affect the NPLs. This model has more advantages in relation to conventional cointegration tests, since it can decide the long-term linkage. Specifically, a positive and significant linkage between VAT and NPLs was found. That means that if government regulations increase VAT, households become less able to pay. In this situation households need to borrow more money, i.e. NPLs. Similar research was done by Nurja and Kufo (2016), where they found that the tax rate affects NPLs. A negative and significant relationship was found with respect to the index of industrial production and NPL.

Like any scientific paper, this one also has a limitation. The limitation of this paper is the data availability, especially the data on VAT. In addition, there are several ways in which the work could be improved. First, new econometric techniques with different time frequencies could be used. The quantile-specific short- and long-term effects on the NPL could be analyzed using an ARDL approach (Guo et al. 2021). In addition, it would be interesting to analyze each European Union country separately. This would identify country-specific determinants of NPLs and help policymakers stabilize national economies.

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APPENDIX

Table 1. The classification of loans in Turkey

1. Loans of a Standard Characteristics	This group of loans refers to individuals and legal entities with a creditworthy financial structure, where payments are made when due or up to 30 days after due date. Thereafter, no repayment problems are expected in the future, and they are fully recoverable without realization of collateral.
2. Loans Under Close Supervision	Loans in this group are made to individuals and entities that have a creditworthy financial structure, but where adverse indications of the borrower's solvency or cash flow have been identified or projected due to adverse trends in economic conditions or the areas in which the borrower operates.
3. Loans with Limited Collectability	In this group, full repayment without liquidation of the collateral is unlikely because the net realizable valuation of the collateral or the borrower's own funds are insufficient to pay the debt. In addition, loans are restricted as performing loans after the application of forbearance measures.
4. Doubtful Loans	The characteristics of this group of loans are the maximum collection of the principal and/or interest following the agreement; the creditworthiness of the debtor is not considered a complete loss, since chances such as a merger, new financing opportunities or an increase in capital are available to the debtor and the loan is collectible.
5. Loans classified as Loss	In this group, no or little recovery is expected because the debtor's creditworthiness has completely deteriorated. In addition, late payments of more than one year are to be expected.

Source: BRSA, 2018.

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THE IMPACT OF INSTITUTIONS ON ECONOMIC AND ENVIRONMENTAL PERFORMANCE: EVIDENCE FROM EUROPE

Maria Panteli, Sofia Delipalla

Abstract

Within the Environmental Kuznets Curve framework, we investigate whether the effect of institutions on environmental quality differs among the Western Balkans, the other European post-socialist states, and Western Europe. We estimate both direct and indirect effects of institutions on air pollution for each respective sub-sample and for the whole European region (45 countries during 1996-2014). The negative direct effect is greater for non-post-socialist states, compared to post-socialist ones. Regarding the indirect effect, improving the quality of economic institutions induces an increase in the scale of economic activity, leading to an increase in CO_2 emissions per capita. Estimated elasticities of CO_2 emissions with respect to institutions, for all sub-groups, uncover a total positive effect, which is larger for Central-eastern and South-eastern European states. Improving the quality of institutions should go hand in hand with stricter formation and implementation of policies designed to decouple economic growth from CO_2 emissions.

Keywords: *Environmental quality, carbon dioxide (CO2) emissions, institutional quality, corruption, economic performance, Europe.*

JEL classification: *D02, Q01, Q53*

1. Introduction

Climate change manifestations range from shifting weather patterns to rising sea levels, highly increasing the risk of catastrophic events and affecting economies and societies around the globe in an unparalleled scale (United Nations (UN) n.d.). In our focus area, the European region, the pressure exerted on the environment is linked to adverse environmental, social, and economic sustainability effects. There exist, however, wide disparities in emissions trends between European Union (EU) member countries and post-socialist states in Central-eastern and South-eastern Europe and, especially, the countries in the Western Balkans region.

The hypothesized non-linear relationship between income and environmental quality, as

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depicted by the Environmental Kuznets Curve (EKC), has received considerable attention in the literature. Under the EKC hypothesis, economic growth and environmental protection may not necessarily be mutually exclusive, as the deterioration of environmental quality following an increase in the magnitude of economic activity (scale effect) may prevail only at the outset of economic development. In later stages, alterations in the economy structure (i.e., a move from the primary and secondary sector to the service sector) and technological improvements in production methods may lead to reductions in pollution levels at higher incomes (Grossman and Krueger 1991, 1995). Results examining the potentially inverted U-shape pattern in the relationship between income and environmental degradation have been at best mixed, as various pollution indicators, time frames, samples of countries and estimation methods have been used in the empirical studies; see, for example, Stern (2004), for an early study, and Shahbaz and Sinha (2019).

The EKC framework, apart from its importance in studying economic growth sustainability, has offered a basis for examining the potential relationship between institutional quality and environmental performance. Rising income levels, along with other factors such as environmental awareness and education, can lead to a point where demand for better environmental quality induces improvements in environmental performance (Panayotou 1993). In the absence of institutional quality and in the presence of corruption, however, government rent-seeking behavior may undermine society's preferences for pro-environmental policies and stricter environmental regulation. Actual pollution levels can depart significantly from the optimal ones and the EKC pattern may occur at significantly higher income per capita levels or may not materialize at all (López and Mitra 2000).

We investigate the impact of institutional quality and corruption control on CO_2 per capita emissions in a panel of 45 European countries during 1996-2014. We place emphasis on Central-eastern and South-eastern Europe by investigating the possibility of a differential impact of institutions/corruption control on CO_2 emissions compared to other non-post-socialist European states. The hypothesis of the existence of a differential effect of institutions on the environment among the countries in the Western Balkans, European post-socialist states – Western Balkans excluded, and Western Europe is also tested.

Central-eastern and South-eastern European states have been undergoing a process of post-socialist transformation. Institutional structures have fundamentally changed and market economies have been established. Environmental quality has been influenced by past legacies, including the pre-transition economic structures, population's environmental behavior and attitude, and in some cases by armed conflict (UNDP 2009; EEA 2010). While institutional inefficiency and corruption prevalence has been pinpointed as a significant obstacle to environmental protection and effective implementation of environmental policies in Central-eastern and South-eastern Europe, and especially in the Western Balkans (Börzel and Fagan 2015), statistical analysis investigating the exact impact of institutions/corruption control on air pollution has been limited. To the best of our knowledge, no empirical analysis focuses on differences in the effect of institutions on air pollution among post-socialist states in Central-eastern and South-eastern Europe, the Western Balkans, and Western Europe. This paper seeks to fill this gap. Moreover, to the best of our knowledge, this is the first study to estimate both the direct and indirect effects of overall institutions (not just corruption) on environmental pollution.

The reminder of the paper is organized as follows. In section 2, we briefly review the literature. In section 3, we describe the methodology and data sources. In section 4, specification issues and estimation methods are discussed. Results are presented in section 5, followed by a discussion in section 6. Finally, section 7 concludes.

2. Literature review

Among governance dimensions, corruption has been studied more extensively. Theoretical analysis demonstrates that rent-seeking and corrupt transactions, involving bribery of government officials and policy makers, can impact negatively on environmental policy stringency (e.g., Fredriksson and Svensson 2003; Damania *et al*. 2003; Wilson and Damania 2005). Corruption in bureaucratic administration can reduce environmental regulation's effectiveness, decreasing compliance (e.g., Damania 2002; Wilson and Damania 2005).

Cross-country empirical studies have shown that the stringency of environmental policy and actual pollution levels can be significantly affected by the presence of corruption (e.g., Pellegrini and Gerlagh 2006b; Fredriksson and Vollebergh 2009; Welsch 2004). Corruption has been found to have either a positive (e.g., Welsch 2004; Biswas *et al*. 2012; Zhang *et al*. 2016) or negative (Cole 2007; Goel *et al*. 2013) relationship with pollution, with both direct and indirect effects been identified. Pollution increases at given income levels due to the "direct" impact of corruption. The "indirect" effect arises from the negative relationship

between corruption and economic growth and a subsequent impact on environmental quality through income (Welsch 2004; Cole 2007). The net impact depends crucially on the sign and relative magnitude of the estimated effects. There are also studies which do not confirm the existence of a statistically significant relationship between corruption and environmental degradation (e.g., Bernauer and Koubi 2013).

In general, quality of institutional setups can be a significant determinant of environmental performance (e.g., Panayotou 1997; Esty and Porter 2005; Gani 2012; Ali *et al*. 2019). A large part of the literature has focused on developed (e.g., Fredriksson and Vollebergh 2009) and developing countries (e.g., Gani 2012; Ali *et al*. 2019) or world samples (e.g., Cole 2007; Leitão 2010; Biswas *et al*. 2012; Goel *et al*. 2013; Akhbari and Nejati 2019). From a regional policy-making perspective, however, estimates of the effect of institutions and corruption control on air pollution are very important.

With respect to Central-eastern and South-eastern European countries, limited research has investigated the effect of institutions on the environment. Solakoglu (2007) finds preliminary evidence of a positive effect of property rights on environmental quality, comparing transition countries which became EU member states in 2004 and the rest of transition economies. Tamazian and Rao (2010), in a sample of 24 transition economies during 1993-2004, find institutional quality to be a significant determinant of environmental performance. Both studies focus exclusively on countries in transition and neither takes into account direct and indirect effects of institutions on environmental quality.

In sum, empirical findings are not uniform. Direct and indirect effects of corruption on environmental performance have been found either to reinforce or contradict each other. Results regarding the sign of the total effect are still inconclusive, while statistical significance of the relationship has also been contested. Furthermore, it is not only the presence of corruption that can induce indirect effects. Economic institutions, broadly defined, can have a statistically significant impact on economic performance (Knack and Keefer 1995; Hall and Jones 1999; Acemoglu *et al*. 2001; Hall and Ahmad 2014), hence affecting the environment indirectly through income. To the best of our knowledge, there is no empirical study estimating direct and indirect effects of institutions on the environment in the European sub-regions and in the whole continent, an issue that we investigate extensively below.

3. Methodology and data

We follow the methodology proposed by Welsch (2004) and Cole (2007) and formulate two equations to be estimated simultaneously. An important contribution within this framework is that we take into account overall institutional quality (and not just the effect of corruption) on environmental performance. Our environmental indicator is carbon dioxide (CO_2) emissions per capita (C), expected to be a direct function of institutions ($Inst$), income (GDP) per capita, and a vector of factors (Z) commonly examined in the EKC literature. Hence,

$$C = f(Inst, GDP, Z) \tag{1}$$

The explanatory variables in Z include the share of industry in GDP, energy efficiency, energy production structure, openness to international trade, and population characteristics such as population density, population growth, and degree of urbanization.

The indirect effect of institutional quality on environmental performance arises from the positive effect of economic institutions on economic performance. Thus, institutions can influence per capita CO_2 emissions indirectly through their effect on income, a significant determinant of environmental quality. Under the neoclassical framework, income per capita is modeled as a function of economic institutions and factors common in neoclassical growth literature. Hence,

$$GDP = g(Inst, H) \tag{2}$$

where H includes a proxy of physical capital, a measure of human capital, the rate of population growth, and openness to trade.

The total effect of institutions on CO_2 per capita emissions is estimated as

$$\frac{dC}{dInst} = \frac{\partial C}{\partial Inst} + \frac{\partial C}{\partial GDP} * \frac{\partial GDP}{\partial Inst} \tag{3}$$

where C is again CO_2 emissions per capita, GDP is income per capita and $Inst$ denotes the quality of economic institutions. The first term on the right-hand side of equation (3) captures institutions' direct effect. This direct effect is expected to be negative, i.e., an improvement in institutional quality is expected, ceteris paribus, to lead to a reduction in CO_2 emissions. The indirect effect, the change in pollution caused by the change in income due to changes in institutional quality, is captured by the second term. It should be noted that the sign and magnitude of the indirect

effect are crucial in determining the overall impact of economic institutions on air quality. If an inverted U-shape pattern in the relationship between income and CO_2 emissions is not confirmed, then an increased scale of economic activity (due to improved institutional structures) may lead to a positive indirect impact of institutions on CO_2 emissions. The total effect will then be determined by the relative magnitude of the direct and indirect effect.

Before proceeding to model specification and estimation method, we discuss further the choice of institutional quality measure and control variables used in the analysis. Our indicator of institutional quality is measured as a simple average of four dimensions of governance pertaining to government effectiveness, rule of law, regulatory quality and corruption control, following the categorization developed in the Worldwide Governance Indicators (WGI) project by Daniel Kaufmann and Aart Kraay (n.d.). Since governance dimensions, as constructed in the WGI project, are not suitable for time series and panel data analysis (Arndt and Oman 2006), we use data from the "IHS Markit World Economic Service", obtained through the WGI website. Our variable captures cross-country and over-time variation in economic institutions, with its values laying between zero (lower quality) and one (higher quality).

The use of a single measure indicating institutional quality is deemed more appropriate. The inclusion of four variables proxying different governance dimensions into one regression could have raised serious concerns of bias in the estimates, due to multicollinearity among the independent variables. On the other hand, the examination of the effect of each institutional dimension in a separate regression could possibly suffer from omitted variables bias.

Perceptions-based data are only imperfect proxies for measuring institutional quality (e.g., Gleaser *et al*. 2004; Kurtz and Schrank 2007). Nevertheless, their use is prevalent in empirical research since in most cases they can overcome the bias caused by the use of objective measures (Lambsdorff 2006). The choice of the specific data source ensures wide European country coverage, limiting issues of sample selection bias.

When it comes to the control variables in equation (1), the structure of the economy can play a significant role in the deterioration of environmental quality, a relationship described by Grossman and Krueger (1991, 1995) as the composition effect. For this reason, the share of industry in GDP is included in the analysis and is expected to have a positive relationship with CO_2 emissions. Energy efficiency is expected to have a negative sign. A higher share of coal as a primary source in electricity generation is expected to have a positive sign.

The relationship between openness to international trade and air pollution is theoretically ambiguous. Trade openness can have a negative impact on air quality through a scale effect (Grossman and Krueger 1991). The composition effect is also relevant, through the possible specialization of countries with more lax environmental regulations in the production of pollution intensive goods; this is the Pollution Haven Hypothesis (PHH) (see Gill *et al.* (2018) for a review). If the PHH holds, increased international trade and trade liberalization can reinforce this pattern, increasing emissions for certain countries while reducing them for others. Openness to trade can also have a positive effect on air quality. First, through its effect on economic growth, income and subsequently demand for environmental protection (Grossman and Krueger 1991) and, second, through the adoption of cleaner technologies by local economies (OECD n.d.).

Population growth is expected to have a positive impact on CO_2 emissions (e.g., Liddle 2013; Weber and Sciubba 2019), as is the degree of urbanization (e.g., Al-Mulali *et al*. 2015). Population density has been previously found to have either a positive (e.g., Marshall *et al*. 2005) or negative (e.g., Glaeser and Khan 2010) relationship with pollution levels. In areas/countries with low population density, the impact of commuting on the environment can be higher (Muñiz and Galindo 2005), as is the case with household fuel consumption (Brownstone and Golob 2009). On the other hand, an increase in density of (especially) urban population can lead to increased demand for transportation (Frank and Engelke 2005) and an exacerbation of traffic problems (Marshall *et al*. 2005).

GDP per capita and data on all variables are obtained by the World Bank's WDI. Variables' notation and definition are presented in Table A1 in the Appendix.

4. Model specification and estimation

To find the total effect of institutional quality on air pollution, we estimate first the relationship between institutions and income per capita. Hence,

$$lnGDPpc_{it} = \beta_0 + \beta_1 lnInst_{it} + \beta_3 H_{it} + \zeta_i + \delta_t + v_{it} \quad (4)$$

where, subscripts i and t denote country and year respectively, ζ_i are country specific effects, δ_t are year

specific effects and v_{it} is the error term. Income per capita (*GDPpc*) and economic institutions (*Inst*) are expressed in natural logarithms, as is gross capital formation included in H. Enrollment rates to secondary education, the share of exports and imports of goods and services in GDP and the variable capturing population growth are included as further controls in H.

An important issue which may cause bias in the estimates is the problem of endogeneity between income and institutions. To address this, two-stage least squares (2SLS) is frequently used, provided that suitable instrumental variables are available; the most common instruments include ethnolinguistic fragmentation (Mauro 1995), distance from the equator, the extent to which the primary Western European languages are currently spoken as first languages outside Europe (Hall and Jones 1999), and settler mortality rates (Acemoglu *et al*. 2001). The validity of all instruments has been contested (e.g., Easterly and Levine 1997; Diamond 1997; Sachs 2001; Gleaser *et al*. 2004; McCord and Sachs 2013). Moreover, the theoretical argument for the use of these instruments pertains to other contexts.

Given our specific sample of countries and in the absence of valid instruments, we follow an alternative approach common in recent empirical research (e.g., Biswas *et al*. 2012). We use the second and up to four lags of institutional quality as instruments for current institutions. According to Reed (2015), this is an effective strategy provided two conditions are met: the lags do not belong in the model and are adequately correlated with the endogenous variable. Although the conditions are strong, we assume that, when we estimate the contemporaneous relationship between income and institutions, past institutional quality effects on GDP per capita entirely pass through current institutions. Regarding the second condition, the correlation coefficient between economic institutions and its second and third lags are 0.979 and 0.972, respectively. The correlation coefficient with the fourth lag is 0.968.

Two-stage least squares estimation is performed with fixed effects. We opt for this method, since it is most unlikely that all the time invariant factors affecting income per capita which are omitted from our model are uncorrelated with the independent variables used in our analysis. Summary statistics, reporting, among others, overall, between and within variation in our data used in estimating equation (4), are reported in Table A2 in the Appendix.

Results (fitted values) from estimated equation (4) are used to estimate the direct effect of institutions on per capita CO_2 emissions. Our chosen specification is

$$lnC_{it} = \alpha_0 + \alpha_1 lnInst_{it} + \alpha_2 lnGDPpc_{it} + \alpha_3 (lnGDPpc_{it})^2 + \alpha_4 Z_{it} + \gamma_i + \eta_t + u_{it} \quad (5)$$

where CO_2 emissions per capita (C), institutional quality ($Inst$), income per capita (predicted values from equation (4)) and energy efficiency included in (Z) are expressed in natural logarithms. Further controls in the (Z) matrix (already outlined above) enter the model into their original forms. Country and year specific effects are also included in the model. The error term is represented by u_{it}.

5. Results

5.1. Impact of Institutional Quality on Income

The estimated impact of institutions on income per capita is presented in Table 1. The coefficient of the quality of economic institutions is highly statistically significant across all specifications. The elasticity of income with respect to institutional quality in the bivariate regression (model GDP-1) is estimated to be 1.1, i.e., a one percent increase in mean institutional quality is expected to increase mean income per capita by 1.1 percent. The inclusion of further controls leads to a decrease in this elasticity, which in our full specification is equal to 0.77 (model GDP-3). Due to missing data in school enrolment rates, in model GDP-3, the number of countries drops to 43. To compare results with and without the inclusion of human capital, we re-estimate the model (GDP-6) excluding school enrollment rates, but with the same sample of countries as in model GDP-3. Estimates are almost identical. Thus, the omission of human capital does not cause significant bias in the estimates, and we prefer the results from model GDP-2.

With respect to the internal instruments, in columns 1-3, 6 and 7, the second lag of institutional quality is employed. The use of a single instrument for the endogenous variable does not allow to test for exclusion restrictions, since this is only possible when there are more instrumental variables than endogenous variables, i.e., when the model is over-identified.

In models GDP-4 and GDP-5, the instruments used are the second and third lags of institutions, and the second and up to the fourth lag of institutions, respectively. In these models, the Sargan statistic does not reject the null hypothesis of joint validity of the instruments, and the models pass the weak identification and under-identification tests.

Note that the higher the value of the weak identification test, compared to the Stock-Yogo (2005) critical

Table 1. Effect of institutional quality on income per capita

lnGDPpc	GDP-1	GDP-2	GDP-3	GDP-4	GDP-5	GDP-6	GDP-7
lnInst	1.1*** (0.09)	0.89*** (0.13)	0.77*** (0.09)	0.8*** (0.11)	0.83*** (0.15)	0.77*** (0.09)	0.89*** (0.32)
lninvest		0.21*** (0.03)	0.24*** (0.02)	0.14*** (0.02)	0.14*** (0.02)	0.24*** (0.02)	0.21*** (0.06)
popgrowth		0.015 (0.01)	0.004 (0.009)	0.023** (0.009)	0.024** (0.01)	0.004 (0.008)	0.015 (0.02)
trade		-0.0014*** (0.0003)	0.00006 (0.0003)	0.0004 (0.0004)	0.0006* (0.0004)	0.00006 (0.0003)	-0.0014 (0.001)
school			0.0003 (0.0006)	-0.0005 (0.0007)	-0.0005 (0.0007)		
No. of countr.	45	45	43	43	43	43	45
No of obs.	621	605	545	396	356	545	605
Sargan	-	-	-	0.908	0.144	-	-
Weak Identification Cragg-Donald Wald F statistic	766.9	303.1	221.9	41.89	17.1	227.1	303.1
Under Identification Chi-sq(1) P-val	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0007

*Notes: Standard errors in parentheses. ***, ** and * indicate significance at the 99%, 95% and 90% levels, respectively. 2SLS with fixed effects is used in all specifications. In models GDP-1 through GDP-3, GDP-6 and GDP-7, the second lag of institutional quality is used as an instrument. In model GDP-4, the second and third lags of institutions are used as instruments. In model GDP-5, the second and up to the fourth lags are employed. Goodness-of-fit measures are unclear with fixed effects estimation, thus R^2 is not reported. Unreported year specific effects are included in all models.*
For models GDP-1 to GDP-3, GDP-6 and GDP-7 the Stock-Yogo (2005) weak identification test critical value for 10% maximal IV relative bias is 16.38. For model GDP-4 the critical value for 10% maximal IV relative bias is 19.93, while for model GDP-5 the critical values for 5% and 10% maximal IV relative bias are 13.91 and 9.08, respectively.

values for maximal IV relative bias given in Table 1, the more confidence we have that the instruments used in the analysis are not weak. With respect to the under-identification test, the p-value obtained throughout Table 1 leads to a rejection of the null hypothesis, which states that the equation is under-identified.

