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# The influence of business ethics and community outreach on faculty engagement: the mediating effect of legitimacy in higher education

The influence  
of ethics on  
faculty  
engagement

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## Abstract

**Purpose** – The aim of this paper is to measure the effects of universities' ethical management and positive impact on society affect the faculty engagement through the mediating effect of organizational legitimacy.

**Design/methodology/approach** – Engaged employees are characterized by better performance, increased productivity and by generating higher customer loyalty as well greater economic profit. The commitment to the organization they work for is affected by internal and external inputs. Among these, business ethics and corporate community outreach are key factors for improving employee engagement. The authors developed a survey that was distributed to professors of Spanish universities. To treat the data and test the proposed hypotheses, the authors applied structural equations through PLS-SEM.

**Findings** – This research contributes to the organizational management field literature and advises university administrators to adopt an ethical management style based on information transparency, accountability and faculty member involvement in the decision-making process in order to improve their engagement and, therefore, increasing student satisfaction, academic results and positive impact on the common good.

**Originality/value** – The novelty of the authors' research stands in the inclusion of legitimacy as a mediation effect between business ethics and community outreach that affect employees' engagement and, specifically, faculty engagement.

**Keywords** Ethics, Legitimacy, Engagement, Community outreach, Higher education

**Paper type** Research paper

## 1. Introduction

The ethical management of an institution is key to generate positive relationships with internal and external stakeholders as well as to guarantee their cooperation and commitment (Egan, 2019; Hudson *et al.*, 2017). Business ethics defines the pillars for sustainable and responsible corporate governance, designing the moral structure of the entire organization (Rezaee, 2008). Organizations, that are managed taking into consideration the ethical impact and consequences of their activities, are able to engage with their stakeholders and, therefore, to gain a sustained competitive advantage (Porter and Kramer, 2006).

### JEL Classification — M14, M31

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One of the most important stakeholders are the employees, and responsible managers focus their efforts in taking care of them (Carroll *et al.*, 2019). Employees tend to mirror the behavior of their supervisors, so ethically managed companies are more likely to have more responsible workers (Afsar *et al.*, 2020). An ethical management influences positively the attitudes and behaviors of employees (Hur *et al.*, 2019; Lee and Chen, 2018; Testa *et al.*, 2018) and ethical leadership favors and increases employee engagement (Furlotti and Mazza, 2020). Engaged employees are characterized by higher performance, greater productivity and by generating superior customer loyalty as well as greater economic profit (Decuyper and Schaufeli, 2020; Harter, 2018).

Engaged employees consider their job as a meaningful activity. They care about the impact of their actions on society and they feel fulfilled by improving and cooperating for the common good (Afsar *et al.*, 2020). The community outreach component of their job is important for their satisfaction and identification with the organization they work for (Cycyota *et al.*, 2016).

Employee engagement generates a competitive advantage in many industries (Decuyper and Schaufeli, 2020; Harter, 2018). Higher education (HE) institutions are experiencing a competitive environment and they are adapting themselves to an increasingly global and demanding context. They compete for financial resources, but also for students and top faculty members. Universities administration is comparable with corporate business strategy and it is ruled by competitiveness, quality assurance, effective budget allocation, fundraising and employee management (Miotto *et al.*, 2018). HE institutions must identify a competitive advantage to stand out in a crowded marketplace (Ali-Choudhury *et al.*, 2009; Judson *et al.*, 2007) and, at the same time, to positively impact the common good (Akrivou and Bradbury-Huang, 2015). Students' quality perception is influenced by professors' attitudes and capabilities. Committed professors deliver a better service, improving students results, satisfaction and sense of belonging to the institution (Van Maele and Van Houtte, 2011). Within the demanding HE environment, faculty engagement can be a valuable source of competitive advantage (Marken and Maton, 2019). Professors' engagement may be generated internally, thanks to their identification with their managers' ethical behavior and good governance, and externally, thanks to the positive community outreach of their job (Kim *et al.*, 2010).

Because of the intangible nature of the HE sector, quality is hard to perceive and communicate. Universities have understood the importance of intangible assets such as the legitimacy to manage internal and external stakeholders (Alves and Raposo, 2010; Del-Castillo-Feito *et al.*, 2019; Helgesen and Nettet, 2007). According to Suchman (1995, p. 574), corporate legitimacy is "*a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructive system of norms, values, beliefs and definitions.*" By fulfilling stakeholders' needs and expectations, organizations acquire legitimacy that provides them with an easier and more sustained access to the necessary resources to survive (Díez-Martín *et al.*, 2020; Miotto *et al.*, 2020). Legitimacy comes from the societal perception of the positive impact of an institution (Alajoutsijarvi *et al.*, 2015; Deephouse and Carter, 2005; Khurana and Nohria, 2008; Patriotta *et al.*, 2011; Scherer *et al.*, 2013). University legitimacy improves faculty identification and acceptance and, therefore, also students' likability and satisfaction (Dzimińska *et al.*, 2018).

The objective of this paper is to analyze which are the most important dimensions that affect employee engagement, specifically in the HE industry. We defined four hypotheses to better understand faculty engagement, suggesting that business ethics and community outreach influence professors' commitment and that organizational legitimacy has a mediating effect. Since legitimacy has a clear benefit for institutions and it reinforces the relationship with stakeholders, we found it relevant to analyze the potential mediating role that this variable can have on enhancing faculty engagement. Our objective is to understand whether the positive impact of business ethics and community outreach on faculty

engagement are related or not to the legitimacy grade held by the considered institutions. There are few studies focused on behavioral context, and generally they explore the effects of social responsibility (SR) on employee's attitudes and behaviors (Hur *et al.*, 2019) but they do not include the mediation of legitimacy. The novelty of our research stands in the inclusion of legitimacy as a mediation effect between business ethics and community outreach that affect employees' engagement and, specifically, faculty engagement. To achieve these objectives, we developed a survey that was distributed to professors of Spanish universities. To treat the data and test the proposed hypotheses, we applied structural equations through PLS-SEM.

The paper is organized as follows: first we define a theoretical framework for faculty engagement, business ethics and community outreach in the HE environment. Second, we propose the four hypotheses and explain the mediating role of organizational legitimacy. Third, we describe the quantitative methodology used. Finally, we discuss our findings, their implications and the research limitations.

## 2. Theoretical framework

### 2.1 Business ethics

Business ethics is a concept that has a philosophical background and it is related to the ethical dimension of organization management (Crane *et al.*, 2008). It is a subset of applied ethics that deals with the morality of the business decision-making processes and effects. This concept describes the decision-making process that a manager should adopt according to society's perception of good and evil and common sense. "*Business ethics may be defined as the study of business situations, activities and decisions where issues of right and wrong are addressed*" (Crane *et al.*, 2008, p. 56). The judgment on morality and justice in the behaviors, practices and policies that are implemented in the business context are considered part of business ethics (Dierksmeier, 2013). Organizational ethics includes conscious stakeholders management, taking into consideration all the possible consequences for all the involved groups of people, trying to increase the positive impacts and decrease the negative ones, in order to improve the "*common good*" (Zadek, 1998).

Scholars often combine the construct of SR and business ethics. Nevertheless, the second concept is more related to philosophical theories based on right or wrong decisions or moral principles than to doing well or wrong. From a normative perspective, business ethics relates to principles and values. From a descriptive perspective, it refers to codes of conducts and compliance policies. Ethical decision-making is linked to individuals' or business units' practices which affect internal and external stakeholders' interests (Ferrell *et al.*, 2018). Business ethics is focused on the individual role of the management activity since it underlines the individual responsibility and not the collective and abstract corporate context (Fisher, 2004).

The business policies that guide organizational behaviors and respectful conducts towards all the stakeholders are described in SR strategies. However, the attitudes that each professional, regardless of their position and role, assumes when deciding if their actions will have a positive or negative impact for the company or for society as a whole, depend on the ethics of each individual (Davidson and Griffin, 2000).

It is not the companies that act in an ethical or unethical way, but the people who work in them. "*Most Business decisions or statements about business have some ethical content or an implicit ethical view. Most ethical decisions or statements about ethics have some business content or an implicit view about business*" (Freeman *et al.*, 2010, p. 7). In fact, it makes no sense to talk about business without talking about ethics. Responsible managers are required in all kinds of industries, including private, public and third sector to implement ethical, responsible and sustainable practices (Laasch *et al.*, 2020).

Nevertheless, integrating social and sustainable strategies into corporate governance are mandatory factors in the organizational management (Porter and Kramer, 2006) to gather legitimacy (Vidaver-Cohen, 2007) and to develop a sustained competitive advantage (Beddewela and Fairbrass, 2016; Hemsley-Brown *et al.*, 2016; Honig *et al.*, 2017). The implementation of socially and environmentally responsible strategies is crucial for institutions' legitimation, and it will increase access to key resources and, therefore, will guarantee organizations' survival and success (Beddewela and Fairbrass, 2016; Bitektine and Haack, 2015; Deephouse and Carter, 2005; Miotto *et al.*, 2018; Scherer *et al.*, 2013; Zimmerman and Zeitz, 2002).

