



STUDIA UNIVERSITATIS  
BABEŞ-BOLYAI



# OECONOMICA

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**OECONOMICA**

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## WHY COMMIT WHEN THE FUTURE IS BRIGHT? THE INTERACTIVE EFFECTS OF FUTURE TIME PERSPECTIVE AND ORGANIZATIONAL CYNICISM

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**Abstract.** An employee's organizational commitment is essential to a firm's success and performance. Past research reports mixed relationships between future time perspective and commitment. Recently, research has supported several moderating variables for this relationship. The current study tested organizational cynicism as a potential moderator. The sample consisted of 301 university alumni working in a variety of industries. The cross-sectional data supports an interaction between future time perspective and organizational cynicism on an individual's affective and continuance commitment level. Data failed to support an interaction effect on the employee's normative commitment.

**JEL classification:** M12, M54, Z13.

**Keywords:** Future Time Perspective, Organizational Cynicism, Organizational Commitment.

### 1. Introduction

*"Time, why you punish me? Like a wave crashing into the shore,  
you wash away my dreams." (Hootie & the Blowfish, 1995)*

Time, within our daily schedules, is a fixed commodity encumbered with opportunity costs for the choices we make. Engagement in the social exchange of labor does not reduce those opportunity costs. Individuals embark in this social exchange of labor for a variety of goals but most importantly, it is a necessity for

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organizational survival. The industrialized economies have long shifted from the agrarian landscape. Thus, this social exchange of labor between individuals and organizations is mutually beneficial. The one item neither the organization nor individual can control, though, is the fixed commodity of time. Both entities are bound by the accepted premise of 24 hours per day, 7 days per week, 52 weeks per year, and in the United States, 2080 compensable, work hours per year. Of course, organizations can entice one into additional work hours and purchase extra time from their employees at the rate of 150% beyond their hourly wage rate (*Fair Labor and Standards Act of 1938*). Nevertheless, the individual engages in the social exchange relationship as an opportunity cost for a better future. As Bandura (1986) proposed, social-cognitive and goal-based motivation theories contribute to one's anticipated future self.

*Future time perspective* was defined by Lewin (1951) as, "the totality of the individual's views of his psychological future and psychological past existing as a given time" (p. 75). Employee future time perspective is a growing body of literature for human resource managers seeking to reduce employee stress, improve employee well-being, and increase productivity (Gagne & Bhave, 2011). Investigation of future time perspective orientation, although well established in developmental psychology literature, is relatively recent for organizational scholars (Kooij, Kanfer, Betts, & Rudolph, 2018). As Kooij et al. (2018) noted, organizational scholars are conceptualizing the proper nomological network and operationalization of future time perspective. The purpose of this study is to extend our knowledge about the outcomes of the future time perspective orientation. Specifically, data from 301 business school alumni are analyzed to test the interaction of future time perspective and organization cynicism on employees self-reported level of organizational commitment. This research report provides brief descriptions of the pertinent variables, data collection, statistical analyses, and extensions for future research.

## **2. Literature Review**

### *2.1 Future Time Perspective*

Carstensen (1992) proposed socioemotional selectivity theory as a life span theory of motivation wherein individuals perceive a shrinking timeline and selectively invest their resources into meaningful goals and activities. As described by socioemotional selectivity theory, future time perspective is a critical aspect in determining the motivational goals of aging employees. From this operationalization, employees with a deep or long future time perspective perceive their time in role to be limitless. These individuals would focus their energy on broadening and increasing the social capital within their networks. In contrast, employees with shallow or short future time perspectives view their time as limited and will focus their energies on maximizing the emotional aspects of their lives rather than setting and developing long-range goals within their organizations (Carstensen et al., 2000).

The extant literature for future time perspective is found mostly in the fields of developmental psychology. However, a growing body of literature is developing within the organizational sciences. For example, Park, Rie, Kim, and Park (2020) found that understanding one's future time perspective served as a positive intervention for

career decision making. Fasbender, Wohrmann, Wang, and Klehe (2019) found that future time perspective mediated the relationship between older employee's career adaptability and late career planning. Korff, Bieman, and Voelpel (2017) investigated future time perspective in a multilevel model between human resource management systems and employee work attitudes. Specifically, the authors found that future time perspective mediated the relationship between HRM systems and employee self-reported job satisfaction and organizational commitment levels. Treadway, Duke, Perrewé, Breland, and Goodman (2011) found that work-family and family-work conflicts moderated the relationship between future time perspective and organizational commitment. Specifically, those with shallow future time perspective and high levels of work-family conflict reported lower continuance commitment. Those with a deep future time perspective expressed lower levels of affective commitment when experiencing family to work conflict. Finally, two recent meta-analyses provided an extensive literature review and expanded the nomological network for the organizational sciences (Kooij et al., 2018; Andre, van Vianen, Peetsma, & Oort, 2018). Of importance to this study, Kooij et al. (2018) established that future time perspective explained more variance than personality traits on Grade Point Average and risk behavior (p. 882).

## 2.2 Organizational Cynicism

Organizational cynicism is “a negative attitude toward one's employing organization in general, and toward its procedures, processes, and management, that is based on a conviction that these elements generally work against the employee's best interests” (Wilkerson, 2002, p. 533). Organizational cynics believe their employers are self-serving, putting the economic well-being of management above employee interests. Furthermore, a central aspect of cynicism at the workplace is the belief that an organization will take advantage of and exploit employees. Organizational cynics believe their employers operate unfairly and lack sincerity and that “unscrupulous behavior is the norm” (Dean et al., 1998, p. 346). Because attitudes represent a summary evaluation of a particular object (Ajzen & Fishbein, 1977; Eagly & Chaiken, 1993), organization cynics report lower job satisfaction, organizational citizenship behaviors, and organizational commitment (Evans, Goodman, & Davis, 2011).

## 2.3 Organizational Commitment

Organizational commitment can be defined as one's strong belief and acceptance of the organization's goals and values and a desire to remain with the organization (Mowday, Porter, & Steers, 1982). Meyer, Allen, and Smith (1993) offered three types of commitment employees may experience. First, *affective commitment* refers to the extent to which employees identify with the organization. Second, *normative commitment* refers to the extent that the employee feels some social pressures or moral obligations to remain with the organization. Finally, *continuance commitment* refers to the employee's perception of some cost-benefit analysis with the organization. Firms are concerned with the level of commitment to their specific organization. Higher levels of organizational commitment equate to reduced employee turnover, increased task and contextual performance, and employee well-being (Cohen, 2007).



### 3. Research Hypotheses

Placing future time perspective into its proper nomological network remains of utmost importance to organizational scholars. Whereas other studies sought to understand specific antecedents, the current study addresses future time perspective, organizational cynicism, and the interaction effects upon the three levels of organizational commitment. Socioemotional theory posits individuals with a deep future time perspective foresee time as open-ended and therefore, new or interesting opportunities remain available. However, those with a shallow future time perspective foresee a shirking time and invest their energies into present-oriented goals. In reference to this study, the opportunity costs to switch employers far exceed the benefits of remaining with one's current organization. Furthermore, cognitive dissonance theory posits that one must maintain equilibrium between their attitudes, beliefs, and behaviors (Festinger, 1975). We therefore propose the following hypothesis:

*H1a: Individuals reporting a deep future time perspective and high organizational cynicism will express lower levels of organizational commitment.*

*H1b: Individuals reporting a shallow future time perspective and high organizational commitment will express higher levels of organizational commitment.*

### 4. Research Method

#### 4.1 Data Collection Procedure

An electronic survey was distributed through the alumni mailing list of a large southeastern university. Business School Alumni were solicited for participation if they had graduated between the calendar years 1968 through 2000. In sum, 5,179 emails were distributed. Finally, data for this study were collected prior to the 2020 worldwide coronavirus pandemic which resulted in alternate working arrangements (Bick, Blandin, & Mertens, 2020).

#### 4.2 Survey Measures

*Future time perspective.* Future time perspective ( $\alpha = .90$ ) was measured using the 10-item scale developed by Carstensen and Lang (1996). Each item is scored on a 5-point scale ranging from "very good" to "not at all." Sample items include "Many opportunities await me in the future" and "My future is filled with possibilities."

*Organizational cynicism.* Organizational cynicism ( $\alpha = .90$ ) was measured with a seven-item scale developed by Wilkerson, Evans, and Davis (2008). Employees were asked to think about their employing organization when responding to each of the items. Items were scored on a 5-point Likert type scale ranging from 1 = strongly disagree to 5 = strongly agree. Sample items include "Company management is more interested in its goals and needs than in its employees' welfare" and "Overall, I expect more success than disappointment in working with this company" (reverse scored).

*Organizational commitment.* Affective ( $\alpha = .75$ ), Continuance ( $\alpha = .72$ ) and Normative ( $\alpha = .66$ ) organizational commitment was measured using the 16-item scale developed by Meyer and Allen (1997). Each item is scored on a 7-point scale ranging from “strongly disagree” to “strongly agree.”

*Control variables.* Positive ( $\alpha = .89$ ) and negative affect ( $\alpha = .82$ ) were measured using the PANAS scale (Watson, Clark, & Tellegen, 1988). Respondents were asked to indicate the extent to which they experienced 10 positive (e.g., interested and determined) and 10 negative (e.g., distressed and hostile) emotions. Responses ranged from 1=*very little or not at all* to 5=*extremely*. Finally, the respondents were asked to indicate their age, organizational tenure, and job tenure in years. Gender was coded as 1 for males and 0 for females.

## 5. Data Analysis

### 5.1 Demographic Results

Forty-seven percent or 2,434 electronic surveys were returned as undeliverable; thus, 2,745 alumni remained. A total of 652 or 23.8 percent of alumni responded to the email request. Of the alumni responding, only 301 responses provided sufficient information for analyses. Twenty-one percent of the participants identified themselves as female. The majority of the sample was Caucasian (60%) with an average age of 41.39 years (s.d. = 12.99). Approximately two percent reported an annual salary range of \$25-40,000, six percent reported a salary range of \$40-60,000, 20 percent reported a salary range of \$60-80,000, 12 percent reported a salary range of \$80-100,000 annually, 13.8 percent reported a salary range of \$100-125,000 annually, 16 percent reported a salary range of \$125-150,000 annually, and 22 percent reported a salary range greater than \$150,000.

### 5.2 Multiple Regression Analyses

A moderated multiple regression analysis was conducted to test the interaction of future time perspective and organizational cynicism on affective, normative, and continuance commitment (Cohen, Cohen, West, & Aiken, 2003). In the first step, age, negative and positive affect were entered as control variables. In the second step, the main effects of future time perspective and organizational cynicism were regressed on the dependent variables. The final step included the cross-product term representing the interaction of future time perspective and organizational cynicism. Table 1 reports the bi-variate correlation coefficients and Table 2 reports the multiple regression analyses.

Three separate moderated multiple regression analyses were conducted to test the interactive effects. For the moderated regression results upon affective commitment, age was positively correlated ( $\beta = .25$   $p < .01$ ). The future time perspective main effect was not significant but organizational cynicism was ( $\beta = -.13$   $p < .05$ ). The interaction term was significant ( $\beta = -.67$ ,  $p < .10$ ) and explained significant variance ( $\Delta R^2 = .013$ ,  $p < .10$ ) in the final step. For the moderated regression results upon normative commitment, organizational cynicism main effect was significant ( $\beta = -.47$   $p < .01$ ). The interaction term was not significant ( $\beta = .05$ ,  $p = .69$ ) in the final step.

For the moderated regression results upon continuance commitment, age was positively correlated ( $\beta = .16$   $p < .01$ ). Neither the future time perspective main effect nor organizational cynicism was significant in the second step. The interaction term was significant ( $\beta = -.75$ ,  $p < .05$ ) and explained significant variance ( $\Delta R^2 = .017$ ,  $p < .05$ ) in the final step.

**Table 1. Bivariate Correlations**

Variable	1	2	3	4	5	6	7	8
1. Affective Commitment	----							
2. Normative Commitment	.19**							
3. Continuance Commitment	.29**	.28**						
4. Positive Affect	-.04	.22**	-.16*					
5. Negative Affect	.08	-.10	.12	-.31**				
6. Future Time Perspective	-.16*	.21**	-.19**	.41**	-.12*			
7. Organizational Cynicism	-.07	-.62**	.05	-.34**	.30**	-.30**		
8. Age	.18*	.09	.010	.05	-.23**	-.44**	.00	
9. Gender	.16*	-.01	-.05	.01	.01	-.10	.03	.31**

Note: Significance Level \*\*  $p < .01$ ; \*  $p < .05$

**Table 2. Regression Analysis**

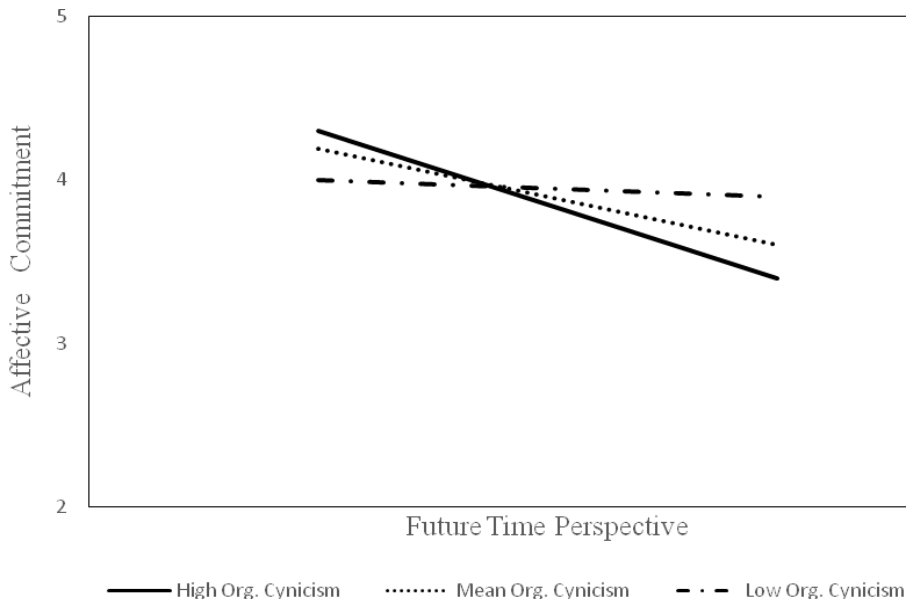
Variables	Affective Commitment			Normative Commitment			Continuance Commitment		
	Step 1 $\beta$	Step 2 $\beta$	Step 3 $\beta$	Step 1 $\beta$	Step 2 $\beta$	Step 3 $\beta$	Step 1 $\beta$	Step 2 $\beta$	Step 3 $\beta$
Age	.25**	.24**	.26**	.07	.14*	.14*	.19*	.14†	.14†
Gender	.03	.03	.04	-.04	-.03	-.03	-.10	-.09	-.09
Positive Affectivity	-.05	-.08	-.07	.22**	.02	.02	-.18*	-.16*	-.15*
Negative Affectivity	.13*	.15*	.14*	-.07	.07	.07	.14*	.13†	.12†
Future Time Perspective (A)		-.02	.34†		.08	.12		-.10	.30
Organizational Cynicism (B)		-.13*	.54		-.60**	-.54†		-.05	.69*
A x B			-.67†			-.07			-.74*
R <sup>2</sup>	.07	.09	.10†	.07**	.40**	.40	.09**	.09	.11*
$\Delta R^2$		.02	.01†		.32**	.00		.01	.02*
F	3.15**	2.56*	2.56*	3.29**	18.20**	15.51	4.03**	2.91**	2.97**

Note: Significance Level \*\*  $p < .01$ ; \*  $p < .05$ ; †  $p < .10$

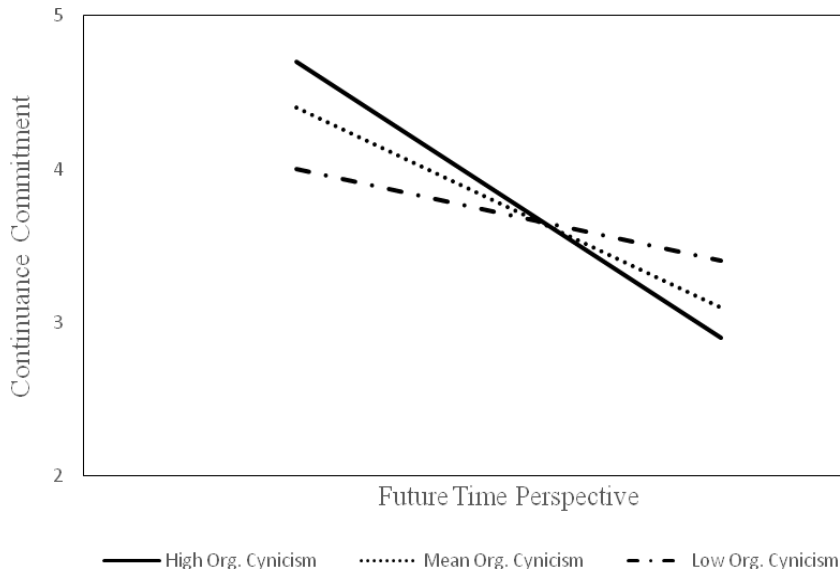
### 5.3 Signification Interaction Plots

The significant future time perspective x organizational cynicism interaction terms were plotted across three levels of organizational cynicism. Following past research (Stone & Hollenbeck, 1989), three levels of perceived accountability scores were plotted at one standard deviation above the mean, at the mean, and at one standard deviation below the mean (See Figures 1 and 2). Each graph depicts interactions found to be significant.

**Figure 1. Interaction: Future Time Perspective and Organizational Cynicism on Affective Commitment**



**Figure 2. Interaction: Future Time Perspective and Organizational Cynicism on Continuance Commitment**



## 6. Discussion

The objective of the current study was to provide theoretical and empirical support for the interactive effect of organizational cynicism on the future time perspective-organizational commitment relationship. To that end, we found support for two types of commitment: affective and continuance. The interaction was strongest for continuance commitment, whereas the interaction was only marginally significant for affective commitment. Data did not support a moderating effect for normative commitment. These findings suggest that individuals with deep levels of future time perspective and high levels of organizational cynicism reported lower levels of affective and continuance commitment. Interestingly, the highest levels of affective and continuance commitment came from individuals reporting shallow future time perspective and high organizational cynicism. In short, the results of the study indicate that employees with a shallower time perspective were more attached to the organization when their cynicism increased. The results of the current study provide several conceptual and practical implications, as well as, avenues for future research.

### 6.1 Theoretical and Practical Implications

Despite the increasing prevalence of older workers, organizational scientists still know little about the organizational experiences of older workers (Lawrence, 1996). The current study offers evidence that age-related research within the organizational sciences can benefit from moving away from traditional, linear treatments of the

aging process. Indeed, by encompassing the age-related changes in motivational foci, inherent in socioemotional selectivity theory, the current study provides a glimpse into the dynamics of the aging process. As such, future research within the organizational sciences may benefit from more accurate modeling of the role of motivation predicting of the attitudes and behaviors of older workers. Furthermore, Bersin and Chamorro-Premuzic (2019) argue that older workers are a competitive advantage for organizations. In light of our findings, it may be plausible that those with shallow future time perspective are more likely to have stronger commitment attitudes. Future research is necessary to determine if this translates into greater performance.

The growing future time perspective research continues to expand the literature. Park et al. (2020) reported that those with a deep future time perspective also possessed high levels of self-efficacy. The current data suggest that these individuals are less committed to the organization and potentially perceive that there is still sufficient time to find better employment opportunities. As such, they are less committed to the organization. Future research is necessary to determine if this translates to actual employee turnover and to what type, functional or dysfunctional turnover.

At the organizational level, practices that promote and express fairness and equity in policies and procedures may help mitigate the impact of cynical attitudes and repair negative organizational perceptions. Korff et al. (2016) argue that through signaling theory, organizations shape employee attitudes. Those with a deeper future time perspectives and higher organizational cynicism may observe apathetic signals before reporting lower commitment levels. Recent research has found that lower levels of job satisfaction and organizational commitment negatively impact employee's organizational loyalty (Pandey & Khare, 2021). Our results demonstrate that coupled with high organizational cynicism, employees lack of commitment and longer time horizon may lead them to miss opportunities to develop impactful relationships with agents of the organization. For example, it is possible that cynicism not only leads to lower-quality LMX relationships, but also to negative reciprocity (e.g., Uhl-Bien and Maslyn, 2003). If so, negative performance outcomes could be even more pronounced. Future research should incorporate data from both supervisors and subordinates to allow for a more complete understanding of how organizational cynicism and future time perspective impact dyadic relationships

## *6.2 Study Limitations*

The findings do have at least two limitations. First, participants were selected from a university alumni database. The nature of this method limits some of the controls we had concerning the accuracy of the survey responses. However, this method is consistent with other studies (Treadway, Perrewé, Ferris, Hochwarter, Witt, & Goodman, 2005) and preliminary validation checks support participant accuracy. Second, this study relied upon a single method of self-reported data gathering. While self-reports may not produce completely objective data due to employee moods or other biases, this method is generally the proper choice for measuring perceptions and other internal states (Spector, 1994).

## 7. Conclusion

Both future time perspective and organizational cynicism have predicted organizational commitment in past research. The current study investigated the interactive effects of these two constructs on affective, continuance, and normative commitment. Theory and data support an interactive effect; yet, a clearer understanding would benefit from longitudinal examinations or a single organizational source. Our findings also indicate, from an applied perspective, that the expected benefits of future time perspective are altered through employee attitudinal perceptions, i.e., organizational cynicism. Thus, our research study offers future avenues to develop and place future time perspective within its nomological network.

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## BANKING WITH A CHATBOT – A STUDY ON TECHNOLOGY ACCEPTANCE

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**Abstract.** The implementation of chatbot technology is evolving rapidly in the banking industry, yet customer acceptance is behind. The aim of the present paper is to identify the factors that influence consumers' intention to use chatbot technology applied in the banking industry. The measurement development and hypotheses were based on the technology acceptance model extended with compatibility, customers' perceived privacy risk and awareness of the service. The sample contains 287 respondents, out of whom 24% have previously used a banking chatbot. The measure items were validated by a measurement model and hypotheses were tested using Partial Least Squares-Structural Equation Modeling (PLS-SEM). The findings highlight the importance of perceived compatibility and perceived usefulness in the adoption of banking chatbot technology. Awareness of the service has an effect on perceived ease of use, perceived privacy risk, and it indirectly affects usage intention of banking chatbots through perceived usefulness. Also, perceived ease of use influences perceived usefulness, and perceived compatibility has an effect on both perceived ease of use and perceived usefulness. Perceived ease of use and perceived privacy risk show no effect on usage intention.

**Keywords:** Technology acceptance model, Artificial Intelligence, Chatbot, Self-service, Banking, Partial Least Squares-Structural Equation Modeling (PLS-SEM)

**JEL classification:** M31, O33.

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## 1. Introduction

Recent technological developments have transformed the way consumers and financial institutions interact with each other (Shaikh and Karjaluoto, 2015). Moreover, the COVID-19 pandemic has led to rapid shift to digital technologies and banks have transitioned to remote sales and provision at a fast pace (McKinsey, 2020). The rise of artificial intelligence (AI) based technology is contributing extensively to this transformation as more and more banks have begun to implement AI-based applications with the aim of deepening customer relationships, providing more personalized offers, detecting and preventing fraud, improving processes for anti-money laundering, and cost saving (Business Insider, 2021). One very popular and impactful form of technological development in the financial sector is the implementation of the AI-based chatbot technology (Richad et al., 2019).

Chatbot technology is a system based on AI that communicates with users and performs basic tasks through chat or speech interfaces (Nguyen and Sidorova, 2017). According to forecast, the chatbot market size is projected to reach 102.29 billion USD by 2025 (Mordor Intelligence, 2019), and the success rate of bot interactions (queries completed without the interference of a human operator) in the banking sector is expected to be over 90% by 2022 (Juniper Research, 2020). Yet, in order for both banks and consumers to exploit from the advantages of the banking chatbot technology, it is important to examine the drivers of consumers' willingness to adopt this technology.