The use of a higher number of internal instruments in models GDP-4 and GDP-5 reduces the number of observations employed in estimation. The value of the weak identification test is significantly lower than the one reported in previous models. Thus, we conclude that our best estimate of the impact of institutions on income per capita is obtained from model GDP-2 and, in what follows, we make use of these results. Finally, to address the potential issue of serial correlation, we conduct the Wooldridge (2002) test for autocorrelation in panel data obtaining a test statistic of 0.389. Thus, we fail to reject the null hypothesis of no first-order autocorrelation. Nevertheless, in model GDP-7 we re-estimate model GDP-2 correcting for within-panel serial correlation and cross-sectional heteroskedasticity.

5.2. Impact of Institutional Quality on Environment

Results of the direct effect of institutional quality on CO_2 emissions are presented in Table 2. In models CO-1 and CO-2, a fixed effects estimation method is used. The result of the Hausman test in model CO-1 provides evidence in favour of random effects estimation, since we fail to reject the null hypothesis that the difference in coefficients between fixed and random effects is not systematic. Including further controls in model CO-2, however, makes the p-value highly statistically significant, indicating that fixed effects should be used.

The issue of serial correlation is also relevant in the case of estimating the direct effect of institutions on CO_2 per capita emissions. For this reason, we apply the Wooldridge (2002) test for first-order serial correlation in the set of variables used in estimating equation (5), obtaining a test statistic equal to 0.0000. Under this result, we reject the null hypothesis of no first-order serial correlation and procced our estimation in models CO-3 to CO-7 employing a GLS random-effects estimator with an AR(1) disturbance. The Hausman test, in models CO-3 to CO-5, validates the choice of using

Table 2. Effect of institutional quality on CO_2 emissions per capita

lnCO_2 per capita	CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7	CO-8
lncInst	-0.31*** (0.116)	-0.22** (0.11)	-0.41*** (0.08)	-0.38*** (0.08)	-0.41*** (0.08)	-0.44*** (0.11)	-0.42*** (0.11)	-0.51*** (0.16)
(lncInst)^2								-0.3 (0.25)
(lncInst)^3								-0.18 (0.13)
lnGDPpc	0.68 (0.48)	1.25*** (0.45)	0.21 (0.47)	0.33 (0.47)	0.25 (0.47)	0.47 (0.48)	0.56 (0.49)	0.38 (0.49)
(lnGDPpc)^2	-5.99e-06 (0.027)	-0.034 (0.026)	0.021 (0.026)	0.014 (0.026)	0.02 (0.03)	0.002 (0.027)	-0.003 (0.03)	0.01 (0.03)
lnenergeff		-0.39*** (0.04)	-0.61*** (0.04)	-0.61*** (0.04)	-0.62*** (0.04)	-0.65*** (0.04)	-0.65*** (0.04)	-0.62*** (0.04)
indshare		0.007*** (0.002)	0.007*** (0.002)	0.007*** (0.002)	0.008*** (0.002)	0.009*** (0.002)	0.009*** (0.002)	0.008*** (0.002)
coalelectr		0.005*** (0.0009)	0.004*** (0.0006)	0.005*** (0.0006)	0.004*** (0.0006)	0.004*** (0.0006)	0.004*** (0.0006)	0.004*** (0.0006)
trade		0.0008** (0.0004)	0.0015*** (0.0003)	0.0013*** (0.0003)	0.0013*** (0.0003)	0.0012*** (0.0003)	0.0012*** (0.0003)	0.0014*** (0.0003)
popgrowth		0.04*** (0.011)		0.012 (0.009)				
populdens		-0.001 (0.0006)		0.0005** (0.0003)	0.0006** (0.0003)	0.0002 (0.0003)	0.0002 (0.0003)	0.0006*** (0.0003)
populurban		0.005*** (0.0015)		0.0009 (0.0008)				
dPS						-0.51*** (0.12)		
dPS2							-0.51*** (0.13)	
dWB							-0.59*** (0.19)	
*dPS*lnInst*						0.12 (0.1)		
*dPS2*lnInst*							0.13 (0.1)	
*dWB*lnInst*							-0.007 (0.15)	
Hausman Prob>chi2	0.0597	0.0001	0.7758	0.7163	0.9995	-	-	0.9883
No of obs.	683	682	682	682	682	682	682	682
No of countr.	45	45	45	45	45	45	45	45

*Notes: Standard errors in parenthesis. ***, ** and * denote significance at the 99%, 95% and 90% levels, respectively. Estimation is performed using results from model GDP-2 (Table 1). Fixed effects estimation is used in models CO-1 and CO-2. GLS random effects estimation with an AR(1) disturbance is used in models CO-3 to CO-7. Unreported year specific effects are included in all models.*

random effects estimation. Note that, in models CO-6 and CO-7, we report no values for the Hausman test since the inclusion of dummy variables that are constant over time does not permit to test if the difference in coefficients between fixed and random effects is not systematic.

Institutional quality is found to be a negative and highly statistically significant determinant of CO_2 emissions across all specifications. In model CO-1, where only institutional quality and GDP per capita are included in the regression, a one percent increase in mean institutional quality is expected to decrease mean CO_2 emissions per capita by 0.31 percent. In model CO-2, the inclusion of further controls slightly influences the significance of the coefficient of institutions, while its magnitude decreases. In subsequent models, in which a random effects estimator with an AR(1) disturbance is employed, the coefficient of institutional quality is statistically significant at the one percent level, while its magnitude increases compared to fixed effects estimation results.

Energy efficiency decreases (as expected) mean CO_2 emissions per capita, while its coefficient is considerable in magnitude and highly statistically significant. A larger mean share of coal-based electricity production leads to an increase in mean CO_2 emissions per capita, a relationship which is again highly statistically significant and holds across all specifications. Openness to trade, on the other hand, is found to have a statistically significant relationship with mean CO_2 emissions at the five percent level, when fixed effects estimation is used. When the issue of serial correlation is dealt with in models CO-3 to CO-7, trade openness is found to be a positive and highly statistically significant determinant of CO_2 per capita emissions in Europe, although the magnitude of its effect is smaller compared to other factors, such as institutional quality and energy efficiency.

As expected, population growth and urbanization have a positive relationship with CO_2 emissions per capita. While in model CO-2 a highly significant effect of these variables is estimated, in model CO-4 their coefficients lose their statistical significance. Hence, they are dropped from subsequent models. The coefficient of population density has a negative sign with fixed effects estimation, indicating that, on average, more densely populated countries have lower mean CO_2 emissions per capita. However, the sign of the relationship changes once a random effects estimator with an AR(1) disturbance is used.

It is worth noting that we find no evidence for the existence of an EKC pattern in the relationship between income and CO_2 emissions. In most specifications, the linear and the squared income terms have a positive sign, indicating that air pollution emissions increase as income level rises. Moreover, in the cases where a negative sign of the squared income term is obtained, its magnitude is so small compared to the linear term, leading to a hypothetical EKC with a turning point at an implausible income per capita level.

In models CO-6 and CO-7, we test if there is a statistically significant different effect of institutional quality on CO_2 emissions per capita between countries with a socialist history in Central-eastern and Southeastern Europe and countries that did not have centrally planned economies in past decades. Emphasis is placed on possible differences between the countries in the Western Balkans and the other sub-groups defined throughout the analysis so far. In model CO-6, an interaction term between institutional quality and the dummy variable indicating European post-socialist states is included. In model CO-7, we distinguish between countries in the Western Balkans and the rest of post-socialist states by including in our regression separate interaction terms between the dummy variables indicating these groups and institutions. The estimated average marginal effects of institutions on CO_2 emissions per capita for each group of countries, as well as the differences in the estimated coefficients of institutions across the geopolitical European subregions, are presented in Table 3.

Estimates in Tables 2 and 3 indicate that, in Western European countries, an improvement in the mean quality of economic institutions by one percent leads to a reduction in mean CO_2 emissions per capita by 0.44 percent. In post-socialist states, this mean reduction is equal to 0.32 percent. However, while the average marginal effects of institutions on CO_2 emissions are individually significantly different from zero, there is no evidence that the estimated difference between subgroups is also statistically significant.

Likewise, the average marginal effect of institutions on CO_2 per capita emissions for the countries in the Western Balkans is estimated at 0.427, i.e., a one percent increase in mean institutional quality is associated with a decrease in mean CO_2 emissions by 0.427 percent. For Western European countries, this mean reduction is estimated at 0.42 percent, while for post-socialist states – Western Balkans excluded, it is estimated at 0.29 percent. Again, despite the fact that the simple slopes of institutions are found to be statistically significant for each respective European sub-region, the difference in the effect of institutional quality on CO_2 emissions among Western European countries, post-socialist states – Western Balkans excluded, and the countries in the Western Balkans region is not found to be significantly different from zero.

Table 3. Average marginal effects of institutions on CO_2 emissions by sub-region

lnCO_2 per capita	Average marginal effects Model CO-6	Average marginal effects Model CO-7
lncInst		
Western Europe	-0.44*** (0.11)	
dPS	-0.32*** (0.08)	
Western Europe vs dPS	0.12 (0.1)	
Western Europe		-0.42*** (0.11)
dPS2		-0.29*** (0.09)
dWB		-0.427*** (0.12)
Western Europe vs dPS2		0.13 (0.1)
Western Europe vs dWB		-0.01 (0.15)

Findings in model CO-7 are surprising, in the sense that, in our sample, non-post-socialist European states and the countries in the Western Balkans region are the subgroups with the highest and the lowest mean performance, respectively, with respect to institutional quality. At the same time, estimates indicate that these two geopolitical regions have, on average, the greatest direct improvement in environmental quality, resulting from improved institutional structures. Since this result cannot be attributed to their differences with respect to past economic and political organization, we have to consider the possibility of the existence of a nonlinear relationship between the quality of economic institutions and environmental degradation.

In model CO-8, we include a quadratic and a cubic term of institutional quality in our specification. Testing for joint significance of the coefficients of economic institutions, we obtain a p-value equal to 0.000. Our results indicate that the direct effect of an improvement in mean institutional quality on mean CO_2 emissions is negative throughout the sample's institutional quality range. That is, improved institutional structures lead to reduced emission levels. This effect (which is non-linear in nature), however, is higher towards the upper and the lower ends of the institutional quality range in our sample (see, Table A3 and Figure A1 in the Appendix).

5.3. Total Impact of Institutional Quality on Emissions

We now turn to calculating the total effect of institutions on CO_2 per capita emissions. For this, we need to estimate the indirect effect. Indirect and total effects are calculated for our sample as a whole. Given the nonlinear nature in the relationship between institutions and CO_2 per capita emissions, we also calculate indirect and total effects at the mean institutional quality level of post-socialist versus non-post-socialist European states, and the Western Balkans versus the other subgroups separately.

For estimating total effects, the coefficients of interest from Tables 1, 2 and Table A3 (in the Appendix) are plugged into equation (3). As discussed already in the Methodology and Data section, the direct effect is captured by the first term of the right-hand side of equation (3). It is the average marginal effect of institutions at the mean institutional quality level (of the sample, and of each respective subsample) estimated using results from model CO-8 in Table 2 (see, Table A3, in the Appendix). The indirect effect of institutional quality on CO_2 emissions per capita is the product of the change of emissions caused by income and the change of income caused by institutions. The change of emissions caused by income is obtained from the coefficients of the linear and the squared income per capita terms (model CO-8) in Table 2. To calculate the

slope of the relationship between income and CO_2 per capita emissions, which is non-constant and depends on the given income level, we use

$$\%\Delta co2pc \approx [\alpha_2 + 2\alpha_3 lnGDPpc]\%\Delta GDPpc \quad (6)$$

where $\%\Delta co2pc$ stands for the percentage change is CO_2 emissions per capita, $\%\Delta GDPpc$ stands for the percentage change in income per capita, α_2 and α_3 are the estimated coefficients of the linear and the squared income terms, respectively (Table 2), and $lnGDPpc$ is the natural logarithm of GDP per capita at which we choose to estimate our elasticity (Wooldridge 2012, p.198). We calculate the indirect (and total) effect of institutions on air pollution at the median income level.

For the whole sample of the 45 European countries, the direct effect of a one percent increase in mean institutional quality on mean CO_2 emissions per capita is -0.36 percent (Table A3, Appendix). Using formula (6), at the median income level (US$ 15,064.5), the change of CO_2 per capita emissions caused by income is 0.61. The total effect of institutional quality on CO_2 emissions per capita is then

$$\frac{dC}{dInst} = (-0.36) + [(0.61) * (0.89)] = 0.18$$

That is, in Europe, one percent increase in mean institutional quality is expected to increase mean CO_2 per capita emissions by 0.18 percent.

The indirect and total effects are calculated in the same manner for European post-socialist states versus Western European countries, using estimated average marginal effects from Table A3 (Appendix), coefficients from models GDP-2 and CO-8, and the corresponding values of the median income per capita levels in each subgroup. They are also estimated separately for the Western Balkans region. Findings are presented in Table 4.

To sum up results displayed in Table 4, the direct impact of institutional quality on CO_2 emissions per capita is always negative, as expected. A higher mean quality of economic institutions results in a lower mean level of per capita air pollution emissions. The direct effect of one percent increase in mean institutional quality in the European region is estimated to be -0.36 percent while, when we examine the effect separately for European post-socialist states and Western Europe, it is larger for the latter group (|0.34| compared to |0.44|).

The direct negative effect of institutional quality on air pollution is found to be close in magnitude between the countries in the Western Balkans region and post-socialist states – Western Balkans excluded, with the former, however, being slightly more pronounced. At the same time, Western European states enjoy the highest mean decrease in CO_2 per capita emissions resulting from improved institutional structures (Table 4). Therefore, these results indicate that improvements in the underlying dimensions of governance and in the overall quality of economic institutions have a more pronounced direct impact on environmental performance in the upper and lower ends of the institutional quality range of our sample.

Improvements in the quality of economic institutions, however, are not necessarily associated with an overall improvement in air quality since, apart from the direct effect, economic institutions positively affect the level of economic development. Thus,

Table 4. Total impact of institutions on per capita CO2 emissions

	Direct	Indirect	Total
Europe (45 countries)	-0.36	0.54	0.18
Central-eastern & South-eastern Europe, Western Balkans included	-0.34	0.53	0.19
Western Europe	-0.44	0.55	0.11
Central-eastern & South-eastern Europe, Western Balkans excluded	-0.34	0.54	0.2
Western Balkans region	-0.36	0.53	0.17
Western Europe	-0.44	0.55	0.11

institutional quality can impact emissions indirectly (scale effect), especially if an EKC pattern in the relationship between income and air pollution does not materialize. If the indirect impact is positive, the net result crucially depends on the magnitude of the opposite effects.

The indirect impact of improvements in economic institutions and control of corruption on CO_2 emissions is indeed positive, i.e., increased income per capita resulting from better institutions leads to higher mean CO_2 emissions per capita (Table 4). This indirect impact is found to be positive for the whole sample (with an elasticity of 0.54) and for each respective subsample examined. This was anticipated, given that the existence of an EKC pattern between income and air pollution is not confirmed (Table 2).

Total effect is always positive, since the indirect effect outweighs the direct one. The calculation of different elasticities of CO_2 emissions, with respect to institutions for Central-eastern and South-eastern European states and Western Europe, reveals that the total negative effect of institutions on air quality is larger in magnitude for European former socialist countries. In Central-eastern and South-eastern Europe, an improvement in the mean quality of economic institutions by one percent is expected to lead to an increase in mean CO_2 emissions per capita by almost 0.19 percent (Table 4). In the rest of Europe, this mean increase is lower in magnitude and estimated to be 0.11 percent.

Finally, when we examine the total effect of institutions on air pollution for the countries in the Western Balkans, post-socialist states – Western Balkans excluded, and Western European states separately, we see that it is mainly influenced by, and closely follows, the pattern of the direct effect. Hence, the total positive effect of improved institutional structures on air pollution emissions is found to be the largest for Central-eastern and South-eastern European states – Western Balkans excluded.

6. Discussion

Our findings indicate that an improvement in the quality of economic institutions and higher corruption control can lead to significant benefits, both in terms of increased income per capita and in terms of reduced CO_2 emissions per capita through the direct channel. This conclusion applies to the sample as a whole but also to subsamples of countries which have (in some cases markedly) different mean levels of institutional quality.

The analysis also reveals that an increase in mean income per capita resulting from improved institutional structures is most likely to increase mean emissions, an effect which outweighs improvements in air quality achieved through the direct channel. Under these findings, the goal of improving the quality of governance structures throughout Europe should go hand in hand with stricter formation and implementation of policies designed to decouple economic growth from CO_2 emissions.

Regarding research limitations, employing a single measure of institutional quality makes it impossible to estimate the magnitude and significance of each governance dimension and the presence of corruption on environmental performance separately. However, the current limitations in measuring economic institutions, the possibility that individual measures broadly capture the same thing (Langbein and Knack 2010), and the fact that the underlying components of the quality of governance most probably simultaneously determine the overall quality of an economy's institutional structure, lead us to believe that the selected measure is better suited for analyzing the link between institutions and environmental quality, overcoming serious estimation challenges.

7. Conclusion

Our results identify a statistically significant effect of institutional quality on CO_2 emissions per capita in the European region. The estimated elasticities of CO_2 emissions with respect to institutions, for all sub-groups in Europe, uncover a total positive effect, which is larger in magnitude for Central-eastern and South-eastern European countries – Western Balkans excluded. This result, which is mainly influenced by the pattern and relative magnitude of the direct effect, cannot be attributed to differences in past economic and political organization, but to the non-linear nature of the relationship between economic institutions and air pollution.

Although previous studies examining the effect of (just) corruption on pollution have estimated both direct and indirect effects (e.g., Welsch 2004; Cole 2007), no study, to the best of our knowledge, examining the effect of overall institutions (not just corruption) on pollution has estimated the indirect effect. Regarding the direct effect, our results are in accordance with previous estimates, identifying a statistically significant (negative) direct effect of institutions on air pollution (e.g., Panayotou 1997; Esty and Porter 2005; Gani 2012; Ali *et al*. 2019 and Salakoglu 2007; Tamazian and Rao 2010 for transition economies). Our study, to the best of our knowledge, is the first to estimate both

the direct and indirect effects, finding that the overall impact of institutions on environmental pollution is positive.

In the whole European region, the magnitude of the indirect positive effect of institutional quality always outweighs the direct negative one, resulting in a net positive impact of institutional quality on environmental degradation. This finding is very important from a policy-making perspective, since the goals of accelerating economic performance, improving standards of living (through improvements in institutional quality), and mitigating the effects of climate change through reductions in air pollution emissions, are not expected to be simultaneously met without further effort.

Our results indicate that a simple formula, which boils down to improving institutions, advancing economies and then improving environmental quality (achieved both through improved governance structures and higher environmental protection at higher income levels), is not expected to work without further action in terms of decoupling economic activity from air pollution emissions. Since we found no evidence for the existence of an EKC pattern in the relationship between CO_2 emissions and income per capita, an increase in the level of economic development resulting from improved governance structures is expected to induce further environmental problems.

This does not mean that efforts directed towards improving economic institutions are fruitless. Institutional quality is an important determinant of economic performance and therefore its enhancement can be a significant step in achieving higher living standards and convergence among European sub-regions. Moreover, improvements in institutional quality are expected to have a direct negative effect on environmental degradation in the European region. Given, however, that in all subsamples the net effect is estimated to be positive, greater attention should be paid to making economic growth environmentally sustainable.

Finally, although per capita CO_2 emissions are generally considered a good indicator of overall environmental performance, results obtained from analyzing different types of air pollutants and other forms of environmental degradation may be very different from the ones presented here. Future research could concentrate on examining the direct and indirect effect of overall institutional structures on other pollution sources.