A network of relationships has to be created within the organization, since each individual needs to count on others to receive the necessary resources to operate. These relationships are based on socially responsible and ethical behaviors (Kleinrichert, 2008). A socially responsible firm's management requires the respect and appropriate ethical administration of the needs of all its stakeholders (Freeman, 2010; Freeman *et al.*, 2010; Garriga and Melé, 2004). This relationship is based on ethical principles that refer to the respect for mutual benefits, justice, cooperation, fairness and common good (Garriga and Melé, 2004), and they are closely related to the variables presented in this study.

### *2.2 Employee engagement*

Engaged employees are more productive and loyal, they perform better, have less intentions to leave and are an asset for their organizations (Welch, 2011). Besides performing a higher economic output, engaged workers also have better health and psychological wellbeing (Harter, 2018). Employee engagement is the simultaneous employment and expression of a person's preferred self in task behaviors that promote the relationships to work and to others (Kahn, 1990). Saks (2006) establishes that engagement is the level to which an individual is attentive in the performance of their job. Ewing *et al.* (2019) determine that engaged employees are connected to organizational values and mission (Ewing *et al.*, 2019).

Employees connect to their work roles emotionally, expressing the feeling they have for the employers, and cognitively, through their perception of the organization's management and the workplace, and physically, by the energy they use to fulfill their working duties and tasks (Kahn, 1990). Employees may be engaged with the organization and with their job in different ways and to different levels, these two conditions are related but not necessarily overlapping (Saks, 2006). This positive and fulfilling work-related state of mind is a long term and persistent perception (Decuyper and Schaufeli, 2020). Engagement is very difficult to generate and keep (Knight *et al.*, 2017; Zhou *et al.*, 2018), and only the 15% of the working population worldwide defined themselves engaged in their job (Gallup, 2017).

Knight *et al.* (2017) determine that pride, reputation, attractiveness, work environment, and image of an organization increase employee engagement and, therefore, responsible organizations are the ones with higher levels of work engagement. Employees that work for organizations with a high level of economic, legal and ethical best practices feel grateful and willing to repay them with a higher grade of engagement (Michailides and Lipsett, 2013). The norms of reciprocity boost employees willingness to work harder in order to achieve the organization's goals and, according to the social learning theory, ethical business practices act as a role model for employees who, inspired by the managers' positive example, feel more committed and engaged (Afsar *et al.*, 2020).

Employee engagement increases when the organization they work for shows willingness to disclose relevant and truthful data, to share accountable information, and to involve stakeholders in the decision-making process. Transparency, considered as the creation and the distribution of relevant and faithful information and knowledge, generates credibility and trust that foster employee engagement (Rawlins, 2008). When employees have a clear idea of the

company's mission, vision, values and goals (Berggren and Bernshteyn, 2007), they feel their image and positive impact enhanced (Madsen, 2016). Employees identify themselves with ethical, transparent and accountable entities, therefore this sense of communality increases their belonging and engagement. Ethical management positively influences the attitudes and behaviors of employees (Hur *et al.*, 2019; Lee and Chen, 2018; Testa *et al.*, 2018). Ethical leadership favors and increases employee engagement (Decuyper and Schaufeli, 2020).

Stakeholder's involvement and active participation is also a key factor for employee engagement, since being part of the organization strategy and narrative helps the employee identification and feeling of belonging, which are important intangible assets for all kinds of organizations. Employee engagement is positively linked to better performance, higher customer loyalty, well-being and lower turnover (Decuyper and Schaufeli, 2020).

Gallup (2017) shows that engaged faculty and staff members are critical to student success, since being emotionally and psychologically committed to their work helps students overcome the difficulties and anxiety they face. Professors who are engaged at work produce better student outcomes than their less-engaged peers (Marken and Maton, 2019). Engaged faculty members enhance students' experience, satisfaction, and academic results, since a committed professor is able to engage in a trustful and productive relationship with students. Besides, engaged faculty members trust their organizations and therefore are more willing to develop positive attitudes, behaviors and organizational commitment (Van Maele and Van Houtte, 2011).

Universities' role is crucial for society since they act as knowledge broadcasting agents and they are responsible for training future leaders in social values and sustainability (Dzimińska *et al.*, 2018). In the last decades, the most prestigious academic institutions of the world have been criticized for forging and training professionals on knowledge but not on values and ethics. These institutions have been requested to improve their ethical orientation and to base their internal management on transparency and accountability in order to regain public trust and social acceptance (Khurana and Nohria, 2008; Khurana and Spender, 2012; Wigmore-Álvarez *et al.*, 2020).

Under these circumstances, HE institutions have become more socially embedded: they engage in relationships with relevant agents who can provide resources, support, commitment, trust, and legitimacy (Christensen and Gornitzka, 2017). They have been investing more resources with the aim of building strong relationships with these actors (Lafuente-Ruiz-de-Sabando *et al.*, 2018). HE institutions have a civic mission to produce and to spread new knowledge, and faculty engagement is a core value to fulfill this responsibility of the twenty-first century universities (Sandmann, 2008).

Considering the previously discussed arguments, universities that behave ethically, show commitment to their stakeholders, and are transparent and trustworthy, will be able to enhance their employee engagement.

Therefore, the following hypothesis is proposed:

*H1.* Business ethics positively and significantly affects faculty engagement.

### 2.3 Community outreach

Universities' mission has changed, and it now goes far beyond simply teaching and researching (Wigmore-Álvarez and Ruiz-Lozano, 2012). Universities have the responsibility to work to improve people's lives and to find answers to globally important issues (Martínez-Usarralde *et al.*, 2017; Setó-Pamies *et al.*, 2011). Universities' main mission is to provide society with knowledge and solutions for the common good (Martínez-Usarralde *et al.*, 2017; Miotto *et al.*, 2018). Community outreach is a partnership through which the university opens itself up to the society, adding to the teaching and research tasks the responsibility to deliver a public service (Sandmann, 2008).

The importance of the teaching staff engagement and commitment can be considered as a key factor for universities success. Engaged faculty members work in contact with administrations, local communities and firms in order to transfer and adapt their academic knowledge to improve people's daily lives (Figueiró and Raufflet, 2015; Salvioni *et al.*, 2017). Universities that fulfill this public service through outreach activities are considered ethical and aligned with social values, therefore, isomorphically legitimate (Chedrawi *et al.*, 2019).

Having a positive impact on their communities will increase faculty members' engagement with their organization, since they will feel more connected with the university's values and behavior (Collier and Esteban, 2007). Many authors have supported the relationship between positive impact on society and employee commitment (Albinger and Freeman, 2000; Alrowwad *et al.*, 2016; Backhaus *et al.*, 2002; Gupta, 2017).

Taking into consideration this theoretical framework, the following hypothesis is presented:

*H2.* Community outreach positively and significantly affects faculty engagement.

#### *2.4 The mediating effect of legitimacy*

Stakeholders' expectations have determined the need for organizations to justify their right to exist and to explain the positive impact they have on society (Simcic Brønn and Vidaver-Cohen, 2009). Service organizations need to satisfy demanding stakeholders, providing benefits, and delivering a product whose quality might be difficult to objectively evaluate.

Deephouse *et al.* (2017, p. 9) defined organizational legitimacy as "*the perceived appropriateness of an organization to a social system in terms of rules, values, norms and definition.*" It depends on the perceptions of the audience and it is granted when behaviors, values and beliefs are shared and coincident (Díez-Martín *et al.*, 2020). Legitimacy is affected by the evaluation and judgment based on stakeholders' perceptions on the organization's behavioral response (Bitektine, 2011). An organization is considered legitimate when it fulfils stakeholders' expectation and complies with the actual social system, norms, values and beliefs (Díez-Martín *et al.*, 2020).

Legitimacy is a critical factor (Suddaby *et al.*, 2017) to reach the necessary resources that foster and organizations' success and growth (Zimmerman and Zeitz, 2002). Legitimacy grants higher levels of trust and support from stakeholders (Alajoutsijarvi *et al.*, 2015; Bitektine and Haack, 2015; Deephouse and Carter, 2005; Díez-Martín *et al.*, 2013; Patriotta *et al.*, 2011), since most groups are only willing to engage with legitimated institutions and will avoid maintaining relationships with those that are questioned and criticized within their social system (Deephouse *et al.*, 2017).