The adoption of innovations applied in the banking industry, such as i-banking and m-banking, is widely studied in the literature. Although the above mentioned studies provide essential contribution to technology adoption in the context of the banking industry, there is limited knowledge on the acceptance of banking chatbots. There are already a few studies that highlighted the importance of studying chatbot acceptance in the context of the banking industry, but only one has conducted a research related to the technology acceptance model (Richad et al., 2019), and one is related to the customer experience for consumers who are banking with chatbot technology (Trivedi, 2019). In order to extend the knowledge regarding chatbot acceptance in banking, the present study aims to investigate the determinants of chatbot adoption in the banking industry, based on technology adoption literature in the banking industry.

The aim of the current study is to identify those factors that have an influence on consumers' intention to use chatbot technology applied in the banking industry. A special adoption model was developed for banking chatbots, extending the TAM model. Data is collected through an online, self-administrated questionnaire and the conceptual model is examined using the PLS-SEM method.

The structure of the paper is as follows. First, in the Literature review section, earlier research findings on banking technology adoption (e.g. i-banking and m-banking) are presented, and the chatbot technology and research on its adoption in the banking industry are described. Next, in the Conceptual framework development section, the research model is conceptualized and hypotheses are formulated. In the Research method section, the sample and measures are described. Thereafter, in the Data analysis section, the data and methods used in this study are presented.

Finally, the results are discussed, including the implications for theory and practice, limitations of the study and further possible research directions are outlined, and conclusions are drawn.

## **2. Literature review**

### *2.1 Banking technologies' adoption by customers*

The banking industry has been profoundly influenced by technological evolution in recent decades and consumer adoption of banking technologies is a widely researched topic in the literature. Thus, a more in-depth look into the processes behind the adoption of banking chatbots can be gained through the review of the existing literature on the adoption of other technologies applied in the banking sector, such as i-banking and m-banking.

Several theories have been implemented in order to analyze the adoption of different IT systems. According to Hanafizadeh and Khedmatgozar (2012), the most influential theoretical models applied in i-banking adoption studies, are the Diffusion of innovation theory (DIT), the Technology acceptance model (TAM), the Decomposed theory of planned behavior (DTPB), the Extended technology acceptance model (TAM2) and the Unified theory of user acceptance of technology (UTAUT), the latter becoming dominant in the literature in recent years. Shaikh and Karjaluoto (2015) analyzed and synthesized existing studies of m-banking adoption and concluded that the most frequently used adoption models were TAM, followed by DIT and UTAUT, while several studies applied a combination of different technology acceptance models (e.g. TAM and DIT). Several of the above mentioned models are composed of intention to use or actual usage as the dependent variables. Consequently, the key dependent variables in the i-banking adoption literature (Yousafzai, 2012) are behavioral intention to use and actual usage of the technology, while in m-banking adoption, besides the two earlier mentioned dependents, attitude is also adopted in order to analyze technology acceptance (Shaikh and Karjaluoto, 2015).

Based on the literature review, it could be concluded that usefulness and ease of use are fundamental variables in studying technology acceptance in the banking sector. It should also be highlighted that compatibility was found as a key determinant for m-banking (Koenig-Lewis et al., 2010; Shankar and Kumari, 2016; Giovanis et al., 2019) and i-banking (Giovanis et al., 2012) adoption. Therefore, it is expected that compatibility will influence banking chatbot adoption as well. However, technology acceptance could be inhibited directly or indirectly (Moldovan and Săplăcan, 2018) by several factors, such as different types of risk factors. In some cases, perceived privacy risk was found to be a barrier for m-banking (Arif et al., 2016; Shankar and Kumari, 2016) and i-banking (A. N. Giovanis et al., 2012) adoption. Supposedly, perceived privacy risk will be a barrier in adopting banking chatbot as well.

### *2.2. Chatbot technology: description and previous research*

A chatbot application is a computer program that mimics human conversations in its natural format, including text or spoken language, using artificial intelligence techniques, such as Natural Language Processing (NLP), image and video processing and audio analysis (Bala et al., 2017).

Chatbot applications offer benefits for both companies and consumers. First, chatbots enable consumers to get in touch with companies anytime from anywhere using their own mobile devices, thus they can get quick and relevant responses to their questions. Second, the implementation of these applications allows companies to target consumers in a more direct and personal way, and companies can save on personnel costs in the area of customer services. In addition to the benefits of the technology, the usage of chatbots may also involve several risk factors, including issues regarding data security and financial risks (Vieira and Sehgal, 2017; Richad et al., 2019).

Recently published scientific papers analyzed the adoption of chatbot technology in the tourism industry (Melián-González et al., 2021), in the health care industry (Laumer et al., 2020), and in the field of higher education (Almahri et al., 2020). Regarding the adoption of chatbots applied in the financial industry, only a few studies examined the acceptance of these applications in the context of the insurance sector (Cardona et al., 2019) and the banking sector (Gupta and Sharma, 2019; Quah and Chua, 2019; Trivedi, 2019; Richad et al., 2019; Sarbabidya and Saha, 2020). Although several studies have examined the factors influencing the acceptance of chatbots, the findings carried out in different fields may not be transferable for financial services (Cardona et al., 2019). Specific research is required in case of banking.

### *2.3 Chatbot technology in the banking industry*

Chatbots applied in the financial industry can assist customers in managing financial transaction such as reviewing an account, reporting lost cards or making payments, renewing a policy or handling a refund (Tarbal, 2020). In the literature, there are several recently published studies that focused on chatbot technology applied in the financial industry (Cardona et al., 2019; Gupta and Sharma, 2019; Quah and Chua, 2019; Richad et al., 2019; Trivedi, 2019; Sarbabidya and Saha, 2020) (Table 1).

Cardona et al. (2019) studied the adoption and diffusion of chatbots in the context of insurance, concluding that the majority of the participant were familiar with the technology and would prefer to use it at the beginning of the advisory process, while one third of the participants rejected the adoption of chatbots. Gupta and Sharma (2019) examined the customers' attitude towards chatbots in the banking industry and the findings of the study revealed positive correlation between the positive attitude for chatbots and their utility, accessibility and threats. Quah and Chua (2019) explored the effectiveness of the use of chatbot technology in Singapore's banking industry and investigated chatbot functionality to determine if it would meet customer expectations. They found that detailed information provided by the banking chatbot was the most important factor for consumers, followed by fast response, functionality, interactivity, ease of use and data privacy and protection. It was also found that some of the users were not satisfied with the banking chatbot because it didn't provide an immediate answer when needed. Richad et al. (2019) investigated the acceptance factors of chatbot technology in the banking industry in Indonesia in case of Millennials based on TAM, and found that innovativeness, perceived usefulness, perceived ease of use and attitude towards using the chatbot had significant effect on behavioral

intention. Trivedi (2019) examined customer experience of using banking chatbots and its impact on brand love adopting the Information Systems (IS) success model among. The results showed that system quality, information quality and service quality had significant impact on customer experience, system quality being the strongest predictor. Perceived risk reduced the impact of the three quality dimensions on customer experience, and customer experience of using the chatbot led to love for the brand that provided the technology. Sarbabidya and Saha (2020) found that the role of chatbots in customer service of the banking industry was positively affected by advisory services, ease of use and convenient service, cost effective and efficient service, customer-friendly service, customized service, relationship banking services, responsive service, trustworthy service, value-based useful service and maintaining customers security and privacy.

**Table 1: Summary of studies regarding banking chatbots**

Authors	The aim of the study	Theories/Studied variables	Research method/sample	Data analysis
(Cardona et al., 2019)	Adoption and diffusion of chatbots in the German insurance sector	DOI: relative advantages, compatibility, complexity, trialability, observability TOE: top management support, IS infrastructure, costs, environmental threats, competitive pressure, collaborative networks TAM: perceived usefulness, perceived ease of use, perceived behavioral control	Qualitative, quantitative Semi-Structured Expert Interviews, N=7 Web-based cross sectional survey, N=300 Data collected in Germany in 2018	Descriptive
(Gupta and Sharma, 2019)	Analysis of customers' attitude towards the chatbots in banking industry of India	attitude observed utility (ease of use, ease of process, engagement with customer service) observed accessibility (easy for basic transactions, speedy process, user friendliness) observed threat and awareness (data security and privacy, social awareness, friends and family using it)	Quantitative Data collected via Facebook and WhatsApp, N=72 Data collected in India in 2019	Bivariate analysis
(Quah and Chua, 2019)	Analysis of the effectiveness of the current use of chatbots in Singapore's banking industry	user experience: response rate, functionality and usability satisfaction: interactivity, informative, data privacy and protection	Quantitative, qualitative Interviews Qualitative user tests	Descriptive
(Richad et al., 2019)	Analysis of the factors that influence millennial's technology acceptance of chatbots in the banking industry in Indonesia	TAM attitude towards usage, behavioral intention innovativeness, perceived usefulness, perceived ease of use	Quantitative Simple random sampling technique, N=400 Data collected in Indonesia in 2018	SEM

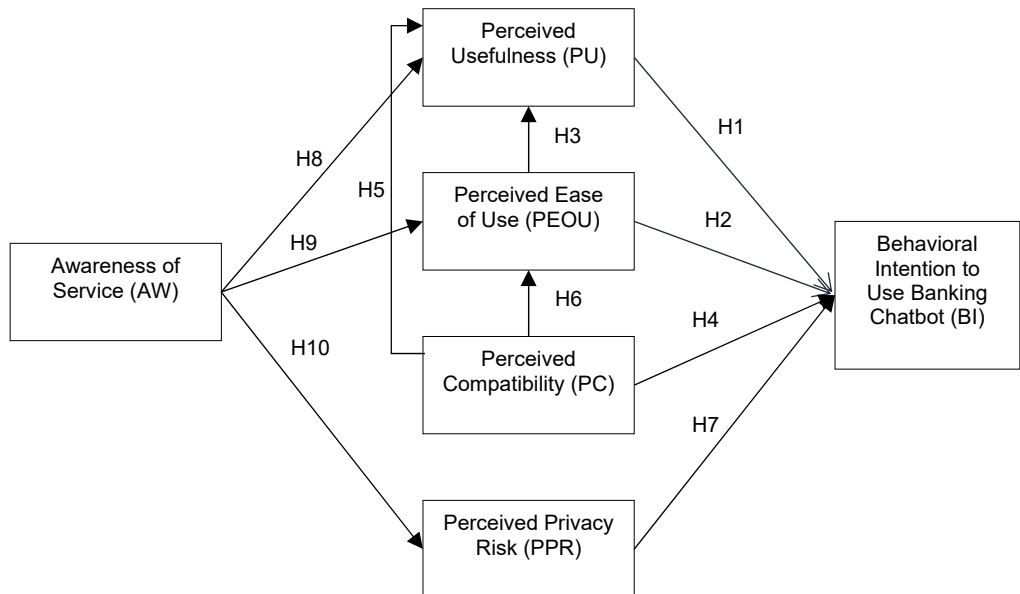
Authors	The aim of the study	Theories/Studied variables	Research method/sample	Data analysis
(Trivedi, 2019)	Examination of customer experience of using banking chatbots and its impact on brand love in India	Information Systems (IS) success model customer experience, brand love system quality, information quality, service quality, perceived risk	Quantitative Online questionnaire sent to Gen Z individuals, N=258 Data collected in India in 2018	SEM
(Sarbabidi a and Saha, 2020)	Examination of the role of chatbots in customer service of the banking industry of Bangladesh	customer service advisory services, ease of use and convenient service, cost effective and efficient service, customer-friendly service, customized service, relationship banking services, responsive service, trustworthy service, value based usefulness, security and privacy	Quantitative Judgment sampling method, N=125 Data collected in Bangladesh in 2019	Regression

Based on the reviewed literature regarding the adoption of chatbots applied in the banking industry, it can be concluded that this topic is in the early phase of research, mostly based on descriptive analysis (Table 1). Only one study (Richad et al., 2019) analysed chatbot acceptance based on theoretical models and analysed a conceptual model in order to identify the factors that have significant impact on adoption. Thus, the present study aims to fill this research gap by building a conceptual model of technology acceptance based on previous studies related to chatbots used in financial services (Cardona et al., 2019; Richad et al., 2019), and other technologies' acceptance in the financial sector (e.g. m-banking, i-banking).

### 3. Conceptual framework development

The aim of the paper is to identify those factors that have an influence on consumers' intention to use chatbot technology applied in the banking industry. Therefore, the proposed research model is based on technology acceptance (Davis' TAM, Venkatesh's UTAUT) in the context of the financial services. In order to provide a simple conceptual model, only those variables were included into the model, which were found to be relevant for different banking technologies' adoption. It is generally accepted that perceived usefulness (known as performance expectancy in Venkatesh's UTAUT) and perceived ease of use (known as effort expectancy in Venkatesh's UTAUT) are key determinants in financial technologies' acceptance and for banking chatbots as well (Richad et al., 2019). The basic TAM model will be extended with one more driver, namely with compatibility and one barrier, namely privacy risk. When introducing new services, banks tend to inform their customers as part of a communication campaign. Therefore, customers' awareness of the new technology is an important antecedent of technology acceptance. Knowledge about chatbot technology was examined in the context of insurance companies (Cardona et al., 2019). Figure 1 illustrates the proposed research model.

**Figure 1: Proposed research model for intention to use banking chatbots**



### 3.1 Behavioral Intention to Use Banking Chatbot (BI)

It was found that behavioral intention is a strong predictor of an individual's actual usage behavior (Venkatesh et al., 2003). BI is defined as "the strength of one's intention to perform a specified behavior" (Fishbein and Ajzen, 1975 p. 288). As banking chatbots are a relatively new type of technology, currently being in the phase of adoption, actual system usage would be difficult to measure. Thus, the present study will analyze customers' intention to use banking chatbots. In the banking technology adoption literature, perceived usefulness (Koenig-Lewis et al., 2010; Safeena et al., 2012; Martins et al., 2014; Alalwan et al., 2018; Farah et al., 2018), perceived ease of use ( Safeena et al., 2012; Martins et al., 2014; Alalwan et al., 2018; Farah et al., 2018), perceived compatibility (Kolodinsky et al., 2004; Koenig-Lewis et al., 2010), perceived privacy risk (Akturan and Tezcan, 2012; Giovanis et al., 2012; Arif et al., 2016; Shankar and Kumari, 2016), and awareness of the service (Sathye, 1999; Pikkarainen et al., 2004; Al-somali et al., 2009) were identified as predictors of behavior intention to use the technology.

### 3.2 Perceived Usefulness (PU)

Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989 p. 320). PU is considered to be similar to the performance expectancy construct in the UTAUT model (Li and Kishore, 2006), which was adopted and found to be a strong predictor of usage intention in several banking technology (e.g. m-banking i-banking and m-payment) adoption studies. Several studies on the adoption of



m-banking (Koenig-Lewis et al., 2010; Safeena et al., 2012; Farah et al., 2018; Giovanis et al., 2019) and the adoption of i-banking (Martins et al., 2014; Alalwan et al., 2018) found that PU had a direct, positive effect on intention to use the studied technology. Moreover, Richad et al. (2019) found that perceived usefulness of the banking chatbot had significant effect on behavioral intention. Therefore, the first hypothesis is proposed:

**H1:** Perceived usefulness has a significant and positive effect on customers' intention to use banking chatbot.

### *3.3 Perceived ease of use (PEOU)*

Perceived ease of use is defined as “the degree to which a person believes that using a particular system would be free from effort” (Davis, 1989 p. 320). PEOU is considered to be similar to the effort expectancy construct in the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Li and Kishore, 2006), which was studied and found to be a strong predictor of usage intention in several banking technology (e.g. m-banking, i-banking and m-payment) adoption studies. First, existing literature on the adoption of m-banking (Safeena et al., 2012; Farah et al., 2018; Giovanis et al., 2019) and the adoption of i-banking (Alalwan et al., 2018; Martins et al., 2014) found that PEOU had a direct, positive effect on intention to use the studied technology. Second, studies showed that lower levels of effort expectations improved performance expectations of m-banking (Akturan and Tezcan, 2012; Koenig-Lewis et al., 2010) and i-banking (Martins et al., 2014) activities. In addition (Richad et al., 2019) concluded that perceived ease of use of the banking chatbot had significant effect on behavioral intention. Therefore, the second and third hypotheses are proposed:

**H2:** Perceived ease of use has a significant and positive effect on customers' intention to use banking chatbot.

**H3:** Perceived ease of use has a significant and positive effect on perceived usefulness.

### *3.4 Perceived compatibility (PC)*

Innovations that are compatible with the lifestyle of an individual, have a faster adoption rate (Rogers, 1983). Perceived compatibility is “the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters” (Rogers, 1983 p. 42). Several studies on m-banking (Koenig-Lewis et al., 2010; Giovanis et al., 2019;) and i-banking (Kolodinsky et al., 2004) adoption concluded that perceived compatibility had direct and positive effect on intention to use the certain technology. Moreover, some studies on m-banking (Koenig-Lewis et al., 2010) and i-banking (A. N. Giovanis et al., 2012) adoption found that perceived compatibility had a direct and positive effect on perceived usefulness, respectively on perceived ease of use. Thus, the fourth, fifth and sixth hypotheses are proposed:

**H4:** Perceived compatibility has a significant and positive effect on customers' intention to use banking chatbot.

**H5:** Perceived compatibility has a significant and positive effect on perceived usefulness.

**H6:** Perceived compatibility has a significant and positive effect on perceived ease of use.

### *3.5 Perceived Privacy Risk (PPR)*

Consumers tend to have concerns about the security and privacy of their financial information in online environments. Moreover, consumers are also concerned about the banks sharing their personal information with other companies (Kolodinsky et al., 2004). Perceived privacy risk refers to an individual's concern about potential loss of control over personal information, such as when information about an individual is used without that person's awareness (Akturan and Tezcan, 2012). Several studies on the acceptance of i-banking found that customers' perception of privacy risk (also referred as credibility) was an inhibitor of i-banking acceptance (A. N. Giovanis et al., 2012). Other studies on m-banking (Arif et al., 2016; Shankar and Kumari, 2016) adoption found that perceived privacy risk had a direct and negative effect on attitude toward the technology and on usage intention. Therefore, the seventh hypothesis is proposed:

**H7:** Perceived privacy risk has a direct and negative effect on customers' intention to use banking chatbot.

### *3.6 Awareness of service (AW)*

Awareness of a new product or services is an important adoption factor of innovative technologies (Sathye, 1999). It was found that the amount of information that customers have about online banking, is a major factor influencing online banking adoption (Pikkarainen et al., 2004). Whereas, low awareness of online banking is a significant variable in causing people not to adopt online banking technology (Sathye, 1999). Al-somali et al. (2009) found that the awareness of online banking and its benefits had significant effects on the perceived usefulness and perceived ease of use of online banking acceptance. Furthermore, awareness of i-banking also decreased all aspects of perceived risk (Hanafizadeh and Khedmatgozar, 2012). Therefore, the eighth, ninth and tenth hypothesis are proposed:

**H8:** Awareness of service has a significant and positive effect on perceived usefulness.

**H9:** Awareness of service has a significant and positive effect on perceived ease of use.

**H10:** Awareness of service has a significant and negative effect on perceived privacy risk.

## **4. Research method**

### *4.1 Procedure*

The survey method was used to test the proposed research model based on a Romanian sample. Previous research is focused mostly on Asian countries, therefore data from an East Central European country will extend the actual literature.

In Romania, there are 32 banks (Curs BNR, 2020) out of whom five institutions have implemented banking chatbots so far. Data were collected from April to May in 2020. It should be outlined that this was a pandemic period in Romania because of COVID-19. Therefore, the use of digital channels were highly recommended for all services. The questionnaire was distributed online through the Facebook platform. 307 questionnaires were collected. Data were assessed for multivariate outliers using a Mahalanobis Distance Test (Tabachnick and Fidell, 2007). Twenty multivariate outliers were identified and removed, the final sample contains 287 questionnaires. The present study follows a two-step approach to the analysis of the data obtained, including the assessment of measurement and structural models using the Partial Least Squares-Structural Equation Modeling (PLS-SEM) (Ringle et al., 2015).

#### 4.2 Measure items

Measurement items used in this study were adapted from previously validated measures or developed on the basis of the literature review. Applying a forward-backward method, the questionnaire was translated from English into Romanian. A five-point Likert scale ranging from totally disagree (1) to totally agree (5) was used in all statements. A pilot test of the measures was carried out on a sample of 5 randomly chosen people. Questionnaire statements were modified based on the results of the pilot test. The final questionnaire items that were used in order to measure each construct are presented in Table 2.

**Table 2: Summary of measurement scales**

Constructs	Measures	Source
Perceived usefulness (PU)	PE1	I find the banking chatbot useful in my daily life.
	PE2	Using the banking chatbot increases my chances of achieving things that are important to me.
	PE3	Using the banking chatbot helps me accomplish things more quickly.
	PE4	Using the banking chatbot increases my productivity.
Perceived ease of use (PEOU)	EE1	Learning how to use the banking chatbot is easy for me.
	EE2	My interaction with the banking chatbot is clear and understandable.
	EE3	I find the banking chatbot easy to use.
	EE4	It is easy for me to become skillful at using the banking chatbot.
Perceived compatibility (PC)	PC1	Using the banking chatbot fits well with my lifestyle.
	PC2	Using the banking chatbot fits well with the way I like to interact with companies.
	PC3	I would appreciate using the banking chatbot instead of alternative modes of customer service.
Perceived privacy risk (PPR)	PPR1	Privacy information could be misused, inappropriately shared, or sold when using the banking chatbot.
	PPR2	Personal information could be intercepted or accessed when using the banking chatbot.

Constructs	Measures	Source
	PPR3 Personal information could be collected, tracked, and analyzed when using the banking chatbot.	
	PPR4 Privacy could be exposed or accessed when using the banking chatbot.	
Awareness of service (AW)	AW1 My bank has communicated a banking chatbot usage policy to me.	(Al-somali et al., 2009)
	AW2 My bank has a strategy regarding the usage of the banking chatbot.	(Guesalaga, 2016)
	AW3 I have received sufficient information from my bank regarding the usage of the banking chatbot.	
	AW4 I have received recommendations from my bank on the use of the banking chatbot in the context of the COVID-19 pandemic.	
Behavioral intention to use (BI)	BI1 Given the opportunity, I will use the banking chatbot.	(Davis, 1989)
	BI2 I am likely to use the banking chatbot in the near future.	(Venkatesh and Davis, 2000)
	BI3 I am willing to use the banking chatbot in the near future.	(Gefen et al., 2003)
	BI4 I intend to use the banking chatbot when the opportunity arises.	(Schierz et al., 2010)

## 5. Data analysis

### 5.1 Respondents' demographic profile

Descriptive statistics were used to picture the demographic characteristics of the survey respondents. Table 3 illustrates the demographic profile of the respondents in terms of gender, age, education levels, occupation, field of work/study and residence.