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Appendix

List of countries included in the sample:

Albania, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia & Herzegovina, Cyprus, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Kazakhstan, Latvia, Lithuania, Luxembourg, Moldova, Montenegro, Netherlands, North Macedonia, Norway, Poland, Romania, Russian Federation, Portugal, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, The Republic of Malta, Turkey, Ukraine, United Kingdom

Table A1. Definition of variables and data sources

Variable	Definition	Source
co2pc	Carbon dioxide emissions, metric tons per capita	World Bank – World Development Indicators (WDI)
GDPpc	GDP per capita in constant 2010 US$	World Bank – WDI
GE	Government effectiveness. Scale 0-1 (higher values indicate higher effectiveness). IHS Markit World Economic Service	Accessed through the Worldwide Governance Indicators (WGI)) website
RQ	Regulatory quality. Scale 0-1 (higher values indicate better quality). IHS Markit World Economic Service	Accessed through the WGI website
RL	Rule of law. Scale 0-1 (higher values indicate better quality). IHS Markit World Economic Service	Accessed through the WGI website
CC	Control of corruption. Scale 0-1 (higher values indicate less corruption). IHS Markit World Economic Service	Accessed through the WGI website
Inst	Institutional quality measured as a simple average of government effectiveness, regulatory quality, rule of law, control of corruption. Scale 0-1 (higher values indicate better institutional quality)	Own calculation
indshare	Industry (including construction), value added (% of GDP)	World Bank – WDI
coalelectr	Electricity production from coal sources (% of total)	World Bank – WDI
energeff	Energy efficiency: GDP per unit of energy use	World Bank – WDI
popgrowth	Population growth (annual %)	World Bank – WDI
populdens	Population density: people per square kilometer of land area	World Bank – WDI
populurban	Urban population (% of total)	World Bank – WDI
invest	Gross capital formation in constant 2010 US$	World Bank – WDI
trade	Sum of imports and exports of goods and services (% of GDP)	World Bank – WDI
dPS	Dummy variable indicating post-socialist states (1 if post-socialist, 0 otherwise)	
dWB	Dummy variable indicating the six countries in the Western Balkans (1 for Western Balkans countries, 0 otherwise)	
dPS2	Dummy variable indicating post-socialist countries, Western Balkans excluded	

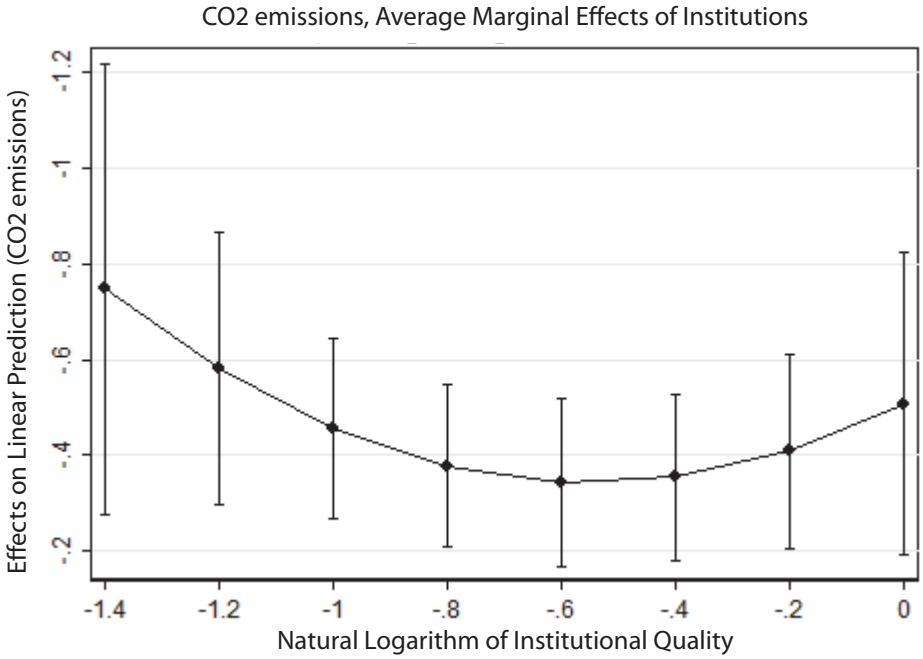
Table A2. Summary statistics

Variable		Mean	Median	Std. dev.	Min	Max	Obs.	No. of countries	Units
GDPpc	overall	24,346.6	15.064,5	23,083.8	946.4	111,968.4			
	between			23,102.6	1,369.9	97,756.6	854	45	2010 US$
	within			3,188.1	1,380.1	38,558.4			
Inst	overall	0.72	0.76	0.21	0.24	1			
	between			0.206	0.36	0.98	711	45	Index
	within			0.05	0.54	0.96			
invest	overall	9.67e+10	3.12e+10	1.57e+11	8.40e+07	7.33e+11			
	between			1.54e+11	9.89e+08	6.68e+11	817	45	2010 US$
	within			2.77e+10	-8.84e+10	2.64e+11			
popgrowth	overall	0.17	0.17	0.83	-3.8	2.9			
	between			0.71	-1.26	1.62	854	45	% (annual)
	within			0.43	-3.3	2.33			
trade	overall	99.8	87.1	50.57	24.17	382.3			
	between			48.1	47.6	290.2	851	45	% (of GDP)
	within			16.8	0.05	191.9			
school	overall	100.7	98.3	15.4	61.96	162.3			
	between			14.4	74.67	155.6	755	44	% (of gross)
	within			6.56	74.75	134.3			

Table A3. Average marginal effects of institutions on CO_2 emissions at different institutional quality levels

lnCO_2 per capita		Model CO-8
Institutional quality at sample	*min*	-0.78*** (0.26)
	25th percentile	-0.34*** (0.089)
	mean	-0.36*** (0.09)
	median	-0.39*** (0.09)
	75th percentile	-0.45*** (0.13)
	max	-0.51*** (0.16)
at Western Europe	*mean*	-0.44*** (0.12)
at Post-socialist states	*mean*	-0.34*** (0.09)
at Post-socialist states,Western Balkans excluded	*mean*	-0.34*** (0.09)
at Western Balkans	*mean*	-0.36*** (0.09)

Figure A1. Average marginal effects of institutions on CO_2 emissions



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EURO AREA PRODUCT MARKET INTEGRATION

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Abstract

The goal of this paper is to determine if there is product market integration in the euro area (EA). The paper employs LM and RALS-LM unit root tests with two breaks on the relative price series, constructed using the seasonally adjusted monthly Harmonized Index of Consumer Prices (HICP), from 1996:01 to 2017:05. The analysis shows EA-accession related breaks in price series for most of the EA11 countries, but, apart from Malta, no such breaks for the later-EA-joiners. However, there are breaks in both EA and non-EA countries at the time of EA formation. There is also evidence of greater product market integration and less adverse effects after negative shocks in the EA12. However, unit root analysis points to a conclusion that EA membership is not a sufficient condition for product market integration and integration is not necessarily related to being an EA member.

Keywords: *prices, euro area, stochastic convergence, unit root, structural breaks*

JEL classification: *E31, F45, O52*

1. Introduction

Euro area (EA) consists of nineteen European Union (EU) member states that have adopted the euro after meeting the five so-called Maastricht criteria. Behind its creation was a need to form a unique and integrated system that would stabilize economic shocks. It was envisioned to function as an optimal currency area (OCA) – the area that is heavily commercially linked and can thus at the same time achieve full employment, low inflation and balance of payments balances (Mundell 1961; McKinnon 1963; Kenen 1969). The Maastricht criteria, also called the convergence criteria, are specific economic conditions that were designed to be met by accessing countries to ensure economic convergence within the EA. These criteria cover the necessity of price stability, the soundness

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and sustainability of public finances, durability of interest rates convergence and exchange rate stability, prior to the EA accession. One of the goals of this economic convergence was to ensure that the EA increases product market integration (Engel and Rogers 2001; Allington et al. 2005). According to the Law of One Price (LOOP), identical tradable goods prices in the same currency were expected to, under competitive conditions, equate across all locations. The tradables' markets should become integrated. But if there is sufficient economic integration (e.g. integrated production factors' markets), which is the promised idea of EA; the same is expected for the non-tradable goods markets as well (Allington et al. 2005).

The recent global financial crisis and the apparent increase in differences among the EA countries made economists question whether the EA really functions as the OCA (Krugman 2009), and placed this issue in the center of the debate. It is argued that the EA is only a monetary union, not an OCA, because EA member states are not affected by symmetric shocks, there is low labor mobility, no common fiscal system, inflation rates are different and salaries and prices are rigid. Krugman (2012) argues that the member states have difficulties adjusting after (asymmetric) shocks precisely because of this failure of the EA to function as the OCA, primarily due to labor market adjustment mechanism failure (ECB 2012). In order to properly investigate whether the EA functions optimally, it is important to analyze whether macroeconomic variables converge and how well they adjust after a shock.

This paper analyzes the price convergence as an indicator of product market integration in the EA. Since the findings of the existing literature on the price convergence in the EA is inconclusive, this paper employs alternative approach, i.e. LM unit root test by Lee and Strazicich (2003) and RALS-LM unit root tests by Meng et al. (2016) with two breaks on the relative price variable, as suggested by Bernard and Durlauf (1995). Namely, Bernard and Durlauf (1995) ration that the variables of interest (in this case prices) should not differ arbitrarily for countries that converge and hence their relative prices should be stationary. This is a novel approach to analyzing the price convergence in the EA. The calculation of the relative prices is based on the seasonally adjusted monthly Harmonized Index of Consumer Prices (HICP), from 1996:01 to 2017:05.

The remainder of the paper is structured as follows; Section 2 provides a literature review; Section 3 discusses data and methodology; Section 4 displays and discusses the results of the analysis; and finally Section 5 concludes.

2. Literature review

This paper focuses on price convergence as an indicator of product market integration in the EA. There are two strands of literature on product market integration in the EA. The first analyzes trade volumes and mostly agrees on the positive effects of euro on trade volumes (Micco et al. 2003; Rose 2016). Interestingly, Micco et al. (2003) found that euro increased trade among EA countries, but also between the EA and non-EA countries. The second strand of literature analyzes price convergence as an indicator of product market convergence. The introduction of the euro should have decreased price dispersion (Wolszczak-Derlacz 2010). However, the evidence is mixed.

There is a body of literature that finds positive effects of EA membership (Estrada et al. 2013; Nikolsko-Rzhevskyy and Ogrokhina 2018) and common currency (Isgut 2004; Allington et al. 2005; Glushenkova and Zachariadis 2014) on price convergence, using differences-in-difference (DID), cross-sectional, panel data approach, and relative price dispersion measures[1]. Alternatively, others find no significant effects of EA membership and euro using panel data analysis (Parsley and Wei 2001; Fischer 2012), cross-sectional and DID approach (Lutz 2003; Parsley and Wei 2008). And finally, there are also studies that find diverging effects of euro on prices using relative price dispersion measures (Engel and Rogers 2004) and DID approach (Ogrokhina 2015). Using a regression analysis, Bergin and Glick (2007) pinpoint the price of oil and transport costs as drivers of this rising price dispersion. Obviously, the existing literature is inconclusive regarding the existence of price convergence in the EA and the role of EA accession in the price convergence. This paper approaches this issue differently, using non-linear unit root tests to analyze stochastic convergence of price indices and the related structural breaks. This enables conclusions on whether there is price convergence in the EA, but also to discern between potential EA creation and EA accession effects based on the break locations, thereby adding valuable new information to the existing literature.

The test of stochastic convergence is conducted using the approach by Bernard and Durlauf (1995) who suggested that the variables of interest should not differ arbitrarily and hence, in this case, the relative prices should be stationary for countries that converge. This approach found its' application in many convergence topics, such as GDP per capita convergence (e.g. Pesaran 2007), unemployment convergence (e.g. Raguž Krištić et al. 2019), fiscal convergence (e.g. Arčabić 2018) as well as price convergence (e.g. Camarero et al. 2000), although not

for the analysis of EA product market integration. To test the stationarity of these relative prices, the two-break LM unit root test by Lee and Strazicich (2003) and RALS-LM test by Meng et al. (2016) is applied. Unit root testing enables us to test whether there is price convergence i.e. product market integration in the EA member countries, while structural break testing endogenously determines the break locations that are then further discussed in light of the EA formation and EA accession, as well as the financial and sovereign debt crisis.

3. Data and methodology

The data used in the analysis are seasonally adjusted monthly Harmonized Index of Consumer Prices (HICP), 2015 = 100, from 1996:01 to 2017:05 from Eurostat for the nineteen EA countries: Austria, Belgium, Cyprus, Estonia, Finland, France, Greece, Germany, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia and Spain. Annual data on the price convergence indicators from 1995 to 2016 from Eurostat is also used. These price convergence indicators are calculated as the coefficient of variation of price level indices of household final consumption expenditure across the chosen countries. A decreasing convergence indicator indicates price convergence. For a robustness analysis, paper uses monthly data on seasonally adjusted HICP at constant taxes from 2005:01 to 2017:05 from Eurostat.

The analysis consists of two broad parts. First, the HICP price indices are analyzed in search for the persistence of their means and potential break locations around the time of the EA accession which would suggest EA might have had permanent effects on the prices of its member countries. To accomplish this, unit root testing with structural breaks is used on the natural logarithms of each country's price index.

Second, the convergence of the EA countries is addressed. The paper first briefly analyzes the price convergence indicators from Eurostat, followed by the formal convergence testing performed on the relative prices. Namely, the existence of a divergence of the individual countries' price from the average price of the first eleven member countries (EA11)[2] is being formally tested using the approach by Bernard and Durlauf (1995). They suggested that if there is a stochastic convergence across different countries, the variables of interest, in our case prices, should not differ arbitrarily and hence the relative prices should be stationary. Hence, the relative price of country i is defined as the natural logarithm of the ratio of the country i's price index (P_{it}) and the average price index of the EA11 countries (avg_P_t).

$$lnavg\_P_{it} = \ln \frac{P_{it}}{avg\_P_t} \quad (1)$$

Although technically the rejection of the divergence null hypothesis means non-divergence, the paper follows the phrasing of Pesaran (2007) and concludes that there is a stochastic convergence if $lnavg\_P_{it}$ is trend-stationary and, following a shock, individual country's prices deviate from the EA11 average only temporarily.

In both parts of the analysis, two-break LM unit root test by Lee and Strazicich (2003) and RALS-LM test by Meng et al. (2016) is used. The non-linear tests are preferred to the linear unit root tests because the latter lose power in the presence of structural breaks (Perron 1989).

The two-break LM unit root test tests the non-stationarity null hypothesis. Unit root test statistic is obtained from the following regression:

$$\Delta u_t = \delta' \Delta Z_t + \emptyset \tilde{S}_{t-i} + \varepsilon_t \quad (2)$$

where $\tilde{S}_t$ is a de-trended series $\tilde{S}_t = u_t - \tilde{\psi}_x - Z_t\tilde{\delta}$, $t = 2, \ldots, T$, $\tilde{\delta}$ is a vector of coefficients in the regression of Δu_t on ΔZ_t and $\tilde{\psi}_x = u_1 - Z_1\tilde{\delta}$ and ε_t is the error term, assumed independent and identically distributed with zero mean and finite variance. A Trend Break model is used which assumes two breaks in both constant and a trend. Under the unit root null hypothesis $\emptyset=0$ in Equation (2), the t-statistic is defined as $\tilde{\tau}$. To determine the location of breaks $(\lambda_j = \frac{T_{Bj}}{T}, j = 1,2)$ a grid search is used and a break is endogenously determined where t-statistic is minimized.

$$LM_\tau = \inf_\lambda \tilde{\tau}(\lambda) \quad 3)$$

Critical values depend on the break locations and are available in Lee and Strazicich (2003). This test allows for breaks under both null and alternative hypothesis and its properties are unaffected by the breaks under the null. As a consequence, the rejection of the null indicates trend-stationary with or without breaks and stochastic convergence.

RALS-LM unit root two-break test is an extension of an LM test which incorporates information on non-normal errors and is thus more powerful than the LM test in the presence of non-normal errors ε_t in Equation (2). The transformed RALS-LM test statistic is obtained from the regression:

$$\Delta u_t = \delta' \Delta Z_t + \emptyset \tilde{S}_{t-i} + \gamma \hat{\omega}_t + v_t \quad (4)$$

where v_t is an error term and an Equation (4) is connected to Equation (2) with $\varepsilon_t = \gamma\widehat{\omega}_t + v_t$, where $\widehat{\omega}_t$ is the RALS-augmenting term that utilizes the information on non-normal errors and is uncorrelated with ε_t. The t-statistic is defined as $\tau^*_{RALS-LM}$ for the null hypothesis $\emptyset$=0.

RALS-LM test is also free of nuisance parameters that indicate the location of the breaks; it is free of the spurious rejections meaning that the rejection of the null can be considered as a more accurate evidence of stationarity. In addition, since the variance in the error term in Equation (4) is smaller than that in Equation (2), RALS-LM test provides some asymptotic efficiency gains with non-normal errors compared to LM test.

To test the normality of errors, a Jarque-Bera normality test (Jarque and Bera, 1987) is performed on the residuals ε_t in Equation (2). Its test statistic is given by

$$JB = n\left[\frac{\sqrt{b_1}^2}{6} + \frac{(b_2-3)^2}{24}\right]$$

where n is the sample size, $\sqrt{b_1}$ is the sample skewness coefficient and b_2 is the kurtosis coefficient. Jarque-Bera tests the null hypothesis that the residuals are normally distributed. If the residuals are normally distributed at 5% significance level, LM unit root test is used, and RALS-LM unit root test otherwise.

4. Results and discussion

4.1. The price trends in the EA19

The results of the LM and RALS-LM unit root test analysis of the EA prices are outlaid in Table 1. The results of the LM test with two structural breaks are graphically shown in Figure 1, since this is a test more commonly used in the literature.

After accounting for Jarque-Bera normality test results, prices are trend-stationary in only a quarter of analyzed countries (Belgium, Finland, Malta, Netherlands, and Slovakia). For the rest of them, the

Table 1. Jarque-Bera, LM and RALS-LM test results for the natural logarithms of HICP

Country	JB statistic	LM		RALS-LM	
		Statistic	Breaks	Statistic	Breaks
Austria	4.9960*	**-4.8029**	**2002:04** 2012:07	-2.8572	**1998:01** 2006:08
Belgium	42.9724***	-5.0581	**2002:03** 2012:05	**-5.0323*****	2007:08 2008:08
Cyprus	2.9425	**-5.1965**	*2002:02* 2014:06	-3.8572*	1998:11 2013:05
Estonia	161.1830***	-4.1313	*2002:04* 2009:04	**-2.816**	2007:01 2008:06
Finland	28.0770***	-5.1752	**2003:02** 2010:04	**-6.1094*****	2007:11 2008:02
France	5.6968*	**-4.1764**	**2003:05** 2010:02N	-1.9099	**1998:01** 2014:09
Germany	18.9345***	-4.4594	2007:02 2014:10	**-3.456**	**1998:01N** 2006:08
Greece	29.7429***	-4.654	2009:08N 2014:07	**-2.5461**	1998:01 2012:04
Ireland	6.6272**	-4.6711	**2002:07** 2006:11	**-2.5632**	**1998:01** 2008:06
Italy	10.2116***	-6.0139**	2008:06 2010:05	**-2.6069**	**1998:01** 2013:12
Latvia	5.1055*	**-4.1105**	2001:06 2008:12	-3.1372	2006:03 2009:02
Lithuania	44.1271***	-4.411	2001:08 2009:06	**-2.0642**	1998:01 2000:12N
Luxembourg	34.6999***	-3.9594	**2000:01** 2011:05N	**-2.2841**	**1998:01** 2008:11N
Malta	124.8787***	-5.5046*	2000:01 2012:03	**-4.9148*****	**2008:05 2008:11**
Netherlands	66.5002***	-5.0526	**2001:11** 2015:06	**-6.5402*****	2009:05 2009:08
Portugal	103.7407***	-4.4779	2008:06 2010:05	**-3.3115**	**1998:01** *2004:06N*
Slovakia	2315.2453***	-4.9271	*2002:01* **2009:01**	**-10.9826*****	1999:05 1999:08
Slovenia	3.9091	**-5.004**	2001:12N 2011:05	-2.2043	1998:01 *2002:04*
Spain	36.8292***	**-4.6636**	2004:12 2011:05	-1.6673	**1998:01** 2012:09

Notes: *, **, *** denote 10%, 5% and 1% significance respectively. The break dates in bold, italics and underlined are located +/- 2 years from EA, EU and ERMII accession dates, respectively. Test statistics in bold are the reference test statistics according to the normality test results.