For HE institutions, legitimacy has become critical to receive social support since some institutions have lost their focus and are perceived as not pursuing their original missions of serving the public good (Blanco-Gonzalez *et al.*, 2020; Khurana and Nohria, 2008). Only legitimated universities will have the competitive advantage to count with valuable business and institutional partners, to be able to adapt to the complex regulatory environments, to benefit from new educational partnership arrangements and to positively manage a global market (Low, 2019).

In this attempt, organizations must consider that ethical behavior is a determinant factor to maintain or increase an institution's legitimacy (Baumann-Pauly *et al.*, 2016; Scherer *et al.*, 2013). Universities may increase their legitimacy through internal management based on business ethics principles and by positively impacting the society. Business ethics-based administration improves employee engagement and loyalty, and community outreach promotes social acceptance and legitimacy (Castelló and Lozano, 2011; Yang and Ji, 2019). Legitimacy has been related to positive perceptions of employees (Blanco-Gonzalez *et al.*,

2020; Kanat-Maymon *et al.*, 2018) and it is linked with employee's commitment level toward their organization (Lee *et al.*, 2018; Morin *et al.*, 2016). Universities have to manage their legitimacy level to build lasting relationships with their faculty members and earn their commitment. According to the above literature review and theoretical framework, business ethics has been considered as an antecedent of legitimacy and legitimacy has been empirically proven as a critical factor to strengthen the relationships with internal stakeholders and, more precisely, with faculty members. Therefore, we propose that the mediating effect of legitimacy in the relationship between business ethics and faculty engagement is important and it will highlight relevant implications to the academic and management fields, demonstrating that the relationship between these two variables is affected by the legitimacy level of the institution. Therefore, the following hypothesis is proposed:

*H3.* Legitimacy mediates the effect of business ethics on faculty engagement.

Legitimated institutions have better access to necessary resources to survive and succeed because stakeholders will be willing to engage only with legitimated organizations (Deephouse *et al.*, 2017). Organizations, that are able to align with ethical norms and values, engaging in substantial relationships with their internal and external stakeholders through transparency, accountability, positive impacts and participation will be the ones with better outcomes (Kostova and Zaheer, 1999). To acquire legitimacy and a competitive advantage, universities need to focus on developing ethical behavior but also on positive community outreach through knowledge transfer, solving global and relevant issues and caring for the common good (Dyllick, 2015; Schensul, 2010). Legitimacy, influencing the sense of belonging and identification of the employees, affects the impact that community outreach has on faculty engagement. Therefore, testing the mediating role of legitimacy on this relationship is important to analyze the determinant role that legitimacy has on how community outreach affects faculty engagement.

Based on these arguments, we propose the following hypothesis:

*H4.* Legitimacy mediates the effect of community outreach on faculty engagement.

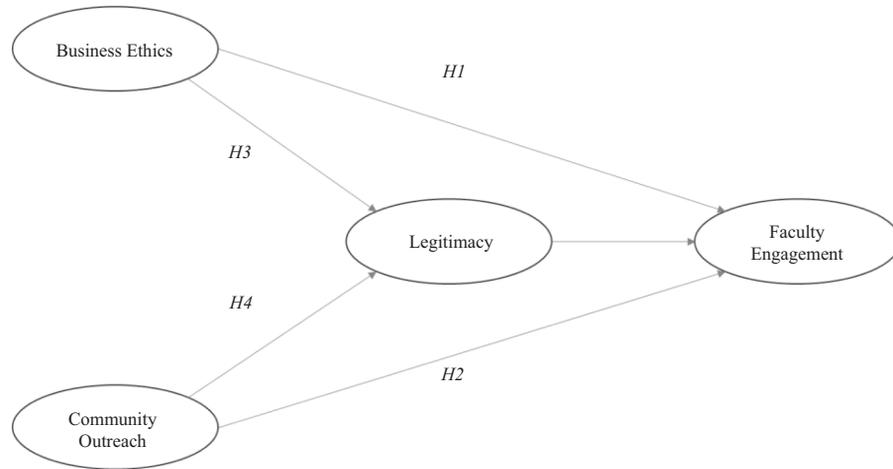
Figure 1 presents the measurement model applied to this research paper.

### 3. Sample and methodology

The research setting for this analysis is defined within the Spanish public universities due to the complex environment in which they operate. These institutions have been working to improve their management approach and business ethics practices. They have increased the level of transparency and accountability, providing information and sharing data with all stakeholders and involving them in the decision making-process as active participants (Wigmore-Alvarez and Ruiz-Lozano, 2012).

A survey was designed and then distributed to faculty members of the business departments of 47 Spanish universities (Table 1). In a first stage, a pre-test was launched to verify the questions and scale. After analyzing the results, some questions were updated, and others removed to shape the final version of the questionnaire. We collected 509 effective responses from faculty members across Spain throughout May and June of 2018.

All the considered variables were measured through adapted items from existing scales using an 11-point Likert scale (Table 2). The items used to measure community outreach and business ethics were defined combining different existing scales (Vidaver-Cohen, 2007; Vidaver-Cohen and Brønn, 2015). For measuring legitimacy, we considered the definition provided by Suchman (1995) and for faculty engagement, the research developed by several



**Figure 1.**  
Proposed model

Source(s): Own elaboration

Characteristics	Responses	%
<i>Gender</i>		
Men	248	49%
Women	261	51%
<i>Age</i>		
18–22	4	1%
22–30	48	9%
30–45	169	33%
45–60	248	49%
>60	40	8%

**Table 1.**  
Sample profile

Factor	Item	Description
Business ethics	GOV1	There is a clear vision of the objectives that guide my university
	GOV2	It is managed with ethics and transparency
	GOV3	It takes into consideration its stakeholders in their management decisions
Community outreach	COMOUT1	Exerts positive influence on society
	COMOUT2	Supports good causes
	COMOUT3	My university cares about their stakeholders' well being
Legitimacy	LEGGLOB1	My university is an essential institution for society's development
	LEGGLOB2	The actions and activities developed by my university are appropriate (consistent with social norms, values and beliefs)
Faculty engagement	FACENG1	I am committed in my relationship with my university
	FACENG2	I would defend this university if others criticized it
	FACENG3	If had to do additional courses or studies, my university would be my first choice
	FACENG4	If someone asked for advice, I would recommend my university
	FACENG5	I will encourage friends and family to study in my university

**Table 2.**  
Measurement instruments

authors (Castañeda-García and Luque-Martínez, 2008; Hennig-Thurau *et al.*, 2001; Morgan and Hunt, 1994).

To prove the hypotheses, we applied structural equations using SmartPLS system. This methodology was chosen due to the benefits it provides for this type of research (Hair *et al.*, 2014), since it applies a statistical analysis of the relationships, through the prediction of the dependent variables and we could calculate and quantify the effects that some variables have on others (Hallak *et al.*, 2018). Furthermore, PLS is appropriate for measurement models with both formative and reflective items, such as this one (Diamantopoulos and Winklhofer, 2001).

#### 4. Data analysis and results

In Table 3, we present the descriptive analysis and show the values of all variables and items considering the professors' perceptions. The lowest value was "business ethics" with 6.54 over 10, then, "community outreach" as well as "legitimacy" held values close to 7 over 10 (7.38 and 7.87 respectively). Finally, "faculty engagement" presented the highest value with 8.06 over 10.

##### 4.1 Reliability and validity evaluation

Table 4 shows information regarding the model's reliability and validity. Considering legitimacy and faculty engagement's reflective items, all Cronbach's alphas (CA) surpassed the recommendation of 0.70 (Nunnally and Bernstein, 1994). Regarding the composite reliability (CR), every item is within the scope since they are all over 0.60 (Bagozzi and Yi, 1988). All items present average variance extracted (AVE) values over 0.50 which is considered correct (Fornell and Larcker, 1981). Moreover, the standardized loadings of the reflective items are presented as well as their significant value ( $p < 0.01$ ) showing that every item is significant within its variable.

Regarding discriminant validity, Table 5 shows the HTMT ratio method (Henseler *et al.*, 2015). Since every ratio was lower than 0.85 (Clark and Watson, 1995), no problems appear in the model. The collinearity (VIF) value is presented for the formative constructs and every item is under the appropriate level of  $VIF < 5$  (Hair *et al.*, 2011). Also, the standardized weights and their significant values ( $p < 0.01$ ) are presented, supporting the significance of every item of the formative constructs of business ethics and community outreach.