**Table 3: Demographic profile of survey sample**

Respondents characteristics	Frequency (n=287)	Percentage (%)
<i>Gender</i>		
Male	114	39.7
Female	173	60.3
Total	287	100.0
<i>Age</i>		
24 and younger	148	51.6
25-44	99	34.5
45 and older	40	13.9
Total	287	100.0
<i>Education</i>		
High school	88	30.7
Superior studies	199	69.3
Total	287	100.0

<b>Respondents characteristics</b>	<b>Frequency (n=287)</b>	<b>Percentage (%)</b>
<i>Occupation</i>		
Employed (including business owner, freelancer)	173	60.3
Student	108	37.6
Other (unemployed, retired)	6	2.1
Total	287	100.0
<i>Field of work</i>		
Business (e.g. Accounting, Consulting, Finance, HR, Marketing)	110	38.3
Engineering & Computer Science (e.g. IT)	42	14.6
Services related activities (e.g. Hospitality)	97	33.8
Other	38	13.2
Total	287	100
<i>Residence</i>		
County seat	99	34.5
City	129	44.9
Village	59	20.6
Total	287	100.0
<i>Satisfaction with financial situation</i>		
(1) very dissatisfied	3	1.0
(2) dissatisfied	22	7.7
(3) neutral	127	44.3
(4) satisfied	106	36.9
(5) very satisfied	29	10.1
Total	287	100.0

Results show that the majority of respondents are female (60.3%) and the largest proportion (51.6%) of respondents by age groups, were those in the 24 years and younger category. 69.3% of respondents finished superior studies and 60.3% of respondents are employed, while 37.6% are students. In terms of field of work/study, the majority of the respondents work or study in the business field (38.3%). The vast majority lives in county seats (34.5%) and cities (44.9%). Overall, 47% of survey respondents are either satisfied or very satisfied with their financial situation.

Table 4 summarizes the descriptive statistics for survey respondents in terms of chatbot usage. Respondents reported that m-banking (44.9%) and i-banking (34.9%) are the technologies that they are commonly using for banking purposes. Seventy respondents (24.4%) stated that they have previously used a banking chatbot, while 75.6% of survey respondents haven't used such a system. The majority of those who have used banking chatbots, used it with a personal banking account (80%) and 30% used it for the first time in the last six months. Finally, 47% of the respondents who have not used a banking chatbot before, stated that they are aware of the existence of the technology.

**Table 4: Descriptives of chatbot technology usage among respondents**

<b>Respondents characteristics</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<i>Usage of banking technologies</i>	n=287	
I-banking	146	30.9%
M-banking	194	41.1%
M-payment technology	94	19.9%
Other	35	7.4%
None	3	0.6%
Total	472	100%
<i>Have used banking chatbot technology</i>	n=287	
Yes	70	24.4
No	217	75.6
Total	287	100.0
<i>Use of chatbot for different types of banking</i>	n=70	
Personal account	56	80
Business account	4	5.7
Both	10	14.3
Total	70	100
<i>First usage of a banking chatbot</i>	n=70	
This month	7	100
A month ago	11	15.7
6 months ago	21	30
A year ago	13	18.6
More than one year ago	18	25.7
Total	70	100
<i>Awareness of the banking chatbot</i>	n=217	
Yes	102	47.0
No	88	40.6
Don't know	27	12.4
Total	217	100

## 5.2 Validation of the measurement scale

The analysis of the data was carried out employing a two-phase approach in order to assess the reliability and validity of the measurement items using the Partial Least Squares-Structural Equation Modeling (PLS-SEM). The first phase consisted of the measurement model's analysis, while in the second step, structural relations between latent constructs were tested. The analysis of the measurement model involved the estimation of indicator reliability, internal consistency reliability, composite reliability, convergent validity and discriminant validity (Ringle et al., 2015).

Cronbach's Alpha and composite reliability (CR) were used to measure the reliability, while factor loadings (outer loadings) and Average Variance Extracted (AVE) were applied to measure the convergent validity. The results revealed that the questions measuring the constructs had reasonably acceptable reliability, and

the measures of the latent variables had high levels of convergent validity. As shown in Table 5, the values of Cronbach's Alpha, composite reliability (CR) and factor loadings (outer loadings) were above the threshold value of 0.7, the values of Average Variance Extracted (AVE) were all above the recommended value of 0.5, respectively.

**Table 5: Psychometric properties of the constructs**

Construct	Indicator	Outer Weights	Outer Loadings	Cronbach's $\alpha$	CR	AVE
Awareness of service (AW)				0.902	0.907	0.932
	AW 1	0.299	0.914			
	AW 2	0.307	0.822			
	AW 3	0.289	0.921			
Perceived usefulness (PU)	AW 4	0.242	0.858	0.928	0.929	0.949
	PE 1	0.26	0.89			
	PE 2	0.283	0.901			
	PE 3	0.273	0.906			
Perceived ease of use (PEOU)	PE 4	0.286	0.931	0.933	0.934	0.952
	EE 1	0.259	0.902			
	EE 2	0.289	0.921			
	EE 3	0.275	0.926			
Perceived Compatibility (PC)	EE 4	0.273	0.9	0.871	0.876	0.921
	PC 1	0.394	0.887			
	PC 2	0.385	0.916			
Perceived privacy risk (PPR)	PC 3	0.342	0.871	0.894	0.935	0.926
	PPR 1	0.288	0.857			
	PPR 2	0.244	0.896			
	PPR 3	0.232	0.814			
Behavioral intention to use Banking Chatbot (BI)	PPR 4	0.379	0.912	0.926	0.928	0.947
	BI 1	0.301	0.916			
	BI 2	0.264	0.908			
	BI 3	0.269	0.892			
	BI 4	0.272	0.901			

It has been found that the "Heterotrait-Monotrait ratio (HTMT)" is a significant measure for testing the discriminant validity (Henseler et al., 2015). As shown in Table 6, all the HTMT ratio values were below the suggested value of 0.85, which indicated that all the items satisfied the criteria for good discriminant validity. Thus, the measurement model is verified, and the evaluation of the structural model can be carried out.

In order to confirm and validate the measurement instruments and to define the relationships between observed and unobserved variables, a measurement model consisting of six constructs has been established. Results showed that the fitted

measurement model provided a fairly reasonable fit, the value of NFI being 0.874, which is greater than the threshold value of 0.8 for the model to be considered good (Forza and Filippini, 1998), while the value of SRMR being 0.049 (Hair et al., 2017).

**Table 6: Discriminant validity of constructs - Heterotrait-Monotrait Ratio (HTMT)**

	PEOU	AW	BI	PC	PPR	PU
PEOU						
AW	0.403					
BI	0.479	0.331				
PC	0.546	0.33	0.74			
PPR	0.17	0.19	0.172	0.109		
PU	0.546	0.41	0.623	0.782	0.109	

### 5.3 Examination of research hypotheses

The structural model was evaluated by examining the path coefficients beta weight ( $\beta$ ) and coefficient of determination ( $R^2$ ). The  $\beta$  value indicates the strength of the relationships between the dependent and independent variables, while the  $R^2$  value describes the variance explained by independent variables which can be interpreted as the predictive power of the model. The evaluation of the research hypothesis can be seen in Table 7, while Figure 2 shows the statistical analysis' results of the research model.

Results indicate that seven variables have significant statistical support. First, awareness of service is correlated significantly and positively with perceived usefulness ( $\beta = 0.143$ ;  $p \leq 0.001$ ) and perceived ease of use ( $\beta = 0.25$ ;  $p \leq 0.001$ ), and it has a significant and negative effect on perceived privacy risk ( $\beta = -0.173$ ;  $p \leq 0.05$ ). Second, perceived ease of use has significant and positive effect on perceived usefulness ( $\beta = 0.168$ ;  $p \leq 0.001$ ). Perceived compatibility has significant and positive effect on both perceived usefulness ( $\beta = 0.581$ ;  $p \leq 0.001$ ) and perceived ease of use ( $\beta = 0.421$ ;  $p \leq 0.001$ ). Last, intention to use is significantly and positively influenced by perceived usefulness ( $\beta = 0.176$ ;  $p \leq 0.05$ ) and perceived compatibility ( $\beta = 0.484$ ;  $p \leq 0.001$ ). Also, results indicate that perceived ease of use and perceived privacy risk are not correlated with intention to use. Therefore, H1, H3, H4, H5, H6, H8, H9 and H10 were supported by the empirical data, while H2 and H7 were rejected.

**Table 7: Assessment of the structural model**

No.	Hypothesis path	Path coefficient ( $\beta$ )	STDEV	t-Value	p- Value	Supported?
H1	PU $\rightarrow$ BI	0.176	0.068	2.601	0.010*	yes
H2	PEOU $\rightarrow$ BI	0.104	0.055	1.909	0.057 <sup>ns</sup>	no
H3	PEOU $\rightarrow$ PU	0.168	0.052	3.23	0.001*	yes
H4	PC $\rightarrow$ BI	0.484	0.06	8.116	0.000**	yes
H5	PC $\rightarrow$ PU	0.581	0.047	12.451	0.000**	yes

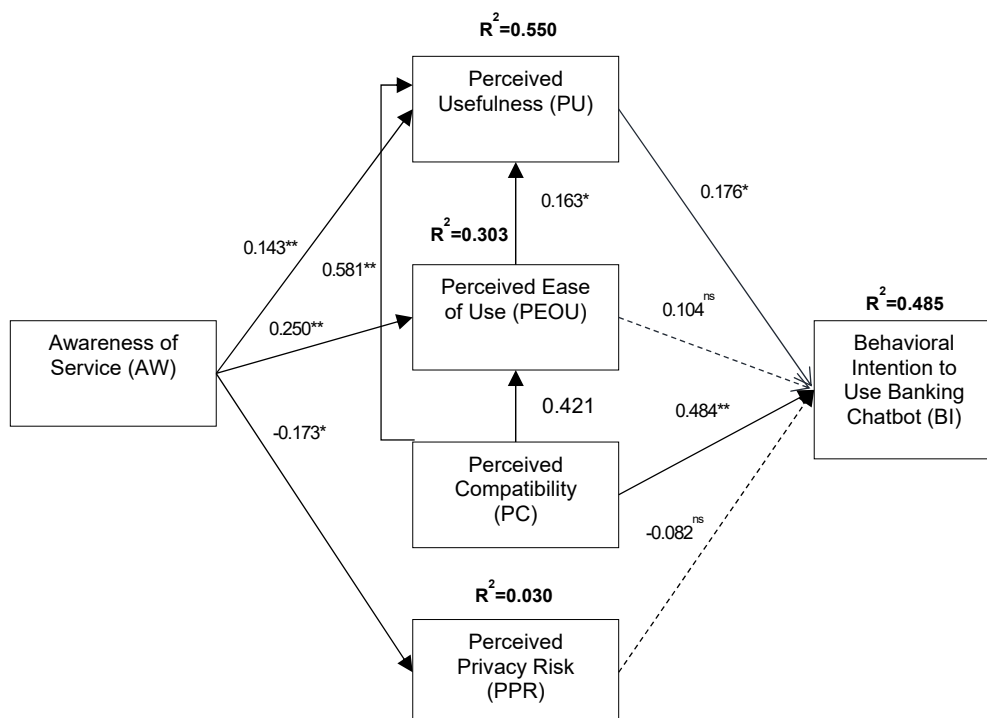


No.	Hypothesis path	Path coefficient ( $\beta$ )	STDEV	t-Value	p- Value	Supported?
H6	PC $\rightarrow$ PEOU	0.421	0.054	7.807	0.000**	yes
H7	PPR $\rightarrow$ BI	-0.082	0.045	1.81	0.071 <sup>ns</sup>	no
H8	AW $\rightarrow$ PU	0.143	0.038	3.763	0.000**	yes
H9	AW $\rightarrow$ PEOU	0.25	0.051	4.896	0.000**	yes
H10	AW $\rightarrow$ PPR	-0.173	0.066	2.63	0.009*	yes

Note: \*Significance at  $p < 0.05$ ; \*\*( $p < 0.001$ ); <sup>ns</sup> Not significant

The results show that awareness of service, perceived ease of use and perceived compatibility together explain 55% of the variance in perceived usefulness. Moreover, awareness of service and perceived compatibility together explain 30.3% of the variance in perceived ease of use. Also, awareness of services explains 3% of the variance in perceived privacy risk. Finally, perceived usefulness and perceived compatibility together explain 48.5% of the variance in behavioral intention.

Figure 2. Proposed research model for attitude toward banking chatbots



Note: \* ( $p < 0.05$ ); \*\* ( $p < 0.001$ ); <sup>ns</sup> and dashed arrows (paths coefficients that are not statistically significant)

## 6. Discussion

Artificial intelligence based chatbot applications have become a very popular form automatizing customer service processes in the financial sector, transforming communication between banks and consumers. Many banks have implemented chatbots in order to reduce costs and to improve services quality. Thus, it is essential for these institutions to identify factors that influence customer adoption of this technology.

The present study identified two factors that significantly impact customers' intention to use banking chatbots in the Romanian banking industry including, perceived usefulness and perceived compatibility. Moreover, the proposed research model explained 48.5% of the behavioral intention to use banking chatbots, the value being higher than that of 40% found in several studies that adopted TAM (Venkatesh and Davis, 2000).

Among the two identified factors, perceived compatibility has the strongest effect on customers' intention to use banking chatbots which is consistent with earlier findings of i-banking (A. N. Giovanis et al., 2012) and m-banking (Koenig-Lewis et al., 2010) adoption research. The results indicate that the higher is consumers' perception of the banking chatbot being compatible with their lifestyle, the higher their willingness is to adopt the technology. This indicates that it is important to develop and implement banking chatbots in a way that is compatible with the lifestyle and values of the bank's customers. Moreover, the findings of this study indicate that perceived compatibility also has an indirect and significant effect on intention to use chatbots through perceived usefulness and perceived ease of use, meaning that compatibility leads consumers to perceive banking chatbots as being more useful and easier to use. These findings are in line with previous research on i-banking (A. N. Giovanis et al., 2012) and m-banking (Koenig-Lewis et al., 2010) adoption.

Perceived usefulness was also found to be an important antecedent of customers' behavioral intention to use banking chatbots. These findings support observation of previous research into i-banking (Martins et al., 2014) and m-banking (Farah et al., 2018; Koenig-Lewis et al., 2010; Safeena et al., 2012) adoption. Consumers perception of the banking chatbot being useful and representing a quicker and easier way to manage their finances, leads to a higher level of intention to use the banking chatbot.

The effect of perceived ease of use on behavioral intention is disputable in banking technology adoption research. Several studies on i-banking (Alalwan et al., 2018; Martins et al., 2014) and m-banking (Safeena et al., 2012; Farah et al., 2018) adoption found that perceived ease of use significantly and positively influenced usage intention, whereas other studies on i-banking (Pikkarainen et al., 2004) and m-banking (Koenig-Lewis et al., 2010) adoption found no significant results in this regard. The findings of the current study are consistent with the findings of Pikkarainen et al. (2004) on i-banking and the results of Koenig-Lewis et al. (2010) on m-banking who found that perceived ease of use had no significant effect on usage intention. Moreover, the results of the current study indicate that perceived ease of use has a significant indirect effect on behavioral intention to use banking chatbots through perceived usefulness. Several studies found that perceived ease of use has less impact on technology acceptance than perceived

usefulness (Davis, 1989; Venkatesh and Davis, 2000) since perceived ease of use influences technology acceptance through perceived usefulness (Pikkarainen et al., 2004).

Contrary to previous expectations, perceived privacy risk had no significant effect on behavioral intention to use banking chatbots. Even though several studies on the acceptance of i-banking (Giovanis et al., 2012) and m-banking adoption concluded that perceived privacy risk had a direct and negative effect on intention to use (Arif et al., 2016; Shankar and Kumari, 2016), the present study did not find significant relationship in this regard. These results are in line with the findings of Akturan and Tezcan (2012) on m-banking adoption who concluded that perceived privacy risk had no significant effect on usage intention. That lack of evidence on this matter has two explanations. First, in i-banking adoption studies, the dimensions of the perceived risk factor are classified into six groups including, time, financial, performance, social, security, and privacy risks (Hanafizadeh and Khedmatgozar, 2012). According to Aldás-Manzano et al. (2009), not all the risk dimensions are relevant in the context of online banking services. The results of the current study indicate that perceived privacy risk is a risk dimension that is not applicable in banking chatbot adoption. Second, the sample of the current research consisted predominantly of individuals aged 24 or younger with a higher education degree. This age and educational demographic generally has considerable experience of online banking, mobile phone usage and other internet-related activities (Akturan and Tezcan, 2012). Thus, the non-significant relation between perceived privacy risk and behavioral intention can be explained by the age of the respondents of the current study.

Regarding the indirect relationships between the studied constructs, it was found that awareness of the service has an indirect effect on behavioral intention through perceived usefulness. Consistent with the results of Al-somali et al. (2009) on online banking adoption, the more information consumers have about the service, the more useful they find it. Moreover, awareness of the service also has significant and positive effect on perceived ease of use, and significant and negative effect on perceived privacy risk which is in line with the findings of Al-somali et al. (2009) and Hanafizadeh and Khedmatgozar (2012) on online banking. Therefore, high awareness of banking chatbots is a critical factor in banking chatbot adoption.

### *6.1 Theoretical implications*

Results of the current study offer useful insights for academic perspective. First, the present analysis extended technology adoption research to the area of banking chatbot technology with the following variables: perceived usefulness, perceived ease of use, compatibility, privacy risk and awareness. Compatibility and awareness are innovative factors in studying chatbot adoption. Overall, 48.5% of the variance of behavioral intention to use banking chatbots is explained by the proposed conceptual model. Perceived compatibility and perceived usefulness were identified as factors that have direct effect on banking chatbot adoption. Second, results highlight the importance of awareness of service in the context of banking chatbot adoption as the construct has an indirect effect on usage intention through perceived usefulness. Even if this study did not find evidence for the effect of perceived ease of use and perceived privacy risk on behavioral intention, it is

unequivocal that awareness has direct effects on these two variables as well. These results emphasize the importance of awareness of the service and its benefits in the context of technology adoption in the banking industry. Thus, the current study was able to contribute to existing literature on technology adoption in the banking industry, and in the field of chatbot technology adoption.

## *6.2 Managerial implications*

There are several managerial implications of this study for the banking sector. First, significant effects of perceived compatibility and perceived usefulness on behavioral intention indicate that consumers expect banking chatbots to be compatible with their lifestyle and to provide benefits for them. Therefore, communication campaigns should contain this type of information. Second, the role of awareness of the services has indirect effect on usage intentions, which indicate the importance of informing consumers about the existence and benefits of using the banking chatbots. Thus, banks and developers of banking chatbot applications should devote great effort to the factors of utility and compatibility when designing, implementing and upgrading such systems. Moreover, marketing campaigns that emphasize the usefulness and benefits of banking chatbots, namely 24/7 availability of the service, high convenience, ease of use, and the time and cost saving aspect of the application, may attract consumers' attention and could drive the acceptance and use of the technology. As awareness of the service, its features and its benefits could be a key factor in banking chatbot adoption, banks should focus on providing information about the system and communication with consumers in order to encourage the adoption.

## *6.3 Limitations and future research directions*

While the current study adds to the existing literature, its limitations should be acknowledged. First, the questionnaire respondents were mainly young, highly educated individuals whose actions may vary somewhat from the population average. Thus, the study sample is not representative and the findings are not generalizable. Second, this research is not specific to a single banking chatbot application or specific bank. Future research should investigate specific banking chatbot systems as these systems could have unique service features depending on the banks that have implemented them. There could be specific variables that are unique for each chatbot, and other adoption factors that have significant impact on adoption, such as relative advantage, which was not investigated, however, future research is encouraged to fill this gap. Future research also needs to investigate the proposed research model in a different geographic location with special emphasis on rural areas and the model should be tested on a different sample.

## **7. Conclusion**

The adoption of technologies applied in the banking industry are widely studied in the literature. However, a more and more popular and frequently implemented technology, namely chatbot technology in the context of the banking industry, has

received limited attention. To address this research gap, the present study was conducted with the aim of identifying the main factors that influence customers' intention to use the banking chatbot technology. The proposed research model was built by adopting concepts from the TAM model, extending it with compatibility, customers' perceived privacy risk and awareness of the service. Data for the present analysis was collected from 287 consumers via online, applying a self-administrated survey method. The findings supported the conceptual model by predicting 48.5% of variance in the behavioral intention. Perceived usefulness and perceived compatibility significantly predicted the customers' intention to use the banking chatbot. Awareness of the service had an effect on perceived ease of use, perceived privacy risk, and it indirectly affected usage intention through perceived usefulness. Also, perceived ease of use influenced perceived usefulness, and perceived compatibility had an effect on both perceived ease of use and perceived usefulness. Yet, perceived ease of use and perceived privacy risk were not found to be significant determinants of behavioral intention. As a result, the current study was able to make a significant contribution to the field for both academics and practitioners.

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**CHALLENGES FACED BY AUDITORS WHEN ESTIMATING FAIR VALUES.  
AN EXPERIMENT IN AN EMERGING ECONOMY****Adela DEACONU\***

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**Abstract.** Risks related to fair value (FV) estimates and their impact on the audit process represent a crucial topic in accounting and audit literature. Therefore, this paper focuses on one of the influential factors of FV estimation and related risks in audit missions, *i.e.* the valuation process performed (provider and measurement). In doing so, it addresses a less analysed FV level of estimation – level 3 according to IFRS 13, 'the models', for the case of tangible assets. An experiment is conducted on a group of auditors, members of the Romanian audit professional body. The results reveal that, if the internal control quality is high, auditors differentiate between FV providers in the case of: FV measurement, *i.e.* income valuation approach versus cost approach, which implies additional effort for verification and risk of misstatement, when the estimation is provided by a third party instead of management. These findings could be related to the volatility of the investigated economic context and the respondents' level of knowledge and expertise. We infer that respondents have a moderate understanding of valuation logic and methodology while excessively relying on their own valuator.

**Keywords:** fair value audit; fair value complexity; estimation risks; fair value provider; tangible asset.

**JEL classification:** M41, M42, R32, G12.

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## 1. Introduction

This paper focuses on the auditor's diligence in verifying accounting estimates, particularly fair value (FV), as the most controversial estimate. Auditors perform specific tests on FV estimates provided by companies' managers, including the assessment of management assumptions on the subject, assumptions' reliability, valuation approaches (methods) and specific inputs used. An appropriately conducted audit process is one of the guarantees for financial reporting quality (Beneish et al., 2012; Zang, 2012; Bolivar and Galera, 2012). Therefore, it is critical to investigate the impact that risks related to FV estimates have on the audit process. The need for such a study is also emphasized by insufficient milestones provided by the literature, audit standards ambiguity, some auditing contexts characterized by market volatility and incomplete adaptation to the international standards' requirements on FV estimation and audit issues.

Among accounting estimates, FV measurement brings forth a unique task due to the recourse to market data, implying greater difficulties when such external information is not immediately available. In order to measure FV, management must use an adequate approach and appropriate assumptions that have the potential to reflect the actions of individuals in the market (Menelaides et al., 2003). The unicity of such an approach is also given by the increasing requirements of accounting standards for the use of FV (Christensen et al., 2012), the complexity of some measurements and their impact on financial statements. In the last years, literature abounds in descriptions and signals of the risks associated with the construction and audit of the estimates. Examples of research topics include valuation inherent risks (e.g. Zack et al., 2009), management opportunism which is sometimes associated with creative accounting techniques (mainly related to earnings management) (e.g. Beneish et al., 2012; Zang, 2012), or, generally, estimation uncertainty and implications for audit (e.g. Christensen et al., 2012; Bratten et al., 2013). Nevertheless, there is still room for additional research on audit and estimates (Bratten et al., 2013; Ettredge et al., 2014). Our research attempts to contribute to this debate, specifically related to the risks induced by FV estimation for the audit mission, in an applied approach, all the more so as the current studies do not contain sufficient empirical, but rather more theoretical developments on the subject matter.

Given that professional regulations did not always provide enough guidance in order to minimize the audit risk related to the uncertainty of estimates, researchers call upon standard setters to intervene in this respect. As a response, the audit standard setters are now preoccupied to strengthen requirements for auditing accounting estimates, including FV. They are aware of the nature of estimates, subjective and susceptible to management bias. As our case is built on the Romanian setting, where International Auditing Standards (ISA) are applied, we are mainly interested in the measures taken by the International Auditing and Assurance Standards Board (IAASB).