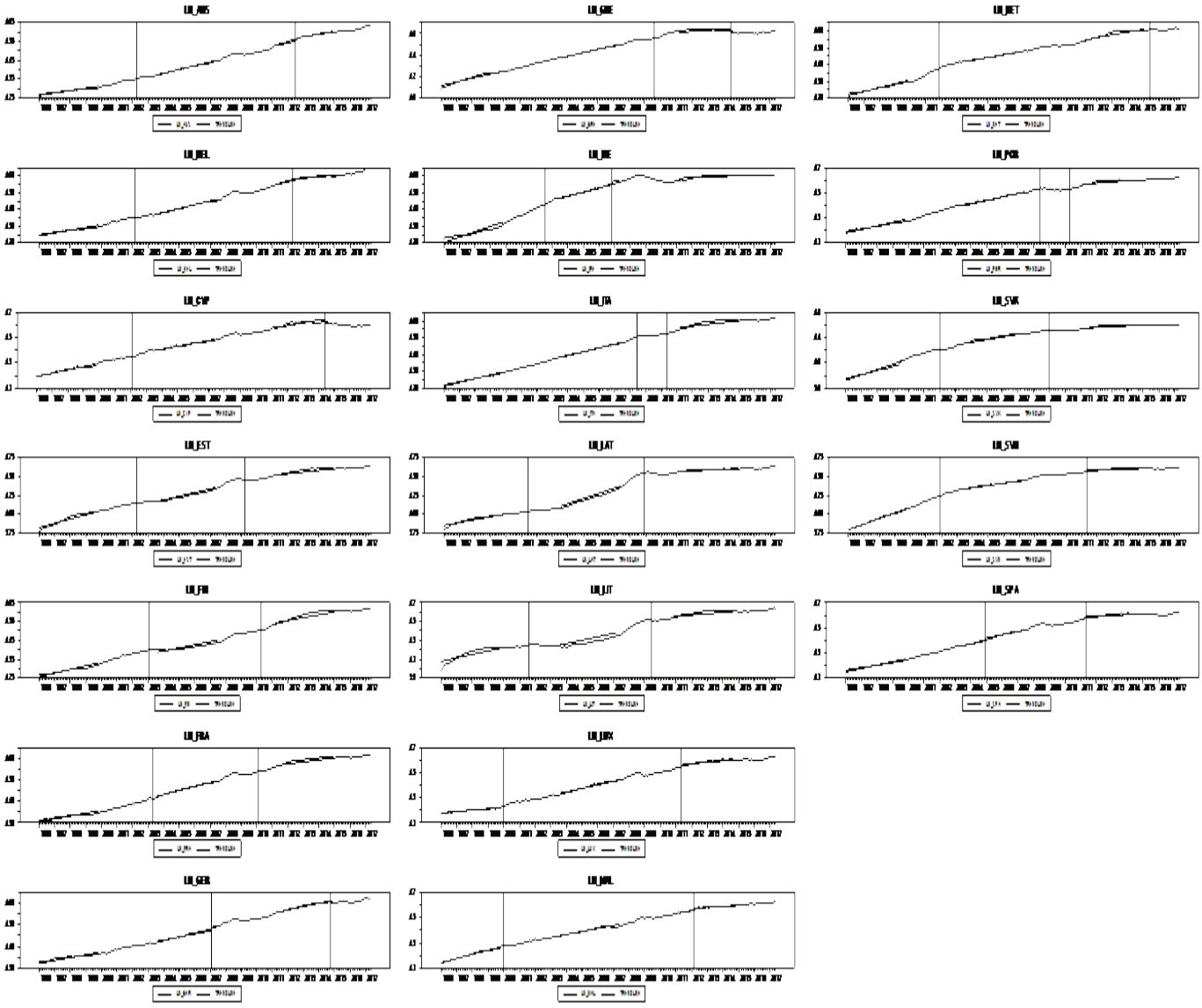
Source: authors' calculation

shocks to their prices appear to have a more permanent, trend-shifting effect (test statistics in bold in Table 1). These results are in line with the existing literature on price persistence (e.g. Camarero et al. 2000).

The structural breaks around the time of the EA accession (+/- 24 months) are presented in Table 1 in bold, EU accession in italics and ERM II accession underlined (these important dates for every country are listed in Table A1 in the Appendix). After accounting for Jarque-Bera test results, there are structural breaks around EA accession in eight countries: Austria, France, Germany (not significant), Ireland, Italy, Luxembourg, Portugal and Malta (in 2008 and 2009), seven of which are EA11 countries and the later-EA-joiners mostly do not display EA-accession-related breaks. However, many of them do display breaks around the time of EA formation and euro adoption: Cyprus, Greece, Latvia, Lithuania, Slovakia and Slovenia (not significant), making it in total 13 out of 19 (68%) countries with structural breaks in prices around that time. Obviously, EA formation (1999) and euro introduction (2002) possibly played a role in price movements of both joining countries and countries that were at the time outside of the EA.

Regarding the other breaks, there are almost no breaks around EU and/or ERM II accessions for the later-EA-joiners. However, there are breakpoints around the 2008 financial crisis and sovereign debt crisis in the majority of the EA countries, as well as breaks around significant election dates (e.g. 2006 grand coalitions in Austria and Germany, or elections and austerity bailout in Greece in 2012).

Figure 1. Natural logarithms of EA countries' HICP and the LM test breaks



Source: authors' calculation

4.2. The price convergence analysis

4.2.1. The convergence indicators

The price convergence indicators displayed in Figure 2 are calculated as the coefficient of variation of price level indices of household final consumption expenditure across a chosen number of countries. A decreasing convergence indicator indicates thus price convergence.

Figure 2 shows much smaller overall dispersion of prices in the EA12 (EA11+Greece) compared to EA19, and EA19 compared to EU28 countries during the entire observed period. This suggests that the EA members have greater product markets' integration, which is in line with the existing literature on price convergence (e.g. Estrada et al. 2013; Ogrokhina 2015).

Additionally, there is an intensive price convergence between the EU28 countries until the financial crisis, when they start diverging and continue to do so until 2016. These trends are similar within the EA19, although the divergence after 2008 is less pronounced for this group of countries. The trends in the EA12 are somewhat different. The fastest price convergence is before EA formation. After the EA was established, there was a divergence in the prices, followed by convergence once again after the introduction of euro in 2002 which lasted until 2009. So the price divergence after 2008 visible in two other groups of countries, did not happen in the EA12. Furthermore, there was almost no change in convergence indicator for EA12 during the sovereign debt crisis, followed by only a slight divergence from 2013 to 2015. So it appears that, overall, EA membership is related to less adverse effects of negative shocks on prices and better adjustment after the shocks, all signs of good product market integration.

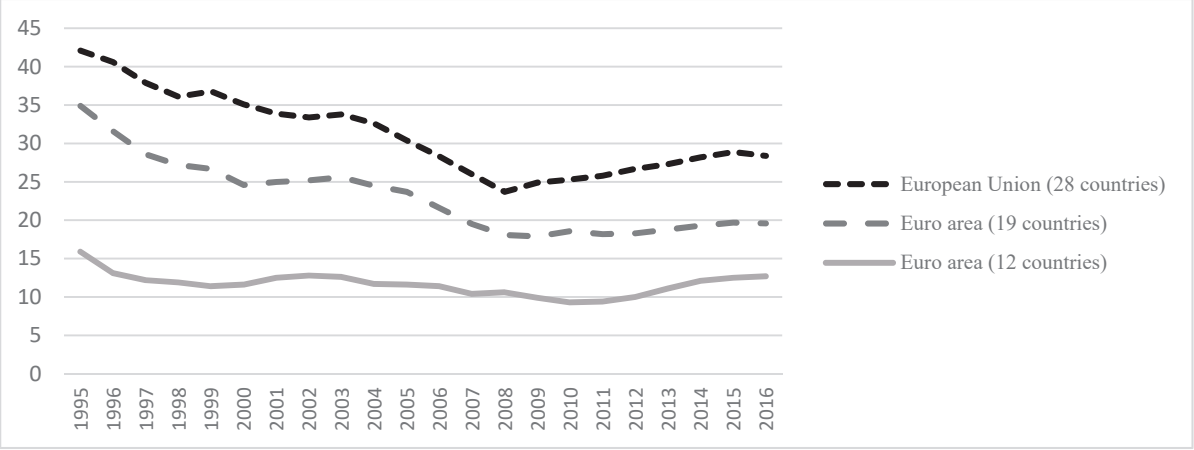
4.2.2. Econometric analysis

Results of the unit root tests conducted on the relative prices are presented in Table 2. After accounting for the (non-)normality of errors, the divergence from the EA11 average can be found in 7 countries: Austria, Estonia, Germany, Italy, Latvia, Lithuania and Slovenia. Obviously, 3 of them are EA11 countries, which suggests that EA membership is not sufficient condition for a full product market integration. However, for most countries, stochastic convergence of prices can be found.

The analysis of structural breaks presented in Table 2 shows 8 countries with EA-accession-related breaks (Austria, Belgium, France, Germany, Italy, Luxembourg, Malta, Netherlands). However, just as with levels, there are later-EA-joiners with breaks around the time of EA formation and euro adoption: Cyprus (not significant), Estonia, Latvia, Slovakia and Slovenia. EA formation and euro adoption thus seem to have played a role in product markets' integration in many countries, both the initial EA countries and outside. On the other hand, the moment of EA accession for the later-EA-joiners did not seem to pose as a shock.

There are structural breaks around the time of the 2008 financial crisis in some countries as well (Austria, Finland, Germany, Ireland, Latvia, Lithuania, Malta,

Figure 2. Convergence indicators, 1995-2016



Source: Eurostat

Table 2. Jarque-Bera, LM and RALS-LM test results for the relative prices

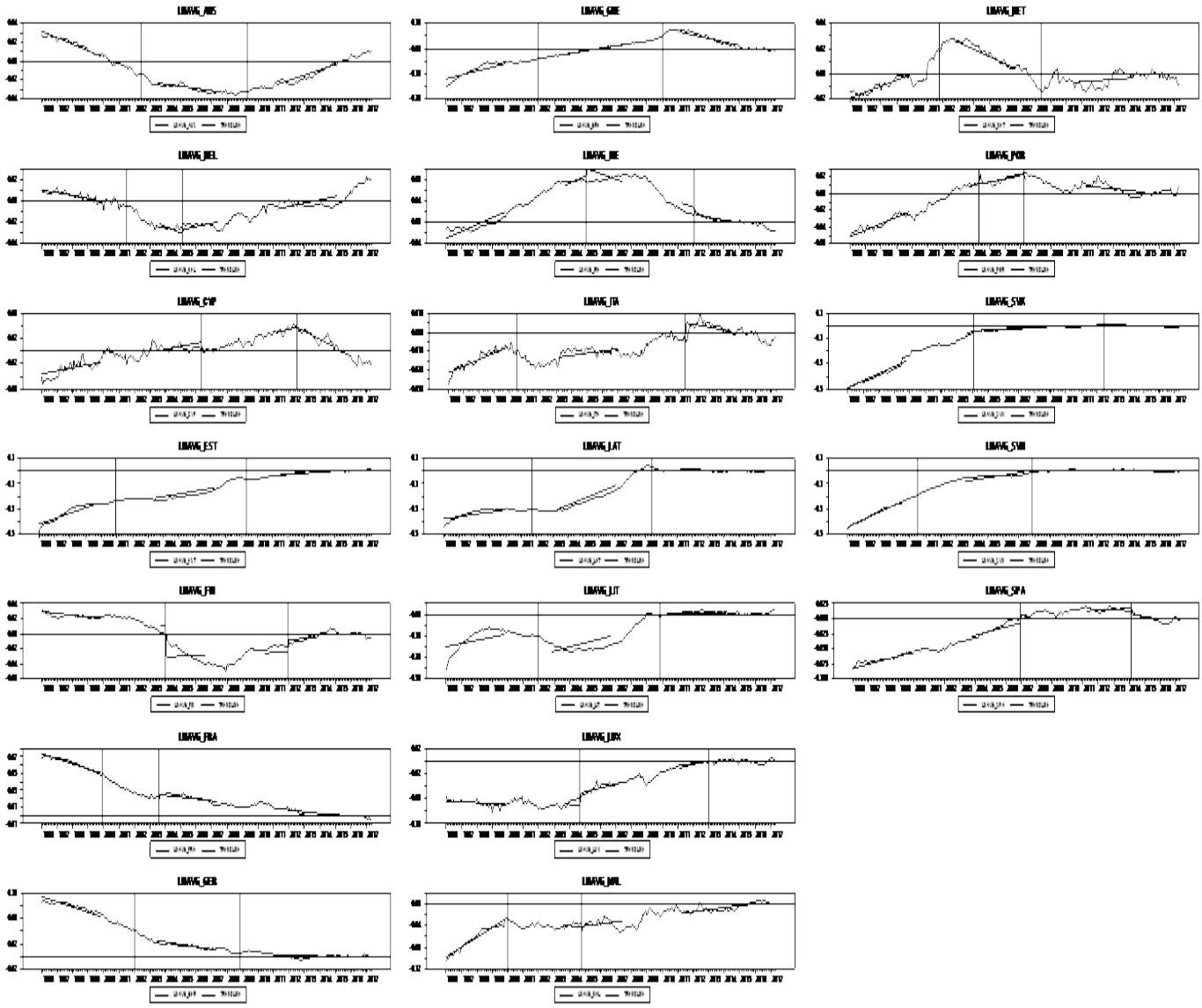
Country	JB statistic	LM		RALS-LM	
		Statistic	Breaks	Statistic	Breaks
Austria	2.7555	**-4.4545**	**2002:06** 2009:05	-3.8893*	2006:09 2012:07
Belgium	10.0148***	-4.787	**2001:07** 2005:02N	**-4.5167****	**1999:12 2000:03**
Cyprus	22.1317***	-5.3637*	2006:05 2012:07N	**-4.1789****	1998:10N 2014:06
Estonia	99.4580***	-4.0989	2000:12 2009:05	**-3.241**	1998:02 2013:06
Finland	114.4131***	-4.5095	2004:01 2011:12	**-6.8536*****	2007:11 2008:02
France	0.9195	**-5.6660****	**1999:12 2003:08**	-2.7111	**1998:01 2003:01**
Germany	1.2348	**-4.0848**	**2002:01** 2008:11	-4.1257*	**1999:09** 2004:02
Greece	62.0586***	-4.5095	**2002:01** 2010:01	**-5.1894*****	2010:07 2014:07N
Ireland	10.8809***	-5.5809*	2005:02 2012:02	**-4.7684*****	2004:04N 2008:10
Italy	2.7652	**-4.7378**	**2000:06** 2011:06	-5.5905***	**2000:09** 2012:08
Latvia	3.4469	**-4.12**	2001:09 2009:06	-3.1931	2006:03 2009:02
Lithuania	66.6410***	-4.4953	2002:01 2009:11	**-3.1434**	2007:03 2009:02
Luxembourg	73.9947***	-5.1684	2004:09 2013:01	**-5.2641*****	**1999:06 2001:01**
Malta	43.7169***	-4.3613	2000:01 *2004:10*	**-4.4500****	**2008:05 2009:05**
Netherlands	181.6297***	-4.2453	**2001:10** 2008:05N	**-5.3003*****	**2000:11 2001:02**
Portugal	179.3862***	-5.3894*	2004:05 2007:04	**-5.6910*****	2004:10 2007:04N
Slovakia	2933.2520***	-5.2127	*2004:02* 2012:07N	**-11.9345*****	1999:05 1999:08
Slovenia	10.0137***	-4.8679	2000:07N **2007:11**	**-2.5095**	1998:01 *2002:04*
Spain	25.7364***	-4.1187	2006:12 2014:03	**-4.4742****	2009:05 2011:02

Notes: *, **, *** denote 10%, 5% and 1% significance respectively. The break dates in bold, italics and underlined are located +/- 2 years from EA, EU and ERMII accession dates, respectively. Test statistics in bold are the reference test statistics according to the normality test results.

Source: authors' calculation

Portugal and Spain). These breaks are followed by more or less pronounced periods of relative prices approaching unity in all of the countries but Spain (Figure 3). These findings speak in favor of the good products' market integration, but one which is not necessarily related to being an EA member. Those countries that were not in the EA, were a part of the EU and ERM II mechanism which reduces exchange rate variability and promotes monetary stability, which could have played a role in their product market integration with the EA11 group. There are structural breaks around the sovereign debt crisis period as well in countries such as Greece, Italy and Spain. These breaks are for the short period of time followed by relative prices moving away from unity, but soon their trend turned back towards it (Figure 3).

Figure 3. EA countries' relative prices and the LM test breaks



Source: authors' calculation

4.2.3. Robustness analysis

Since the main analysis was conducted on price indices that include taxes, for the robustness analysis, this paper employs LM and RALS-LM unit root tests with two structural breaks on the relative prices variable $lnavg\_P_{it}$ derived using two sets of data: seasonally adjusted HICP data and HICP at constant taxes data, to see if there are differences in conclusions resulting from differences in individual countries' taxes. Data span from January 2005 to May 2017, and the countries analyzed are EA19 countries minus France, due to the lack of HICP at constant taxes data. The results are presented in Table 3.

For the most of the countries, unit root test results based on two data sets do not match. They only match for Austria, Latvia and Spain. Comparison of the test results for the two data series is ambiguous for Belgium, Estonia, Ireland, Italy and Slovenia and depend on the chosen significance level for the unit root test. For the remaining 10 countries, the conclusions on convergence and product market integration are not robust. In general, prices converge for 10/18 countries at 10%, i.e. 7/18 countries at 5% significance. Prices at constant taxes series converge for more countries: 12 at 10% and 10 at 5% significance level. So, it appears, based on this very basic robustness analysis, that adjusting for the tax differences and tax changes might reveal more convergence and product markets integration than the main analysis initially suggests. It appears that there are distortions in price indices stemming from taxes that should ideally

Table 3. The robustness analysis

Country	Prices			PricesCT		
	JB	LM	RALS-LM	JB	LM	RALS-LM
Austria	0.6697	**-4.5193**	-4.4249**	3.5395	**-4.4275**	-4.8505***
Belgium	12.8996***	-5.3647*	**-4.2804****	1.2518	**-5.3275***	-6.0515***
Cyprus	2.3961	**-4.7386**	-3.4297	12.9493***	-4.6422	**-4.4944****
Estonia	27.8685***	-5.5092*	**-4.3540****	2.6015	**-5.3606***	-4.7793***
Finland	297.0365***	-4.7536	**-4.4595****	0.0216	**-4.1605**	-4.0013*
Germany	0.9123	**-4.5658**	-4.7425***	9.1257**	-6.4128**	**-5.7452*****
Greece	51.0145***	-5.4252*	**-5.7742*****	25.8632***	-5.7329**	**-2.7539**
Ireland	1.7270	**-5.3312***	-3.8179	4.6996*	**-5.2640**	-4.3510**
Italy	0.5123	**-5.5661***	-5.3279***	1.0098	**-5.9098****	-5.8973***
Latvia	1.7661	**-6.9183*****	-3.4912	7.6694**	-6.5408***	**-6.7187*****
Lithuania	14.3952***	-5.0808	**-3.6024**	194.5785***	-5.8206**	**-4.2903****
Luxembourg	1.9352	**-4.8970**	-5.4401***	13.6686***	-4.5685	**-4.1692****
Malta	6.2341**	-5.5640*	**-3.8062**	0.9716	**-5.9889****	-6.3110***
Netherlands	1.8663	**-4.7917**	-4.1314*	5.7109*	**-5.8895****	-4.0964*
Portugal	16.5827***	-6.3065**	**-5.6863*****	2.1621	**-5.1369**	-4.4596**
Slovakia	6.3553**	-5.8545**	**-3.7048**	17.1188***	-5.1961	**-4.1699****
Slovenia	1.5515	**-5.3217***	-5.3331***	2.2864	**-5.1218**	-5.3233***
Spain	9.5748***	-4.3247	**-4.6363****	27.1998***	-4.3403	**-5.2950*****

Notes: *, **, *** denote 10%, 5% and 1% significance respectively. Test statistics in bold are the reference test statistics according to the normality Jarque-Bera test results.

Source: authors' calculation

be accounted for. Unfortunately, analysis on this data could not have been conducted here due to unavailability of data. Other methodological approaches are required to account for these possible tax distortions.

5. Conclusion

The aim of this paper was to analyze if there is a product market integration in the EA. The paper contributes to the existing empirical literature by providing an analysis of the stochastic convergence of consumer prices in the EA and the related structural breaks to discern between the possible EA creation, EA accession and EA membership effects on national prices and price convergence. The methodologies used are the LM and RALS-LM unit root tests with two structural breaks.

The analysis of consumer prices showed they are trend-stationary in only a quarter of analyzed countries. There are EA-accession related breaks in seven of EA11 countries, but, apart from Malta, no such breaks for the later-EA-joiners. However, most countries display a break in around the EA formation, suggesting that EA creation might have presented a shock for both EA and non-EA countries at that time.

The price convergence analysis was conducted on the price convergence indicators and the relative prices of every country to the average EA11 prices. The price convergence indicators show greater product market integration and less adverse effects after negative shocks in the country groups that have been EA members longer. However, the analysis of relative prices reveals price divergence in three EA11 countries, suggesting that EA membership is not a sufficient condition for a full product market integration of every country.

Regarding structural breaks in relative prices, there are again the EA-accession-related breaks mostly in EA11 and apart from Malta, no such breaks for the later-EA-joiners. And again the majority of countries display breaks around the time of EA formation and euro adoption.

Based on obtained 2008 financial crisis breaks mostly followed by periods of relative prices approaching unity one can conclude that there is a good

products' market integration, but one which is not necessarily related to being an EA member. The preparation for the EA membership through fulfillment of Maastricht criteria probably played a role in it as well. The good adjustment after the obtained structural breaks around the sovereign debt crisis also speaks in favor of relatively good product market integration.

There are limitations to the study that should be stressed. First, methodologically 10% of the sample is disregarded when performing a grid search for a break. Since Lithuania accessed EA later in the sample, locating the EA-accession-related break was methodologically impaired. Second, Malta accessed EA around the time of the financial crisis making it impossible to discern, using this methodology, if the structural break was EA-accession- or crisis-related. Third, our analysis does not control for factors such as differences in taxes, transport or labor costs between countries, so our conclusions should be taken only as broad generalizations about price convergence. The paper does employ a robustness analysis where controlling for taxes results in more conclusions of price convergence than otherwise. Further analysis in this respect is required. Fourth, the data used are aggregate price indices and although they enable us to find more general patterns in product market integration, the valuable information is potentially lost by aggregation. Future analyses should focus on more disaggregated product markets to complete the conclusions about product market integration in the EA.

Finally, there are implications of our study for the policy makers in countries outside the EA. Namely, the EA accession itself is likely not going to have a significant impact on prices or their convergence to the EA11 average. However, EA membership will probably bring about more integrated product market that will come from a preparation for an EA-membership, through a membership itself or both.