Considering the previous analysis, we concluded that the proposed model offers appropriate evidence of reliability, convergent and discriminant validity of the reflective

Factor	Item	Mean	Standard deviation	Average factor value
Business ethics	GOV1	6.36	2.42	6.54
	GOV2	6.64	2.55	
	GOV3	6.62	2.51	
Community outreach	COMOUT1	7.90	1.92	7.38
	COMOUT2	7.33	2.07	
	COMOUT3	6.92	2.06	
Legitimacy	LEGGLOB1	8.07	1.85	7.87
	LEGGLOB2	7.68	1.83	
Faculty engagement	FACENG1	8.47	1.77	8.06
	FACENG2	8.29	2.04	
	FACENG3	7.41	2.42	
	FACENG4	8.09	2.11	
	FACENG5	8.05	2.22	

**Table 3.**  
Descriptive analysis

Factor	Item	Weights/loadings	t-value	VIF	CA	CR	AVE
Business ethics	GOV1	0.274	2.498	1.833			
	GOV2	0.541	4.733	2.317			
	GOV3	0.312	2.716	2.277			
Community outreach	COMOUT1	0.513	7.953	1.833			
	COMOUT2	0.155	2.276	1.742			
	COMOUT3	0.496	9.047	1.600			
Legitimacy	LEGGLOB1	0.886	47.885		0.777	0.899	0.817
	LEGGLOB2	0.921	104.069				
Faculty engagement	FACENG1	0.817	29.892		0.924	0.943	0.769
	FACENG2	0.839	29.033				
	FACENG3	0.844	37.729				
	FACENG4	0.941	109.049				
	FACENG5	0.935	91.447				

**Table 4.**  
Measurement model  
reliability and validity

Factor	Faculty engagement	Legitimacy
<i>Faculty engagement</i>		
Legitimacy	0.787	

**Table 5.**  
Discriminant validity

constructs, as well as in terms of collinearity, weight-loading relationship and significant levels of the formative constructs.

#### 4.2 Hypothesis testing

The obtained results (Table 6) show that the proposed hypotheses established considering the literature review can be confirmed except for the direct relationship between business ethics and faculty engagement (H1).

Finally, regarding the mediating effects of legitimacy, the complete model was designed following the approach proposed by Hair *et al.* (2014). The results (Table 7) confirm the complete mediation in the case of the relationship between business ethics and faculty engagement and partial mediation for the relationship between community outreach and faculty engagement.

	Beta	t-value
H1: Business ethics - Faculty engagement	0.109	1.726
H2: Community outreach - Faculty engagement	0.584	9.444
<i>H3: Mediating effect of legitimacy: Business ethics - Faculty engagement</i>		
Business ethics - Legitimacy	0.227	3.651
Legitimacy - Faculty engagement	0.386	5.166
<i>H4: Mediating effect of legitimacy: Community outreach - Faculty engagement</i>		
Community outreach - Legitimacy	0.569	9.072
Legitimacy - Faculty engagement	0.386	5.166
<b>Note(s):</b> Legitimacy: $R^2 = 0.563$ ; $Q^2 = 0.432$ ; Faculty engagement: $R^2 = 0.511$ ; $Q^2 = 0.367$		

**Table 6.**  
Hypothesis testing

## 5. Discussion and implications

According to the literature review, engaged employees are more motivated, more productive and profitable for the organization they work for and they provide a competitive advantage (Decuyper and Schaufeli, 2020; Harter, 2018). Universities are facing difficult times, being pressured by a highly competitive environment and coping with difficulties to get enough resources to attract the best faculty members, the most promising students and the most helpful corporate partners (Hemsley-Brown *et al.*, 2016). These institutions are asked to build strong relationships with their stakeholders and to achieve students', faculty members' and staff's loyalty by providing a high quality service (Dzimińska *et al.*, 2018). Engaged faculty members are key for building strong, long-lasting and profitable relationships with students and the community, generating a sense of belonging, trust and commitment (Van Maele and Van Houtte, 2011; Marken and Maton, 2019).

The objective of this research is to analyze which dimensions affect employee engagement in the HE sector, specifically focusing on faculty members. We defined two possible aspects that may affect employee engagement: internally, the business ethics principles that guide the institutions' administrators and, externally, the impact of the university's activities in society. According to the results, the surveyed faculty members declared that they feel committed and engaged with their institutions. They would recommend them to their networks and they feel proud to work there. Confirming the literature review, professors consider that their universities have a positive impact on society and the effects of the community outreach of their activities increases the meaningfulness of their job as well as the engagement with their institutions (Afsar *et al.*, 2020; Cycyota *et al.*, 2016). Faculty engagement improves when professors perceive that they are positively impacting the society through the university's community outreach (Albinger and Freeman, 2000; Alrowwad *et al.*, 2016; Backhaus *et al.*, 2002; Gupta, 2017).

Nevertheless, according to the results, faculty engagement and business ethics management are not strongly related. Professors do not feel that their institutions are managed ethically, and they perceive that transparency and accountability are not main characteristics of their universities. According to the literature review, business ethics highly affect employee engagement (Castelló and Lozano, 2011; Yang and Ji, 2019). Ethical leadership, transparency and accountability shape committed employees, since they tend to mirror their managers' behavior and become more emotionally and professionally involved with their tasks, responsibilities and companies (Hur *et al.*, 2019; Lee *et al.*, 2018; Testa *et al.*, 2018). In the analyzed universities, professors feel engaged despite their perception of lack of ethics in their institutions' management. Following these results, we propose a new contribution to the theoretical framework, stating that ethical management improves faculty engagement, but the perception of a lack of ethics does not necessarily impede professors' commitment to their job.

Universities' mission has changed, and it now goes far beyond simply teaching and researching (Wigmore-Álvarez and Ruiz-Lozano, 2012). Universities have the responsibility to work to improve people's lives and solve important global issues (Martínez-Usarralde *et al.*, 2017; Setó-Pamies *et al.*, 2011). Professors feel aligned and committed with their universities' mission to solve social issues and to help the corporate context. They, therefore, consider the

	Total effects	Total indirect effects	VAF
Business ethics	0.109	0.087	80.5%
Community outreach	0.584	0.219	37.5%

**Note(s):** VAF = Variance accounted for

**Table 7.**  
Mediating effect

social positive impact rewarding, empowering and self-representing (Afsar *et al.*, 2020; Cycyota *et al.*, 2016).

The literature supports the benefits of being legitimate since it helps organizations obtain resources, grow and survive (Deephouse *et al.*, 2017; Miotto *et al.*, 2020; Suchman, 1995). Results show that legitimacy has a partial mediating effect on the relationship between community outreach and faculty engagement. When professors consider their institutions as legitimate, they then feel more engaged thanks to their positive impact on the society. The institutions legitimation reinforces the benefits of their community outreach (Dyllick, 2015; Schensul, 2010).

## 6. Conclusions, limitations and future research lines

Our research contributes to the organizational management literature by providing a new and interesting point of view introducing the mediating effect of legitimacy in the relationship between internal and external sources of employee engagement. If we consider the internal source of engagement, professors believe that their universities' managers are not able to fulfil the main requirement of business ethics, especially since they do not share valuable and relevant information and they do not involve them in the decision-making process. Considering the mediating effect of legitimacy, we observe a full mediation. Professors feel that the source of their engagement may come from the inside of their institutions when they work for a legitimate university, even though their internal management does not reflect an ethical behavior. Considering the results, if a university is perceived by the professors as legitimate, then the internal ethical management and the external positive impacts on society encourage faculty members to feel more motivated, aligned with the institutions' values and engaged.

Our research provides interesting implications for universities administrators. We prove that faculty members improve their engagement when they can cooperate with society, through research, knowledge transfer and teaching. Universities should provide professors with the option to dedicate their efforts not just on purely academic research and on teaching time in the classrooms, but also on creating and transferring knowledge useful for companies and for the society in general.

Nevertheless, the perception of an external positive impact is not enough to fulfil professors' need to commit with their institutions, they ask for ethical leadership and active involvement in the universities' administration. Managers have to create a trustful internal atmosphere based on business ethics, where professors may feel that they have access to information, and they may actively participate to define the institution's strategy and priorities. This ethical and trustworthy behavior will increase the institution's legitimacy level and these efforts will positively impact professors engagement.

Universities administrators should improve internal communication, providing more information and the option to involve professors in their decisions. Besides, professors should perceive that their impact on society is as important for their career as their theoretical academic impact. Engaged professors are key to improve universities' performance in the actual competitive environment, so administrators should act to improve both the internal and the external sources of faculty engagement.

The main limitation of this research lies in the fact that we analyze one internal stakeholder group (faculty members) and we do not take into consideration non-teaching personnel which is very important for universities' success. Besides, we considered only one country (Spain). Future research projects should focus on including non-teaching personnel and on replicating the study in other countries. Besides future projects should include studies about how faculty engagement impact the perception of the university legitimacy from the point of view of the students, the corporate partners and the society in general.

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# Active management, value investing and pension fund performance

The performance of pension funds

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## Abstract

**Purpose** – This paper analyses whether the active management and the fundamentals of the pension fund allow products that beat their peers to be identified in terms of risk-adjusted performance.