Romania's case, having an emerging economy, is interesting to explore because it exacerbates some of the FV audit risks due to the market volatility that induces more difficulties in observing relevant market inputs. Thus, as a Central-Eastern European country, Romania has experimented in recent decades with several sets of accounting regulations, successively taking over regulations from continental Europe (more precisely France), aligning with European directives (since 2007), inserting elements of International Accounting Standards (IFRS) in the national

referential and requiring listed companies to fully apply IFRS (since 2016). Therefore, at this moment, the accounting provisions promote, much more than before, the use of fair value, which brings significant challenges for auditors.

Our study examines one of the influencing factors of FV estimates evoked in literature, namely the FV provider who is the management's expert, a valuator. Investigating this issue is useful as, according to Martin et al. (2006), there is not enough research on how auditors use the services of experts, including the management's ones. Cannon and Bedard (2017) and Glover et al. (2017) also confirm auditors' tendency to significantly rely on the work of external valuation experts. This raises the need for further guidance on how auditors should work with valuers. In our paper, we tackle this topic in the particular setting of an emerging economy. Furthermore, we analyse issues related to the FV provider to cover the entire valuation process offering values to be recognized in financial statements. This contributes to the scarce existing accounting literature.

Our research objective is to observe how the type of valuator, as well as FV measurement/reporting quality influence the audit mission in terms of risk of misstatement and additional effort in the likelihood that auditors request adjustments to FV. We report an experiment with 8 different manipulations where the participants are 76 auditors from Romania. The tests being used are meant to shed light on auditors' use of third party versus management FV estimates of non-financial (tangible) assets, conditioning on FV measurement being recognized (cost or income approach) or disclosed (quality of data available to the auditor in the valuation report), all conditional on the quality of internal control.

The main results suggest that auditors expend greater effort when income valuation approach is used instead of cost, and when checking one of the components of FV quality disclosure, *i.e.* Valuation attributes and sensitivity of data, discerning between the FV provider type (third-party or management estimations), and when internal control quality is strong. We believe that in this way we make a contribution to the specific literature by the extensive investigation of the FV provider in an emergent context which is less explored and for non-financial (tangible) assets, which is a controversial topic in terms of verifiability of FV (Sellhorn and Stier, 2018). Furthermore, we contribute by pointing out the audit risk red flags associated to the entire FV measurement process. Based on the obtained results, we argue for the need for further development of the asset valuation logic and methodology in the auditing process. Last but not least, we invite regulators to continue their actions of clarifying approaches for the valuation of assets in the audit standards, while providing recommendations regarding the verification of the elements with high audit risk potential, especially for more volatile economic contexts and types of assets.

The remainder of the paper is organized as follows: Section 2 synthesizes the relevant literature and audit standards on FV influential factors and valuation process; Section 3 develops the research framework for one of the influential factors, FV estimate provider, extended to other coordinates of the valuation process conducted to estimate the FV; Section 4 describes the application of the experimental method to a group of auditors, members of the Romanian audit professional body, the Chamber of Financial Auditors (CAFR); Section 5 provides insights into the Romanian auditing profession's behaviour regarding the FV estimation process; and the final section discusses and concludes.

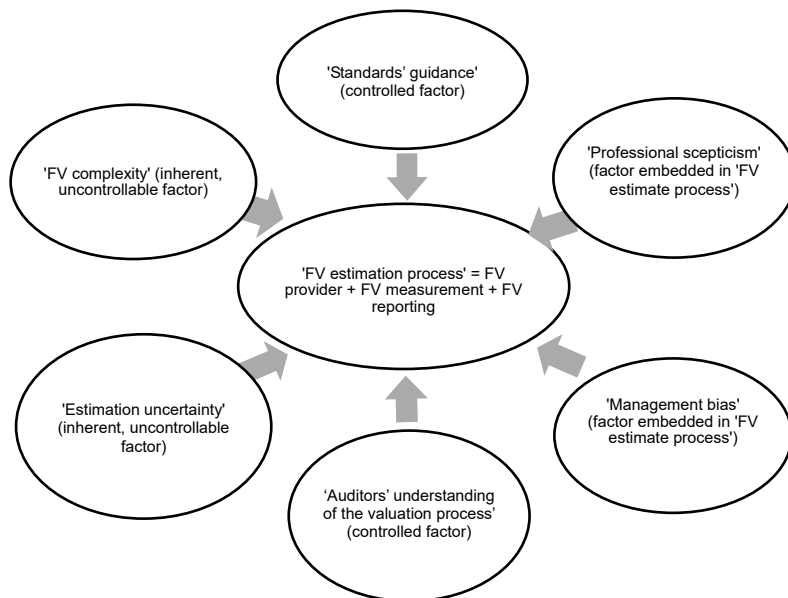
## 2. FV estimation process

### 2.1. Influential factors for FV estimation and induced audit risks

Specific literature has identified several influential factors in the FV estimation audit, those often cited and transposed here in our own words being 'Fair value complexity', 'Estimation uncertainty', 'Managerial bias', 'Professional skepticism', 'Fair value estimate provider', 'Standards guidance', and 'Auditors understanding of the valuation process' (e.g. Bratten et al., 2013 or Doliya and Singh, 2016).

We focus on the influential factor directly related to the valuation process that provides FV, namely 'Fair value estimate provider'. Besides, we extend the area of investigation to the entire process of valuing assets (in our case tangible assets) for financial reporting purposes, adding elements of FV measurement and reporting. This approach aims at a complete understanding of the interference between property valuation and the audit of these estimates, including audit risks. Therefore, we will further call the selected factor 'Fair value estimation process'. The factor under investigation does not act independently, but in interaction with the others mentioned above. As such, it is necessary that we acknowledge such interactions, our view being illustrated in Figure 1.

**Figure 1. FV estimate influential factors. Our approach**



Firstly, 'Fair value complexity' and 'Estimation uncertainty' are viewed as inherent factors, which cannot be controlled, only assumed to occur more or less in different settings. Bratten et al. (2013) describe estimations as an unstructured task of a complex nature, uncertain realisation, which has no objective verifiability. Griffin et al. (2014) measure 'Estimation uncertainty' by inputs volatility (due to subjectivism)

and outcomes imprecision (the degree of volatility of estimates in the future). In our case, the nature of the assets (non-financial) and the emergent economic context amplify FV estimation complexity and uncertainty.

Secondly, 'Managerial bias' and 'Professional scepticism' are embedded in the selected influential factor, 'FV estimate provider'. 'Managerial bias' covers a type of FV provider, *i.e.* the management estimation. It is related to management assumptions, which are subjective in nature through the valuation models and inputs selected (Christensen et al., 2012; Bratten et al., 2013; Griffin, 2014; Brink et al., 2016). To adjust management bias effects, Martin et al. (2006) consider that the auditor must know how managers can generate, voluntarily or not, misstatements in FV estimation. 'Professional skepticism' implies a questioning mind and the critical analysis of audit evidence. In the context of the valuation process and professional scepticism, Martin et al. (2006) discuss about: the manner of data collection for the estimation models, *i.e.* external (more reliable according to Brink et al., 2016), or internal sources; assessing the decision and control process conducted for inputs selection as typology, completeness of available and relevant information, the salience of the inputs; asking questions for the failure to use or lesser weight associated to some potential inputs; the use for his own estimation of other valuation models or inputs than those of the management. Martin et al. (2006) also invoke the auditor's ability to decide if and how the service of external valuers is needed. These suggestions will be transposed in our framework.

Thirdly, the influential factors 'Standards' guidance' and 'Auditors' understanding of the valuation process' are, in our experiment, controlled factors.

When it comes to 'Standards' guidance', we refer to auditing standards that interfere with FV estimate audit. ISA, the standards of interest for us, in their versions up to November 2019, did not offer detailed guidance for auditing specific types of FV estimates (except for derivative instruments, hedging activities and investments in securities), but for understanding management's estimation process and assessing if this conforms to accounting standards. The technical details should be searched for in professional guides and books. Other aspects could still be improved. To date, the updated version of ISA 540 is operational and we will designate it ISA 540 (2019). As a matter of fact, in August 2017, IAASB launched an Exposure Draft on a proposed major revision of ISA 540 *Auditing accounting estimates and related disclosures*, aiming to enhance requirements for risk assessment procedures and the auditor's work effort in responding to the assessed risks of material misstatement (IAASB, 2017). An interest of IAASB in the use of 'external information sources', which is equivalent to the use of the work of specialists, including valuers, can be observed. The intention is to strengthen the requirements for the auditor to evaluate the work of both management's and auditor's expert (the auditor's expert being the employed and auditor-engaged specialist), including to establish a risk-based approach in such cases. We are interested in the first case, the management's expert, as we will further document. We believe that the factor 'Standards guidance' could be controlled, depending on the setting and the specific case under observation, and we further incorporated these prescriptions in our case materials.

As for the influential factor 'Auditors' understanding of the valuation process', Bratten et al. (2013) think that the lack of auditors' valuation knowledge, explicable due to the complexity of FV, is one of the elements affecting the audit process performance and auditors' ability to find and incorporate in their judgement management bias in FV estimation. IAASB, in ISA 540 (2019), highlights the need for specialized skills or knowledge earlier in the auditing process, in relation to either the understanding or

the identification and evaluation of the risks of material misstatement. We, therefore, consider this factor as a controlled one, due to the possibility of asserting its level, as our experiment will reveal.

## 2.2. Valuation process

This section focuses on valuation as the process that concludes on FV estimation, namely on FV provider, FV measurement, and FV disclosure. The section is the result of the literature review and international audit standards on the matter. Literature provides a list of potential positive and negative effects of the FV provider. This enables us to design the experiment that will confirm/infirm these theoretical or empirically demonstrated assertions in earlier research. ISA (2019) recommends to the auditors the verification steps in the case of FV estimate, also useful for our case materials.

Referring to the FV estimate provider, it is important to delimitate our area of inquiry. This is because both management and auditors can resort to third parties - valuation experts, in order to build FV estimates or obtain audit evidence on the subject. ISA 500 *Audit evidence* and ISA 620 *Using the work of an auditor's expert* make a clear distinction between management's valuation and the auditor's own valuation, in terms of expertise. Thus, management's expert work is used by the auditee to assist him in preparing the financial statements, while auditor's expert work is used by the auditor to assist him in obtaining sufficient appropriate audit evidence. Similarly, ISA 540 (2019) states that management may have, or the entity may employ individuals with the skills and knowledge necessary to make the accounting estimates; and in some cases, management may need to engage an expert to make, or assist in making the estimations (IAASB, 2017). In his turn, the auditor's expert may be either an internal expert (partner or staff of the audit firm or a network firm), or an external expert.

In our approach, we deal with the case of the auditee's valuator, both in the case of a valuation generated internally by the auditee (auditee's management estimation), and of an estimation provided by an external consultant of the auditee (auditee's management's expert). This is because we believe that the work of the valuator who assists the auditor - the auditor's expert according to ISA 620, is integrated into the audit process' global effort. Besides that, the efforts of the auditor differ in magnitude and nature when he verifies the valuation provided by the auditee versus when he evaluates the adequacy of his own expert's work. We chose to focus on the most demanding task for the auditor, which has the potential to pose the higher risks for the audit of estimates. Additionally, we will include in our investigation the possibility that the auditor resorts to its own valuator, if that approach impacts auditors' perceptions in our experiment. In this respect, regulators, such as PCAOB (2011) and SEC (2011), are concerned about the auditors' tendency to focus excessively on valuator's reports, neglecting their own verification steps or audit procedures.

Focusing on the issue of FV provider, analysed in relevant papers, it seems that in terms of its effects, the use of a valuation expert apparently reduces the audit risk. There are studies asserting that the reliability of FV estimate increases for the investors when valuation experts' services are used (e.g. Muller and Riedl, 2002; Bratten et al., 2013). This opinion is shared by the American and international auditing standard setters, PCAOB (2014) and IAASB (2018). Using an external

valuator instead of an internal one (management's expert) impacts the valuation process and is considered more objective by Barth and Clinch (1999) and King (2006). Brink et al. (2016) also argue that FV estimation is less risky if generated by an external source. Sellhorn and Stier (2018) conclude that an external valuator's involvement enhances the decision usefulness of FV.

On the other hand, Joe et al. (2017) warn about weaknesses if the data disclosed in the valuation report are significant in quantity, in the case of a high risk of the client's internal control. In this case, the auditor is inclined not to proceed to additional tests, such as checking the subjective inputs, but rather focusing on other details and objective inputs. Also, sometimes auditors do not have access to the particular data used by valuers as inputs for constructing the value, such as, for example, proprietary specific data (Glover et al., 2014; Cannon and Bedard, 2017). Goncharov et al. (2014) formulate the hypothesis that the use of a valuation expert reduces the audit risk in correlation with audit fees supposed to decrease as the auditor effort also decreases. The later study failed to obtain statistically significant results.

As documented, divergent opinions arise on engaging an external valuation expert and its effects on the audit process. Hence, we intend to verify these assertions for the particular setting of our study.

Other issues to characterize FV estimation process, apart from the FV provider effects described above, are linked to the valuation report/document prepared by a third-party or management, which we will consider in our framework.

According to the literature, auditors tend to verify in detail the values provided by valuation reports, if there is an adequate disclosure, mainly estimated by valuation experts (Salzsieder, 2016), reducing management opportunism, as Abernathy et al. (2015) claim. The nature and volume of the tests that auditors will perform to verify FV are influenced by the valuation report content, in the case of a weak internal control of their client (Brown-Liburd et al., 2014; Joe et al., 2017).

In the view of regulators, following the standard's risk assessment procedures, the auditor should obtain an understanding of how management identifies the relevant methods, assumptions, or sources of data, as well as the need for changes in them [ISA 540 (2019), para. 13 (h (ii (a)))]. This includes how management selects or designs, and applies, the methods (including the use of models), selects the assumptions (including consideration of alternatives and identification of significant assumptions) and selects the data to be used. Furthermore, it is important to know how management understands the degree of estimation uncertainty and addresses it [ISA 540 (2019), para. 13 (h (ii (b,c)))]. Para. 13 (f) in ISA 540 (2019) addresses the understanding of how management identifies the need for, and applies, specialized skills or knowledge (including the use of an expert), while para. 13 (g) focuses on the entity's risk assessment process in identifying and addressing risks. The auditor should consider indicators for possible management bias and their implications for the audit [ISA 540 (2019), para. 32].

### **3. Experimental design**

#### *3.1. Variables and framework*

In our framework, the dependent variables, inspired by other experimental studies in audit literature (Griffin, 2014; Brink et al., 2016) are *Likelihood that the auditor develops additional effort to further investigate the FV estimate* and *Higher risk of misstatement of FV estimation*. They suggest the magnitude of risk of misstatement

that the participants will assess, as well as the additional time and effort needed to investigate FV measurement and reporting, depending on the FV provider (third party or management estimation) in the likelihood that auditors request adjustments to FV.

The independent variables are built, as Table 1 shows, according to prior literature, using the new institutional setting (ISA 540), but also our own logic on the importance of the valuation process and verifiable components. The literature on FV estimation influential factors has reported the first of the variables, the FV provider, with mixed results in terms of its effects. Also, other papers provided some hints on the importance of internal control quality, which we found useful to investigate. Furthermore, we developed one other variable for FV measurement. We started from the quantifiable elements suggested to auditors through ISA 540 (2019) when verifying an accounting estimate for a financial statement item, *i.e.* the relevant quantitative and qualitative valuation attributes and the sources of data that would provide appropriate measures of those attributes. We also used ISA 540 (2019)'s recommendations on the steps to verify accounting estimates as references for the minimal requirements of a valuation report, adding some elements judged as relevant for assessing FV measurement accuracy.

**Table 1. Choices for the independent variables**

<i>Independent variables</i>	<i>Condition</i>
1 <i>FV provider:</i> Third-party estimation or management estimation expert	quality of the internal control of the auditee (week or strong)
2 <i>FV measurement:</i> Volume and type of quantitative data in the content of the valuation report	

Within our framework, the independent variables have a particular content which will shape our experimental propositions.

The first variable, *FV provider*, suggests a third-party (external valuator, consultant) or management's estimation (internal valuator). For the Romanian context, both the external valuator and the internal valuator are required to be approved as members of ANEVAR, the national professional association. In these circumstances, we expect fewer evaluation cases through the company's internal staff due to the complexity of the valuation tasks and the specific professional requirements, and thus barriers to becoming an authorized valuator.

The second variable refers to *FV measurement*, which we expressed as a specific valuation approach applied, income or cost, considering that we chose IFRS level 3 of FV estimation (the models) for the experiment. The two approaches denote, in our view, a difference in volume and type of inputs. The volume of inputs will also be suggested in the experiment matrix when FV measurement is combined with FV provider; the volume of data is more significant in the Valuation document provided by a third-party instead of management. The income approach is more linked to market inputs and more predictive data than the cost approach, which uses more historical data combined with current (market) data. Our arguments for choosing Level 3 to be tested are based on the fact that, in Romania, only real estate is usually evaluated for financial reporting, tax and loan guaranteeing purposes. The approaches used in these cases are generally income and cost, and not market approach, if the



assets were not for sale (Level 2 in the value hierarchy). The financial instruments, which could be evaluated at the Levels 1 and 2, require extremely rare evaluations. Furthermore, we chose the income and cost approaches applied to real estate, as we consider these were so far neglected in the fair value accounting literature. Barker (in Mora et al., 2018) believes that measurement concepts applicable to operating versus financial assets should be differentiated within the international accounting referential (Conceptual framework and IFRS 13). One of his arguments is that in terms of verifiability, level 3 fair values are more difficult to verify than level 1. This provides us with the opportunity to bring insights on the subject.

For all these variables, we introduced a condition under the form of the *internal control quality*, a component of the audit process. Table 2 presents the proposed research framework.

**Table 2. Experiment's framework**

<b>Quality of internal control</b>	<b>FV measurement: Volume and type of data in the Valuation Document*</b>	<b>FV provider</b>	
		<i>Third-party estimation</i>	<i>Management's estimation</i>
Week/ Strong	<i>Focus on predictive data in the construction of the variables (income approach)</i>	Typical valuation report Data concerning level 3 of FV	Management's valuation worksheet for the estimation; Data concerning level 3 of FV
	<i>Focus on historical and current data in the construction of the variables (cost approach)</i>	Typical valuation report Data concerning level 3 of FV	Management's valuation worksheet for the estimation; Data concerning level 3 of FV

\* Valuation Document designates both the valuation report of the external expert in the standard format agreed by his professional association (ISA 500 includes a stipulation on the use of analysts' reports, as information from a source independent of the entity), and the management specific documents provided as justification for FV measurement.

With reference to the direction of the relationships between variables, we formulate the following empirical prediction (P):

**P:** *Auditors distinguish between the use by the management of a third party versus an internal valuation, and consider that a third party valuation decreases the estimation risk and audit effort, when income approach is applied instead of cost approach for FV measurement and when the internal control quality is strong.*

In the above prediction, the choice of internal control as strong in quality is justified by the fact that, in this case, the auditors focus on the significance of the valuation approaches as solutions for measuring FV (cost, income), respectively on the disclosure of the elements of the valuation process.

Our expectations related to other FV estimation influential factors which were presented in Figure 1 and accompany these predictions, are further presented.

'Managerial bias' and 'Professional scepticism' as FV estimate influential factors are embedded in these propositions.

For the Romanian setting, we assume that 'Fair value complexity' is higher for the real estate valuation and level 3 of FV estimation than for other types of assets and levels of estimation (1 and 2). Also, we believe that 'Estimation uncertainty' is higher, as the markets (financial markets generally and the real estate market) are volatile and less liquid compared to those in developed economies. These two factors are considered in our framework as uncontrollable, existing factors.

For the factor 'Standards' guidance', which is viewed in our framework as a controlled factor, we inserted the new provisions of ISA 540 (2019) in the experiment cases in order to eliminate the potential lack of professional guidance and thus control the auditors' judgements and directing them towards FV estimate process issues.

The factor 'Auditors understanding of the valuation process' is a controlled factor and our expectations are for a moderate understanding. In fact, the valuation profession has its own challenges, competencies and experience related requirements. This profession is guided by a set of specific standards, professional guides and specific literature. Besides, ISA and IFRS requiring FV use have been mandatory in the last 10 years, reason for which the auditors' expertise in fair value issues is relatively new. Also, the cases requiring FV estimation are not as common as in developed economies. In our paper, the frequency of such cases will be observed in the demographic test. Finally, we wonder if the auditor's use of his own valuator will affect his judgment and interfere with the perception on the valuation provider, respectively on the FV measurement and reporting. Brink et al. (2016), in their study of the Chinese emergent market, expect the auditor to resort to his superior or to a peer for advice, due to the FV complexity and high uncertainty. We thought that it is reasonable to assume that the participants resorted to the advice of a valuator – especially in the Romanian context, where we assume a lack of valuation competencies – and we are interested in the overall effort to analyse the report/valuation worksheet (auditor, plus his expert).

### *3.2. Case materials*

The independent variables are of between-participants type, all integrated in a 2 x 2 experimental design. We created 4 cells as interactions between FV estimate provider and FV measurement, each interaction being doubled for the case of weak internal control and strong internal control as quality. Table 3 below illustrates our logic and also includes detailed descriptions.

**Table 3. Case materials**

<i>FV measurement and reporting</i>	<i>FV provider</i>	
	Use of a third-party (Valuation Report)	Management's estimation (Management Valuation Worksheet)
	<i>Conditioned by the quality of internal control: weak or strong (a and b)</i>	

**FV measurement: Volume and type of quantitative data in the Valuation Document**

<p>Case material 1 – a standard and comprehensive Valuation Report or Management Valuation Worksheet (hereafter Valuation Document 1) containing a valuation based on the income approach; suggestions on checks are made to participants*:</p> <ul style="list-style-type: none"> <li>• How the inputs for Level 3** in the value hierarchy were found and if they represent the assumptions that market participants would use;</li> <li>• Particularly (for the income approach):</li> <li>✓ Whether the estimation of fair value was based on rents or quotations from an active market;</li> <li>✓ If the estimation of fair value was based on the listing of a real estate agency, if it comes from a similar market and if it reflects the market conditions.</li> </ul>	Case A/ a,b	Case B/ a,b
<p>Case material 2 – the Valuation Document 1, modified, containing a valuation based on the cost approach; suggestions on checks are made to participants*:</p> <ul style="list-style-type: none"> <li>• How the inputs for Level 3** in the value hierarchy were found and if they represent the assumptions that market participants would use.</li> <li>• Particularly (for the cost approach):</li> <li>✓ How were the input data obtained and whether these represent the assumptions that market participants would use;</li> <li>✓ If the estimate of the gross replacement cost and of the depreciation is sufficiently substantiated.</li> </ul>	Case C/ a,b	Case D/ a,b

\*inspired from ISA 540 (2019), section Risk assessment procedures and related activities, Application and others explanatory material: A40-41 and A 127-129 and respectively Appendix 1;

\*\* the approaches supposed by Level 3 (income, respectively cost); income approach is supposed to incorporate more predictive data than cost approach which uses historical and current data; also, income approach is supposed to use less subjective inputs than cost approach.

For all the cases, we provided participants with experimental materials - three versions of a valuation report designed to capture the elements to test. We titled the report 'Valuation Document'. The Valuation Document is an adaptation of a real Valuation Report obtained from a prestigious local firm specializing in property valuation. The report was made according to the valuation standards applicable in Romania, SEV, prescribed by ANEVAR, similar to the International Valuation Standards (IVS) and to professional customs, including, for example, valuator certification or limitative conditions. We first removed all the data that could divulge the valuator, his client and the property being subject to valuation. Then, we manipulated the Report according to our intentions as revealed in Table 3. Therefore, we replicated this Valuation Report (cases A, C) into a Management Valuation Worksheet in order to obtain the experimental materials for the cases B and D. Then, we adjusted the same Valuation Report in order to reveal as the valuator's opinion only one of the values and approaches applied in the valuation process, either income (cases A, B), or cost approach (cases C, D). An excerpt of the Valuation Report is provided in Appendix 1 (for the case A/cell A, as example).