Acknowledgments

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Endnotes

1 EA membership can also have positive effects on the productivity growth of the countries. Padilla (2020) suggest that the productivity growth of the countries that joined in 2004 and adopted the euro was higher compared to those that maintained their own currency. Tica and Šikić (2019) report that the productivity gap reduction is a heterogeneous process and a country specific problem.

2 Bayoumi and Eichengreen (1993) warned that there was a core-periphery divide before the EA was formed, that required the syncronization of both supply and demand shocks. Campos and Machiarelli (2020) later found a decrease of the core-periphery gap post-EA between the first members. This paper acklowledges that there is dynamics involved in classifying a country as a core or a periphery country (Campos and Machiarelli, 2020). However, the methodology applied in this paper does not allow for the dynamic definition of the core. Considering an increased cohesion of the EA11 countries at the time of EA formation, as well as the data shown later in Figure 2 concerning this group's convergence, this paper has opted to use the first eleven EA members as a reference for the convergence analysis. EA11 is considered a core ex ante, and later EA joiners a periphery. EA11 were the first countries to fulfill the accession criteria and had been integrating their markets the longest.

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APPENDIX

Table A1. Important dates for the EA19 countries

Country	EU accession	EA accession	Euro adoption	(ERM) and ERMII participation
Austria	1995:q1	1999:q1	2002:q1	(1995:q1)
Belgium	1951:q1	1999:q1	2002:q1	(1979:q1)
Cyprus	2004:q1	2008:q1	2008:q1	2005:q2
Estonia	2004:q1	2011:q1	-	2004:q2
Finland	1995:q1	1999:q1	2002:q1	(1996:q3)
France	1951:q1	1999:q1	2002:q1	(1979:q1)
Germany	1951:q1	1999:q1	2002:q1	(1979:q1)
Greece	1981:q1	2001:q1	2002:q1	(1998:q1)
Ireland	1973:q1	1999:q1	2002:q1	(1979:q1)
Italy	1951:q1	1999:q1	2002:q1	(1979:q1)
Latvia	2004:q1	2014:q1	-	2005:q2
Lithuania	2004:q1	2015:q1	-	2004:q2
Luxembourg	1951:q1	1999:q1	2002:q1	(1979:q1)
Malta	2004:q1	2008:q1	2008:q1	2005:q2
Netherlands	1951:q1	1999:q1	2002:q1	(1979:q1)
Portugal	1986:q1	1999:q1	2002:q1	(1992:q2)
Slovakia	2004:q1	2009:q1	2009:q1	2006:q1
Slovenia	2004:q1	2007:q1	2007:q1	2004:q2
Spain	1986:q1	1999:q1	2002:q1	(1989:q2)

Source: authors' calculation

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DOES DIGITALIZATION WIDEN INCOME INEQUALITY? A COMPARATIVE ASSESSMENT FOR ADVANCED AND DEVELOPING ECONOMIES

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Abstract

The paper raises two questions: (1) Does digitalization contribute to wealth and income inequality? (2) Does it affect inequality differently between advanced and developing economies? For the answers, the paper investigates the impact of digitalization on inequality for a balanced panel dataset of advanced economies and a balanced panel dataset of developing economies from 2002 through 2020. It applies the system-GMM and PMG estimators for estimation and robustness check. Some exciting results it provides. First, digitalization narrows inequality in developed economies and widens in developing economies. Second, the economic growth – income inequality relationship is U-shaped as real GDP per capita increases from low (developing economies) to high (advanced economies). Third, unemployment enhances inequality in two groups. The results note some necessary implications to develop digital technology and reduce income inequality in these economies.

Keywords: *digitalization, income inequality, advanced economies, developing economies.*

JEL classification: *C33, D31, J31, O33*

1. Introduction

Income inequality in society is one of the severe problems in both advanced and developing economies under rising digitalization and globalization because it can lead to social stabilization. Narrowing inequality across countries has become one of the eight worldwide Millennium Development Goals (MDGs) suggested by United Nations. At the same time, digitalization is currently emerging as a globally dominant and irreversible process. Governments in several developing economies hope that digitalization improves economic activities and enhances economic growth to catch up with advanced economies. Thus, digitalization is expected to be an appropriate solution to reduce income and wealth inequality in the development agendas of policy-makers in these economies. Unfortunately, economists still do not consensus about its effect on inequality. From the beginning of the GINI index in 1912 to measure global income inequality by Corrado Gini, a strand of literature on income inequality has investigated the determinants of income inequality. Notably, digital progress with the digital divide in society leads to several efforts to test

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the impact of digitalization on inequality. However, no papers study the different impacts of digitalization on inequality between advanced and developing economies.

In practice, advanced economies have many resources to solve the severe problem of inequality. Most advanced economies have high levels of economic development and high living standards with high income. In particular, these economies have a rule-based governance environment that enables them to better coordinate resources and run their economies (Li and Filer 2003). As a result, policies for addressing income inequality in these economies have also become more effective. Notably, high levels of education along with a universally applied digital background is also an advantage in helping these economies deal with income inequality if digital technology has a meaningful impact on income inequality in these economies. However, developing economies do not have enough necessary resources and appropriate solutions to decrease income and wealth inequality. Most developing economies have low levels of economic development and low living standards with low income. These economies have a relation-based governance environment (Li and Filer 2003). Governments in these economies try to formulate and implement regulations and policies to enhance digital development and reduce the income difference in society. Digitalization also helps to reform governance in developing economies in terms of E-government. Unfortunately, the digitalization process indicates a global digital divide in society in which high-income people have better access to digital technology than low-income people. It comes from the knowledge and cost required to access digital technology facing low-income people. More importantly, this challenge is more severe in developing economies because low-income people spend their income on accommodation and food. As such, differences in economic development reflected in living standards, income levels, education levels, and digital technology platforms between developed and developing economies can lead to differences in the effect of digitalization on income inequality between these two groups of economies. In particular, if digitalization has a significant effect on income inequality, the differences in this effect become even more pronounced between these two groups. Therefore, this paper suggests two research questions: (1) Does digitalization contribute to wealth and income inequality? (2) Does it affect income inequality differently between advanced and developing economies?

In short, narrowing inequality is one of the main goals of development policies in advanced and developing economies, and digitalization affects significantly this goal. In particular, the digital divide can lead to the different contributions of digitalization to income and wealth inequality between developing and advanced economies. Given these facts, this paper studies the impact of digitalization on inequality for a panel dataset of 30 advanced economies and a panel dataset of 35 developing economies between 2002 and 2020. It employs the system-GMM Arellano-Bond estimator (S-GMM) and Pooled Mean Group estimator (PMG) for estimation and robustness check.

The study presents its structure as follows. Section 1 (Introduction) provides the theoretical framework and motivation, while Section 2 presents the global income inequality and the global digital divide. Section 3 (Literature review) notes the impact of digitalization on income and wealth inequality, whereas Section 4 (Methodology) describes the empirical model, the characteristics of estimators, and the data. Section 5 provides the findings and discussion. Finally, Section 6 is a conclusion with some implications.

2. Some facts on the global digital divide and global income inequality

2.1. Global digital divide

According to UNCTAD (2021), there is a highly uneven digital development across countries. Today, the world is characterized by a big difference between less connected and hyper-digitized economies. Compared to four in five in advanced countries, just one out of five in developing countries accesses the Internet. It only reflects one aspect of the digital gap. This gap is significant in some industries like frontier technology and digital data. Both Latin America and Africa, for example, occupy below 5% of global data centers.

Notably, ITU (2018) reports that 51.2% of the global population accessed the Internet in 2018 with 3.9 billion people online. Although it reflects the advancement in digitalization, there remains a significant gap in Internet access. The Internet access growth has driven from developing economies, standing for about 90% of the global rise, with the highest rates going to developing countries. However, the Internet use growth rate these days has slowed down, implying that several middle- and low-income countries can increase Internet use for their citizens. The decrease in new online persons is partly related to their incapability to link to related devices and basic Internet. Just 40% of middle- and low-income countries have Internet access. African people have the highest average cost of Internet use compared to those in other

developing regions.

Geographically, UNCTAD (2021) reports that digitalization-based economies do not mirror a traditional gap between North and South. Indeed, United States (a developed country) and China (a developing country) are still leading. They occupy more than 50% of global expenditure for the Internet of things, 75% of blockchain-based patents, and 75% of the world market for public cloud computation. Among 70 global biggest digital platforms, they capture 90% capitalization value, whereas Europe captures 4% and Latin America and Africa 1%. Thus, in the advancement of digital technology, the remaining world (notably Latin America and Africa) is following the United States and China.

2.2. Global income inequality

The rate of increase in income inequality has varied across regions of the world in recent decades. A report by Alvaredo et al. (2018) informs that income inequality in Europe is the lowest, but that in the Middle East is the highest. The share of the top 10% income earners to national income in 2016 was 37% in Europe, 41% in China, 46% in Russia, 47% in the Canada-United States, 55% in Brazil, Sub-Saharan Africa, India. The Middle East is the most unequal region, where 61% of national income belongs to the top 10%. Since 1980 global income inequality has increased sharply. In Asia, the high growth rate has led to growth in income at the 50% bottom. Globally, since 1980 the top 1% of the world's richest have captured double the growth compared to the 50% of the global bottom group due to increasing income inequality across countries. However, the rise in global income inequality has not yet stabilized. After reaching 22% in 2000, the income share of the top 1% globally decreased slightly to 20% from 16% in 1980. Furthermore, the bottom 50% of global income has hovered around 8% since 1980.

Notably, Alvaredo et al. (2018) emphasize the importance of regulations and policies (governance/institutional quality) in dealing with differences in income and wealth inequality across economies, even across economies with the same level of development. Income inequality has risen in North America, Russia, India, China, while it has been moderately in Europe since 1980. In contrast, inequality in Brazil, the Middle East, Sub-Saharan Africa has still kept relatively steady. The statistical report across countries indicates that institutional and political contexts have had impacts on income inequality dynamics since 1980. Good trends on inequality in India, Russia, China point out the positively targeted policies in these nations. However, since 1980 the gap in inequality between the United States and Western Europe has seemed too high. The income share of the top 1% in 2016 slightly rose to 20% in the United States and 12% in Western Europe from approximately 10% in 1980 in these regions. Besides, the income share of the bottom 50% in the United States decreased from nearly 20% in 1980 to 13% in 2016.

3. Theoretical framework and literature review

3.1. Theoretical framework

Given the relevance of the research topic, Mirza et al. (2019) and Prettner and Strulik (2020) have recently suggested some theoretical frameworks. A stylized social-ecological model by Mirza et al. (2019) indicates that a positive connection between digitalization and wealth enhances local income inequality, which increases poverty and natural resource degradation. In addition, the analytical results show how individuals in society access digital technology determine the distribution of wealth. Meanwhile, an R&D-driven growth model by Prettner and Strulik (2020) assumes that education is endogenous in which low-skilled labor is displaced by machines and high-skilled labor is complementary to them. The analytical results project that digitalization (automation) promotes college graduates, leading to rising income and wealth inequality. Notably, this paper discovers the opposite effect of digitalization on inequality between developing and advanced economies. We provide arguments to point out it as follows. In advanced economies with high levels of development, due to a low digital gap and high levels of education, the poor (low-income people) can easily access digital technology to enhance their skills and knowledge (UNCTAD 2021). They are easier to find high-income jobs, which narrows the income gap between low-income and high-income individuals, thereby decreasing inequality. In developing economies with low levels of development, by contrast, due to a high digital gap and low levels of education, the poor (low-income people) can not easily access digital technology. The rich (high-income people) can financially access progress in digital technology to enhance skill and knowledge. They are easier to find a high-income job and get promoted, which widens the income difference between low-income and high-income individuals, thereby increasing income inequality.

3.2. Literature review

Qureshi (2020) notes that income inequality within economies has risen as digital progress has reshaped markets of goods, business, and work. Wealth and income inequalities have increased between not only workers but firms. In the same vein, Zilian and Zilian (2020) find inequality in socio-economic digitalization in Austria through survey data from 2011 to 2012. However, so far, the number of papers on the impact of digitalization on inequality is not much. Some studies report that progress in digital technology decreases income inequality (Richmond and Triplett 2018; Canh et al. 2020), while some note that digitalization increases it (Mönnig, Maier, and Zika 2019; Mohd Daud, Ahmad, and Ngah 2020; Law et al. 2020). For the negative impact, Richmond and Triplett (2018) use the fixed effects estimator for 109 countries between 2001 through 2014. They discover that the impact of digitalization on inequality is subject to the type of digital technology and the proxy of inequality. Canh et al. (2020) apply the twostep system-GMM estimator for 87 countries from 2002 to 2014. They note that digital progress and communication are a way to narrow inequality. Mobile and Internet use should be encouraged as a means of economic policy to reduce income inequality. For the positive impact, Mönnig, Maier, and Zika (2019) use the analytical approach to study the impact of digital technology on wage inequality. They conclude that digitalization enhances income inequality. Meanwhile, Law et al. (2020) use the panel mean group (PMG) estimator for 23 developed countries from 1990 to 2015, while Mohd Daud, Ahmad, and Ngah (2020) apply the onestep system-GMM estimator for 54 countries from 2010 to 2015. Both papers note that digital technology widens income inequality.

Furthermore, some papers investigate the impact of institutional quality on wealth and income inequality. Most of them like Nadia and Teheni (2014), Josifidis (2017), Law and Soon (2020), Kunawotor (2020), Blancheton and Chhorn (2021) report that institutional improvement reduces income inequality. Nadia and Teheni (2014) apply non-parametric correlations tests for 39 countries from 1996 to 2009, while Josifidis (2017) employs the Fixed Effects Vector Decomposition (FEVD) method for 21 OECD economies between 1990 and 2010. Similarly, Law and Soon (2020) use the twostep system-GMM estimator for 65 advanced and developing economies, while Kunawotor (2020) applies the twostep difference-GMM estimator for 40 African economies over the period 1990 – 2017. More recently, Blancheton and Chhorn (2021) employ FMOLS and the DOLS estimations for 8 Asian economies during the period 1988 – 2014. They also report that public spending narrows income inequality. By contrast, Perera and Lee (2013) find that institutional quality increases inequality for a panel dataset of 9 Asian developing economies from 1985 to 2009 via the onestep system-GMM GMM estimator. They suggest that measures for institutional improvement in East and South Asian developing economies should focus on income distribution and poverty. Notably, Asamoah (2021) discovers the opposite effect of institutional/governance quality on wealth and income inequality between 24 advanced and 52 developing economies between 1996 and 2017 using the dynamic panel threshold model. Institutional improvement widens inequality in developing economies but narrows in advanced economies. He also notes a nonlinear impact of economic growth on inequality from developing to advanced economies.

Notably, some studies (Asogwa et al. 2021; Berisha, Gupta, and Meszaros 2020; Deyshappriya 2017; Hailemariam, Sakutukwa, and Dzhumashev 2021) investigate the determinants of income inequality. Deyshappriya (2017) uses the onestep difference-GMM estimator for a group of 33 Asian economies from 1990 to 2013. He finds that education, labor force, official assistance reduce inequality, but political risk, unemployment, trade openness, inflation enhance. In particular, he notes a nonlinear impact of economic growth on inequality in these economies. Meanwhile, Berisha, Gupta, and Meszaros (2020) apply the PMG estimator and the common correlated effects estimator for the BRICS economies between 2001 and 2015 and discover that interest rates, economic growth, and inflation widen income inequality. More recently, Asogwa et al. (2021) employ the GMM (pooled OLS and fixed effects) estimators for a group of 28 African economies during the period 2001- 2016. They note that education and unemployment increase income inequality while labor force, inflation, and economic growth decrease. Likewise, Hailemariam, Sakutukwa, and Dzhumashev (2021) use the panel vector auto-regression method for a sample of 17 advanced economies from 1870 to 2016 and reveal that public spending, financial development, interest rate, and education reduce inequality while growth rate enhances.

In short, in the view of literature, this paper shows two highlights that can be different from related studies. First, it provides empirical evidence to indicate the distinct contributions of digitalization on inequality between advanced and developing economies. Second, it applies the system-GMM and PMG estimators for estimation and robustness check.

4. Methodology and research data

4.1. Methodology

Following Law et al. (2020), the empirical equation is extended as follows:

$$GIN_{it} = \lambda_0 + \lambda_1 GIN_{it-1} + \lambda_2 DIG_{it} + Z_{it}\lambda' + X_{it}\lambda'' + \mu_i + \zeta_{it} \quad (1)$$

where t and i are the time and country index. GIN_{it} is the Gini index, a proxy for income inequality. Its value ranges from 0 to 100 where 0 notes complete equality (everyone has the same income) and 100 reports the highest level of income inequality. $GIN_{it\text{-}1}$ is the initial level, and DIG_{it} is digitalization. Z_{it} is a set of control variables (economic growth, education, and unemployment), while X_{it} is a set of annual time dummies. μ_i is a country-specific, time-invariant, unobserved effect and ζ_{it} is an observed error term. λ_0, λ_1, λ_2, λ', and λ'' are estimated coefficients. According to Roodman (2009), the difference and system GMM Arellano-Bond estimators are built on the assumption that errors are correlated only within individuals, not across them. Because of this, following the suggestion by Roodman (2009), we include annual time dummies to remove universal time-related shocks from the errors.

We apply Equation (1) to study the impact of digitalization on inequality for a panel dataset of advanced economies and a panel dataset of developing economies. We use fixed broadband subscriptions and Individuals using the Internet as proxies of digitalization in this paper. There are several measures to proxy for digitalization in a country. They are two measures (fixed broadband subscriptions and Individuals using the Internet) released by World Bank and some digital metrics (Digital Economy Metrics, Digital Society Metrics, Digital Industry Metrics, Digital Enterprise Metrics, Digital Client Metrics, and Digital Investment Metrics) recommended by Kotarba (2017). However, this paper employs only two measures released by World Bank because so far some digital metrics recommended by Kotarba (2017) are not available.

Some severe problems in econometrics arise from estimating Equation (1). Firstly, government revenue, public spending, economic growth, and unemployment can be endogenous. They may correlate with μ_i, which results in the endogenous phenomenon. Secondly, some unobserved effects such as culture, geography, customs, and anthropology (fixed effects) can correlate with the independent variables. These fixed effects exist in μ_i. Thirdly, a high autocorrelation comes from the presence of $GIN_{it\text{-}1}$. Finally, panel data contain a large unit of economies (M = 30) and a short length of observation (L = 19). These problems can make the OLS regression biased. The random-effects model (REM) and the fixed-effects model (FEM) could not handle serial autocorrelation as well as endogenous phenomena. The IV-2SLS estimator needs some suitable instruments out of independent variables in the empirical model. Following Judson and Owen (1999), we apply the system-GMM Arellano-Bond estimator and the PMG estimator for estimation and robustness check.

Holtz-Eakin, Newey, and Rosen (1988) are the first to propose the general method of moments (GMM) Arellano and Bond (1991). Two kinds of GMM Arellano-Bond estimators are developed: the difference and the system. The past values of persistent regressors in the empirical models do not provide information for their changes, making their lags become weak instrumental variables in the difference GMM estimator. Therefore, the S-GMM (system-GMM estimator) is better than the D-GMM (difference-GMM estimator) (Arellano and Bover 1995).

For estimation, the twostep S-GMM can be more efficient than the onestep S-GMM. However, employing the twostep S-GMM in small research samples like our sample has a problem (Roodman 2009). It is the instrumental variables proliferation that quadratically rises as the dimension of time increases, which causes the number of instruments to be larger than the number of panel units. The solution is to employ the thumb rule to keep the number of panel units more than or equal to the number of instruments (Roodman 2009). The study uses Arellano-Bond, Sargan, and Hansen statistics to test the instruments' validity in the S-GMM. The Arellano-Bond test AR(2) searches the serial autocorrelation of errors in the first difference while the Sargan and Hansen tests detect endogenous phenomena.

The study applies the PMG estimator by Pesaran, Shin, and Smith (1999) to validate the robustness of the S-GMM estimates. It presents the PMG-based model as follows:

$$Y_{it} = \psi X_{it-1} + \sum_{j=1}^{p} \pi_{ij} \Delta Z_{it-j} + \sigma_{it}$$
$$where \;\; X_{it-1} = Y_{it-1} - \lambda Z_{it-1} \quad (2)$$

where Y_{it} is the Gini index, a proxy for income inequality; $X_{it\text{-}1}$ is the deviation from long-run equilibrium for group i at any period t, and ψ is the error-correction coefficient. The vector λ captures the

long-run coefficients. They express the long-run elasticity of inequality corresponding with every variable in $Z_{it\text{-}1}$. Meanwhile, the vector π captures the short-run responses of the Z_{it} variables. σ_i is a fixed effect and τ_{it} is an error term. The study uses the value and significance level of the speed of adjustment ψ (negative, smaller than 1) to examine the validity of the PMG estimates.

4.2. Research data

The dataset contains GINI index, fixed broadband subscriptions, individuals using the Internet, GDP per capita, school enrollment, and unemployment. The paper exacts them from the World Bank database. The research sample contains 30 advanced economies[1] and 35 developing economies[2] from 2002 to 2020. The Appendix presents the definition as well as descriptive statistics. Table C and Table D indicate the correlation coefficient between fixed broadband subscriptions and individuals using the Internet is relatively high; hence, the paper uses them separately in the empirical equations.