**Design/methodology/approach** – The sample is composed of all the pension funds active in the period 2000 to 2017 investing in the Eurozone. What this means is that a greater similarity is guaranteed in terms of benchmark, assets available for investment and currency. All the data have been retrieved from the Morningstar Direct database.

**Findings** – The paper reveals that the degree of concentration and value for money are important determinants of performance. In this sense, the strategies of investing in concentrated portfolios that differ from the benchmark and with undervalued assets in terms of price earnings ratio (PER)-return on assets (ROA) achieve better results.

**Originality/value** – This is one of the few papers that shows the effect of active management and value investing strategies' on the performance of pension funds.

**Keywords** Individual pension funds, Active management, Value investing, Performance

**Paper type** Research paper

## 1. Introduction

Pension funds have increased in popularity as a vehicle for long-term saving. Given that profitability determines future income that the beneficiaries receive to a large extent, a relevant question is whether there are selection criteria which can be used to identify pension funds with positive prospects over their rivals. As with mutual funds, the use of brokers or ratings is common. Several studies highlight the lowest profitability of mutual funds recommended by brokers or managed portfolios (Bergstresser *et al.*, 2009; Hackethal *et al.*, 2012; Karabulut, 2013; Armstrong *et al.*, 2017). Regarding the use of ratings, *Morningstar* data shows that investors use them to invest their savings. During the period 2015–2017, equity pension funds that received a greater flow of funds were those classified as five stars, around 700 million euros, almost equivalent to the one received by those rated four and three (734 million) and much higher than the funds with one and two stars (98 million). However, the existing literature is all related to mutual funds and conclusive results cannot be drawn. Thus, previous research, developed by Howe and Pope (1996), Blake and Morey (2000), Morey (2005) and Chotivethamrong (2015), concluded that star ratings have little predictive power to identify mutual funds that perform better. However, several studies indicate that investing in assets with better ratings can help to beat its peers



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in the long term (Morey and Gottesman, 2006; Müller and Weber, 2014; Meinhardt, 2014 and Otero *et al.*, 2020; Otero and Durán, 2021).

Other relevant criteria related to management types in the field of pension funds have been studied little. Active management is an important source of performance for pension funds (Aglietta *et al.*, 2012). Andonov *et al.* (2012) decompose pension funds returns it into three active asset management components: asset allocation, market timing and security selection. For each of these components, US pension funds are able to beat their benchmarks, which is different to the results of Coggin *et al.* (1993) who find selectivity measure is positive and the average timing measure is negative. In the UK, Blake *et al.* (1999) highlight that is different strategic asset allocation between bonds, equity and cash and not market-timing or security-selection which yields different performance. Cremers and Pareek (2016) and Gonzalez *et al.* (2020) find that the pension fund's performance increases if a fund is patient (long-term holdings) and has an active investment strategy (high active share). In the case of mutual funds, several authors have shown that the divergence between the composition of the funds portfolio and the benchmark can give reasons for a positive effect on performance (Brands *et al.*, 2006; Kacperczyk *et al.*, 2005; Cremers and Petajisto, 2009; Petajisto, 2013 and Cremers, 2017). In addition, value-based management is also considered helpful for finding funds whose future performance beats their competitors'. Within the field of management based on value investing, multiple strategies are included that try to identify quality assets undervalued by the market (Greenblatt, 2006; O'Shaughnessy, 2011; Asness *et al.*, 2019; Paramés, 2016; Blackburn and Cakici, 2017).

Despite there being several studies about the determinants of pension funds' performance, like the gender of the manager (Niessen and Ruenzi, 2007 and Alda, 2016), the experience (Kempf *et al.*, 2017), the tenure (Clare *et al.*, 2016), the superior investment skills due the level of specialization (Alda *et al.*, 2017) or expenses (Ferruz and Alda, 2012; Broeders *et al.*, 2019), little is known about the effect of active management and value investing strategies. To date there is no study that has evaluated the effect of both factors on the performance of pension funds.

In this paper we study the performance of pension funds according to the active and value investing strategies of the pension fund portfolio. In particular, we try to answer three important questions: Do investors get an excess return when choosing actively-managed pension funds? Does the application of criteria based on "value investing" allow extraordinary returns to be obtained? Does the consideration of the competitive advantages of the companies in the portfolio determine the level of performance?

This work contributes to the existing literature by analyzing whether active management and investment based on the fundamentals of the portfolio should be considered to identify pension funds with better future performance. Given that pension funds have a longer time horizon and different investment objectives, the results could differ from those found for mutual funds. On the other hand, we have not found any paper analyzing all the criteria considered in this article. To develop such an analysis, we have used panel data of all equity pension funds that invest in the Euro area based on the information provided by the Morningstar Direct database. In this way, we intend to evaluate the extent to which the selection of pension funds based on these criteria can help to identify those that outperform their peers' in the mid- and long- term. This study is useful for managers, financial advisers and investors interested in selecting assets.

The results obtained show how certain aspects related to the investment portfolio of the pension fund, such as management type, degree of concentration, fundamentals and competitive advantages, determine future risk-adjusted performance. Nonetheless, the relationship is non-linear, indicating that concentrated portfolios that differ from the benchmark and invest in undervalued assets in terms of price earnings ratio (PER)-return on assets (ROA) outperform their peers.

The rest of the paper is organized as follows. In section 2 we present the empirical analysis, in section 3 we present the estimated models and the results and, finally, in section 4 we present the conclusions.

## 2. The related literature and hypothesis development

Management type has usually been seen as a possible determinant of performance, with an important literature in the field of mutual funds. Higher profitability of active management over passive management implies managers possessing selection skills. However, there are inconclusive results (Clare *et al.*, 2009, 2010). In this sense, Grinblatt and Titman (1989, 1993) and Wermers (2000) find that in the North American market there are managers who have the ability to choose assets which provide a higher gross but not net return. In addition, the most successful managers have been regarded as lucky (according to Carhart (1997)) bearing in mind how difficult is to dissociate profitability obtained by skill and by chance (Fama and French, 2010). In addition, the distinction between active and passive management raises issues with respect to how to identify the managers that actually are active. In many cases, products that generate small changes in the composition of the index are classified as active management funds and, in this way, higher commissions could be justified. For this reason, several recent works have included active management based on the fact that its composition differs from the index and not just because a manager decides to declare their business as so. The divergence between the composition of the mutual fund and the benchmark explains the positive effect on performance in several papers (Brands *et al.*, 2006; Kacperczyk *et al.*, 2005 and Cremers and Petajisto, 2009). In the particular case of Cremers and Petajisto (2009), they use the active share to evaluate the degree of differentiation between the funds and the benchmark. Active share measures the proportion of assets where a fund differs from the benchmark and it indicates to what extent the manager is replicating the index. Later, Petajisto (2013) establishes denominations for funds based on active share: the *stock pickers* are those with shares that are far from the index and diversified, the *factor bets* have less diversification and are more exposed to volatility, while the *concentrated funds* have a large exposure to risks with a high level of screening; *closet indexers* try to make a slight differentiation with respect to the index, providing the least active management. The empirical results of his work show that the stock pickers have the funds that provide the best results for investors. However, Jin *et al.* (2016) observe that managers who are very different from the index show an excess of self-confidence that negatively affects performance and increases risk. In this sense, they consider that moderate levels of active share present better performance and in their work they showed a relationship in the form of an inverted Crane and Crotty (2018) suggest that only a small percentage of mutual funds with high Active Share outperform a passive investing strategy (index funds). An alternative measure of active management is proposed by Amihud and Goyenko (2013), who used the  $R^2$ -squared and showed that the portfolios of lower  $R^2$  combined with higher alphas generated a higher risk-adjusted return in the next period. Elton *et al.* (2019) evidence that the criterion of Amihud and Goyenko (2013) resulted in a group of active funds that outperformed passive investing.

Based on previous work, we propose the following hypotheses:

- H1.* Active management pension funds obtain better performance (measured by the five factor Fama-French alpha).

The conviction, defined by Cremers (2017) as “the willingness to translate the identified investment opportunities into a portfolio that is sufficiently different to outperform in the long-term” is other important pillar that active managers need to bring long term economic rewards to the investors. Examples are those strategies looking for long-term underpricing.

Shleifer and Vishny (1997) argue that these strategies require strong convictions because they can underperform in the short-term. According to Cremers (2017), a high active indicator is not a sufficient condition because the conviction and identification of interesting investment opportunities are necessary. Cremers and Pareek (2016) and Gonzalez *et al.* (2020) use the active share and a modified active share to evidence that the pension fund's performance increases if a fund has an active investment strategy and a patient strategy (long-term holdings). Therefore, active pension funds that hold long-term positions by conviction are "outperformers" and those that do a lot of trading are usually "underperformers". The concentration of the portfolio can be used as a measure of conviction because it is an indicator of the magnitude of bets taken by fund managers. The degree of concentration has been related positively with mutual fund performance (Kacperczyk *et al.*, 2005). Also Brands *et al.* (2005) found a positive and significant relationship between performance and portfolio concentration for our sample of active equity mutual funds.