For the item 'Volume and type of quantitative data in Valuation Document' (FV measurement), we provided, apart from the Valuation Document, a list of auditor steps to verify FV estimate, according to ISA 540 (2019), as measurement checks related to the nature of the valuation approaches used, and then as reporting, checks related to inputs, methods and assumptions made for the measurement. In order to simplify the presentation, according to Table 3, we will designate the cases for FV measurement as Income approach versus Cost approach.

In our discussions with the respondents, we made a brief reference to internal control, mentioning that it can be differentiated by features such as: existence of separation of tasks for the specialized personnel, existence of all supporting documents, existence of written procedures and policies for all activities.

Both dependent variables were quantified by the participants on a 7-point Likert scale, anchored by 1 (very low likelihood of a higher risk of misstatement/developing additional effort, and 7 (very high likelihood of a higher risk of misstatement/developing additional effort).

For the variable '*Higher risk of misstatement of FV estimation*', we recommended to participants that they link their assessment to ISA 540 (2019)'s requirements in the case of risk assessment procedures and related activities. As response to the assessed risks of material misstatement, the standard specifically recommends, in order to face the complexity, judgement (management bias) and estimation uncertainty, the following checks: whether the method and significant data and assumptions are appropriate in the context of the applicable financial reporting framework; whether significant data is relevant and reliable; whether management has properly understood or interpreted significant data; whether the integrity of significant data and assumptions has been maintained in applying the method; whether the calculations are mathematically accurate and appropriately applied; when management's application of the method involves complex modelling, whether judgements made have been applied consistently, the design of the model meets the measurement objective and is appropriate in the circumstances; if changes of the models of the previous period or adjustments to the output of the model are appropriate; when management has not appropriately addressed the estimation uncertainty, the auditor shall develop a point estimate or range.

In order for the participants in the experiment to better understand the variable 'A higher risk of misstatement of FV estimation', we also recommended them to consider the likelihood that the auditor that is the character in our case materials requires value adjustments. Appendix 1 Measurement bases of accounting estimates, para. 8 of ISA 540 (2019) provides a suggestion in the context of making an estimate. This is the nature and extent of any adjustments that may be made to the estimate arising from the application of method(s) used to build the estimate, for example to reflect practical limitations in the validity of the valuation technique(s) used in measuring what it purports to measure.

For the variable '*Likelihood that the auditor develops additional effort to further investigate the FV estimate*', we recommended that participants associate the additional effort with additional audit procedures during both the risk assessment phase and the gathering of audit evidence one. We also offered details of ISA 540 (2019) in the case materials, starting from one requirement of the extant ISA 540 (2019), *i.e.* to test how management (or its expert, we added) made the accounting estimate and the data on which it is based. ISA 540 (2019) adopted a control-based approach, much more applied and expanded than the extant ISA 540.

The case materials were reviewed with two experienced auditors and, after some clarifications, we proceeded to a pilot test with 160 first-year Master students, specializing in audit, accounting and, diagnosis and property valuation. The students had completed at the bachelor's and master's level two courses in the field of auditing and two other courses in the field of valuation of assets and companies, attesting their competencies in the field of our research study. Some refinements were made on case materials, as form of presentation. Also, we noticed the need to introduce a prior verification of the understanding of the central concepts of our study (as Appendix 2 presents).

### 3.3. Participants

The experimental materials have been applied through direct meetings within the regular workshops of the auditors registered under the Chamber of Financial Auditors in Romania (CAFR). The applications were carried out successively, in the period September – November 2019 in two meetings organized within two regional branches, located in representative cities from Romania, Transylvania region. The experiment subjects were assigned randomly, counting, overall, 76 participants. Each person filled two case materials, the type of the valuation document (Valuation Report of a third-party or Management Valuation Worksheet), as well as the type of internal control quality (weak or strong) being identical. We believe that our test is sufficiently powerful compared to our possibilities of obtaining data and other experimental studies in audit that involved between 97 and 106 participants (Earley et al., 2008; Griffin, 2014; Brink et al., 2016).

Before the experiment began, we performed some manipulation checks to verify the auditors' understanding of the issues investigated, namely FV provider and the level of the FV in the value hierarchy, associated with the valuation approaches. An excerpt from this preliminary case study, as we named it, is presented in Appendix 2. The results were satisfactory (almost all of the auditors provided accurate answers for FV provider and about 70% for the valuation approaches

associated to value levels). Considering the second part of these results, we continued to process the data in order to view the extent to which auditors rely on valuers or on their own knowledge in the field of real estate valuation methodology.

In the last part of the meetings, we asked the participants to fill in a short demographic survey. It has integrated variables related to the way auditors practice their profession (independently or within an audit firm), their position within the audit firm (partner, manager, senior or junior), experience in the audit profession as number of years, experience in FV auditing as number of cases / reports, frequency of training courses on FV (for the whole of their activity), respectively, if they have used the services of a valuator (internal, of the audit firm, or external) (for the whole of their activity). Specifically, for our experiment, we checked if the group of auditors has enough valuation expertise to understand the valuation process and if they used their own valuator.

Table 4 presents the form in which auditors practice the profession, respectively their general experience in audit and fair value matters.

**Table 4. Descriptive statistics for auditors' main characteristics**

		Position					
		Partner (n=32)	Manager (n=10)	Senior (n=10)	Junior (n=6)	Other situations (n=2)	Overall (n=76)*
<b>Affiliation**</b>							
Independent	No. of cases	13	4	2	0	0	19
Audit firm		19	6	8	6	2	41
<b>Audit experience (years)**</b>							
1-5 years	No. of cases	2	2	6	6	0	16
5-10 years		14	4	0	0	0	18
> 10 years		16	4	4	0	2	26
<b>Fair value audit experience**</b>							
Less than 15 cases	No. of cases	26	10	8	6	2	52
More than 15 cases		6	0	0	0	0	6
<b>Training on FV subject**</b>							
Yes, often	No. of cases	4	0	2	0	0	6
Yes, occasionally		16	8	6	2	0	32
No		12	2	2	4	2	22
<b>Appeal to auditor's own valuator**</b>							
Frequently	No. of cases	12	2	0	0	0	14
Occasionally		16	4	4	0	2	26
Never		4	4	6	6	0	20

\*16 missing information for certain variables; \*\*auditors were advised to judge the criterion for the last five years of their activity.

The majority of the 76 auditors have more than 10 years of experience in audit. However, for the Romanian context, we observed a limited fair value audit experience of our participants, less than 15 cases in their whole activity being the prevailing response. Another indicator of the relatively modest knowledge in valuation issues is the high percent, 90% of cases, in which auditors had only occasional trainings on FV matters or not at all. This observation is consistent with the results for the last two descriptive items related to the frequency of fair value trainings and the use of their own valuator. The auditors seem to resort quite often to a valuation expert (for 23% of cases frequently and for other 43% occasionally).

#### 4. Research findings

As statistical tests proposed, those correlated to our aim are descriptive statistics, univariate and multivariate analysis and, respectively, mean values and simple effects test.

##### 4.1. Multivariate and univariate analysis

We started our statistic tests with the multivariate analysis (three-way MANOVA) in order to see if there is an interaction effect between our three independent variables (FV measurement/FV reporting, FV provider and Internal control) on the two continuous dependent variables ('Likelihood that the auditor develops additional effort to further investigate the FV estimate' and 'A higher risk of misstatement of FV estimation'). The variables FV measurement and FV reporting are complementary and hence we ran a test for each one. We wanted to see whether the effect of FV provider on the dependent variables taken together is dependent on the value of the other independent variable: FV measurement/FV reporting and Internal control, the results being shown in Table 5.

**Table 5. Multivariate analysis results (three-way MANOVA)♦**

<i>Independent variables</i>	<i>F(Wilk's k)</i>	<i>p-value</i>	<i>Partial η<sup>2</sup></i>	<i>Observed Power</i>
<b>FV measurement</b>	0.610	0.546	0.018	0.148
<b>FV provider</b>	6.241	0.003** *	0.161	0.881
<b>Internal control quality</b>	9.302	0.000** *	0.223	0.973
<b>FV measurement x FV provider</b>	2.035	0.139	0.059	0.405
<b>FV measurement x Internal control quality</b>	3.689	0.030**	0.102	0.658
<b>FV provider x Internal control quality</b>	2.333	0.105	0.067	0.456
<b>FV provider x FV measurement x Internal control</b>	1.931	0.153	0.056	0.387

♦between 'Likelihood that the auditor develops additional effort to further investigate the FV estimate' and 'A higher risk of misstatement of FV estimation' as dependent variables, respectively all the independent variables; the tests for FV measurement and FV reporting were run separately

\*\*\*, \*\*, \* significant at 1%, 5%, respectively 10%

Notes: Partial  $\eta^2$ , measured on a scale of 0 to 1, indicates the proportion of the variance in the dependent variables explained by the independent variables; Observed Power, measured on a scale of 0 to 1, indicates the likelihood that an effect will be detected.

Overall, according to Partial  $\eta^2$  Test, the variables FV provider and Internal control quality - independently, respectively FV measurement - in combination with these first variables, have a significant contribution in explaining the variance of the model, meaning an effect on the additional effort to verify FV estimate and on the risk of misstatement in FV estimation. The statistical significance denoted by *p-value* and the values of *Observed Power* test confirms these results.

Our next step was to determine if there is an interaction effect between our three independent variables on the dependent variables (each one taken separately). The results for the dependent variable 'Likelihood that the auditor develops additional effort to further investigate the FV estimate' are presented in Table 6.

**Table 6. Univariate analysis (three-way ANOVA)**

<i>Independent variables</i>	<i>Sum of squares</i>	<i>df</i>	<i>F</i>	<i>p-value</i>
<b>FV measurement</b>	0.647	1	0.389	0.535
FV provider	0.060	1	0.036	0.850
Internal control quality	28.635	1	17.223	0.000***
FV measurement x FV provider	6.519	1	3.921	0.052*
FV measurement x Internal control	9.259	1	5.569	0.021**
FV provider x Internal control	4.855	1	2.920	0.092*
FV provider x FV measurement x Internal control quality	3.974	1	2.390	0.127

*R Squared = 0.331; Adjusted R Squared = 0.260*

\* with 'Likelihood that the auditor develops additional effort to further investigate the FV estimate' as dependent variable

\*\*\*, \*\*, \* significant at 1%, 5%, respectively 10%.

The analysis related to FV measurement reveals the significance of the internal control quality ( $p=0.000$ ) for the auditor's effort. It looks like the valuator type (external or internal) and the valuation process *per se* suggested by FV measurement do not significantly impact the auditors, in terms of additional audit effort, if these variables are taken independently. Thus, FV provider is important for the auditors when it is linked to FV measurement approaches (income, cost) ( $p=0.052$ ); and also when the quality of the internal control is added to these combinations. The internal control quality is also determinant when the auditor focuses on FV measurement without considering the valuator type (FV provider) ( $p=0.021$ ).

We also ran the univariate analysis for the other dependent variable, 'A higher risk of misstatement of FV estimation' and the untabulated statistics are similar in terms of results.

#### 4.2. Mean values and test of simple effects

We continued our analysis with other tests to see whether there were differences in auditors' assessed level of 'Likelihood that the auditor develops additional effort to further investigate the FV estimate' based on FV provider type, quality of the internal control and FV measurement. Table 7 reveals the perceptions of auditors on the Likert scale (as mean values) and the effects on the dependent variable.



**Table 7. Means and simple effects♦**

<i>Panel A – related to FV measurement – when the quality of internal control is weak</i>			
FV provider			
FV reporting	Use of third-party estimation	Management's estimation	Test of simple effects
Income approach	4.67 <sup>a</sup> (0.541) <sup>b</sup> n=12	5.00 (0.365) n=10	F=0.298 p=0.588
Cost approach	4.00 <sup>a</sup> (0.632) <sup>b</sup> n=6	4.60 (0.267) n=10	F=0.665 p=0.421
Test of simple effects	F=0.875 p=0.356	F=0.394 p=0.534	
<i>Panel B – related to FV measurement – when the quality of internal control is strong</i>			
FV provider			
FV reporting	Use of third-party estimation	Management's estimation	Test of simple effects
Income approach	3.67 <sup>a</sup> (0.414) <sup>b</sup> n=12	2.00 (0.267) n=8	F=10.492 p=0.003***
Cost approach	3.50 <sup>a</sup> (0.327) <sup>b</sup> n=8	4.00 (0.378) n=8	F=0.787 p=0.382
Test of simple effects	F=0.105 p=0.748	F=12.590 p=0.001***	

♦ with 'Likelihood that the auditor develops additional effort to further investigate the FV estimate' as dependent variable

<sup>a</sup> mean; <sup>b</sup> standard error

\*\*\*, \*\*, \* significant at 1%, 5%, respectively 10%

The results show that only if the internal control is strong as quality, the auditors really differentiate the FV issues (Panels B and D). Therefore, the cases when the quality of internal control is weak, do not present statistical relevance as differentiated perceptions (Panels A and C), but the mean values suggest a preference for a third party valuation, the management's estimation requiring more audit effort, independently of the valuation approaches applied or the issues of the valuation process disclosure quality.

When the quality of internal control is higher, it can be observed from panel B that the FV provider has an impact on the possible effort that the auditor is going to make in order to investigate more the FV estimate, for one of the valuation approaches, income approach that use predictive inputs ( $p=0.003$ ), but in the sense of an additional effort of verification (mean of 3.67 for the use of a third-party versus 2 for the management estimation). Also, auditors differentiate better between the two valuation approaches when it comes to the management

estimation ( $p=0.001$ ), instead of a third party valuation. For this situation, the probability of additional effort increases in the case of cost approach compared to income approach, according to the mean values (mean of 4 for cost approach versus 2 for income approach).

Untabulated statistics revealed similar results when we changed the dependent variable, using 'A higher risk of misstatement of FV estimation' instead of 'Likelihood that the auditor develops additional effort to further investigate the FV estimate'. These results can be seen as robustness tests, supporting our data quality and auditors' message.

## 5. Discussion

A *first observation* is that the multivariate and univariate analysis (Tables 5 and 6) provide a first clue about the importance of Internal control quality, FV provider and FV measurement in relation to auditors' additional effort to verify FV estimate and higher risk of misstatement of FV estimation. The variable Internal control quality acts independently and this outcome is explicable knowing the relevance of this issue for the audited company in relation to the entire audit process. The variables FV provider and FV measurement act in combination between them and Internal control quality in order to generate a reaction on the auditor's part. These results confirm our choice to link auditors' perception with the internal control quality and the relevance of the investigation of the valuator type (third-party or management).

A *second observation* is that for 6 out of 8 cases the mean values indicate the preference for a third-party versus management estimation, associated with a lower audit effort (Table 7, all the panels). But if we look at the statistical significance of these findings, denoted by the simple effects test, it appears that auditors discern between FV provider types only in the case of a strong quality of internal control occurrence (Table 7, Panel B). The explanation is, in our view, that when the quality of the internal control is weak, auditors do not further look into valuation process nuances and detecting new risks, because they have already observed the global risks for the auditee. The statistical significance for the type of valuator appears for the use of Income versus Cost approach, when auditors claim less audit effort, and when the valuation is provided by the management instead of a third-party. This result leads us to believe that auditors do not discern very precisely between the type of valuator (third party or management employee) in correlation with the specificity of valuation process, *i.e.* FV measurement. Therefore, our initial supposition was also confirmed by the descriptive statistics that revealed a low degree of FV use and audit (as training and missions). We infer that, in the Romanian context, auditors display a moderate understanding of the valuation approaches' content and their technical application. Additionally, companies would rather resort to a FV estimation specialist, often suggested by the auditor, who subsequently heavily relies on the competencies of this experienced and well-known valuation expert. The consequence is that the auditor does not investigate himself, in a proper manner, the valuation process.

A *third observation* is linked to the two approaches we investigated, income and cost, both as level 3 in the fair value hierarchy, which are little discussed in the context of the audit and the risk of estimation in the literature. The income approach could be more reliable due to its anticipative viewpoint, but at the same time, more volatile and subjective because it is based on predictions. On the

other side, cost approach is more anchored in the present, sometimes also using historical data, and in the same time subjective because of the need to update the past inputs and the choices for current data on the market. However, for 3 out of 4 cases (in Table 7, Panels A and B), independently of the quality of the internal control, and if we look at the mean values, contrary to our expectations, the income approach is reported as requiring equal or more audit effort than the cost approach. The exception, statistically significant, occurred for the case of a strong internal control quality, in which case the auditors would make a greater effort to verify the approximate cost, and when the estimate is performed by the management, not a third party.

Correlating observations 2 and 3 about the type of valuator and the type of valuation approach, we assert that our prediction P1 is partially verified: *Auditors distinguish between the use by the management of a third party versus an internal valuation, and consider that a third party valuation decreases the estimation risk and audit effort, when cost approach is applied instead of income approach for FV measurement and when the internal control is strong.* The first part of P1 is validated, but the second reverses the type of valuation approach compared to our prediction.

## 6. Conclusions

Our results based on mean values are in line with those obtained by Brink et al. (2016) who found that the auditors consider the FV estimation less risky if it is generated by an external source. However, even if the mean values confirm that issue, simple effects test do not confirm this preference. Considering Salzsieder's (2016) suggestion that auditors have the tendency to verify in detail the Valuation report when disclosed, our outcomes suggest this is valid in the case of income approach application, when the effort of the auditor is greater than when checking management estimation. Therefore, the choice for a third party, associated with less audit effort and risk of estimation, does not occur in all the scenarios, but under some constraints and only partially for some of the issues of the valuation process.

It seems that the income approach creates greater concern for the Romanian auditors compared to the cost approach. A possible explanation is that the income approach has a more sophisticated (market-linked) viewpoint. But in its essence, this choice is contradictory because the cost approach is more technical (surfaces, technical functionalities, and other engineering aspects), and therefore more incompatible with the expertise typical for the accounting profession. As such, we raise a red flag for auditors, for both approaches based on models, income as well as cost, both incorporating a high degree of complexity. Also, we plead for a more consistent guidance in auditing standards in valuation issues that could improve, in a setting like the Romanian one, the lack of trainings on FV subject matter.

Our results could contribute to the existing literature, firstly by enlarging the discussion on FV estimates audit effort and risk of estimation over the entire process of valuation, not only FV provider, but also FV measurement issues. We confirm that, in specific circumstances, audit additional effort and risk of estimation are smaller for the auditor when FV is estimated by a third party, instead of by the management. These specific circumstances are strong quality of the internal control and a component of FV reporting linked to the valuation methodology.

Secondly, we opened a new avenue of discussion on the FV estimate issues for non-financial assets (financial assets being usually analysed in relevant papers), particularly, tangible assets, for which the valuation process is even more difficult, prone to risk of estimation, and hence to audit risks as well.

Thirdly, we prove that the quality of the valuation report and process in terms of sufficient description of inputs and approaches and a reasonable volume of valuation data could minimize the audit risk and additional audit effort. There is a prerequisite for this statement, a good understanding of the valuation process by the auditors.

These results could be of interest for the audit profession, as to awareness raising and training on valuation issues. Also, audit, as well as financial reporting regulators could improve their recommendations on technical issues related to property valuation (non-financial assets), especially when it comes to level 3 of FV measurement. For an emergent economic context, this type of assets and this type of valuation (the models, income and cost approaches) are more likely to occur as measurement and disclosure in financial statements, and therefore their fair values are more exposed to audit risks.

Our results should be interpreted in the light of certain limitations. A possible limitation is the exploratory type of the study, *i.e.* the investigation of the fixed assets valuation process from the perspective of audit risk. Another limitation is related to the sample size used in the experiment.

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## **Appendix 1. Excerpt from the case material (for the cell A/a)**

### **1) BACKGROUND**

Agatha Popescu, financial auditor, just arrived at the office of ALPHA, a joint-stock company that owns industrial type properties. It was February 2019 and Agatha had the task of verifying the values of the assets reported in the financial statements at the end of 2018 for ALPHA. Agatha verifies the estimation of fair value required for revaluation, according to IAS 16.

[The case material focuses on one of the real estate of ALPHA, Building 1 (for simplification, the valuation of the related land is ignored)

### **2) INFORMATION CONCERNING FAIR VALUE AT DECEMBER 31, 2018**

Agatha received from the executive director of ALPHA a valuation report of a consultant (third-party) regarding the value of a real estate, the Building 1. The estimate was classified as Level 3 (IFRS 13)\*.

The details of the valuation performed by the valuator, contained in the Valuation Document (Valuation Report), are given in the Case Material which follows.

### **3) ELEMENTS TO BE OBTAINED BY THE AUDITOR ON THE ESTIMATION**

The estimation of the fair value was made by the valuator of ALPHA, as it appears from the Case Material - Valuation Report.

Suggestions on the elements to be observed in the Valuation Report:

- to take into account the level of estimation: 3 / income approach;
- whether the estimate of fair value was based on rents or quotations of an active market;
- whether the estimate of fair value was based on the quotation of a real estate agency, if it comes from a similar market and if it reflects market conditions...

### **4) INFORMATION ON INTERNAL CONTROL**

Before deciding on the risk of estimating fair value, Agatha integrates the conclusions of the entire audit team regarding the internal control of ALPHA. The evaluation of internal control based on the specific stages of the audit leads to the idea that it has a low quality (weak internal control).

### **5) CONCLUSIONS ON THE ESTIMATION OF THE VALUE**

Agatha expresses her conclusions regarding the risk of estimating the value for her audit mission. To do this, she makes two observations and uses the Likert scale to position her opinion.

A. Likelihood that the auditor (Agatha) will make additional efforts to verify in more detail how to estimate fair value

1	2	3	4	5	6	7

Where 1 - very low likelihood of making extra effort; 7 - very high likelihood of making extra effort

B. Higher risk of misstatement in FV estimation made by the auditor (Agatha)

1	2	3	4	5	6	7

Where 1 - very low likelihood of estimation risk occurrence; 7 - very high likelihood of estimation risk occurrence

\*This excerpt from a case material (taken as an example, one between 16 different case materials) is a one-page preamble that explains the context to the auditors. The preamble continued with the valuation document (as appropriate, third party Valuation report or Management's valuation worksheet) in which the auditor noted the assessment made by the valuator and recognized how was apply a specific approach: income or cost.



## Appendix 2. Excerpt from the manipulation checks

Recognize, according to the descriptions below, without making any calculation, for the Ski Unit (Level .....), and then for the Accommodation Unit (Level .....), the fair value levels, according to the IFRS 13 hierarchy. Then indicate for each Unit the source of the estimate: Ski Unit - source .....; Accommodation Unit - source...

<i>Value levels</i>	<i>Source of estimation</i>
<p><i>Level 1</i> Market comparisons with identical assets Market approach from the valuation methodology</p>	<p><i>Internal</i> Data provided by the company: management/specialized personnel</p>
<p><i>Level 2</i> Market comparisons with similar assets Market approach from the valuation methodology</p>	<p><i>External</i> Data provided by an external source/ consultant</p>
<p><i>Level 3</i> Valuation models Approaches from the valuation methodology: income, cost</p>	

Stela Ionescu, chief accountant for GROUP BETA was sent on July 20X8 to the offices of GAMMA, one of BETA's subsidiaries. Although GAMMA seemed a promising acquisition two years ago, the below average snowfall and the current crisis in the real estate market have seriously affected the initial successful projections. As a result, Stela's mission was to evaluate assets to detect potential impairment.

GAMMA activities are divided into two Units: Ski and Accommodation. Each Unit represents a separate business, so that each one's cash flows are largely independent of the other Units. Stela will then determine the fair value for each Unit.