5. Findings

5.1. Estimated results

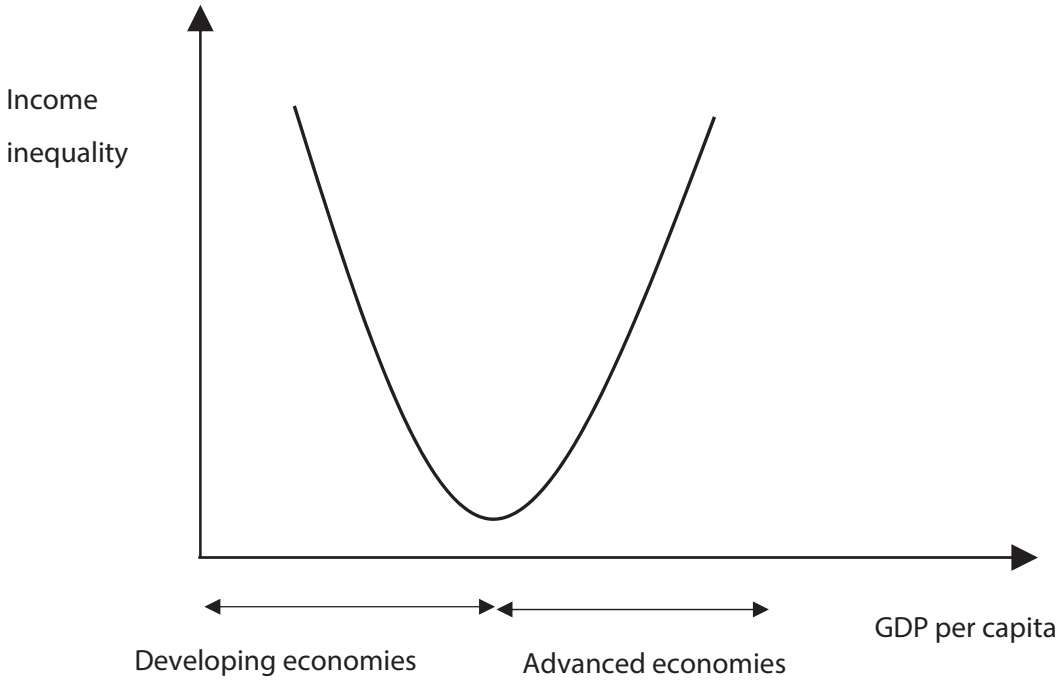
The paper presents the twostep S-GMM estimates in Table 1 and Table 2 and the one-step S-GMM estimates in Table 3 and Table 4. Table 1 and Table 3 indicate the effect of fixed-broadband subscriptions, while Table 2 and Table 4 show the effect of individuals using the Internet. We discover that economic growth is endogenous in estimations; hence, we use economic growth as an instrumented variable in GMM style and income inequality, digitalization, education, unemployment as instrumental variables in IV style.

The results across all empirical models in Table 1 (fixed-broadband subscriptions) and Table 2 (individuals using the Internet), as well as Table 3 (fixed-broadband subscriptions) and Table 4 (individuals using the Internet), indicate that digitalization narrows inequality in developed economies but widens in developing economies. By contrast, economic growth enhances inequality in advanced economies but decreases in developing economies. Furthermore, education in developing economies and unemployment in both groups enhance inequality.

The opposite effect of digitalization on income inequality between advanced and developing economies stems from differences in the digital divide between these groups. Governments in advanced economies have several resources to deal with domestic problems, particularly narrowing income inequality between the rich and the poor. These resources include a high level of economic development, a good governance environment, high income per capita, and high living standards, so governments in these economies can use public spending (even borrowing) to finance education and narrow the digital divide for the poor. In particular, education in these economies is almost free and universal for everyone. As a result, a low digital gap and high levels of education in advanced economies help low-income individuals (the poor) easily access progress in digital technology to improve their skills and knowledge. They can find a job with a high income, which reduces the income difference between high-income and low-income individuals, thereby narrowing income inequality. In contrast, developing economies do not have several resources to handle domestic problems, especially income inequality. Most developing economies have a low level of economic development, a poor governance environment, a low income per capita, and low living standards, so they cannot use public spending to finance education and improve the digital platform for the poor. Borrowing to finance public spending in these economies is also relatively hard due to the difficulty of repayment for loans. In addition, the poor also have to pay school costs for education in these economies. As a result, a high digital gap and low levels of education in developing economies prevent low-income individuals (the poor) from accessing progress in digital technology. However, high-income individuals (the rich) have enough money to access progress in digital technology to enhance their skills and knowledge. They can easily find a job with high income and get promoted, which increases the income difference between high-income and low-income individuals, thereby widening income inequality. In short, the effect of digitalization on income inequality is different between advanced and developing economies. Therefore, governments in developing economies should focus on policies that enhance public spending to finance education and reduce the digital divide to narrow the income gap between the poor and the rich.

Notably, the economic growth narrows inequality in developing economies but widens in developed economies, given in Figure 1 with the U-shape curve of income inequality. In the view of a whole, in economies with low levels of development (developing economies), income inequality decreases against per capita income throughout economic development;

Figure 1. The U shaped curve of income inequality



Source: Author's drawing

then, it increases when these countries have a higher level of development (advanced economies). This finding contrasts the hypothesis by Kuznets (1955) on the inverted U-shape curve when considering the shift of income inequality against per capita income from low (developing economies) to high (advanced economies). Wong (2017) and Asogwa et al. (2021) discover that economic growth reduces inequality in Latin American economies, while Berisha, Gupta, and Meszaros (2020), Apergis (2021), and Hailemariam, Sakutukwa, and Dzhumashev (2021) confirm it enhances income inequality in 21 advanced economies.

Education enhances income inequality in developing economies. Education is a public good that governments supply for free, and students do not pay the money to attend public schools. However, wealthy families agree to pay charges to send their children to high-quality private schools. Students from these families receive better knowledge and skills than those from average families. Therefore, students from wealthy families easily find high-income jobs and get more promoted, which increases income inequality. This finding can be found in Asogwa et al. (2021), Demir et al. (2020), Kaulihowa and Adjasi (2018).

The high unemployment often falls into the poor who lack the necessary knowledge and skills to get a high-income job, boosting the income gap in society. Deyshappriya (2017) and Asogwa et al. (2021) support it. This finding implies that governments in advanced economies should pay more attention to the poor and help them access education and healthcare to get high-income jobs.

Table 1. Digitalization (fixed broadband subscriptions) and income inequality: two-step S-GMM estimates, 2002 – 2020

Dependent variable: Income inequality (GINI index)

Variables	Advanced economies	Developing economies
Income inequality (-1)	0.944***	0.934***
	(0.011)	(0.004)
Digitalization	-0.0018***	0.0046***
	(0.0001)	(0.0001)
Economic growth	0.005***	-0.012***
	(0.0002)	(0.001)
Education	-0.027	0.048***
	(0.113)	(0.006)
Unemployment	0.031***	0.009**
	(0.003)	(0.006)
Year2003	-3.209	9.078
	(8.673)	(6.980)
Year2004	-2.940	8.243
	(8.930)	(6.088)
Year2005	-3.176	8.842
	(8.986)	(5.830)
Year2006	-3.079	7.437
	(9.128)	(5.727)
Year2007	-2.978	7.517
	(9.368)	(5.508)
Year2008	-2.996	7.384
	(9.361)	(5.431)
Year2009	-3.149	6.999
	(9.418)	(5.407)
Year2010	-3.204	7.464
	(9.389)	(5.288)
Year2011	-3.006	7.255
	(9.354)	(5.319)
Year2012	-2.927	7.549
	(9.400)	(5.222)
Year2013	-2.889	7.370
	(9.523)	(5.262)
Year2014	-3.083	7.014
	(9.471)	(5.178)
Year2015	-2.965	7.403
	(9.443)	(5.196)
Year2016	-3.109	7.331
	(9.501)	(5.189)
Year2017	-3.196	7.167
	(9.503)	(5.129)
Year2018	-3.059	7.434
	(9.577)	(5.173)
Year2019	-3.067	7.205
	(9.599)	(5.127)
Year2020	-3.020	7.196
	(9.656)	(5.125)
Instrument	30	34
Country/Observation	30/540	35/630
AR(2) test	0.211	0.445
Sargan test	0.380	0.602
Hansen test	0.986	0.791

*Note: ***, **,* note significance level at 1%, 5%, 10% respectively*

Table 2. Digitalization (individuals using the Internet) and income inequality: two-step S-GMM estimates, 2002 – 2020

Dependent variable: Income inequality (GINI index)

Variables	Advanced economies	Developing economies
Income inequality (-1)	0.973***	0.912***
	(0.028)	(0.011)
Digitalization	-0.002***	0.007***
	(0.000)	(0.001)
Economic growth	0.012***	-0.001***
	(0.001)	(0.000)
Education	-0.021	0.112***
	(0.040)	(0.003)
Unemployment	0.031***	0.027**
	(0.010)	(0.001)
Year2003	-12.559	10.284
	(6.980)	(5.385)
Year2004	-12.369	10.191
	(7.031)	(5.324)
Year2005	-12.752	9.242
	(7.055)	(5.137)
Year2006	-12.868	10.297
	(7.205)	(5.286)
Year2007	-12.875	10.024
	(7.281)	(5.194)
Year2008	-12.911	10.279
	(7.275)	(5.229)
Year2009	-13.283	10.267
	(7.463)	(5.200)
Year2010	-13.361	9.719
	(7.483)	(5.143)
Year2011	-13.106	9.897
	(7.435)	(5.146)
Year2012	-13.057	9.550
	(7.488)	(5.200)
Year2013	-13.143	9.430
	(7.623)	(5.136)
Year2014	-13.259	9.845
	(7.558)	(5.046)
Year2015	-13.261	9.390
	(7.574)	(5.092)
Year2016	-13.387	9.375
	(7.615)	(5.003)
Year2017	-13.579	9.461
	(7.641)	(4.975)
Year2018	-13.458	9.204
	(7.675)	(5.009)
Year2019	-13.524	9.458
	(7.722)	(4.938)
Year2020	-13.585	9.301
	(7.800)	(4.946)
Instrument	30	33
Country/Observation	30/540	35/630
AR(2) test	0.227	0.392
Sargan test	0.334	0.125
Hansen test	0.994	0.736

*Note: ***, **,* note significance level at 1%, 5%, 10% respectively*

Table 3. Digitalization (fixed broadband subscriptions) and income inequality: one-step S-GMM estimates, 2002 – 2020

Dependent variable: Income inequality (GINI index)

Variables	Advanced economies	Developing economies
Income inequality (-1)	0.929***	0.931***
	(0.012)	(0.009)
Digitalization	-0.011**	0.0005**
	(0.002	(0.000)
Economic growth	0.005**	-0.004***
	(0.001)	(0.001)
Education	-0.018	0.072***
	(0.049)	(0.015)
Unemployment	0.034**	0.014
	(0.016)	(0.013)
Year2003	-1.509	1.749
	(3.306)	(2.800)
Year2004	-1.196	1.311
	(3.356)	(2.588)
Year2005	-1.302	0.650
	(3.415)	(2.521)
Year2006	-1.478	1.814
	(3.467)	(2.457)
Year2007	-1.080	1.468
	(3.510)	(2.431)
Year2008	-1.043	1.686
	(3.537)	(2.400)
Year2009	-1.248	1.885
	(3.543)	(2.373)
Year2010	-1.423	1.026
	(3.538)	(2.359)
Year2011	-1.116	1.490
	(3.529)	(2.338)
Year2012	-1.026	1.246
	(3.532)	(2.329)
Year2013	-0.896	1.198
	(3.563)	(2.318)
Year2014	-1.301	1.480
	(3.553)	(2.310)
Year2015	-1.143	1.184
	(3.565)	(2.299)
Year2016	-1.261	1.189
	(3.570)	(2.293)
Year2017	-1.301	1.157
	(3.591)	(2.287)
Year2018	-1.146	1.087
	(3.598)	(2.294)
Year2019	-1.165	1.316
	(3.605)	(2.299)
Year2020	-1.116	1.194
	(3.626)	(2.285)
Instrument	30	34
Country/Observation	30/540	35/630
AR(2) test	0.215	0.107
Sargan test	0.380	0.618

*Note: ***, **,* note significance level at 1%, 5%, 10% respectively*

Table 4. Digitalization (individuals using the Internet) and income inequality: one-step S-GMM estimates, 2002 – 2020

Dependent variable: Income inequality (GINI index)

Variables	Advanced economies	Developing economies
Income inequality (-1)	0.925***	0.936***
	(0.017)	(0.009)
Digitalization	-0.010**	0.023***
	(0.003)	(0.004)
Economic growth	0.003**	-0.006***
	(0.0001)	(0.003)
Education	-0.004	0.083***
	(0.016)	(0.023)
Unemployment	0.020*	0.010
	(0.010)	(0.014)
Year2003	-1.431	1.326
	(4.224)	(3.542)
Year2004	-1.211	1.035
	(4.234)	(3.523)
Year2005	-1.397	0.397
	(4.265)	(3.503)
Year2006	-1.622	1.572
	(4.307)	(3.477)
Year2007	-1.253	1.268
	(4.351)	(3.485)
Year2008	-1.213	1.527
	(4.396)	(3.467)
Year2009	-1.378	1.795
	(4.436)	(3.437)
Year2010	-1.520	1.011
	(4.454)	(3.409)
Year2011	-1.201	1.542
	(4.452)	(3.379)
Year2012	-1.092	1.385
	(4.472)	(3.351)
Year2013	-0.967	1.375
	(4.516)	(3.324)
Year2014	-1.359	1.732
	(4.513)	(3.294)
Year2015	-1.208	1.504
	(4.526)	(3.261)
Year2016	-1.324	1.597
	(4.537)	(3.229)
Year2017	-1.377	1.623
	(4.562)	(3.203)
Year2018	-1.223	1.618
	(4.573)	(3.204)
Year2019	-1.239	1.916
	(4.588)	(3.203)
Year2020	-1.192	1.860
	(4.624)	(3.179)
Instrument	30	34
Country/Observation	30/540	35/630
AR(2) test	0.220	0.109
Sargan test	0.334	0.139

*Note: ***, **,* note significance level at 1%, 5%, 10% respectively*

5.2. Robustness check

The paper employs the PMG estimator for Equation (2) to test the robustness of S-GMM estimates. The PMG estimator is a kind of panel Error Correction Model (ECM) that requires co-integration between regressors and the dependent variable. The PMG estimator requires the panel co-integration among regressors and the dependent. So, the paper examines the stationary of all variables in the empirical model to ensure that they all have the same order of co-integration. Then, it performs the panel co-integration tests by Westerlund (2007).

The stationary tests in Table 5 (advanced economies) and Table 6 (developing economies) show that income inequality, fixed broadband subscriptions, individuals using the Internet economic growth, education, unemployment are stationary at a significance level of less than 10%, meaning that they have co-integration of zero-order I(0). The Westerlund tests in Table 7 and Table 8 note that three of four tests deny the null hypothesis of no co-integration, suggesting that income inequality co-integrates with fixed broadband subscriptions, individuals using the Internet economic growth, education, unemployment.

The estimated results by PMG across all empirical models are indicated in Table 9 (advanced economies) and Table 10 (developing economies). Similar to those by the two-step S-GMM, estimates by the PMG estimator note that (i) digitalization widens inequality in developing economies but narrows in developed economies, (ii) economic growth increases inequality in advanced economies but reduces in developing economies. The significance level and value of the speed of adjustment at the bottom of tables report that PMG estimates are highly reliable.

Table 5. Fisher type unit root tests: 2002 – 2020 (Advanced economies)

Variables	Augmented Dickey-Fuller test		Phillips-Perron test	
	Prob > chi2		Prob > chi2	
	Without trend	With trend	Without trend	With trend
Income inequality	67.430	92.163***	69.072	102.602***
Fixed broadband subscriptions	176.981***	529.239***	1781.414***	1082.451***
Individuals using the Internet	196.841***	85.751***	521.950***	205.598***
Economic growth	93.364***	60.155	71.661	23.079
Education	181.606***	232.144***	46.100	55.226
Unemployment	116.632***	88.899***	61.361	39.757

*Note: ***, **,* note significance level at 1%, 5%, 10% respectively*

Table 6. Fisher type unit root tests: 2002 – 2020 (Developing economies)

Variables	Augmented Dickey-Fuller test		Phillips-Perron test	
	Prob > chi2		Prob > chi2	
	Without trend	With trend	Without trend	With trend
Income inequality	63.328	142.940***	105.919***	216.918***
Fixed broadband subscriptions	390.697***	171.170***	1445.687***	526.533***
Individuals using the Internet	69.036	51.241	101.519***	77.903
Economic growth	96.342**	51.023	138.331***	42.294
Education	127.279***	175.431***	113.106***	127.065***
Unemployment	80.369	62.171	109.798***	47.855

*Note: ***, **,* note significance level at 1%, 5%, 10% respectively*

Table 7. Westerlund panel co-integration tests: 2002 – 2020 (Advanced economies)

Normalized variable: GINI index (income inequality)

Covariates	G_t	G_α	P_t	P_α
Fixed Broadband subscriptions	-2.732***	-6.267	-10.959***	-6.206***
Individuals using the Internet	-3.063***	-14.053**	-15.194***	-11.490***
Economic growth	-3.279***	-14.273**	-14.411***	-10.694**
Education	-3.604***	-17.113***	-16.414***	-13.677***
Unemployment	-3.819***	-18.611***	-18.735***	-13.095***

*Note: ***, **,* note significance level at 1%, 5%, 10% respectively*

Table 8. Westerlund panel co-integration tests: 2002 – 2020 (Developing economies)

Normalized variable: GINI index (income inequality)

Covariates	G_t	G_α	P_t	P_α
Fixed broadband subscriptions	-3.657***	-17.556***	-20.710***	-16.913***
Individuals using the Internet	-3.647***	-17.219***	-26.950***	-21.849***
Economic growth	-3.573***	-15.648***	-23.656***	-19.289***
Education	-3.186***	-21.928***	-17.618***	-16.089***
Unemployment	-3.399***	-24.842***	-18.066***	-18.603***

*Note: ***, **,* note significance level at 1%, 5%, 10% respectively*

Table 9. Digitalization (fixed broadband subscriptions) and income inequality: PMG estimates, 2002 – 2020

Long run co-integrating vectors

Dependent variable: Income inequality (GINI index)

Variables	Advanced economies	Developing economies
Digitalization	-0.004***	0.002***
	(0.001)	(0.000)
Economic growth	0.046***	-0.146***
	(0.013)	(0.007)
Education	-0.148***	0.023
	(0.041)	(0.020)
Unemployment	0.076**	0.085***
	(0.033)	(0.027)
Error correction	-0.472***	-0.454***
Observation	540	630
Log likelihood	-359.442	-706.422

*Note: ***, **,* note significance level at 1%, 5%, 10% respectively*

Table 10. Digitalization (individuals using the Internet) and income inequality: PMG estimates, 2002 – 2020

Long run co-integrating vectors

Dependent variable: Income inequality (GINI index)

Variables	Advanced economies	Developing economies
Digitalization	-0.049***	0.001*
	(0.007)	(0.000)
Economic growth	0.046***	-0.148**
	(0.008)	(0.010)
Education	-0.000	0.008***
	(0.020)	(0.015)
Unemployment	0.087***	-0.014
	(0.032)	(0.044)
Error correction	-0.371***	-0.378***
Observation	540	612
Log likelihood	-360.768	-743.219

*Note: ***, **,* note significance level at 1%, 5%, 10% respectively*

6. Conclusion

Income inequality in society is one of the global problems in advanced and developing economies under rising globalization and digitalization. Narrowing income inequality is one of the main goals in the development agendas. Meanwhile, digital progress is an irreversible process, significantly contributing to economic growth in these economies. Unfortunately, the digital divide is also emerging in society. Given these facts, the paper tests the impact of digitalization on inequality for 30 advanced economies and 35 developing economies between 2002 and 2020. The study applies the S-GMM and PMG estimators for estimation and robustness checks. The results indicate that (i) Digitalization narrows income inequality in developed economies, but widens it in developing economies, (ii) the economic growth – income inequality relationship is U-shaped as real GDP per capita rises from low (developing economies) to high (advanced economies). Third, unemployment increases inequality in two groups.

The findings suggest some crucial implications to design, formulate, and implement regulations and policies related to digital development. The implication is that digitalization is an irreversible process in countries but significantly affects income inequality. Notably, severe income inequality can lead to social instability. Developing economies should adjust the strategies and methods of digital technology development to reduce the digital divide and its adverse impact on income inequality. In particular, governments in developing countries should use public spending to focus on digital education programs for the poor and help them better access digital technology to enhance job search and improve income.

The limitation of this paper is that it uses two measures released by World Bank to proxy for digitalization, while some digital metrics recommended by Kotarba (2017) can use to measure digitalization better. They are Digital Economy Metrics, Digital Society Metrics, Digital Industry Metrics, Digital Enterprise Metrics, Digital Client Metrics, and Digital Investment Metrics. However, these metrics are not available now. It needs more time to develop and collect the database.

Future research should focus on the impact of digitalization on inequality by sector/industry. Furthermore, the contribution of institutional/governance quality to the digitalization – inequality relationship is another suggestion for future research.

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Endnotes

1 Austria, Belgium, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Italy, Israel, Ireland, South Korea, Luxembourg, Lithuania, Latvia, Malta, Norway, Netherlands, Portugal, Switzerland, Slovak Republic, Spain, Slovenia, Sweden, United Kingdom, United States.