## H2. More concentrated pension funds outperform those less concentrated.

The future profitability of pension funds may be related to the fundamental parameters of the assets of the portfolio. *Value investing* includes a diverse set of strategies based on the identification of undervalued assets, which have better future behavior when the market values them correctly. Among the ratios considered to identify "undervalued" assets, the *market-to-book* is usually included (Stattman, 1980, Rosenberg *et al.*, 1985 or Fama and French, 1992). Pontiff and Schall (1998) show that it contains information on future profitability that is not captured by other variables. Mohanram (2005) finds that growth companies with high *price-to-book* ratios outperform those with low growth in future performance. Additionally, Gu (2015) maintains that the yields of the shares are related to characteristics of the company such as the *book-to-market*, PER and *cash-flow-to-price* among others. Likewise, Ball *et al.* (2020) conclude that the *book-to-market* is significant in explaining future returns. Piotroski and So (2013) attribute the value effect to the errors valuing the fundamentals of the company. Furthermore, Paramés (2016) explains that the shares quoted with low values in the ratios can have better future performance. As multiples, various ratios have been included, such as *earnings-to-price* (Basu, 1977; Reinganum, 1981), *cashflow-to-price ratio* (Lakonishok *et al.*, 1994) and *sales-to-enterprise-value ratio* (O'Shaughnessy, 2011). In this sense, O'Shaughnessy (2011) analyzed various investment strategies, finding several options that could beat the indexes, among which he pointed out: low PER ratios, EV/EBITDA ratio compared with profit, low price/sales ratio, etc. Likewise, the value factor three strategy, which combines low values of *price-to-book*, PER, price/sales, EBITDA/EV, price/cashflow and repurchase of shares, outperforms the profitability of the indexes evaluated.

An alternative strategy to the search for exclusively "cheap" stocks is one proposed by Greenblatt (2006), called the "magic formula", which consists of selecting cheap securities, in terms of value (EBIT / EV), provided that they have "quality", which can be defined by the high profitability gained on the tangible capital invested [ratio EBIT / (Working Capital + net fixed assets)], which, to put it in other words, means buying cheap assets of high quality. In relative terms, one expects for profitable, quality and undervalued companies to perform better in the future. Within this value approach, shares with higher PER can be selected if they are of high quality, measured in accordance with the capacity to generate profitability. Blackburn and Cakici (2017) using a so-called "improved version" of the magic formula, which uses gross margin instead of EBIT, based on the proposal of Novy-Marx (2013), shows that in general the portfolios provided higher risk-adjusted results for all the global regions considered. Paramés (2016) explains how its investment policy is based on the application of the Greenblatt principles combined with the identification of competitive advantages in the

mid- and long- term. This strategy is consistent with the approach of Asness *et al.* (2019), who consider that investment in quality companies, understood as safe and profitable, sharing growth and with well-managed assets, are those that perform better in the future.

*H3.* Pension funds that combine “undervaluation” (low book-to-market, PER or cash-flow-to-price) and “quality” (high ROA) provide better performance. In this sense, a non-linear relationship in the form of an inverted U is expected.

Finally, competitive advantages that are sustainable over time are also very relevant as they can allow future performance to be maintained. Several authors indicate the importance of competitive advantages to maintain extraordinary returns in the future (Greenblatt, 2006 and Paramés, 2016). In this sense, the Economic Moat is a term proposed by Warren Buffet that helps evaluate to what extent the assets of the portfolio have sustainable competitive advantages. Morningstar evaluates the historical capacity of companies to obtain returns above their cost of capital for many years, especially if they have increased or remained stable. The attributes of the company that can provide economic moats are, mainly, what is known as the network effect, as well as intangible assets, cost advantages, exchange costs and economies of scale. Kanury and Mcleod (2016) found that portfolios with wide moat outperform the S&P 500 and Russell 3,000 indices in terms of several measures of performance, including Carhart four-factors model. Based on previous work, we propose the following hypotheses regarding the effect of management on performance:

*H4.* Pension funds with a higher Economic Moat provide better ex-post performance.

### 3. Empirical study

#### 3.1 Sample

Our sample is composed of all the pension funds active in the period 2000 to 2017 [1]. In order to have a homogeneous database, we selected exclusively pension funds investing in the Eurozone [2]. What this means is that a greater similarity is guaranteed in terms of benchmark, assets available for investment and currency. Considering the investment style, more than 48% are large blended capitalization pension funds, compared to 36.6% for value funds and 9.41% for growth funds. The rest (4.7%) belongs to different styles of mid and small caps. Regarding country of residence, it should be emphasized that more than 80% were domiciled in Spain and Belgium, with a minority representation for the United Kingdom, Ireland and Luxembourg, among others. Depending on the year, the number of pension funds can range from 39 (like in 2000) up to 103 (like in 2010) and for many variables the information is available from 2007. All the data has been retrieved from the Morningstar Direct database.

#### 3.2 Performance variables

We analyze the performance of pension funds in terms of risk-adjusted return, using a five-factor model proposed by Fama and French (2015, 2016, 2017). The alpha is estimated annually via the following regression model (Eqn (1)):

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,1} Mkt_t + \beta_{i,2} SMB_t + \beta_{i,3} HML_t + \beta_{i,4} RMW_t + \beta_{i,4} CMA_t + \varepsilon_{i,t} \quad (1)$$

where  $R_{i,t}$  is the performance of the fund  $i$  in month  $t$ ,  $R_f$  is the yield of the risk-free asset in month  $t$ ;  $Mkt_t$  is the average monthly return of the benchmark minus the risk-free interest rate;  $SMB_t$  considers the exposure to returns of diversified portfolios of small and large companies;  $HML_t$  takes into account the difference between the yields of portfolios with high and low book-to-market;  $RMW_t$  is the difference between the returns of the portfolio of assets with robust profitability, compared to assets with weak profitability;  $CMA_t$  is the difference

between the yields of aggressive portfolios versus conservators and, finally  $\varepsilon_{i,t}$  is the error term. The parameters  $\beta_i$  measure the sensitivity of the excess performance to each risk factor.

Therefore, the performance of a fund conditioned to all the risk factors can be evaluated with the alpha given by the parameter  $\alpha_i$  of the above equation. For each year, we estimate the regression model for all individual pension funds, using weekly prices information. Subsequently, we computed yearly alphas based on the following expression:  $\alpha_{\text{yearly}} = (1 + \alpha_{\text{weekly}})^n - 1$ , where  $n$  is the number of trading weeks in each year. We have also used the alpha of three and four factors as alternative measures. The data used to estimate the alphas have been extracted from the Morningstar database and from Professor Kenneth R. French's website [3].

### 3.3 Independent variables

As explanatory variables related to management type, we have included *R-squared* as an indicator of active management (Table 1). This variable has been used in several mutual funds papers, highlighting that of Amihud and Goyenko (2013). In addition, the level of concentration in the 10 main assets of the portfolio (*Assets10\_*) has been included in line with Cremers' approach (2017) and the total number of shares (*Holdings\_*) to consider whether the fund invests in few assets or if it diversifies into many of them.

Relating to the fundamentals of the investment portfolio, several ratios have been included that are usually considered predictors of future performance, in particular, *market-to-book* (Gu, 2015; Ball *et al.*, 2020), where a positive relationship is expected with the excess of return. Likewise, the *price earnings ratio* (PER) (Basu, 1977; Reinganum, 1981) and the *Price-to-Free Cash Flow* (PtoFCF) used in the work of O'Shaughnessy (2011) have been included. As a quality indicator we have incorporated return on assets (ROA), used by Greenblatt (2006). Finally, the Economic Moat (Moat) calculated by Morningstar and linked to the portfolio percentage with sustainable competitive advantages has been added.

Several control variables have traditionally been used, such as the *percentage-of-expenses* (*Expenses\_*), *net-flow-over-total-assets* (*NetflowTA*), *volatility* (*LossDev*), *fund size* (*NetAssets\_*) and *gross return* (*Return\_*). For more information, see the recent works of El Ghouli and Karoui (2017) and Armstrong *et al.* (2017).