The Ski Unit earns revenue from the sale of lift tickets and other services, such as ski and snowboard lessons, equipment rentals and other recreational activities. Stela consulted with a local valuator who told her that, although there are no business units identical to the GAMMA ski resort, two other very similar ski areas were sold in the last year. Stela will use these sales to calculate a multiple (applied to sales revenue) and estimate the value of GAMMA's Ski Unit. Comparable sales are: Pietra Craiului Mountain, which generated average annual sales revenue of \$ 6,500,000, was sold for \$ 11,375,000; and Predeal Resort, which generated average annual sales revenue of \$ 13,000,000, was sold for \$ 22,750,000. GAMMA generated average annual sales revenue of \$ 5,500,000.

The Accommodation Unit .....

## THE REGIONAL STRUCTURE OF HIGHER EDUCATION AND THE ROLE OF DISTANCE LEARNING

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**Abstract.** In the time of the COVID-19 pandemic the importance of distance learning is being enhanced, while formal, full-time, face-to-face university education is being converted to distance learning. The study explores the role of the Universities in distance learning market and reveals the factors that influence the students' university choice. The regional embeddedness of higher education in the Western Transdanubian region is analysed, highlighting the catchment areas of the region's universities. The educational commuting of distance learning students to the region increases purchasing power, has a positive impact on the rental market, the labour market and can boost future settlement. Commuting, university selection and training selection behaviours of correspondence and distance training of students is examined using questionnaires. The aim is to establish whether the university selection of correspondence training students is influenced by distance and by the characteristics of the student's place of residence. The findings show that distance is one of the main factors during the university-selection process in the case of any kind of distance learning.

**Keywords:** lifelong learning, distance learning, regional development, tertiary education.

**JEL Classification:** I21, I23, O18, R23.

### 1. Introduction

The use of distance learning techniques is becoming more important for higher education during these pandemic times, when face-to-face teaching faces tremendous challenges. The institution of the Internet has caused a paradigm

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change in distance education during the 21 century. „Twenty-first-century distance learning is an electronically driven, synchronous, or asynchronous and web based enterprise” (Eaton, 2010, 386). The distance learning process may be recorded for asynchronous presentation. The all day/any time availability of these courses offers maximum flexibility time wise for learning and is well suited for adult, working learners. „Interaction in the course takes place via written messages or audio/video posts to discussion boards, forums, wikis, and blogs“ (Clark, 2020, 410). Distance education is an organizational form of Higher Education (HE) in which instructional provisions, tutorial interactions, monitoring of practice, as well as individual control of learning may take place via media which make the simultaneous personal presence of tutors and students avoidable (Fritsch, 2001, 3781). The wide range of distance learning courses increases the attractiveness of the Universities. Commuting students discover the labour market opportunities in the region and the settlement of a highly skilled workforce contributes to the economic growth of the region.

Previous studies on motivations to continue higher education (Rámháp, 2017) and school choice (Polónyi, 2012) have focused on full-time students. There is a dearth of research that investigated the university choice preferences of correspondence students. In particular, the clustering by location is a rather new feature.

The terms and expressions used in HE do not form a concise, universally accepted system. In the Hungarian higher education system, we can find full-time and part-time training. The part-time training is called correspondence training, which is an asynchronous and web based distance learning using e-learning methods. Electronic communication plays a prominent role in distance learning, while traditional forms of education are avoided. The most common method is “blended learning”, which is a mix of e-learning and traditional forms of education (“classroom learning” and “face-to-face learning”). It can also be called „fostered open learning” according to Juszczuk and Kim (2020). Hereinafter, in Hungarian HE we mean distance training by correspondence.

In the past fifty years, the major part of discussions relating to higher education were linked to the appearance of mass education (Hrubos, 2016, Trow, 2000), thus, for example, to the operation and accessibility of the system or to the management of ever-increasing student numbers. Martin Trow agrees with the opinion of research universities that the creation of mass higher education should be promoted and momentum should be given to Internet-based universal accessibility. He also expressed that expanded learning opportunities promoted by information and communications technologies (ICT) highlight opportunities for improving innovations and the quality of educational systems.

Internationally, the definition of e-learning is explicitly related to training based on electronic communication (sharing of web-based training materials, video and audio), without making a difference between school-based (formal) and non-school-based (informal) training.

According to the definition of lifelong learning used by the EU, it includes “all learning activity undertaken throughout life, with the aim of improving knowledge, skills and competences within a personal, civic, social and/or employment-related perspective” (COM, 2001, 9, UNESCO, 2014).

Lifelong learning is connected with the growing average age of the population (E-ruralnet, 2011, Muñoz et al., 2013, Slowey and Schuetze, 2012, Klug et al., 2014).

The average age in the OECD countries was 28 years in the 1950s, 38 years in 2010 and it might be as high as 45 years by 2100 (OECD, 2019). Regarding lifelong learning, the study of Slowey and Schuetze (2012) designates three categories with respect to students, which are the following: nature of entry/enrolment skills, route of access, and primary motivation for learning.

The question is if the distance between home address and the location of the parent institution has any significance, if the training is delivered in some sort of virtual space. There are usually many electronic communications between the university and the students, who may use e-materials and communicate with their fellow students, e.g. over the phone or via email, chat, Messenger, Facebook or Twitter.

In the opinion of Csepeli (2016), with the rapid growth in the use of technological tools and the move of Generation Z into the online space, the consequent social changes are unforecastable. He calls members of this generation 'digital natives', since they were born into the online space, the online reality, which is the primary space for them. This space can be shared with the "digital immigrants" willing to experience this reality. A significant ratio of correspondence students can be regarded as digital immigrants.

In the first years of the new century, many researchers investigated the issue of the digital divide (Godard et al., 2000, Clark, 2003, Henning and Westhuizen, 2004). Szarvák discussed Internet penetration rate, as the factor defining digital inequality (Szarvák, 2011). In Western societies the Internet is currently accessible by 80-90% of the population, while the digital divide still presents a problem to all generations, except young people.

In addition to student headcount, the rate of participation within the appropriate age group is a characteristic of higher education within a given country. According to 2019 data, 26% of the Hungarian population have a higher education qualification, which falls short of the OECD average (38%). Hungary ranks well with respect to secondary education, with a respective share of 59%, as compared to the average of 41%. The share of the population with higher education qualifications is below 30% in the majority of countries of the CEE Region (Slovakia, Czech Republic), while it is not far from the OECD average in Austria with 33.4% (OECD 2019). "Lifelong education is far from being safe from the waves of globalization of economic and social life" (Dabija et al., 2016, 34)."

## **2. Influence of Universities on the Western Transdanubian Region**

The Western Transdanubian region is a rather developed region in Hungary and Győr-Moson-Sopron is the richest county (if we disregard the capital city of Budapest). (In 2018, GDP was 121.8% of the national average). The city of Győr is a county seat with a population of 130000; it is a regional centre with a significant industrial base and a favourable transport geographical location that is also home of Széchenyi István University.

In Hungary there are 64 higher education institutions, 28 of which are operated by the government (86.63% of the overall number of students), 23 are managed by churches (8.34% of students) and 13 are privately run (5% of students).<sup>1</sup> Most institutions (42) are located in Budapest, the country's biggest educational market,

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<sup>1</sup> Data in 2018. In 2021 the legal form of more state universities was changed, they are operated as foundation forms

while outside Budapest, institutions are organized in local hubs and county seats, where there was previously no higher education (Tatabánya) or where one-sided higher educational specialization has evolved (Székesfehérvár), but there are also examples of institutions established in educational blind spots and the centres of underemphasized regions (Keszthely). The institutions employ up-to-date tools to develop their offers, as evidenced by the use of new training method elements (distance learning, e-learning), the renewal of the line and quality of services (Zalaegerszeg, Szombathely) and the use of an ever-increasing number of tools of higher education marketing (Kuráth, 2007, citing Rechnitzer, 2009).

Interregional activity was accelerated by the development of dual-level training (Bologna reform). As a result, new regional higher education centres have evolved. Győr became such a centre in Western Transdanubia, while a campus in Mosonmagyaróvár is also managed by Széchenyi University (with 337 full-time and 228 correspondence students) in addition to the Győr seat. 53% of the overall number of students attend faculties located in Budapest (149 466 students). The other institutions that hold a significant share of interregional activity are Debrecen, Pécs, Szeged, Veszprém and Miskolc (Rechnitzer, 2009). The regional structure of Hungarian higher education is depicted in Table 1.

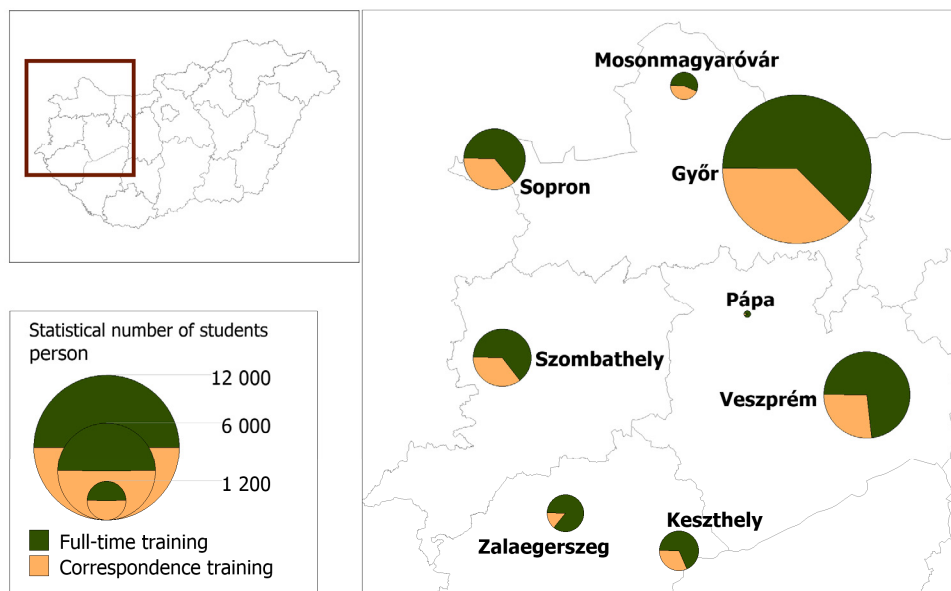
**Table 1. Regional structure of higher education (2018)**

NUTS2	Overall number of students		Full-time students		Number of academic teachers		Overall number of students per 1000 inhabitants		GDP per capita as a percentage of the national average	
	2007	2018	2007	2018	2007	2018	2007	2018	2007	2018
Western Transdanubia	28428	22943	16610	16419	1235	1171	28,5	23,3	100,69	101,75
Central Transdanubia	27268	24854	16983	16545	1284	795	24,6	23,5	92,32	93,23
Southern Transdanubia	37486	21338	21827	15011	2476	2260	38,7	24,1	67,18	69,14
Central Hungary	172435	85678	113709	57986	10701	12110	60	28,4	165,04	150,68
Northern Hungary	39171	27199	15414	18089	1490	1265	31,3	24,0	62,73	69,02
Northern Great Plain	50060	37881	31385	25520	2373	2372	32,8	25,9	62,06	64,32
Southern Great Plain	42856	31405	26965	21958	2817	2546	31,9	25,2	66,99	73,01
Hungary	397704	281461	242393	200130	22376	22519	39,5	28,8		

Source: compiled by the author based on CSO data

In the academic year of 2018, 28.6% of the higher education students, i.e. 81.5 thousand students studied their education in the form of non-full-time training. Therefore, the share of students involved in correspondence training continued to increase (90%). The Western Transdanubian Region involves three counties: Győr-Moson-Sopron, Vas, and Zala Counties. Within the region, training opportunities are offered by 6 higher education institutions, according to the distribution of students presented in the following figure (Fig. 1).

**Figure 1.** Student numbers in the Western Transdanubian Region and Veszprém county in 2018



Source: compiled by the author and prof. Tamás Hardi based on Educational Authority data

In addition to Széchenyi István University (with 11 557 students) the Theological College of Győr also operates in the city, but represents a much less significant weight (with 89 students). The 200-year-old agricultural university of Mosonmagyaróvár merged into Széchenyi University with its respective 602 students. Sopron University is likewise the only institution operating in the town of Sopron with 2 457 students enrolled at its economic and engineering faculties. Although the Veszprém-based Pannon University (4 457 students) does not belong to the West-Transdanubian Region, it clearly impacts the region on account of its catchment area to the west, its training courses organized within the region and its proximity to Győr (70 km).

Szombathely and Zalaegerszeg are more recent western hubs, where no universities are based, only local campuses operate. Local courses are run in Szombathely by Eötvös Loránd University (1 863 students, university seated in Budapest), the Theological College of Győr (42 students; university seated in Győr) and the University of Pécs (288 students; university seated in Pécs), while in Zalaegerszeg by Budapest Business School (433 students; university seated in Budapest), Pannon University (115 students) and the University of Pécs (384 students). An agricultural course has also been launched by the Georgikon Faculty of Pannon University in Keszthely with 1098 students.

Among the counties with higher education institutions, the proportion of students per one hundred thousand people is higher in those counties where large universities have a long history. Győr-Moson-Sopron county is an exception, where this ratio is 30.1%, despite the fact that the Széchenyi István University in Győr only has a 15-year-old history.

### **3. Overview and analysis of the students of correspondence training**

Due to ICT (Information Computer Technology) development distance learning centres have been established at universities all over the world in recent decades. The Distance Education Centre has been also operated at Széchenyi István University in Győr since 2004, therefore, the better utilization of infrastructure and human resources, the tasks of student training, such as separate student affairs management (training organization) for courses, course organization, timetable compilation, training material preparation and course book ordering, are carried out more efficiently.

In the case of distance learning, communication is fundamentally conducted through an electronic framework with the support of an up-to-date Learning Management System (LMS). This is especially important from the aspect that the catchment area of the university can be widened to include the entire country.

Subsequently, we can redefine the correspondence training offered in Győr within the formal framework, as a learning activity that forms part of higher education and that aims to develop the knowledge-based society via the fundamental tool of electronic communication.

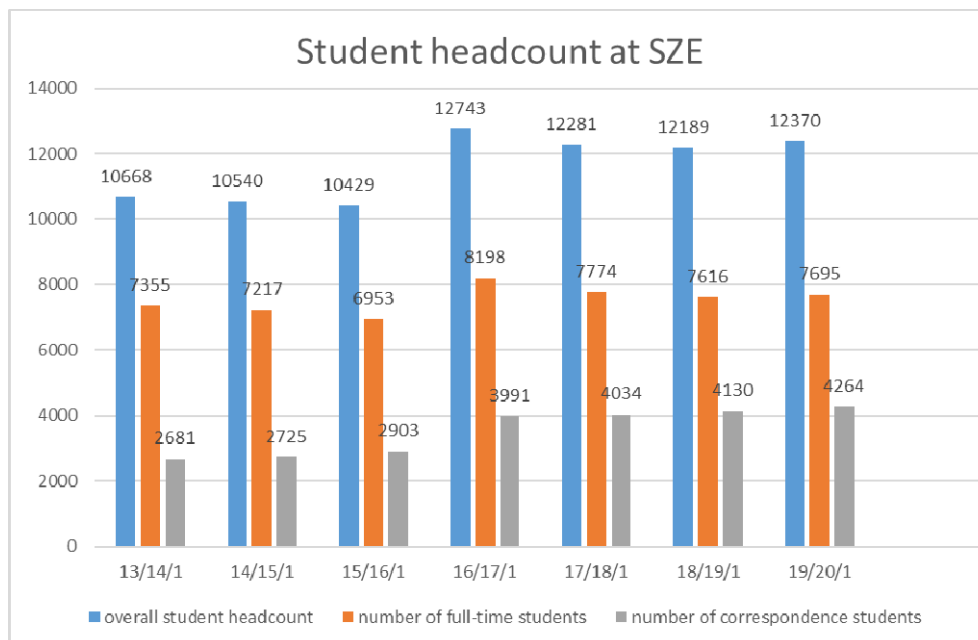
Széchenyi István University is offering a sub centre in Budapest, where students are able to comply with their exam obligations. Student drain by universities of the capital city from other parts of the country is a well-known phenomenon, therefore, it is of strategic importance that students living farther away do not have to travel to Győr in the e-learning framework. It is sufficient for the student to indicate that they intend to take their exams in Budapest and they have the chance to complete the exam tasks of the given course, via the electronic examination system, in the chosen location.

The Széchenyi István University Distance Learning Centre delivers services to a significant number of students, launching 14 000 courses annually (1 course refers to 1 course subject registration instance) and running close to 150 course e-materials. The Centre organizes 11 exam days during the exam period, which involves 11 000 exams being taken by students of the different courses, also via the e-learning framework system. The exams taken in Budapest account for 20% of the number of overall exams.

### **4. Local headcount analyses of students**

Student headcounts have evolved in a very favourable manner at Széchenyi István University during the past 7 years (Fig. 2). Overall student headcount was above 12 000 during the last four years and the number of correspondence students exceeds 50% of the full-time student headcount, which puts the university in a special position, even on a regional scale.

**Figure 2.** Student headcount at Széchenyi István University, 2013-2019



Source: compiled by the author

At country level the 23 to 29 age group is the most numerous in non-full-time higher education, accounting for 36% of the overall number of students (29.6 thousand individuals). Student headcounts decrease, as the age group is increased with 17% (13.6 thousand students) belonging to the 30 to 34, 13% (10.6 thousand students) to the 35 to 39, 12.5% (10.2 thousand students) to the 40 to 44 and 13.5% (11 thousand students) to the 45+ age group.

In the following section we will analyse the students of Széchenyi István University attending courses according to correspondence learning. The necessary data for the analysis have been gathered from the NEPTUN System. Data access was granted by the university course organization department. Data from the 2020/21 academic year were used in the analyses with new enrolled correspondence students, N=1 239.

Typical age and gender distributions of these students can be seen in Tab. 2.

The sample includes 676 female respondents (54%), of an average age of 30.16 years, with the oldest female student being 61 years old. Male students accounted for 46% and had an average age of 29.5 years, with the oldest student being 59 years old. Correspondence students are predominantly already working therefore, their motivations are different from regular students, with the goal being the acquisition of new skills or the retention of the inspiratory impact of the family background or of the place of work.

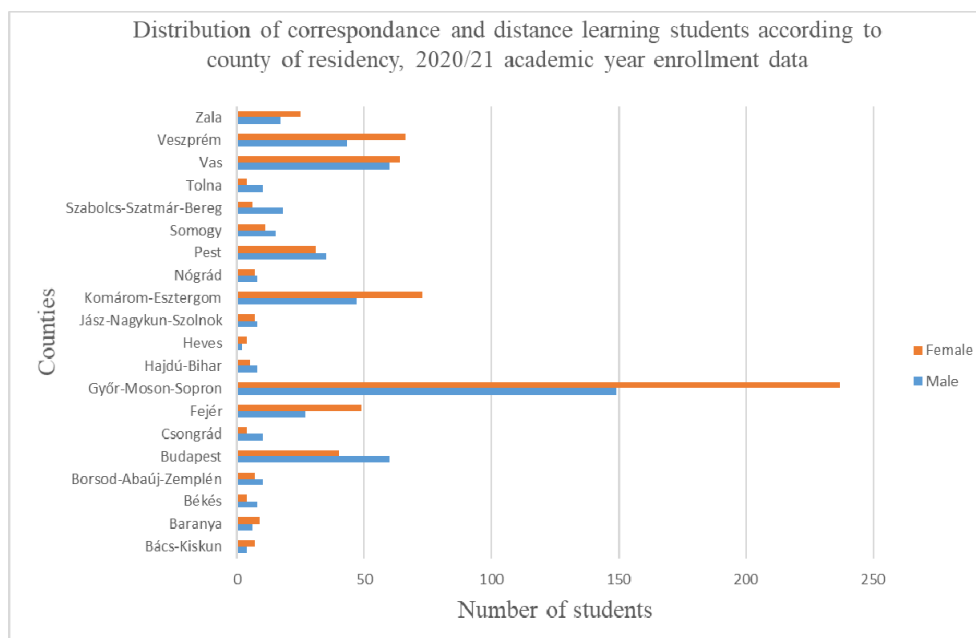


**Table 2.** Age and gender distribution of correspondence students that have enrolled at Széchenyi István University for the 2020/21 academic year, N=1 239

Age groups	Frequencies		Total %
	male	female	
18-20	28	43	5.75%
21-25	193	230	34.25%
26-30	158	146	24.62%
31-35	62	73	10.93%
36-40	54	73	10.28%
41-45	34	76	8.91%
46-50	19	26	3.64%
51-60	11	9	1.62%
<b>Overall</b>	<b>559</b>	<b>676</b>	<b>100.00%</b>

When examining the residency of students, we can conclude that a predominant majority of students live in Győr-Moson-Sopron county, but the share of students from Komárom-Esztergom and Veszprém counties and from Budapest is also significant (Fig. 3). Therefore, the geographical location of the university is a decisive factor.

**Figure 3.** Number of correspondence students that enrolled at Széchenyi István University for the 2020/21 academic year, by place of residence (NUTS 3), N=1 239



Source: compiled by the author

## **5. Methodology**

### *Participants*

The participants of the study were undergraduate correspondence students at Széchenyi István University during spring semester in 2019-2020 academic year. When selecting the target group, we included all students that had an active status in the given semester, i.e. who have validly enrolled for the semester and have validly registered for course subjects. The online questionnaire consisted of 42 questions: socio-demographic data, career choice, application, impressions regarding the university, learning methods and motivations, and the learning process and the Covid19 pandemic.

Data in the study were collected using online forms sent out in the NEPTUN student's administration module. A total of 512 responses were received. This study analyses the relationship between the university selection preferences and geographical place of their residence.

In the following section we intend to determine whether university selection by correspondence students is influenced by geographical distance and the characteristics of the students' place of residence.

### *Data analysis*

Researchers use different statistical methods to develop and confirm their research findings. Descriptive statistics (e.g., frequency, percentage, correlation) were conducted for the data analysis. A cross tabulation analysis of the answers (e.g., Pearson Chi-Square, p-value, Cramer's V value, Gamma value) showed that hypotheses gained empirical support.

## **6. Results and Discussion**

Universities with a tradition of distance learning, a usable LMS platform, and experience in electronic examinations perform better during the pandemic. Distance learning students take their exams in the usual way, manage their own schedules and work-study-family balance better. Their e-learning skills and satisfactions are more positive than full-time students.

Hardi explained the commuters' behaviours: "Compared to the other regions of Hungary, the number and proportion of commuters is high in North Transdanubia: 45% of employees in this region commute, which is the highest among all regions of Hungary. This fact is due not only to the high level of economic development but also to the special characteristics of the settlement network" (Hardi – Szörényiné, 2014, 41). The results show that the distance learning area and the commuting area overlap.

Primary data collection has confirmed that our correspondence students came primarily from Győr-Moson-Sopron county and the neighbouring counties. Our questionnaire research has also shown this relation; therefore we formulate the following hypothesis:

H1: Correspondence students come primarily from the nearby villages and small towns.

Relationship between settlement structure and commuting is significant, the Pearson Chi-Square value is 152.717, and the p-value <0.001. The Cramer's V value is 0.381 which is a medium strong relation between the two features.

**Table 3. Relationship between settlement structure and commuting**

		How do you ensure that you are in Győr on contact hour weekends/exam days?			Total
		Others*	In Győr**	I commute	
settlement structure	village	13	7	100	120
	town of small/medium size	27	14	107	148
	county seat/city	21	96	55	172
	capital	23	11	53	87
Total		84	128	315	527

Notes \* I stay at friends/relatives or in guest house, hotel, Airbnb, couch surfing

\*\* live in a student home; rent an apartment; have a permanent place of residence in Győr.

Distance does not cease to be a factor, even with the use of e-learning. Proximity and availability of accessible affairs management and exams is important. The average commuting time is only half an hour for 7.6 percent of respondents, 23.1% commute for between half an hour and an hour, 41.5% commute for between 1 and 2 hours and 27.8% commute for more than 2 hours. This does not qualify as excessive, since they do not have to make this journey on a daily basis.