2 Armenia, Argentina, Belarus, Bolivia, Bulgaria, Brazil, Costa Rica, Chile, Colombia, China, Croatia, Dominican Republic, El Salvador, Ecuador, Georgia, Honduras, Hungary, Indonesia, Kazakhstan, Kyrgyz Republic, Malaysia, Moldova, Mexico, Pakistan, Paraguay, Panama, Poland, Peru, Russian Federation, Romania, Thailand, Turkey, Ukraine, Vietnam, West Bank & Gaza.

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Appendix

Table A. Data description

Variable	Definition	Type	Source
Income inequality (GIN)	Gini index on the income distribution.	value	World Bank
Fixed broadband subscriptions (BRO)	Refers to fixed subscriptions for high-speed access to the public Internet (TCP/IP connections), at downstream speeds greater than or equal to 256 kbit/s.	log	World Bank
Individuals using the Internet (INT)	Internet users are persons who have used the Internet within the last three months (from any location). They can use the Internet through mobile phones, computers, game consoles, digital TVs, digital assistants,...	%	World Bank
Economic growth (GDP)	Real per capita GDP (constant 2015 US$)	log	World Bank
Education (EDU)	School enrollment, primary (% gross)	%	World Bank
Unemployment (UNE)	Refers to the proportion of the workforce who are unemployed but available and looking for work.	%	World Bank

Table B. Descriptive statistics for advanced economies

Variable	Obs	Mean	Std. Dev.	Min	Max
GINI index	570	31.607	4.250	23.7	42.5
Fixed broadband subscriptions	570	25.966	11.738	0.075	48.334
Individuals using the Internet	570	72.302	19.354	14.67	99.7
GDP per capita	570	1047.25	54.117	898.825	1162.597
School enrollment, primary	570	102.194	4.207	95.648	127.2
Unemployment	570	7.648	4.134	2.01	27.466

Table C. Descriptive statistics for developing economies

Variable	Obs	Mean	Std. Dev.	Min	Max
GINI index	665	40.332	8.633	24	59.5
Fixed broadband subscriptions	665	7.970	8.074	0.0002	34.452
Individuals using the Internet	665	37.806	24.126	1.587	89.555
GDP per capita	665	854.062	76.461	651.6592	977.395
School enrollment, primary	665	103.661	8.992101	70.894	146.827
Unemployment	665	7.347	4.767	0.398	27.465

Table D. Matrix of correlation coefficients for advanced economies

	GIN	BRO	INT	GDP	EDU	UNE
GIN	1					
BRO	-0.054	1				
INT	-0.254***	0.780***	1			
GDP	-0.136***	0.330***	0.472***	1		
EDU	0.179***	0.029	-0.081**	0.000	1	
UNE	0.271***	-0.135***	-0.258***	-0.418***	0.025	1

*Note: ***, **,* note significance level at 1%, 5%, 10% respectively*

Table E. Matrix of correlation coefficients for developing economies

	GIN	BRO	INT	GDP	EDU	UNE
GIN	1					
BRO	-0.133***	1				
INT	-0.204***	0.786***	1			
GDP	0.136***	0.565***	0.569***	1		
EDU	0.511***	0.007	-0.102***	0.236***	1	
UNE	-0.174***	-0.010	0.056	0.076**	-0.008	1

*Note: ***, **,* note significance level at 1%, 5%, 10% respectively*

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PROFILE AND FINANCIAL BEHAVIOUR OF CRYPTO ADOPTERS – EVIDENCE FROM MACEDONIAN POPULATION SURVEY

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Abstract

Regulators and policymakers in many developing countries are facing challenges on how to create opportunities for the crypto industry to grow, but at the same time protect investors and consumers. This study aims to better understand the demographic and socio-economic characteristics of crypto adopters and their financial behavior. Our study advances the knowledge within an array of recent contributions to the token economy and covers the geographical and contextual research gaps through survey data from a developing country in South Eastern Europe. We use descriptive statistics and chi-square analysis and we find that Macedonian crypto-adopters are more men of younger age, employed, with higher education and living in their own apartments in an urban area, and are mainly passive investors. We compare the findings with studies from other countries to provide valuable insights for policymakers and regulators.

Keywords: *Crypto-adopters, cryptocurrencies, financial behavior, demographic profile, socio-economic profile*

JEL classiffication*: G20, G40, G41*

1. Introduction

On May 13th, 2022 an article titled "The week that shock crypto" was published in Financial Times. The crypto market lost approximately 600 billion dollars in the second week of May 2022. Bitcoin slumped below $30,000 for the first time since July 2021 and the value of some cryptocurrencies such as Terra and Luna slid to zero. The article brings to light how hedge fund rock star Mike Novogratz in early January 2022 tweeted a picture image of a wolf howling at the moon and a banner saying "Luna" referencing a cryptocurrency then trading at $78. "By the start of April 2022 Luna peaked at $116 after being snapped up by buyers including enthusiastic retail investors" (Chipolina and Martin 2022). But in the third week of May 2022 Luna lost it all and Terra, a sister token, collapsed in value, despite being designed to track the value of the US

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dollar (Chipolina and Martin 2022). Moreover, changes in the crypto market are happening at high speed, as evidenced by the recent bankruptcy of FTX, a cryptocurrency trading firm (Elder and Scaggs 2022).

Although the adoption of cryptocurrencies by the general public is still quite scanty, crypto mania is a global trend that we are all experiencing, and every day, people throw large amounts of money into crypto expecting to seize the opportunity when they hear about dramatic returns due to price volatility. According to Wątorek et al. (2021) crypto market in the last couple of years grew to the level of the middle-size stock exchange market. However, many in the financial world in advanced economies view cryptocurrencies with distrust, seeing them as the territory of passionate „crypto bros" and a speculative and highly volatile fad that can only end badly (Wheatley and Klasa 2021). On the other hand, there is evidence that crypto is quietly establishing deeper roots in the developing world. Cryptocurrency use is quickly becoming a part of everyday life, particularly in countries with a history of financial instability or where the barriers to traditional financial goods such as bank accounts are very strong (Wheatley and Klasa 2021).

Palvia et al. (2021) emphasize the relevance of contextual reality in doing research, stating that having the just U.S. and a few regional studies available in the literature limits our comprehension of the worldwide range of technology concerns. This approach poses a significant risk of stakeholders in other countries adopting the American or European results and recommendations incorrectly, resulting in actions that are suboptimal or harmful to a variety of stakeholders (Palvia et al. 2021). Despite the tremendous growth of the crypto market, it is still quite unknown why people buy cryptocurrencies (Martin, Chrysochou, and Strong 2022), especially in developing countries where crypto investing is not sufficiently studied. Hence, our research aim is to understand better the crypto-adopters by studying the demographics and motives for crypto investing. "Understanding where and why cryptocurrencies are used, and by whom, helps regulators to assess the field of tension between the protection of investors and the facilitation of innovation, and allows businesses to assess how cryptocurrencies might affect them" (Steinmetz et al. 2021, p. 2). To the best of our knowledge, this is the first study that delves more deeply into cryptocurrency ownership from the population in North Macedonia. Our study contributes to an array of recent contributions to the token economy based on survey data. We believe that our study is one of the rare studies reporting on the characteristics and financial behavior of crypto-adopters in a developing country.

Cryptocurrency adopters are more risk tolerant and hold risky portfolios (Lammer, Hanspal, and Hackethal 2020). Mills and Nower (2019) point out the anonymity characteristic of cryptocurrencies that facilitates risk-taking activities over the Internet such as gambling. In that direction, according to past research, internet users use cryptos to hide their online gambling activity (Gainsbury and Blaszczynski 2017; Orsolini et al. 2017). Cryptocurrency trading overlaps with trading with high-risk stocks, due to its volatility (Wilmoth 2018) with depression and anxiety being the main predictors of frequent crypto trading (Grall-Bronnec et al. 2017). Moreover, Griffiths (2018) views 'crypto-trading addiction' as a form of gambling addiction and a sub-type of online day trading addiction.

Further, we believe that it is important to understand more deeply what drives people's behavior to invest in cryptocurrencies, and what are the potentially damaging effects of crypto-assets adoption on people's behavior (Levkov 2022). After the first crypto purchase, an average cryptocurrency investor increases trading activity (Lammer, Hanspal, and Hackethal 2020). Cryptocurrencies' frequent trading is strongly associated with problem gambling severity (Mills and Nower 2019). On the other hand, according to a recent study by Watanapongvanich et al. (2021) financially literate people are less likely to gamble. When it comes to a developing country such as The Republic of North Macedonia, with an increased poverty rate compared to most of the countries in the region (Sharlamanov and Petrusheva 2022), and a lack of financial literacy of the population that eventually leads to the less stable economy (REF 2018) it is important to gain insight into the profile of active and passive crypto investors having in mind the pro-risk orientation of crypto investors (Lammer, Hanspal, and Hackethal 2020).

Hence, the reasons to better understand the financial behavior of cryptocurrency adopters are manyfold looking from the perspective of a developing country struggling to provide a better quality of life for its citizens. One of the many important reasons is to protect the savings and investments of its citizens from potential hazard losses. As relatively little is known about the profile of cryptocurrency adopters and their motives, our paper aims to shed light on some pertinent issues by answering the following research questions:

1. What are the most common demographic and socio-economic characteristics of cryptocurrency adopters in a developing country like North Macedonia?
2. How knowledgeable are crypto-adopters about cryptocurrencies and blockchain technology and how does their knowledge affect their financial behavior?

3. Are there any major disparities in the financial behavior of crypto-adopters between men and women?
4. What data reveal about Macedonian crypto-adopters in comparison to crypto survey data from more developed countries?

2. Theoretical background

2.1. Crypto asset markets - attractiveness, risk, and volatility

Even though the first cryptocurrency Bitcoin was introduced in 2009, the crypto-assets market is still relatively new and not entirely understood (Kim, Sarin, and Virdi 2018; Boxer and Thompson 2020; Hackethal et al. 2021) partially because of the large variation in its market valuation (Demertzis and Wolf 2018). Bitcoin was partially introduced as a response to the global financial crisis of 2008-2010 (Wątorek et al. 2021). Crypto assets are often called cryptocurrencies (Demertzis and Wolf 2018; Gerritsen, Lugtigheid, and Walther 2022). According to Kim, Sarin, and Virdi (2018), cryptocurrency is an inapplicable title, due to its volatile nature, making it difficult to represent metrics of value and cost of goods. Furthermore, Söderberg (2018) states that no single definition of crypto assets can be applied. However, cryptocurrency can be explained as a digital asset secured by a technology called blockchain that allows peer-to-peer transactions (Kim, Sarin, and Virdi 2018) or as digital units, created and transferred among investors, through cryptography (Söderberg 2018). Volatility as an evident characteristic of the crypto assets market due to price shifts is a result of investor sentiment (Boxer and Thompson 2020; Stix 2019; Bonaparte 2021) and attracts investors to cryptocurrencies (Urquhart 2018; Hackethal et al. 2021). The dramatic price rise of the largest cryptocurrency Bitcoin value (Gerritsen, Lugtigheid, and Walther 2022) was a key event in 2017 that draw attention to crypto-assets and cryptocurrencies in the eyes of a wider audience (Kim, Sarin, and Virdi 2018; Boxer and Thompson 2020).

Another event put crypto-assets markets at the center of attention in the scientific community and investors as well. Ever since Facebook announced the introduction of Libra cryptocurrency in 2019 there has been a shift in scientists' and investors' perceptions regarding cryptocurrency use from mainly to store and save value to a viewpoint where crypto assets are facilitating day-to-day transactions as everyday payment tools (Fujiki 2020; 2021). Crypto investors benefit from including Bitcoin in their investment portfolio when considering liquidity (Gerritsen, Lugtigheid, and Walther 2022). Understanding the characteristics of crypto investors is of great value for the future development of crypto-assets markets (Hackethal et al. 2021). Despite being a topic of interest to a vast number of scientists and researchers (Fujiki 2020; 2021; Bonaparte 2021; Stix 2020; 2021; Henry et al. 2019; Halaburda et al. 2020), due to the anonyms nature of crypto assets markets and cryptocurrencies, it is a challenge for the researcher to conduct empirical research (Hackethal et al. 2021).

In a developing country like North Macedonia, there are various challenges for innovations in the financial system strongly related to fragile institutions, corruption, and money laundering. Along with the explosion of interest in cryptocurrency, the high volatility of crypto market prices put individual investors face a very high risk of losing their own financial stability. Hence, various state institutions, tax authorities, and central banks in many countries should be very careful in allowing cryptocurrencies without first securing the financial system. Nevertheless, it seems like this crypto-mania has caught the attention and become very attractive to some statesmen. The most vivid example is the government of El Salvador whose crypto enthusiast president, Nayib Bukele, introduced bitcoin as legal tender in 2021. President Bukele claimed that accepting Bitcoin could bring unbanked citizens into the economy and enable easier cross-border payments, although critics including IMF called this move irresponsible and very risky. But in May 2022, although the crypto market is crashing, president Nayib Bukele stocked up on more of the cryptocurrency, making the government's most recent purchase of 500 bitcoins at an average price of $30,744 each (Chipolina and Martin 2022). Playing against the market is always a dangerous investing strategy, especially when using public funds and putting your country's financial stability at risk.

2.2. Who are crypto investors? - Demographic and socio-economic characteristics

Bonaparte (2021) investigates who owns cryptocurrencies indicating that crypto ownership varies by generation and crypto investors are male, millennials, with college degrees, pessimistic, social, certain about income, financially literate, and own stocks. Other studies indicate that the ownership of cryptocurrencies is mostly associated with younger age, higher education, and living in urban areas or major cities

(Wciom 2019). Exton and Doidge (2018) found that in Europe, the probability of owning cryptocurrency is higher for males than for females, and it is greatest for 25–34-year-olds. Similarly, Laboure and Reid (2020) found that in France, Italy, Germany, and the UK, the rate of ownership among the youngest age group (19-34) is at least twice as high as for 35–54-year-olds. Fujiki (2020) conducted research on Japanese owners and the results indicate that crypto-asset owners are male, under 30 years old, with higher income, overconfident about financial literacy, obtain financial information from mass media, and tend to use non-cash payment methods (Fujiki 2021). Furthermore, according to the same study (Fujiki 2020), crypto assets owners can be analyzed and divided into four heterogeneous groups based on their level of crypto assets understanding, how profitable are their investments in crypto assets, their holdings of conventional risky financial assets, and their adoption of non-cash payment methods.

Crypto asset owners tend to hoard cash (Fujiki, 2021). Furthermore, average crypto asset owners, mostly young and male, are tech-affine and use their crypto assets for investment purposes rather than as a means of facilitating daily actions due to price shifts (Fujiki 2020; 2021; Henry et al. 2019; Stix 2020; 2021). Different countries yield different characteristics of crypto asset owners when it comes to financial literacy. Accordingly, the study of Henry et al. (2019) points out the lower level of financial knowledge of Canadian crypto asset owners. On the contrary, Austrian crypto asset owners are financially literate (Stix 2019) so as are the Japanese crypto asset owners (Fujiki 2021). Hackethal et al. (2021) found that cryptocurrency investors are active traders with risky portfolios and invest in stocks with high media sentiment.

Despite the solid base of past research investigating crypto assets by focusing on characteristics and differences between owners and nonowners (Fujiki 2020; 2021; Halaburda et al. 2020; Henry et al. 2019; Stix 2019), there is a lack of research focusing on characteristics of crypto asset owners from developing countries across the globe. Our research endeavor tends to fill that gap and add value to the growing literature around this topic by investigating and analyzing the characteristics of crypto asset owners in North Macedonia. The latest crypto market downturn in May 2022, to a large extent, suggests that instead of forging a path toward building a new, decentralized financial system, cryptocurrencies are likely destined to remain get-rich-quick bets for highly risk-tolerant investors (Chipolina and Martin 2022). Therefore, small and fragile developing countries need to be very aware of their crypto adopters and familiar with their crypto population.

2.3. Hypothesis development

The aim of this research study is to provide a deeper and better understanding of the financial behavior and demographic and socio-economic profile of crypto investors in a developing country. To better understand the financial behavior of crypto-adopters we developed and tested the following research hypotheses H1-H11.

Real-world investors are classified as active and passive investors (Garleanu and Pedersen 2022). While active investors are focused, study the stocks and invest in positive stocks, passive ones just buy everything in the toy stock market regardless of the potential of the stocks (Capocci and Zhang 2001). Warren, Stevens, and McConkey (1990) devoted research to developing lifestyle and demographic profiles of investors based on the types of investors (heavy-active and light–passive investors) indicating that educational level is a good predictor of the type of investors. Boxer and Thomson (2020) researched active cryptocurrency investors and the respondents to their survey were male, mostly in the age range of 25-34 years. Kristjanpoller and Olson (2015) examined the effect of financial knowledge on the choice of active or passive investment and found that people with more income and more financial knowledge were more likely to actively manage their retirement funds. Wang (2009) investigating the interplay of financial knowledge and risk-taking found that gender emerges as an important factor that differentiates investors' levels of objective knowledge, subjective knowledge, and risk-taking. Further, participants who felt fairly knowledgeable about their investments sought less contact with their investment professionals (Hung, Clancy, and Dominitz 2011). Hence, building on the theoretical insight gained from the previous studies and our research questions we propose the following hypotheses (H1-H7).

H1: There is a significant association between the level of knowledge about cryptocurrencies and the type of investor.

H2: There is a significant association between the type of investors and their education level.

H3: There is a significant association between the level of knowledge about blockchain technology and the type of investor.

H4: There is a significant association between gender and level of knowledge about blockchain technology.

H5: There is a significant association between gender and the level of knowledge about cryptocurrencies.
H6: There is a significant association between the level of knowledge about cryptocurrencies and asking for investment advice.
H7: There is a significant association between the level of knowledge about blockchain technology and asking for investment advice.

Active investing in cryptocurrencies is a strategy that involves ongoing buying and selling in a highly volatile market. Hence, we believe that active investors are more prone to be proactive in searching for information and monitoring prices frequently than passive investors. Frequent trading on a highly volatile market requires a regular update of cryptocurrency price information. Without that constant attention, active crypto investors would not be able to make trading decisions confronted with the highly volatile market fluctuations of the crypto market. Further, Robichaud et al. (2002) emphasize that research has shown that there is a significant gender difference in the worry report of women and men, with women often reporting more worry than men regarding the intolerance of uncertainty. Ricciardi (2008) apart from providing evidence from gray literature and studies, call for more researchers to explore whether women reveal greater degrees of a worry than their male counterparts for different categories of financial services and investment products. To the best of our knowledge, we think that this study is the first study testing the gender differences in the degree of wariness regarding the volatility of crypto prices. We further theorize that having a greater level of worry about the potential price drop of cryptocurrencies would probably press women more to frequent monitoring of cryptocurrency prices.

H8: There is a significant association between the type of investors and the frequency of monitoring cryptocurrencies' prices.
H9: There is a significant association between gender and the level of wariness regarding the volatility of cryptocurrency prices.
H10: There is a significant association between the level of wariness and the frequency of monitoring cryptocurrency prices.
H11: There is a significant association between gender and the frequency of monitoring cryptocurrencies' prices.

3. Research context, method and data

3.1. Research context

The Republic of North Macedonia is a small country located in Southeast Europe on the Balkan Peninsula. The latest Census conducted in 2021, reveals a 1.836.713 total resident population (State Statistical Office of the Republic of North Macedonia 2021a) with a Gross Domestic Product per capita of 6,863 U.S. dollars (International Monetary Fund 2022). According to the estimated data of the State Statistical Office of the Republic of North Macedonia (2021b), the growth rate of the Gross Domestic Product (GDP) in the fourth quarter of 2021 is 2.3% and the largest increase was registered in several sectors, including the Information and Communication sector with an increase of 5.3%. Out of the total population, 83.7% of the households had access to the Internet at home (State Statistical Office of the Republic of North Macedonia 2021c) and 1.13% of the population, or more precisely 23,639 individuals are crypto owners in the Republic of North Macedonia (Triple A 2021). Transactions with crypto assets in the Republic of North Macedonia are not regulated by any law including the Law on Foreign Exchange Operations (and its bylaws) meaning they are not illegal but currently the process is not regulated at all (National Bank of the Republic of North Macedonia 2022).

3.2. Method and data collection

Data for the study have been collected through an online questionnaire distributed to crypto adopters in the Republic of North Macedonia during the period August – to October 2021. A total set of 127 responses were collected and after data screening and cleaning procedures, the effective number of 122 responses was subject to further analysis. The total number of survey questions was forty-one. The survey instrument consisted of questions regarding the demographic characteristics of respondents and the financial behavior of crypto-adopters regarding cryptocurrency trading. The questions in the survey were adopted and adjusted from OECD (2019), OECD Consumer Insights Survey on Cryptoassets - A questionnaire to explore consumers' attitudes, behaviors, and experiences (www.oecd.org/finance/2019-cryptoassets-in-asia.pdf, accessed in July 2021). The link from the online survey was posted on several Facebook fan pages in North Macedonia focused on crypto investing with

upfront approval from the fan page administrator. The list of the Facebook groups where the survey was posted online are:

(1) https://www.facebook.com/groups/CryptoMacedonia/permalink/1468886246829317/
(2) https://www.facebook.com/groups/cryptorevolucija/permalink/217618716948780/
(3) https://www.facebook.com/groups/cryptostef/?ref=share
(4) https://www.facebook.com/groups/137886980224476/permalink/776742483005586/

First, we conducted a descriptive analysis of the collected data mainly to depict crypto adopters' demographic and socio-economic characteristics. Second, we use the Chi-square analysis, to test the proposed hypothesis H1-H11 to better understand the financial and investment behavior of crypto adopters and to address the research questions formulated in the introduction.