Variable	Sign	Source
<i>Dependent variables</i>		
R <sup>2</sup> <sub>-</sub>	-	Morningstar Direct
Assets10	+	Morningstar Direct
Holdings <sub>-</sub>	-	Morningstar Direct
PtoBook <sub>-</sub>	+	Morningstar Direct
ROAPER <sub>-</sub>	-	Morningstar Direct
PtoFCF <sub>-</sub>	-	Morningstar Direct
ROA <sub>-</sub>	+	Morningstar Direct
Moat <sub>-</sub>	+	Morningstar Direct
<i>Control variables</i>		
Expenses <sub>-</sub>	-	Morningstar Direct
NetflowTA	+	Morningstar Direct
LossDev <sub>-</sub>	-	Morningstar Direct
NetAssets <sub>-</sub>	+	Morningstar Direct
Return <sub>-</sub>	-	Morningstar Direct

**Table 1.**  
Variables and  
hypothesis

### 3.4 Summary statistics

Table 2 summarizes the main variables. As can be seen, risk-adjusted performance has a negative mean value, albeit close to zero, with noticeable differences in variation. If we analyze the alphas, we can observe that, on average, the pension funds do not beat the market index, although there are a certain proportion that do. The return without risk-adjustment (Return) shows the level of risk that investors have assumed at specific times and assets, with losses and gains that exceed 50%. Regarding the rest of the explanatory variables, those related to management type show moderate values of  $R^2$  (71.40) [4] which indicates a high percentage of closet indexer strategies, tracking the index with small variations with respect to it. The portfolios concentrate an average of 50% of the assets in the 10 main securities, but they invest in approximately 60 different assets. The fundamentals of the portfolios have average PER values of around 14 years and ROA of 4.31%, while the indicator of competitive advantages has an average value of 11, which highlights, following the Morningstar methodology that, on average, the companies included in the portfolios do not have competitive advantages in the long term. The pension funds evaluated have experienced net outflows, have a volatility of 12% and handle 18.7 million euros.

Most of the previous analysis (negative mean alphas, moderate values of  $R^2$ , medium portfolio concentration, etc.) hold for the different temporary sub-periods considered in Table 2. However, obviously the behavior of the flows and returns do vary in the different sub-periods considered.

## 4. Models

In this section we detail the models employed to measure the level of performance of the fund in year  $t$  explained by the variables analyzed above. The impossibility of having a complete database for all the factors must be underlined because the inclusion of many variables would imply a considerable reduction in sample size. This has motivated to build independent models for active management and fundamentals, using common control variables and, finally in the robustness test, to show an overall model. Following the works of El Ghouli and Karoui (2017) and Armstrong *et al.* (2017) we estimate panel data models. The GMM model was used to estimate the regression between performance and independent variables. System GMM dealt well with independent variables that were not strictly exogenous, i.e. they correlated with past and possibly current realizations of the error, with fixed effects, heteroscedasticity and autocorrelation within individuals (Roodman, 2009).

### 4.1 Models for the level of active management

In this section we detail the model used to estimate the effect of active management versus passive management on performance. Following Amihud and Goyenko (2013), we use the  $R^2$  of the regression of the return on the index in such a way that the most active funds are those that have a lower value. As can be seen in Table 3, more than 50% of the funds have an  $R^2$  close to 90%, which implies rather passive management in a high percentage of pension funds. However, more than 25% opt for portfolios that differ substantially from the benchmark.

Another interesting feature is related with the degree of concentration and the number of assets of the pension fund portfolio. As we can see in Table 4, pension funds concentrate a notable proportion of their investments' portfolio in 10 shares. However, it is also observed that in general the number of assets exceeds 55 in more than 50% of the portfolios, which implies that it also diversifies through a broader number of securities.

Table 2.  
Summary of statistics

Variable	Obs	All sample			2000–2006			2007–2011			2012–2017		
		Mean	Std. Dev	Min	Max	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev		
alpha5f_	1,387	-0.15	0.91	-2.84	2.98	-0.12	1.02	-0.13	1.02	-0.21	0.90	0.82	
R <sup>2</sup> _	1,195	78.94	24.43	0.05	99.22	69.64	22.84	81.82	24.03	84.17	24.03	23.94	
Assets10_	438	48.31	22.18	17.98	116.02	38.39	16.28	56.01	25.41	45.80	25.41	20.12	
Holdings_	453	60.07	38.98	1	261	106.85	67.42	57.80	44.98	56.61	44.98	28.20	
ProBook_	730	1.62	0.62	0.76	4.79	2.62	0.74	1.62	0.79	1.48	0.79	0.38	
PER_	730	14.4	3.65	0.02	25.1	14.45	3.79	11.89	2.69	15.31	2.69	3.51	
ProFCF_	459	24.05	8.02	4.9	51.28	-	-	12.54	4.51	26.26	4.51	9.6	
ROA_	730	4.31	1.41	-0.02	9.12	3.19	2.50	4.64	1.38	4.33	1.38	1.13	
Moat_	621	11.72	6.55	0	100	-	-	25.10	13.16	32.00	13.16	14.1	
Expenses_	298	1.67	0.57	0.44	3.01	1.68	0.62	1.56	0.59	1.76	0.59	0.46	
NetflowTA	967	0.015	0.34	-1.92	1.34	0.23	0.33	-0.04	0.35	-0.02	0.35	0.31	
LossDev_	1,324	12.37	6.41	0	41.88	10.68	5.45	16.34	7.21	9.88	7.21	3.86	
NetAssets_	1,006	15.05	2.16	4.14	19.54	15.27	1.96	14.99	2.04	15.10	2.04	9.51	
Return_	1,318	2.79	17.94	-51.32	48.62	4.11	18.57	-5.17	21.05	9.68	21.05	8.18	

**Note(s):** alpha5f\_ refers to the estimated alphas of 5 factors respectively; R<sup>2</sup>\_ is the goodness of fit of the pension funds' return with the index (MSCI Euroland); Assets10\_ is the percentage of the portfolio invested in the 10 main assets; Holdings\_ is the number of assets in the Pension Funds' portfolio; ProBook\_ is the price-to-book ratio; PER\_ is the Price-to-Earnings ratio of the pension fund; ProFCF\_ is the Price-to-Cash-flow ratio; ROA\_ is the return on assets; Moat\_ refers to the percentage of the portfolio with competitive advantages according to Morningstar; Expenses\_ is the difference between the gross profitability of the pension fund and the profitability obtained by the investor; NetflowTA is the indicator of net flows of the pension fund divided by the total assets; LossDev\_ is the standard deviation of pension fund yields; NetAssets\_ is the size of the fund measured by the net assets of the fund and expressed in millions of euros; Return\_ is the annual return of the pension fund; Obs refers to the number of observations, Mean to the mean, Std. Dev. to the standard deviation and Min and Max to the minimum and maximum values respectively

In order to evaluate the relationship between management type and the performance of the pension funds, we estimate the following model (Eqn (2)):

$$Y_{i,t} = \text{cons}_i + \beta_1 R_{it}^2 + \beta_2 \text{Assets10}_{it} + \beta_3 \text{LogAssets}_{it} + \beta_4 \text{Return}_{it} + \beta_5 \text{logAssets}_{it} + \beta_6 \text{LossDev}_{it} + \beta_7 \text{NetflowTA}_{it} + \sum \text{style} + \sum \text{year} + \varepsilon_{it} \tag{2}$$

where:

- $Y_i$  = Alpha.
- $i = 1$  to  $N$ , where  $N$  is the number of mutual funds in the sample.
- $R^2$  =  $R$  squared of the regression between the returns of the fund and the index.
- Assets10 = Proportion invested in the 10 main assets.
- logHoldings = Logarithm of the number of securities in the portfolio
- Return = Annual net return.
- LogAssets = Size of the pension fund measured by total assets.
- LossDev = standard deviation of the returns.
- NetflowTA = Net flows over total assets.
- Style = Investment style.
- Year = Time Dummies.
- cons<sub>*i*</sub> and  $\beta$  are the parameters of the regression  $\varepsilon_{it}$  the error term.

Probability	Percentile
0.05	1.16927
0.1	5.47632
0.25	55.03145
0.5	88.85685
0.75	96.75473
0.9	98.05594
0.95	98.48854
0.99	99.01876

**Table 3.**  
 $R^2$  distribution for pension funds

Percentile	Concentration in the 10 main assets	Number of assets
5	28.59	9
10	31.58	13
25	35.36	46
50	40.21	55
75	49.04	62
90	97.44	90
95	100.00	144

**Table 4.**  
Portfolio concentration and number of assets

4.2 Models considering value investing strategies

In this section we comment the model employed to relate the effect that the fundamentals of the pension fund portfolio have on future performance. Again, there are important differences in the ratios of the portfolios; in other words it is possible to carry out strategies based on fundamental criteria (Table 6).