**Table 4. Relationship between settlement structure and time spent with commuting**

		Time spent with commuting on one way				Total
		half an hour	between 0.5 and 1 hour	between 1 and 2 hours	more than 2 hours	
settlement structure	village	20	28	34	18	100
	town of small/medium size	4	33	43	28	108
	county seat/city	0	9	26	20	55
	capital	0	3	28	22	53
Total		24	73	131	88	316

Pearson Chi-Square value is 54.437, and the p-value <0.001. The Gamma value is -0.191 that means the medium strong, negative sign relations between two features (students do not commute from the capital, and from remote large cities).

The next question directly inquired whether physical distance played an important factor when students chose this form of training. Distance is important to 70.7% of students, 29.7% drive their own car when commuting and another 4.3% commute by car together with others. Public transport is used by 22.4% of the respondents – the county seat of Győr can be easily accessed either on motorway or by rail, while the inferior road network in Western Transdanubia is one of the best-maintained in the county. 29.3% have indicated that distance wasn't really a factor for them, whilst 14.3% only travel to Győr for exams, therefore they were not very concerned about the physical distance between their home and the university. With respect to analysing the university selection preferences of students, to the question "Please indicate which factors had the most influence on your selection" 43.8% of the responses confirmed that respondents have chosen the University of Győr, because "*the university is close to where I live*".

**Table 5. TOP 5 factors of university selection**

<b>TOP 5 factors of university selection</b>	<b>N</b>	<b>Percentage</b>
the university is close to where I live	233	18.2%
good labour market opportunities	211	16.5%
can be easily accessed using public transportation	111	8.7%
enough and high-quality curriculums	111	8.7%
I have studied here before	106	8.3%

With respect to whether they would again choose the university, if they could rethink their application, students gave the university an average score of 7.79 on a Likert scale of 10, which we can consider as an exceptionally high value. A significant part (47.4%) of students already had some earlier higher education qualification, with the typical level of bachelor degree (40.9%) or higher-level specialist training (19.4%). Another interesting feature is that correspondence students have predominantly obtained their first degrees through full-time training (75.8%), switching to the correspondence time schedule later on. One obvious explanation is that a significant proportion of correspondence students already have jobs during the educational training, so they could not take another full-time course.

The responses given to the question "why they chose distant learning/ correspondence training" also confirmed that "this is the only way they can study while working" (89.2%). With respect to specialization, 61.1% of respondents indicated that they have chosen a scientific discipline that is different to the previous one(s).

## **7. Conclusion**

Higher education in Hungary has retained its characteristics since the appearance of mass higher education (1990). Budapest continues to play a dominant role, concerning both the number of students (53% of the overall student headcount) and the number of educational institutions. Notwithstanding the Budapest dominance, the position of other higher educational centres in other parts of the country is also strengthening, bringing educational opportunities closer to potential students. Certain

local university centres can be isolated and highlighted, as statistical regions (NUTS2) however, the catchment area of correspondence training expands over the border of regions and counties. The results of the questionnaire research have confirmed our hypothesis, namely that “The university selection of correspondence training students is influenced by distance and the characteristics of the student’s place of residence.” We were able to confirm this statement, on one hand, through statistical data collection from the residency data originating from the student database, and on the other hand, the questionnaire confirmed that the accessible distance of the educational centre is important to students. 43.8% of the responses confirmed that respondents chose the University of Győr, because “the university is close to where I live”. Most of the students come from villages and small-towns. Rámháp explains that when choosing an institution, students prefer to choose a region that is suitable for settlement and employment (Rámháp, 2017). However, he does not distinguish between full-time and part-time students, the latter being under-represented in the surveys. We agree with this, but this research has also shown that for distance learning students the role of distance is important in their choice of institution. Széchenyi University is a young university with dynamic growth, capable of increasing the number of distance learning students. Nowadays, the trend is to put distance learning techniques into practice, which is why this topic should be pursued. This study explores the relationship between the university selection preferences and geographical place of their residence. The study does not compare the preferences of distance learners and full-time students during the pandemic.

As we have discussed, the role of regional centres also extends to higher education. In the case of Győr, the following factors jointly contribute to the expansion of the catchment area of the university: favourable transport-geographical position, good accessibility, wide training spectrum at the university, favourable labour market conditions, low unemployment level and the second highest average income after Budapest.

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## MODELLING TOTAL FACTOR PRODUCTIVITY IN A DEVELOPING ECONOMY

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**Abstract.** Total factor productivity is an important driver of economic growth. It is therefore important to understand its determinants. This will help to enhance it and accelerate economic growth. The objective of this paper is therefore to investigate drivers of total factor productivity in Angola. The investigation covers the period 1995 – 2018. It is conducted for selected sectors of the economy. The results show that foreign direct investment has a positive effect on total factor productivity in all sectors. Increase in openness of the economy and depreciation the exchange rate have a positive effect on total factor productivity in the manufacturing sector. However, an increase in these two variables is associated with a decrease in total factor productivity of the primary and service sectors. The results indicate that a rise in inflation is associated with a decrease in total factor productivity in the manufacturing and service sectors. However, an increase in inflation is positively associated with an increase in total factor productivity in the primary sector. Increase in official development assistance impact negatively on total factor productivity in the primary and service sectors. This variable has a positive effect on total factor productivity of the manufacturing sector. The implication of these results is that Angola should pursue policies that attract foreign direct investment in order to ensure sustainable total factor productivity growth. The impact of other drivers such as openness of the economy, inflation, official development assistance and exchange rate depends on sectors. This implies that it is important for Angola to implement policies, which are specific to sectors. This will help to enhance the growth of total factor productivity.

**JEL classification:** O40; O47; O49; O55.

**Keywords:** Angola; total factor productivity; ARDL, cointegration, growth accounting.

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## 1. Introduction

The primary objective of government and policy makers in any economy is the acceleration of economic growth. It is not surprising that many studies such as Ahmed (2008) and Saleem et al (2019) identified total factor productivity as one of the main drivers of economic growth. Kim and Park (2018) states that an improvement in total factor productivity helped countries to move from middle income to high income group. The importance of economic growth led to many studies that developed models, which can be used to investigate its determinants (of economic growth). One of the early studies that developed models for drivers of economic growth is Solow (1956). The model in Solow (1956) put emphasis on the diminishing marginal return on capital, and assumes that population and savings rate are exogenous. This model does not take into account the depreciation and changes in the technology. It assumes that technology is exogenous, and this has been identified as a shortcoming of this model.

The Solow (1956) model is followed by the endogenous growth. The endogenous growth theory differs from the Solow model in the sense that it identifies technological changes as the most important variable that drives economic growth. According to Lucas (1990), economic growth depends on human capital. Lucas (1990) acknowledges that physical capital accumulation and human capital accumulation are the key variables, which determine economic growth.

There are several theoretical and empirical studies on the determinants total factor productivity in both developed and developing countries. Some of them acknowledge that the degree of openness, investment in knowledge and education are the main drivers of total factor productivity in both developed and developing countries (Nelson and Phelps, 1996). Other studies such as Romer (1990) postulated that research and development, infrastructure have a positive impact on total factor productivity. According to Khalid (2012), macroeconomic variables such as exchange rate, inflation, fiscal deficits and government size are important determinants of total factor productivity. Total factor productivity is influenced by human capital through the facilitation, adoption and implementation of new technologies. Human capital can also influence total factor productivity through the facilitation of domestic production and technological innovations.

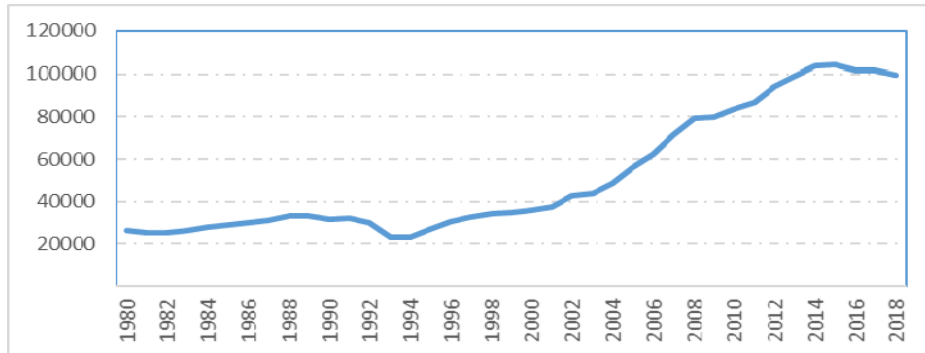
There are various channels through which variables such as trade openness affects total factor productivity. These channels include (among others) utilisation of comparative advantage, knowledge and technological transfer, exposure to competition and economics of scale. Studies such as Danquah (2006) investigate the drivers of total factor productivity in Ghana. The results indicate the effect of inflation on total factor productivity is negative. This can be attributed to the fact that inflation has an adverse effect on capital accumulation and demand for real money. Inflation also has a negative effect on supply of labour and cause inefficiency in the allocation of resources. The quality of institutions is one the important determinants of total factor productivity. This is confirmed by Fadiran and Akanbi (2017) on South Africa. The results of this study indicated that the relationship between institutions and total factor productivity is positive. According to Fadiran and Akanbi (2017), the reason for the positive relationship between the two variables is because it is regarded as an expansion of investment, technological innovation and ultimately economic growth.

Most studies estimated total factor productivity at an aggregate level. They did not examine the determinants of total factor productivity at sectoral level. Investigating the total factor productivity at an aggregate level not be appropriate and can result in blanket policy for the sectors. Blanket policy for all sectors is not appropriate. That is because sectors are not similar and if that is case, different policies will be required for different sectors. Furthermore, it is important to note that there are studies conducted on the determinants of total factor productivity in developing countries including those in Africa. These studies do not include Angola. That means studies on the determinants of total factor productivity in Angola are scanty of non-existent, despite the fact that it has been identified as one key drivers of economic growth. This suggest that it is important to investigate the determinants of total factor productivity in Angola. This study from previous research in the sense that it estimates total factor productivity at sectoral level. The determinants of total factor productivity will be estimated and investigated for selected sectors of the Angolan economy. According to our best knowledge, this is the first study that investigate the determinants of total factor productivity at sectoral level (instead of aggregate level), and specifically on Angola. The rest of the study is structured as follows. Section 2 briefly discuss economic overview and the sources of growth in Angola. Section 3 reviews the literature on the determinants of total factor productivity. Section 4 presents the methodology. The results are presented in section 5. The conclusion is provided in section 6.

## **2. Economic overview and sources of growth**

Angola is a country that has faced economic challenges since it independence from Portugal in 1975. It has been exporting a significant amount of crude oil, but its GDP remained relative low for several years. The relative low GDP despite the fact that Angola has been the second largest oil producer in Sub-Saharan Africa is attributed to the civil war that lasted for the period 1975 – 2002. This made it difficult for Angola's GDP to grow during that 30 year period. The trends in Angola's GDP for the period 1980 to 2018 is presented in Figure 1. Figure 1 shows that the country's GDP fluctuated between US\$20 and US\$ 40 billion. The civil war that affected Angola resulted in fluctuating economic activities. The civil war ended in 2002, and this resulted in Angola's GDP to increase from US\$ 42.3 billion in 2002 to US\$101 billion in 2015. This is a huge increase and according to Angola National Bank (2015), it indicates that the GDP increased by almost three times as much during the period 2002 to 2015. Angola National Bank (2015) indicated further that this is an increase of more than 30 times since the country's independence in 1975.

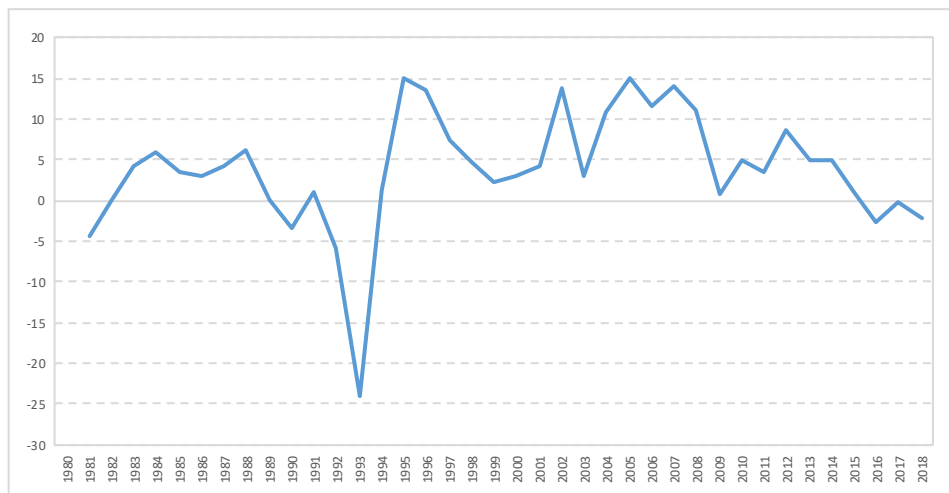
**Fig. 1: Trends in Angola's GDP for the period 1983-2018 (measured in US dollars)**



Source. Data for the figure are obtained from the World Bank (2018). An earlier version of this figure appeared in Eita and Pedro (2020)

The economic growth of Angola for the period 1983 to 2018 is presented in Figure 2. Angola recorded a negative economic growth rate 24 percent in 1993. This decline in economic growth rate can be attributed to the fact that there was an election in 1992 which was won by the ruling party, People's Movement for the Liberation of Angola (MPLA). The election results were rejected by the opposition party or rebel movement, the National Union for the Total Independence of Angola (UNITA). This resulted in the continuation of the civil war and the economic growth was negatively affected. Growth picked up in 1995 due to prospects of peace in Angola. After the end of the civil war in 2002, Angola's growth picked up, reaching 14% in 2010. The growth rate for the period 2015 to 2017 was on average 8.6%.

**Fig. 2: Angola's economic growth, 1983 to 2018**



Source: Data for the figure are obtained from the World Bank (2018). An earlier version of Figure 2 was presented in Eita and Pedro (2020)

The country achieved high growth rate after the end of the civil war in 2002. Angola achieved a high growth rate of 11.2 percent in 2008, but the economy declined in 2016 and 2018 as a result of a fall in prices of international crude oil. Despite this external shock, Angola's economy remains strong with growth expected to increase above 3.2% in 2020 predicted by International Monetary Fund.

The sources of Angola's economic growth are presented in Table 1. The first covers the period 1995 – 2001 and this is associated with the civil war that affected Angola. The second is the post-civil war period of 2002 – 2018.

The sources of growth (in Table 1) were computed using a growth accounting technique proposed by Solow (1956). The results of Table 1 shows that during the period 1995 to 2001, the economic growth in the primary sector in Angola was driven by labour and productivity. The contribution of capital to economic growth was low during this period. The period 2002 -2017 is associated with economic growth in the primary sector that was driven by labour and capital. The contribution of productivity was low during this period. The higher contribution to growth by labour and productivity in the primary sector during periods 1995 to 2001 may partly be due to political uncertainties and the civil war that the country experienced during that period. In addition, during the civil war, farmers in Angola were receiving draft deferments as well as loans for increasing production through mechanization, land acquisition, and increased use of fertilizers. This could explain the higher contribution of productivity to growth.

The period 1995 and 2001 is associated with economic growth in the manufacturing sector that was led by growth capital. The contribution of labour and productivity to economic growth was low during this period. The low contribution of labour and productivity to economic growth can be attributed to the fact that during Angola's civil war, the agricultural sector was the principal source of employment for the majority of the country's population. There were also many people that were employed in the military. During the civil war, most resources were dedicated to the military and investment in the manufacturing sector was low. This resulted in low productivity contribution to economic growth during this period. The years 2002 – 2018 represent the post-civil war period which led to an increase in investment in the manufacturing sector. It is not surprising that the leading contributors to economic growth in the manufacturing sector were capital and productivity. The post-civil war period of 2002 - 2018 is associated with the resumption of prospecting for new minerals and oil crude exploration. Investment in new technology and oil exploration increased and this made the prospect of the manufacturing sector to be optimistic. Hence, the contribution by productivity to economic growth increased from 0.05% in the period 1995 - 2001 to 2.06% during the period 2002 - 2018.

Finally, Table 1 shows that economic growth in the services sectors was driven by all three factors during the period 1995 - 2001. The three factors contributed almost equally to growth in the service sector (although productivity's contribution was higher than that of capital and labour). Economic growth in the service sector was driven by productivity and capital during the period 2002 - 2018. The post-civil war period (2002-2018) is associated with the prospecting for new investments in the financial sector, tourism and telecommunication. The contribution to economic growth by productivity increased from 0.71 % during the period 1995 - 2001 to 2.04 % for the period 2002 - 2018.

**Table 1: Source of Angola's economic growth**

	<b>1995-2001</b>	<b>2002-2018</b>
<b>Primary Sector</b>		
Capital contribution	0.15	0.62
Labour contribution	0.39	0.45
<i>Total input contribution</i>	<i>0.54</i>	<i>1.07</i>
Total factor productivity contribution	0.46	0.37
<i>Total output growth in primary sector</i>	<i>1</i>	<i>1.44</i>
<b>Manufacturing sector</b>		
Capital contribution	0.59	2.5
Labour contribution	0.10	0.08
<i>Total input contribution</i>	<i>0.69</i>	<i>2.58</i>
Total factor productivity contribution	0.05	2.06
<i>Total output growth in manufacturing sector</i>	<i>0.74</i>	<i>4.64</i>
<b>Service sector</b>		
Capital contribution	0.47	1.98
Labour contribution	0.51	0.46
<i>Total input contribution to growth in service sector</i>	<i>0.98</i>	<i>2.44</i>
Total factor productivity contribution	0.71	2.04
<i>Total output growth in the service sector</i>	<i>1.69</i>	<i>4.48</i>

Source: Authors' own computation. The earlier version of this table was presented in Eita and Pedro (2020)

### 3. Literature review

There are many studies conducted on the drivers of total factor productivity. These studies can be classified into two groups. The first group consists of studies that look at cross country or panel data studies. The second group has research that deal with single country studies. We start with the first group of studies. Phillip (2012) used panel autoregressive distributed lag (PARDL) to investigate the determinants of total factor productivity for four

economies (Nigeria, Mexico, Turkey and Indonesia). The results indicate that human capital and government stability have positive and significant effects on TFP. Other variables such as foreign direct investment (FDI) and corruption have negative effect on TFP. The negative effect of foreign direct investment on total factor productivity is also found by Abdullah and Chowdhury (2020). This study is on several developing countries in both Africa and other regions such as Latin America. The results indicate that foreign direct investment does not promote trade. This can be attributed to the fact that there is a lack of absorptive capacity which prevent a direct association between foreign direct investment and total factor productivity. The negative effect of foreign direct investment on total factor productivity is also supported by Olomola and Osinubi (2018) for the economies of Mexico, Indonesia, Nigeria and Turkey. However, studies such Adnan et al (2019) conducted on four South East Asian economies revealed that foreign direct investment is associated with an increase in total factor productivity.

The determinants of total factor productivity for eight East Asian economies were investigated by Liao and Liu (2009). The results show that there is evidence of export-led growth Korean and Singapore economies. The results, further reveal that productivity– led export growth in the economies of China, Hong Kong, Indonesia, Philippines and Malaysia. The causality between exports and productivity I South Korea, Singapore and Taiwan bi-directional. However, causal relationship between export and productivity is unidirectional in China, Hong Kong, Indonesia, Malaysia and Philippines. If runs from productivity of exports.

Akinlo (2006) uses pooled time series and cross-sectional data to investigate macroeconomic variables that determine total factor productivity in 34 Sub-Saharan African countries for the period 1980 -2002. The results of the study reveals that macroeconomic variables such as external debt, inflation rate, agriculture value-added as percentage of GDP, the lending rate and local price deviation from purchasing power parity are significantly and negatively related to total factor productivity. Other variables such as human capital, export-GDP ratio, credit to private sector as percentage of GDP, foreign direct investment as a percentage of the GDP and manufacturing value-added have a significant positive impact on total factor productivity.

Garzarelli and Limam (2019) uses stochastic frontier analysis to investigate the role of physical capital accumulation and TFP in explaining output growth in 36 sub-Saharan African (SSA) countries for the period 1996-2014. The stochastic frontier analysis is a methodology that decomposes total output growth into input growth, technological change and technical efficiency change. The results shows that the contribution of physical capital to total growth exceeds that of TFP in 22 out of the 36 countries. The result withstands issues of TFP-induced effects on inputs.

Malikane and Chitambara (2018) investigated the impact of foreign direct investment on total factor productivity for 45 African countries. The investigation covers the period 1980 – 2012. The generalised method of moment is used for this purpose. The study reveals that foreign direct investment has a positive effect on economic growth.

It is important to mention that there are also studies that focus on single country. These studies belong to the second group as explained earlier in this section. Myasnikov (2018) investigates the drivers of total factor productivity growth in several regions of Russia. Specific emphasis was put on the importance of spillovers and agglomeration effects. The results indicate that firms from regions with large capitals and high shares of credit in gross regional product (GRP) are

more actively expanding into neighbouring regions. The links with local firms in host regions create positive correlations between total factor productivities in such host regions and their home regions. Ludmila (2016) investigates the impact of the productivity sector in Latvian on economic growth. It applies the Cobb-Dougllass and trans log production functions to control the changes in the sources of total factor productivity. The results show that an increase in productivity sector in Latvian adds value to total output growth, which in turn has a positive effect on total factor productivity.

The drivers of total factor productivity are investigated by Nunung (2016) for Indonesia's palm oil production sector. The results of the investigation show that total factor productivity in Indonesia's palm oil production sector is determined by land, pesticide, fertilizer and labour. The autoregressive distributed lag (ARDL) was applied by Wadad (2016) to investigate the drivers of total factor productivity growth in Lebanon. The investigation reveals that total factor productivity in Lebanon is driven by trade openness and credit extended to the private sector. The positive effect of openness on total factor is confirmed by Haider et al (2019) for India. The results of this study revealed that openness has a positive effect on total factor productivity. The causality runs from openness to total factor productivity. According to Misra (2020), an increase in variables such as irrigation, health, electricity infrastructure, road infrastructure, financial development and education are associated with an increase in total factor productivity for India.

The data envelopment analysis (DEA) approach was used by Idris (2007) to analyse the drivers of total factor productivity growth in Malaysia for the period 1971 – 2004. The Malinquist Production Index was used to decompose total productivity into technical change and technical efficiency change. The analysis show that the TFP growth of the Malaysian economy for the entire test period had not been satisfactory due to negative contribution from technical efficiency. Furthermore, the results show that the Malaysian economy was able to cause shifts in its own frontier due to innovation. The study also concluded that the economy needs an enhancement of its productivity-based catching-up capability.

Shao et al (2016) used a panel data fixed effect regression to investigate the determinants of total factor productivity in several sectors of China. The results indicate that the nonferrous metal sector is one of the main determinants of total factor productivity in China. The results indicate that an increase in production of nonferrous metal sector causes China's total factor productivity to rise. Although this study uses panel data, its focus is solely on China. Research and development is also one of the important determinants of total factor productivity. Increase in research and development causes a rise in total factor productivity. This is confirmed by Biatour and Dumont (2011) for Belgium, and Castiglionesi and Ornaghi (2011) for several Spanish manufacturing firms. Cobb-Dougllass and trans log production functions were applied by Chaudhry (2009) to investigate the determinant of total factor productivity in agriculture and manufacture sectors of Pakistan. The results also reveals that research, development, and trade openness impact positively on total factor productivity growth in both primary and secondary sectors.

The effect of foreign direct investment on total factor productivity was found to be negative. This was revealed by Aitken and Harrison (1999) for various plants in Venezuela. The negative effect of foreign direct investment on total factor productivity can be explained by the fact that foreign-owned firms recruit most employees from outside Venezuela, and this deprive domestic plants of their

services. Azeroual (2016) also found a negative effect of foreign direct investment from France to the manufacturing sector of Morocco. Adnan et al (2020) shows that foreign direct investment is associated with a decrease total factor productivity for Pakistan.