4. Data analysis and result

4.1. Demographics and socio-economic characteristics of crypto-assets adopters

In the following section, we present the results from descriptive statistics mainly in four tables 1-4. The data in the respective tables are organized into four categories 1) Demographic and socio-economic characteristics 2) Familiarity with technology and cryptocurrencies 3) Financial behavior of Macedonian crypto

Table 1. Demographic and socio-economic characteristics of crypto-assets adopters

1) Gender	a. Male 82.8% b. Female 11.2%
2) Age	a. Young adult 55.7% b. Middle age 40.2% c. Old adult 4.1%
3) Educational level	a. Elementary school 2.5% b. High school 18.9% c. BSc 53.3% d. Master 18.0% e. Ph.D. 2.5% f. Other (junior college, academy) 4.9%
4) Profession	a. Economist 34.4% b. Engineer 19.7% c. Software developer 14.8% d. Doctor 2.5% e. Lawyer 7.4% f. Professor (education) 23.8% g. Other 17.5%
5) Employment status	a. Full-time employee 79.6% b. Part-time employee 14.7% c. Unemployed 5.7%
6) Average monthly income	a. 0-250 EUR 10.7% b. 251-500 EUR 26.2% c. 501-1000 EUR 29.5% d. 1001-1500 EUR 13.1% e. 1501-2000 EUR 3.3% f. Above 2000 EUR 17.2%
7) Housing arrangement	a. Own house/apartment 86.9% b. Rent house/apartment 6.6% c. Do not rent nor own house/apartment (e.g., living with parents/relatives) 6.6%
8) Living area	a. City (urban area) 87.6% b. Suburban 6.2% c. Village (rural area) 6.2%

adopters and 4) Trust and risk perception of cryptocurrencies. The results of the remaining questions from the survey are presented within the text of the article.

Regarding demographic and socio-economic characteristics (Table 1) crypto investors are predominantly male and young adults between 19-34 years old. They mostly have finished undergraduate studies, with a professional background in economics, are employed with an average monthly income of 501-1500 EUR, and live in an urban area in their own house/apartment.

To better understand the financial behavior of crypto adopters and to address our research questions we present the data in Table 2 about how knowledgeable and how familiar crypto investors with cryptocurrencies and blockchain technology are and whether they seek advice when they make their investment decisions. The results in Table 2 show that almost half of the crypto adopters consider themselves highly knowledgeable in working with computers, but they consider themselves significantly less familiar with blockchain technology and cryptocurrencies. Regarding seeking advice, more than half of crypto adopters reported that seek advice when they invest in cryptocurrencies and most of them seek advice from an expert in blockchain technology or related technologies. What is very interesting is that although learning how to invest in cryptocurrencies and trading in the crypto market requires some time, most crypto investors do not consider this as a strong barrier to further investing in the crypto market.

In Table 3 we present the results from descriptive statistics regarding the financial behavior of crypto adopters. Analyzing investment characteristics, we can say that crypto investors, being mostly passive, usually invest smaller amounts (1000-5000 EUR), probably due to lower-income levels and the high volatility of the crypto market. Almost two-thirds of crypto adopters acquired their cryptocurrencies by purchasing on an online platform with the primary motive to provide inheritance, diversify an investment portfolio and make money quickly. More than half of crypto adopters used their savings to buy cryptocurrencies as the primary source for investment, and they plan to buy more cryptocurrencies in the next 12 months investing not more than 1000-5000 EUR. It is interesting to notice that more than half of crypto adopters reported that they do nothing when the price of their cryptocurrencies fell below the price they paid. This can be an indicator to a large extent that crypto adopters can afford to lose their invested money and choose to wait and hope that the price of their cryptocurrencies will rise again. Regarding crypto intensity behavior investigated through the frequency of

Table 2. Familiarity with technology and cryptocurrencies

1) How knowledgeable you are about working with computers and software?	a. Extremely knowledgeable 49.2% b. Somewhat knowledgeable 42.6% c. Not very knowledgeable 6.6% d. Not at all knowledgeable 1.6%
2) How familiar are you with blockchain technology?	a. Very much familiar 38.5% b. To some extent 41.8% c. Very little 7.4% d. Not at all familiar 12.3%
3) How well do you think you understand cryptocurrencies?	a. Very well 41.8% b. To some extent 42.6% c. Very little 12.3% d. Not at all 3.3%
4) Did you seek advice from someone when you invested in cryptocurrencies?	a. Yes 43.3% b. No 56.7%
5) Who gave you the advice?	a. Professional adviser e.g., financial adviser or accountant 7.4% b. Expert in blockchain technology or related technologies 51.9% c. Family member 18.5% d. Friend 7.4% e. Internet (social media, blogs, forums) 7.4% f. Work colleague 7.4% g. Other 7.4%
6) Does the required time to learn how to invest in crypto demotivate you from further investment in crypto?	a. Yes 19.6% b. No 80.4%

monitoring cryptocurrencies' prices, almost two-thirds of respondents reported that they check the prices once a day. Most crypto adopters don't mine cryptocurrencies, nor plan to do that in the near future.

The results from surveying crypto adopters in North Macedonia show that almost one in every two crypto-adopters consider stocks to be equally risky or even more risky to invest in than cryptocurrencies. As expected, crypto investors in the Republic of North Macedonia believe that Bitcoin and Ethereum are the best and most secure cryptocurrencies for investment. More than two-thirds of surveyed crypto-adopters

Table 3. Financial behaviour of Macedonian crypto adopters

1) Are you a passive investor or an active trader?	a. Passive investor 63.9% b. Active trader 36.1% c. Neither
2) How did you acquire digital or cryptocurrencies?	a. Bought on an online platform 63.1% b. Mind them 16.4% c. Received them in payment for goods or services 3.3% d. 3.3% e. Transferred from family or friends 3.3% f. Other 13.1%
3) Why did you become a digital/cryptocurrency holder?	a. Make money quickly 19.7% b. Use as a means of payment for online purchases 3.3% c. Provide an inheritance 23.0% d. Diversify overall investment portfolio 24.6% e. To support initiatives built on blockchain technology 10.7% f. Other 18.9%
4) How often do you check the prices of cryptocurrencies on the crypto market?	a. Very often, almost every hour 15.6% b. Once a day 58.2% c. Once a week 12.3% d. Rarely 4.9% e. Never 9.0%
5) Besides buying, do you mine cryptocurrencies?	a. Yes 28.9% b. No 71.1%
6) How you paid for acquiring the cryptocurrencies?	a. Savings 52.5% b. Borrowed from friends or family 0.8% c. From the monthly budget 24.6% d. A new loan from a financial institution 2.5% e. Sold (some of) my assets or investments 2.5% f. Other 17.2%
7) What did you do when the price of your cryptocurrencies fell below the price you paid?	a. Bought more of those cryptocurrencies 4.9% b. Sold those cryptocurrencies 42.6% c. I did not take any action 52.5%
8) Thinking about the next 12 months, how likely are you to	a. Buy more of the cryptocurrencies you already hold 35.2% b. Buy different cryptocurrencies 38.5% c. Sell or spend some of your cryptocurrencies 8.2% d. Sell or spend all of your cryptocurrencies 3.3% e. None 14.8%
9) If you invest in cryptocurrencies in the future the amount would be	a. Bellow 100 EUR 6.6% b. From 101-1000 EUR 23.8% c. From 1001-5000 EUR 31.1% d. From 5001-20000 EUR 19.7% e. From 20001-100000 EUR 4.9% f. Above 100001 8.2% g. I would never again invest in cryptocurrencies 5.7%
10) Do you plan to mine cryptocurrencies in near future?	a. Yes 37.7% b. No 62.3%

Table 4. Trust and risk perception of crypto adopters

1) What is riskier for investing?	a. Stocks 18.0% b. Cryptocurrencies 52.5% c. Equally risky in both 29.5%
2) Which of the following statements best describe you	a. I am prepared to risk my own money to invest in cryptocurrencies 32.8% b. I am satisfied with my present financial situation 18.9% c. I tend to live for today and let tomorrow take care of itself 2.5% d. I am well informed about financial matters 23.0% e. I enjoy learning about new ways of using technology 17.2% d. Neither 5.7%
3) Based on your opinion, what is the safest and best cryptocurrency for investing?	a. Bitcoin 50% b. Ethereum 25.4% c. Ripple 3.3% d. ADA 2.5% e. Other 10.7% f. None 8.2%
4) To what extent were you worried about your future financial security when the price of your cryptocurrencies fell below the price you paid?	a. Not worried at all 68.0% b. Slightly worried 26.3% c. Very worried 5.7%
5) Can you afford to lose the money you have invested in cryptocurrencies?	a. Yes 82.7% b. No 17.3%
6) Which do you trust more?	a. The bitcoin blockchain 84.4% b. Record keeping protocols and cybersecurity at large banks 15.6%

reported that they can afford to lose their money invested in cryptocurrencies. Further, every four in five crypto-adopters reported that they can afford to lose their money invested in cryptocurrencies, and two-thirds of them are not worried at all about their future financial security if they enter the loss domain with their crypto-investment. A significantly larger number of crypto-adopters (84.4%) have higher trust in the bitcoin blockchain than in record-keeping protocols and cybersecurity at large banks.

The survey of Macedonian crypto adopters revealed some additional interesting information regarding their perception and financial behavior. Most crypto-adopters became familiar with cryptocurrencies through the Internet and almost half of the crypto-adopters consider the prices of crypto-adopters to be undervalued. One-third of crypto-adopters would invest in the near future 1000-5000 EUR in buying different cryptocurrencies from the ones they own at the moment. The regulation of cryptocurrencies by the government or enabling their use in banks and ATMs as physical currencies will not increase the interest of crypto investors. However, as crypto investors believe that cryptocurrencies protect their privacy more than banks and institutions, they expect in the next 10 years cryptocurrencies to be widely accepted and used as a means of payment.

4.2. Hypotheses testing

We perform a chi-square test of independence to examine the relationships proposed in hypotheses H1-H11. For the chi-square test Hair et al. (2010) recommends that the sample size should be at least five times as many observations as the number of variables to be analyzed. Accordingly, we can confirm that the sample size in this research study exceeds the minimum level recommended by Hair et al. (2010). The results from testing the hypotheses H1-H11 are given in table 5.

A significant relationship is confirmed in all tested hypotheses except in hypotheses H2 and H8. A chi-square test of independence showed that crypto-adopters who are more familiar with blockchain technology and cryptocurrencies are more likely to be active investors (H1 and H3). Further, results showed that women are disproportionally less familiar with blockchain technology and cryptocurrencies, and crypto-adopters who are more knowledgeable about blockchain technology and cryptocurrencies more rarely seek advice for investing compared to less knowledgeable crypto-adopters (H4-H7). The results from testing the hypotheses also reveal that women are more worried than men not entering the loss domain as a result of prices dropping below the level

Table 5. Chi-square test results

Hypothesis	Chi-Square Value	p-Value	Results
H1	11.74	0.008**	Accept
H2	10.67	0.058^{ns}	Reject
H3	13.85	0.003**	Accept
H4	16.31	0.001**	Accept
H5	11.62	0.009**	Accept
H6	11.75	0.008**	Accept
H7	16.31	0.000***	Accept
H8	6.65	0.155^{ns}	Reject
H9	8.26	0.016*	Accept
H10	24.71	0.002**	Accept
H11	16.79	0.002**	Accept

Notes: ns = non-significant, *p < 0.05; **p < 0.01; ***p < 0.001.

when the cryptocurrencies were bought (H9). This higher wariness of women results in more frequent monitoring of the prices on the crypto market and in general as more worried crypto-adopters manifest more frequent monitoring of cryptocurrencies prices (H10-H11). The type of investor (active vs passive) did not play a significant role in the frequency of monitoring prices meaning that the intensity of the behavior of crypto adopters is not determined by their role as a type of investor (H8). In the end, we did not confirm the relationship between the type of investors and their education level (H2).

5. Discusion

The results obtained in this study through descriptive analysis and testing of the hypotheses hold valuable insights for a better understanding of the demographic and socioeconomic characteristics of crypto-adopters and their financial behavior in a developing country. Although there is a significant number of studies investigating crypto-adopters in developed countries, we think that more inquiry is needed to discover their characteristics and financial behavior in developing countries. To answer the research questions stated in the introduction, in this section we discuss the profile of crypto-adopters, explain more thoroughly the confirmed association between their characteristics and we compare the results obtained in our study with recent studies of crypto-adopters in other countries.

The results from our survey reveal that a significant majority of crypto-adopters in North Macedonia are males and young adults between the ages of 19 and 34 with finished undergraduate studies, employed and with an average monthly income of 501-1500 EUR, live in their own home or apartment in an urban area. Our results are in line with findings from other studies confirming that men tend to invest more in cryptocurrencies than women (Auer and Tercero-Lucas 2021; Wciom 2019; Fujiki 2021; Stix 2020) and that ownership of cryptocurrencies is mostly associated with younger age, higher education and living in the urban area or major cities (Wciom 2019). Exton and Doidge (2018) found that in Europe, the probability of owning cryptocurrency is higher for males than for females, and it is greatest for 25–34-year-olds. Similarly, Laboure and Reid (2020) found that in France, Italy, Germany, and the UK, the rate of ownership among the youngest age group (19-34) is at least twice as high as for 35–54-year-olds.

Like the findings of Steinmetz et al. (2021) who found a strong correlation between knowledge about both cryptocurrency and blockchain technology, and the male gender, we discovered that women are disproportionally less familiar with blockchain technology and cryptocurrencies. Regarding income level, it is reasonable to expect significant differences in income level between the crypto-adopters coming from developing countries versus crypto-adopters from highly developed. When it comes to seeking help and advice, our data sample showed that more than half of crypto adopters seek advice when they invest in cryptocurrencies conversely to the findings of Hackethal et al. (2021) who found that crypto-adopters use advice only sparsely and that most crypto-adopters are do-it-yourself (DIY) investors. We think that this

difference may be due to a different method of investigation because in our study we asked crypto-adopters through a survey whether they seek advice, while Hackethal et al. (2021) analyzed data about the use of banking services as investment advice e.g., via telephone, or fully automatic solutions (robo-advice).

Our findings indicate that Macedonian crypto-adopters are mainly passive investors and the demand for cryptocurrencies is highly driven by a motive to provide inheritance, diversify an investment portfolio and make money quickly. Risk diversification preference is in line with the study of Zaimović and Arnaut-Berilo (2014) who point out the investors' preference of having an investment portfolio in securities for a risk-reduction effect. Stix (2021) found that intentions to adopt cryptocurrencies are strongly affected by profit expectations and the FCA (Financial Conduct Authority) in 2019 reported results from a survey that most British respondents stated that the most common reasons to buy refer to the investment as a gamble portfolio diversification and the expectation of quick gains. Blandin et al. (2020) indicate that user activity varies significantly across and within regions and their estimate is that in September 2020 around 40% of all crypto adopters in North America and Europe are considered active meaning that the rest of 60% are passive investors. Half of the surveyed Macedonian crypto-adopters considered investing in cryptocurrencies equally risky or less risky than investing in stocks, while Exton and Doidge (2018) in a survey of 15 countries found that crypto adopters considered investing in cryptocurrencies riskier for investment purposes than stock markets, government bonds, real estate, gold, and cash. We believe that crypto-adopters in more developed countries such as those countries covered in the survey of Exton and Doidge (2018) are more involved in stocks-trading than crypto-adopters in developing countries. Having more experience in trading with both types of assets crypto-adopters from more developed countries can better compare the level of risk when they invest in both assets.

Steinmetz et al. (2021) found through empirical analysis that a major driver of ownership is knowledge about cryptocurrencies, mediated by trust, while Stix (2020) found that distrust in banks or conventional currencies is not found to be a decisive factor for (intended) ownership. Nevertheless, the results from our study showed that a significantly larger number of crypto-adopters have higher trust in the bitcoin blockchain than in record-keeping protocols and cybersecurity at large banks. The crypto intensity behavior of Macedonian crypto-adopters measured by the frequency of monitoring cryptocurrencies' prices is significantly higher compared to the study of Delfabbro, King, and Williams (2021). The results from our study showed that two-thirds of respondents reported that they check the prices once a day, while in the study of Delfabbro, King, and Williams (2021) close to half of the respondents reported that they check the prices once a month. The results from the study of Delfabbro, King, and Williams (2021) show that close to one in five crypto-adopters check the prices once a day while in our study two in three crypto-adopters check the prices once a day.

More than half of surveyed Macedonian crypto adopters reported that the price drop of cryptocurrencies is not something that worries them and usually the vast majority of them do nothing in such cases, probably expecting a future comeback with rising prices. Also, most of the crypto-adopters stated that they can afford to lose their invested money, which is in line with the study of Ante et al. (2020) who found that most German retail investors do not appear to take excessive financial and social risks when buying cryptocurrency since even a total loss of the investment would not threaten their existence. They further indicate that the comparatively low stakes may indicate a general awareness that crypto-assets entail serious risk. We think that the same is true for Macedonian crypto-adopters.

Through testing the hypotheses, we discovered that Macedonian male crypto-adopters are more familiar with blockchain technology and cryptocurrencies and are more likely to be active investors than women. Boxer and Thomson (2020) conducted research on active cryptocurrency investors and the most of respondents to their survey were male. Findings from our study reveal that women crypto-adopters are more worried than men when the crypto-market has a downturn and prices drop below the price paid for acquiring the crypto-currencies. Further, the results from chi-square testing showed that women crypto-adopters are more worried than men, and thus are more involved in frequent monitoring of the prices on the crypto market. Auer and David Tercero-Lucas (2021) indicate that women tend to be more risk-averse than men when it comes to holding risky assets and there are significant differences across genders in the use of FinTech. We think that one important contribution of our study is the discovery that women are passive investors in cryptocurrencies, more crypto-intense in a sense of monitoring crypto prices, and more worried crypto-adopters than men. To the best of our knowledge, we think that this study is the first study testing the gender differences in the degree of wariness regarding the volatility of crypto prices.

6. Research limitations

"Data from online surveys is inherently biased because participation in an online panel necessitates a certain level of technical knowledge" (Steinmetz et al. 2021, p. 16). Although we usually consider someone who has a limited understanding and experience of using the internet to be part of the internet population, he is unlikely to be part of an online panel (Steinmetz et al. 2021). Hence, similar to all other studies based on online surveys our work may be impaired by the underrepresentation of inexperienced internet users in the online survey we employed. "Conversely, tech-savvy internet users, who are more likely to be exposed to the topic of cryptocurrency, may be overrepresented" (Steinmetz et al. 2021, p. 16).

Further, although our study contributes to the recent body of knowledge built through crypto survey data, it has inherent limitations that warrant caution in the interpretation of the results. The first and most important constraint is the relatively low number of crypto-adopters who participated in the survey. To obtain more reliable results, either a larger sample of survey respondents or a different sampling procedure is required. An alternative could be non-random sampling procedures like respondent-driven sampling proposed by Stix (2020). Finally, a subjective interpretation of survey data can be also a limitation of the study. The high volatility and dynamic changes in the crypto market strongly impact and change the perception of crypto-adopters which might undermine some of the findings in our study considering the current state of the crypto market. The data are collected from a small country in South-East Europe and they are highly constrained by its socio-political, cultural, and economic context therefore, the generalization of these results, especially to other countries, should be made with caution.

7. Conclusion

In this paper, we sought to explore and compare the demographic and socio-economic characteristics of crypto adopters and their financial behavior in one developing country and to compare with findings from other countries. We believe that our study is one of the rare studies reporting on the characteristics and financial behavior of crypto-adopters in a developing country. Our study contributes to an array of recent contributions to the token economy based on survey data. We used an online survey to collect data from Macedonian crypto-adopters in the period August-October 2021. We analyze the collected data with descriptive statistics and a chi-square test of independence to test the relationships stated in the proposed hypotheses.

The findings from this survey hold valuable insights for a better understanding of the demographic and socio-economic structure, and the financial behavior of crypto-adopters of one developing country in comparison to other countries. It is important to understand more deeply who are crypto-adopters in developing countries and what drives them to invest in cryptocurrencies.

Findings from our study revealed that Macedonian crypto-adopters are more men of younger age, employed, with an average income of 501-1500 EUR with higher education, and living in their own apartments in an urban area. We further found that women are disproportionally less familiar with blockchain technology and cryptocurrencies and that women are more worried about losses in investing in cryptocurrencies and at the same time they manifest higher crypto-intensity behavior through more frequent monitoring of crypto-prices. The data from our sample revealed a strong gender gap in investing in cryptocurrencies. Macedonian crypto-adopters are mainly passive investors who seek advice for investing and their demand for cryptocurrencies is highly driven by a motive to provide inheritance, diversify an investment portfolio and make money quickly. Most of them do not mine and do not intend to mine cryptocurrencies in near future. Half of the surveyed Macedonian crypto-adopters considered investing in cryptocurrencies equally risky or less risky than investing in stocks and a significantly larger number of crypto-adopters have higher trust in bitcoin blockchain than record-keeping protocols and cybersecurity at large banks.

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