The relationship between total factor productivity and technical efficiency in the manufacturing sector of Ethiopia was investigated by Abegaz (2013) for the period 1996 – 2009. The results indicate that due to large technical inefficiencies in the manufacturing sector in Ethiopia, the variation in output growth had a negative effect on total factor productivity. This study concludes that improvement in technical efficiency in Ethiopia's manufacturing sector is associated with an increase total factor productivity.

Ogunleye and Ayeni (2008) investigated the link between trade and productivity growth for the Nigerian economy with special focus on the export-productivity nexus in the manufacturing sector. The study used the Engle-Granger co-integration technique for the period 1970 - 2003. The study revealed that there is bi-directional causality between export and total factor productivity and this provides support for a link between export growth and productivity growth. The results suggest that Nigeria should look outward in order to promote and develop the manufacturing sector towards increasing production, not only for domestic consumption but also for export.

A review of two groups of the empirical literature shows that most studies investigated determinants of total factor productivity at an aggregate level. They did not investigate determinants of total factor productivity at sectoral level. The sectors are different and policies based on aggregate results may only benefits some sectors. Other sectors may not benefit from policies based on the results of total factor productivity determinants at an aggregate level. Hence, it is important to investigate determinants of total factor productivity at sectoral level. This will ensure that policies are sector-specific. Previous studies did not investigate the determinants of total factor productivity in Angola. Contrary to those previous studies, this study will compute total factor productivity in different sectors of the Angolan economy. The motivation behind this study is that there are large numbers of studies in Africa on determinants of total factor productivity but these studies do not focus on Angola. Therefore, Angola is the focus of this study.

## 4. Methodology

### 4.1 Empirical model

Following an extensive review of the theoretical arguments by the neoclassical (Jorgensen, 1967), exogenous (Solow, 1956; Swan, 1956) and endogenous (Romer, 1986; Lucas, 1988) and the earlier empirical studies (such as Spilioti and Vamvoukas, 2015), the total factor productivity growth dynamics equation in this study can be expressed as follows:

$$TFP_{pt} = \alpha_0 + \alpha_{1pt} INF + \alpha_{2pt} OPEN + \alpha_{3pt} ER + \alpha_{4pt} FDI + \alpha_{5pt} ODA + u_{pt} \quad (1)$$

$$TFP_{mt} = \alpha_0 + \alpha_{1mt} INF + \alpha_{2mt} OPEN + \alpha_{3mt} ER + \alpha_{4mt} FDI + \alpha_{5mt} ODA + u_{mt} \quad (2)$$

$$TFP_{st} = \alpha_0 + \alpha_{1st} INF + \alpha_{2st} OPEN + \alpha_{3st} ER + \alpha_{4st} FDI + \alpha_{5st} ODA + u_{st} \quad (3)$$



Where, the subscripts  $p$ ,  $m$  and  $s$  stands for primary, manufacturing and service sectors.  $TFP$  is total factor productivity in different sectors;  $INF$  represents inflation rate;  $OPEN$  represents openness of the economy (to international trade);  $ER$  represents the exchange rate;  $FDI$  represents the net inflows of foreign direct investment;  $ODA$  represents the official development assistance received per capita.

A rise in inflation indicates macroeconomic instability. An increase in inflation can discourage economic growth and result in higher interest rates. This discourage entrepreneurs from financing their projects. This suggest that inflation is expected to cause a decline in total factor productivity (Espinoza, 2012). This is also supported by Olomola and Osinubi (2018).

An increase in openness of the economy cause the country to be integrated in the global economy. This increase competition and innovation of the domestic firms and results in a rise of total factor productivity (Espinoza, 2012). The positive effect of openness on total factor productivity is also supported by studies such as Haider et al (2019).

According to Rodrik (2008) an appreciation of the exchange is not favourable for total factor productivity. However, if the domestic currency depreciates, total factor productivity will increase.

The effect of foreign direct investment on total factor productivity is an empirical question. If foreign direct investment is used to finance infrastructure development and education, total factor productivity will increase (Ahmed, 2008). However, there are some few studies that concluded that the effect of foreign direct investment on total factor productivity can be negative. That means, it should not be surprising if the coefficient of foreign direct investment on total factor productivity is negative. Abdullah and Chowdhury (2020) also support the view that the effect of foreign direct investment on total factor productivity can also be negative.

Official development assistance can benefit the economy if it is used to finance activities such as education and infrastructure. Official development assistance also make resources available for the financing of economic activities that enhance innovation. This suggest that the coefficient of official development assistance is expected to be positive.

#### 4.2 Data

Annual data are used in this study and the estimation covers the period 1995 – 2018. Although, the observations are observations can be regarded as few, the equation will be estimated using a technique that is appropriate for limited observations. The variables used for estimation of the empirical model are explained as follows. GDP deflator is used as a proxy for inflation ( $INF$ ) and data for this variable are obtained from World Bank's World Development Indicators ( $WDI$ ). Openness of the economy ( $OPEN$ ) is computed as the ratio of the sum of exports and imports to GDP. Angolan Kwanza/US dollar is used to represent the exchange rate ( $ER$ ). Foreign direct investment ( $FDI$ ) is proxied by net foreign inflows. The net official development assistance per capita is used as a proxy for official development assistance ( $ODA$ ). The data for these four variables ( $OPEN$ ,  $ER$ ,  $FDI$  and  $ODA$ ) are also sourced the World Bank's  $WDI$ .

The Cobb-Dougllass production function is used to compute data for total factor productivity for the different sectors. Cobb-Douglas production function links output to factor inputs (capital and labour) and productivity (along the lines of the neoclassical Solow-Swan model). The Cobb-Douglas production that is used to derive total factor productivity in the three sectors is specified as follows:

*Primary sector*

$$Y_{pt} = A_{pt} K_{pt}^{\alpha} L_{pt}^{1-\alpha} \quad (4)$$

$$A_{pt} = TFP = Y_{pt} / (K_{pt}^{\alpha} L_{pt}^{1-\alpha}) \quad (5)$$

*Manufacturing sector*

$$Y_{mt} = A_{mt} K_{mt}^{\alpha} L_{mt}^{1-\alpha} \quad (6)$$

$$A_{mt} = TFP = Y_{mt} / (K_{mt}^{\alpha} L_{mt}^{1-\alpha}) \quad (7)$$

*Tertiary sector*

$$Y_{st} = A_{st} K_{st}^{\alpha} L_{st}^{1-\alpha} \quad (8)$$

$$A_{st} = TFP = Y_{st} / (K_{st}^{\alpha} L_{st}^{1-\alpha}) \quad (9)$$

Where  $Y$  is the output in different sectors,  $K$  is the real capital stock and  $L$  is the total employment in different sectors,  $\alpha$  is the elasticity of output with respect to capital stock and  $1-\alpha$  is the elasticity of output with respect to labour. The subscripts  $pt$ ,  $mt$ ,  $st$  represent primary, secondary and tertiary sectors. Constant return to scale is enforced in such a way that the sum of  $\alpha$  and  $1-\alpha$  must be equal to 1.

**4.3 Estimation technique**

This study uses autoregressive distributed lag (ARDL) estimation technique in order to estimate the empirical models specified in equation (1) to (3). Firstly, unlike other estimation techniques such as the Engle and Granger (1978) two-two step and the Johansen and Juselius (1990), it does not require that all the series be integrated of the same order. Secondly, it can be applied regardless of whether the regressors are integration of  $I(0)$ ,  $I(1)$  or equally integrated, as long as they are not integrated of  $I(2)$  or more (Pesaran et al., 2001). Thirdly, it is valid even for small sample data sets and on variables with different optimal lags. Lastly, with ARDL, the Error Correction Model (ECM) can be derived from the ARDL model through a simple linear transformation, which integrates short-run adjustments with long-run equilibrium without losing long-run information (Pesaran et al., 2001). Therefore, the ARDL estimation technique for equations 10, 11 and 12 is specified as follows:

$$\begin{aligned}
\Delta TFP_{pt} = & \beta_0 + \sum_i^n \beta_1 \Delta \ln TFP_{pt-1} + \sum_i^n \beta_2 \Delta \ln INF_{t-1} + \sum_i^n \beta_3 \Delta \ln OPEN_{t-1} \\
& + \sum_i^n \beta_4 \Delta \ln ER_{t-1} + \sum_i^n \beta_5 \Delta \ln FDI_{t-1} + \sum_i^n \beta_6 \Delta \ln ODA_{t-1} + \alpha_1 TFP_{pt-1} + \alpha_2 \ln INF_{t-1} \\
& + \alpha_3 \ln OPEN_{t-1} + \alpha_4 \ln ER_{t-1} + \alpha_5 \ln FDI_{t-1} + \alpha_6 \ln ODA_{t-1} \dots \dots \dots \epsilon_T
\end{aligned}
\tag{10}$$

$$\begin{aligned}
\Delta TFP_{mt} = & \beta_0 + \sum_i^n \beta_1 \Delta \ln TFP_{mt-1} + \sum_i^n \beta_2 \Delta \ln INF_{t-1} + \sum_i^n \beta_3 \Delta \ln OPEN_{t-1} \\
& + \sum_i^n \beta_4 \Delta \ln ER_{t-1} + \sum_i^n \beta_5 \Delta \ln FDI_{t-1} + \sum_i^n \beta_6 \Delta \ln ODA_{t-1} + \alpha_1 TFP_{mt-1} + \alpha_2 \ln INF_{t-1} \\
& + \alpha_3 \ln OPEN_{t-1} + \alpha_4 \ln ER_{t-1} + \alpha_5 \ln FDI_{t-1} + \dots + \alpha_6 \ln ODA_{t-1} \dots \dots \dots \epsilon_T
\end{aligned}
\tag{11}$$

$$\begin{aligned}
\Delta TFP_{st} = & \beta_0 + \sum_i^n \beta_1 \Delta \ln TFP_{st-1} + \sum_i^n \beta_2 \Delta \ln INF_{t-1} + \sum_i^n \beta_3 \Delta \ln OPEN_{t-1} \\
& + \sum_i^n \beta_4 \Delta \ln ER_{t-1} + \sum_i^n \beta_5 \Delta \ln FDI_{t-1} + \sum_i^n \beta_6 \Delta \ln ODA_{t-1} + \alpha_1 TFP_{st-1} + \alpha_2 \ln INF_{t-1} \\
& + \alpha_3 \ln OPEN_{t-1} + \alpha_4 \ln ER_{t-1} + \alpha_5 \ln FDI_{t-1} + \\
& \alpha_6 \ln ODA_{t-1} + \dots \dots \dots \epsilon_T
\end{aligned}
\tag{12}$$

The ARDL procedure is performed in two steps. The first step is the determination of the existence of a long run relationship among variables. This is a test for cointegration and uses bound test of Pesaran and Shin (1999) and Pesaran et al. (2001) for large samples and Narayan et al. (2005) for small samples. These tests contain two types of critical values. These are lower or I(0) and upper or I(1) limits. The computed F-test is used to test for cointegration. If the computed F-test statistic is below the lower limit, I(0), the null hypothesis of no cointegration cannot be rejected. This means that there is no cointegration. If the computed F-test statistic is between the upper and lower limit, it cannot be determined whether there is cointegration. If the computed F-test statistic is above the upper limit, then the null hypothesis of no cointegration is rejected. Rejection of the null hypothesis of no cointegration implies that there is cointegration. If there is cointegration, it is appropriate to proceed to the error correction model (ECM).

The coefficients of the lagged ECM is expected to be negative and statistically significant, indicating the existence of a long-run relationship between the variables. It also indicates that there is adjustment to equilibrium.

## 5. Empirical results

### 5.1 Unit root test

It is important to test for the stationarity of the variables before estimating the empirical models. This process involves unit root test. The unit root test is done in order to establish the univariate characteristics of the variables. It is important to do a unit root test in order to ensure that there is no I(2) variable. The presence of I(2) is not appropriate for estimating the empirical models using ARDL. The Augmented Dickey-Fuller (ADF) test is used to test for stationarity of the variables and the results are presented in Table 2. The results for unit root tests are presented in Table 2. Table 2 shows that INF, ER,  $TFP_{pt}$  and  $TFP_{st}$  are I(0). The variables OPEN, FDI, ODA, and  $TFP_{mt}$  are I(1). Table 2 shows that there are no I(2) variables. That means it is appropriate to use ARDL estimation technique in order to estimate empirical models.

**Table 2: Unit root test results**

Variables	Level		First difference	
	No trend	With trend	No trend	With trend
INF	-12.210***	-7.489***		
OPEN	-1.538	-1.502	-2.498**	-4.380***
ER	4.717**	-7.667***		
FDI	-1.054	-2.629	-4.590***	-4.370***
ODA	-1.708	-2.195	-3.026**	-2.923*
$TFP_{pt}$	-3.040**	-0.656		-3.519*
$TFP_{mt}$	-0.518	-2.268	-4.098***	-4.167***
$TFP_{st}$	-3.527**	-3.22		-4.097**

Note: \*/ \*\*/\*\*\* indicate stationarity at 10%, 5% and 1% significance levels.

$TFP_{pt}$  is total factor productivity of the primary sector;  $TFP_{mt}$  is total factor productivity in manufacturing sector and  $TFP_{st}$  is total factor productivity for the service sector.

Sources: Computed by the authors. An earlier version of this Table was presented in Eita and Pedro (2020).

### 5.2 Cointegration – ARDL bounds test results

Table 3 presents cointegration test results. The results in Table 3 shows that the F-test statistics is greater than the upper bound critical values for all sectors. It is statistically significant at 1 percent significant level. That means the null hypothesis of no cointegration is rejected for all sectors and this means that there is cointegration between the variables as specified in the empirical models.

**Table 3: Cointegration or bounds test results**

Model	F- statistic	lag	I(0)	I(1)	Significance level
$TFP_{pt}$	8.234	1	2.75	4.43	1%
$TFP_{mt}$	5.169	1	3.41	4.68	1%
$TFP_{st}$	11.380	1	3.41	4.18	1%

Note:  $TFP_{pt}$  is total factor productivity of the primary sector;  $TFP_{mt}$  is total factor productivity in the manufacturing sector and  $TFP_{st}$  is total factor productivity for the service sector.

Source: computed by the authors. An earlier version of this Table was presented by Eita and Pedro (2020).

### 5.3 Estimation results

Table 4, 5 and present estimation results. The results are estimated as per the specification of equation (1), (2) and (3). The results in Table 4 show that an increase in inflation is associated with a rise in total factor productivity. A one percent increase in inflation causes total factor productivity to increase by 0.01 percent. This positive effect of inflation on total factor productivity is not consistent with theoretical expectations. However, it can be explained partially by the fact that there is under development in the primary sector (which is mainly agriculture and fishing). Total factor productivity in the primary sector responds negatively to an increase in openness of the economy, official development assistance and exchange rate depreciation. The negative response of total factor productivity to an increase in the three variables is not in line with theoretical expectations. In line with theoretical expectation, a one percent increase in foreign direct investment causes total factor productivity of the primary sector to rise by 2.27 percent. The short run results indicate that the coefficient of the error correction term is negative and statistically significant. This indicates that there is adjustment to equilibrium. The positive effect of inflation is consistent with the results of Olomola and Osinubi (2018) for Nigeria, Mexico and Turkey. Although the negative effect of openness, exchange rate depreciation and official development assistance is not in line with theoretical expectations, it is in line with the results of Akinlo and Adejumo (2016) for Nigeria. The positive effect of foreign direct investment on total factor productivity is consistent with the findings of Akinlo and Adejumo (2016) for Nigeria, Malikane and Chitambara (2018) for 45 African countries as well as Adnan et al (2019) for some Asian countries (Bangladesh, Pakistan, India and Sri Lanka).

Table 5 presents the results of the manufacturing sector. The results indicate that total factor productivity of the manufacturing sector responds negatively to an increase in inflation. This negative coefficient of inflation is in line with economic theory. Total factor productivity of the manufacturing sector responds positively to an increase in openness, depreciation of the exchange rate and official development assistance. A rise in these three variables by one percent will cause total factor productivity in the manufacturing sector to increase by 0.4, 0.35, 0.01

and 1.96 percent. The short run results show that the error correction term coefficient is negative and statistically significant, indicating that there is adjustment to equilibrium. These results are in line with those in the literature such as Adnan et al (2019), Malikane and Chitambara (2018), Olomola and Osinubi (2018), Abdullah and Chowdhury (2020).

The results of the service sector are presented Table 6. The results of Table 6 show that total factor productivity in the service sector responds negatively to an increase inflation, openness, depreciation of the exchange rate and official development assistance. The results indicate that a one percent increase in the four variables will cause total factor productivity to decrease 0.001, 1.23, 3.12 and 1.89 percent. The negative effect of inflation on total factor productivity is consistent with economic theory. However, the negative response of total factor productivity increase in openness, exchange rate, and official development assistance is not in line with *a priori* expectations. The effect of foreign direct investment on total factor productivity is positive and consistent with theoretical expectations. A one percent increase in foreign direct investment causes total factor productivity in the services sector to rise by 0.03 percent. The short run shows that there is adjustment to equilibrium because the sign of the coefficient of the lagged error term is negative and statistically significant. It is important to note that the negative effect of inflation on total factor productivity is line with those of Adnan et al (2020), Akinlo and Adejumo (2016). The negative effect of openness and exchange rate depreciation compares favourably (although no in line with many studies) with previous studies (such as Akinlo and Adejumo, 2016; Adbullah and Chowdhury, 2020). The positive effect of foreign direct investment on total factor productivity is supported by previous studies in the literature (Malikane and Chitambara, 2018; Adnan et al, 2019).

**Table 4: Long run and short run results of the primary sector**

(a) Long run results

Dependent variable:  $TFP_{pt}$

Variables	Coefficient	t-statistic	Probability
INF	0.01	3.44	0.009***
OPEN	-1.39	-2.83	0.022**
ER	-1.73	-3.95	0.004***
FDI	0.02	2.27	0.053**
ODA	-0.07	-1.90	0.094*
R-squared: 0.9611			
Adjusted R- Squared: 0.8978			

(b) Short run results

Dependent variable:  $\Delta TFP_{pt}$

Variable	Coefficient	t-statistic	Probability
$\Delta$ INF	-0.01	3.44	0.009***
$\Delta$ OPEN	-1.39	-2.83	0.022**
$\Delta$ ER	-1.73	-3.95	0.004***
$\Delta$ FDI	0.24	2.27	0.053**
$\Delta$ ODA	-0.75	-1.89	0.095**
ECM(-1)	-0.262	-0.76	0.046**
R-squared: 0.9131			
Adjusted R-squared: 0.7720			

Note: : \*/ \*\*/\*\*\* indicate 10%, 5% and 1% significance levels.  $\Delta$  is first difference operator.

Source: computed by the authors. This table was also presented in Eita and Pedro (2020).

**Table 5. Long run and short run results of the manufacturing sector**

(a) Long run results

Dependent variable:  $TFP_{mt}$

Variables	Coefficients	t-statistic	Probability
INF	- 0.02	-2.02	0.072*
OPEN	0.40	2.25	0.048**
ER	0.35	2.63	0.025**
FDI	0.01	0.30	0.771
ODA	1.96	1.25	0.240
R-squared: 0.9782			
Adjusted R-squared: 0.9441			

(b) Short run results

Dependent variable:  $\Delta TFP_{mt}$

Variables	Coefficients	t-statistic	Probability
$\Delta INF$	-0.02	-2.01	0.072*
$\Delta OPEN$	0.40	2.63	0.025**
$\Delta ER$	0.35	2.25	0.048**
$\Delta FDI$	0.01	0.30	0.769
$\Delta ODA$	1.95	1.25	0.095*
ECM(-1)	-0.698	-3.63	0.005***
R- squared: 0.8442			
Adjusted R-squared: 0.6737			

Note: : \*/ \*\*/\*\*\* indicate 10%, 5% and 1% significance levels.  $\Delta$  is first difference operator.

Source: Computed by the authors. The earlier version of this table was presented in Eita and Pedro (2020).

**Table 6. Long run and short run results of the tertiary sector**

(a) Long run results

Dependent variable:  $TFP_{st}$

Variables	Coefficient	t-statistic	Probability
INF	-0.001	4.20	0.003***
OPEN	-1.23	-2.24	0.050**
ER	-3.12	-5.79	0.000***
FDI	0.03	2.05	0.075*
ODA	-1.89	-3.20	0.075*
R- squared: 0.9136			
Adjusted R- squared: 0.7732			



(b) Short run results

Dependent variable:  $\Delta TFP_{st}$

Variables	Coefficient	t-statistic	Probability
$\Delta$ INFLATION	-0.01	1.43	0.192
$\Delta$ LNOPEN	-1.04	-2.35	0.047**
$\Delta$ LNER	-0.84	-2.58	0.033**
$\Delta$ FDI	-0.31	-2.87	0.021**
$\Delta$ ODA	2.04	1.04	0.329
ECM(-1)	-0.360	-1.22	0.025**
R- Squared: 0.8167			
Adjusted R-Squared: 0.5189			

Note: : \*/ \*\*/\*\*\* indicate 10%, 5% and 1% significance levels.  $\Delta$  is first difference operator.

Source: Computed by the authors. The earlier version of this table is presented in Eita and Pedro (2020).

The short run results were subjected to diagnostic statistics. The results indicate that short run results passed all diagnostic statistic such as serial correlation, heteroscedasticity, normality and stability test. The results show that the estimated equations are stable and there is no misspecification. This means that the estimated parameters in the models are consistent and reliable. The diagnostic statistics are not presented here but can be obtained from the authors on request.

## 6. Conclusion

The objective of this paper is to investigate the drivers of total factor productivity in Angola. The investigation was conducted through an extensive review of the relevant theoretical and empirical literature. It differs from previous research in the sense that the analysis is conducted for various sectors of the economy and not at an aggregate level. The analysis is conducted for primary, manufacturing and service sectors. This is the first study to investigate the determinants or drivers of total factor productivity in the Angolan economy. The ARDL estimation technique was used to estimate the empirical model for the three sectors of the Angolan economy.

The results indicate that the effect of the determinants of total factor productivity is sensitive to the sector selected. For example, total factor productivity in the primary sector respond positively to an increase in inflation rate. Total factor productivity in the primary sector responds negatively to increase in variables such as openness, exchange rate and official development assistance. Total factor productivity in the primary increase if there is a rise in foreign direct investment. The implication of the results is that total factor productivity in the Angolan primary sector can be improved by attracting foreign direct investment. Contrary to the

theoretical and empirical literature, total factor productivity in the primary sector will not improve in response to an increase variables such openness, exchange rate depreciation, and official development assistance.

The results of the manufacturing sector indicates that a rise in openness, exchange rate depreciation, foreign direct investment, official development assistance will cause total factor productivity to improve. A rise in inflation reduces total factor productivity of the manufacturing sector. The results implies that the manufacturing sector's total factor productivity in can be improved through an increase in openness, and exchange rate depreciation. The manufacturing sector's total factor productivity will improve if Angola can achieve and maintain price stability.

The service sector's total factor productivity responds negatively to an increase in inflation, openness, exchange rate, and official development assistance. However, the service sector's total factor productivity increases if there an increase in foreign direct investment. This suggest that the service sector's total factor productivity in can be improved by attracting foreign direct investment and price stability. Contrary to theoretical and empirical literature, the services sector's total factor productivity will not improve in response to an increase in openness, exchange rate depreciation, and official development assistance.

These results of the three sectors indicate that the effect of the determinants of total factor productivity is sensitive to the sectors. Hence, it is important to come up with policies that are sector specific and not blanket policies that are targeting the entire economy. For example, policies aimed at improving total factor productivity in the service sector may not be appropriate for the manufacturing sector.

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