To evaluate the relationship between the fundamental ratios and the performance of pension funds, we estimate several models, combining several ratios with quality criteria and competitive advantages. First of all we estimate the combination of the PER with the value ratios (Eqn (3)):

Variable	Model 1	Model 2	Model 3
alpha5f_ (T-1)	-0.0294	-0.2264***	-0.1989***
R <sup>2</sup> _ (T-1)	-0.0048*	-	-0.0087**
Assets10	-	0.0054***	0.0045**
logHoldings	-	0.0323	0.0253
Return_	0.0750***	0.0724***	0.0779***
Logassets	-0.0395	-0.0692*	-0.0362
LossDev_	0.0348**	0.1261***	0.1300***
NetflowTA	0.0292	0.2993	0.2616
Largeblend	-0.8275	-0.1395	0.2018
Largegrowth	-0.9052	-0.2162	0.4102
Largevalue	-1.1145*	-0.1941	0.4669
_cons	0.0000	1.4029	0.0000
N	689	279	276
hansen	59.4903	43.1437	44.7197
ar2	0.296	-1.81	-1.9414

**Note(s):** This table contains the GMM regression parameter values between the 5-factor Alphas and a set of explanatory variables. R<sup>2</sup> is the coefficient of regression determination between the profitability of the fund and the index, Assets10 is the percentage invested in the 10 main securities, logHoldings is the logarithm of the number of holdings, Return is the net return and Logassets is the logarithm of the size in euros of the pension fund, LossDev\_ is the volatility of the fund, NetflowTA is the percentage that the net flows represent over the total assets. Largeblend, Largegrowth and Largevalue are dummies for the investment style of the fund. The model has been estimated including temporary dummies that are not shown in the results. N refers to the number of observations. Hansen is a test for overidentifying restrictions and AR2 is the autocorrelation test. Legend: \*p < 0.1; \*\*p < 0.05; \*\*\*p < 0.01

**Table 5.**  
Active management and performance

Percentile	PtoBook_	Per_	PtoFCF_	ROA_
1	0.91	5.61	4.90	0.11
5	1.06	9.04	10.35	1.93
10	1.12	10.31	12.40	3.07
25	1.27	11.54	18.18	3.82
50	1.44	14.65	24.23	4.17
75	1.66	17.24	31.08	4.95
90	2.46	18.96	34.92	6.05
95	3.22	18.96	37.59	6.64
99	3.97	22.10	62.58	8.41

**Table 6.**  
Ratios of the Pension Funds' portfolios

**Note(s):** In this table PtoBook is the Price-to-Book ratio, PER is the Price-to-Earnings Ratio, PtoFCF is the Price-to-free cash flow and ROA is the return on assets

$$Y_{i,t} = \text{cons}_i + \beta_1 \text{ROAPER}(t-1)_{it} + \beta_2 \text{ROAPERSq}_{it} + \beta_3 \text{Return}_{it} \beta_4 \log \text{Assets}_{it} \\ + \beta_5 \text{LossDev}_{it} + \beta_6 \text{NetflowTA}_{it} + \sum \text{style} + \sum \text{year} + \varepsilon_{it}$$

(3)

where:

$Y_i$  = Five factor Alpha

$i = 1$  to  $N$ , where  $N$  is the number of pension funds in the sample.

ROAPER = Interaction variable of the product of *Roa* and the Price-Earning Ratio. We also estimate the same interaction variables with *PtoFCF* and *PtoBook*.

ROAPERSq = ROAPER squared

Return = Annual net return.

LogAssets = Size of the pension fund measured by total assets.

LossDev = Standard deviation of the returns.

NetflowTA = Net flows over total assets.

Style = Investment style.

Year = Time dummies.

$\text{cons}_i$  and  $\beta$  are the parameters of the regression and  $\varepsilon_{it}$  is the error term.

## 5. Results

In this section we show the results of the level of performance of the fund in year  $t$  explained by the variables analyzed above and the previous models [5].

### 5.1 Results for the level of active management

Our findings from the estimation of Eqn (2) (Table 5) support hypothesis 1, which poses a positive relationship between active management and future performance. In fact, in all the models (Model I, II and III) we have found in the specific case of our sample that the pension funds that differ from the index (low  $R$ -squared) are those that achieve better alphas. Therefore, the divergence of the portfolio of equity pension funds with the Eurozone Investment Area has a positive effect on performance in line with previous work on mutual funds (Brands *et al.*, 2006; Kacperczyk *et al.*, 2005; Cremers and Petajisto, 2009). Additionally, regarding the work of Amihud and Goyenko (2013), we find that the funds portfolios with lower  $R$ -squared value generate a higher alpha in the next period. The estimated regression model also shows how the concentration strategy has a positive impact in line with hypothesis 2. In this way, those strategies that choose to invest a relevant part of the portfolio in a low number of assets achieve better future performance (Table 5). These findings are in accordance with those obtained for mutual funds and support the existence of selection skills and convictions in some managers (stock pickers) that provide the best results for investors (Petajisto, 2013). Recently, Cremers (2017) has maintained that only the mutual funds that differ from the indices and have “convictions” are able to beat the market, that is, they are “outperformers”, and those that do a lot of trading generally obtain lower returns, therefore being “underperformers”. This result is also support from the pension funds previous literature. Cremers and Pareek (2016) and Gonzalez *et al.* (2020) find that the pension fund’s performance increases if a fund is patient and has an active investment strategy.

Regarding the number of assets, the relationship is not significant. What that means is that the strategy of concentrating on a few assets and differentiating the portfolio from the index seems to give good results.

5.2 Results considering value investing strategies

Table 7 shows the results of several regressions using the main value and profitability ratios as explanatory variables and Eqn (3). The models have been combined to avoid multicollinearity problems detected due to the important correlation between some of them. Following the approach of Greenblatt (2006) and Blackburn and Cakici (2017), if the quality of the business is good, the combination of price and quality may justify paying more for the securities. For this reason, we use an interaction variable and its square, assuming that there is a non-linear relationship, since higher relative prices can be paid if the quality of the business, as measured by the ROA, is reasonable, but to a level from which the effect is reduced. In line with this approach, we see that the interactions of the PER and the ROA as well as the square are significant, which implies that funds that pay higher prices can have a positive effect on the alpha, although after a certain level the effect is reduced. Analyzing the distribution of the values of PER and ROA, we observe that the best combinations are those of high ROA combined with PER above the average. Evaluating the distribution of the variable ROAPER we observe that less than 5% of the pension funds have values close to the maximum. This implies that a strategy which consists of paying more for assets of higher quality can have positive consequences in terms of Excess Return as explained in

Variable	Model1	Model2	Model3	Model4	Model5	Model6
alpha5f	-0.1967**	-0.2618***	-0.2012***	-0.2203***	-0.2321**	-0.2277***
ROAPER (T-1)	0.0223***	-	-	0.0251***	-	-
ROAPERSq (T-1)	-0.0001***	-	-	-0.0001***	-	-
ROAPtoFCF (T-1)	-	0.0058**	-	-	0.0055**	-
ROAPtoFCFsq (T-1)	-	0.00000	-	-	0.000000	-
RoaPtobook (T-1)	-	-	0.0442	-	-	0.0982
RoaPtobooksq (T-1)	-	-	-0.0002	-	-	-0.0043
Moat	-	-	-	-0.0043	-0.0006	-0.0025
Return_	0.0617***	0.0715***	0.0611***	0.0595***	0.0731***	0.0614***
Logassets	-0.0045	0.017	-0.0127	0.0018	0.0117	0.0106
LossDev_	0.1078***	0.1164***	0.1025***	0.1182***	0.1159***	0.1146***
NetflowTA	0.0182	0.1347	0.0253	0.0345	0.1779	0.0156
Largeblend	0.0322	-0.3854	0.026	-0.1898	-0.2993	-0.2099
Largegrowth	-0.2159	-0.6542**	-0.2825	-0.4893*	-0.5814**	-0.4249
Largevalue	0.0259	-0.4657*	0.0128	-0.2379	-0.4038	-0.1904
_cons	-1.224	-1.8401***	0	-5.3749***	-1.6734**	-2.9528***
N	357	242	357	324	241	324
hansen	0.998	0.971	0.95	0.962	0.967	0.887
ar2	-0.2999	-1.7373	-0.2455	-0.1944	-1.5488	-0.5256

**Note(s):** This table contains the values of the GMM regression parameters among the five- factor alphas and a set of explanatory variables. ROAPER is the interaction variable of the product of *Roa* and the *Price-Earning* Ratio and ROAPERSq is the ROAPER squared. ROAPtoFCF is the product of ROA and the *Price to FCF* and ROAPtoFCFsq is the square of ROAtoFCF. *Roaptobook* is the product interaction variable of the product of *Roa* and *Price-to-Book* and RoaPtobooksq is its squared value. Return is the net return and Logassets is the logarithm of the size in euros of the pension fund. LossDev\_ is the volatility of the fund, while NetflowTA is the percentage that the net flows represent over total assets. Largeblend, Largegrowth and Largevalue are dummies for the investment style of the fund. The model has been estimated including temporary dummies that are not shown in the results. N refers to the number of observations, Hansen is a test for overidentifying restrictions and AR2 is the autocorrelation test. Legend: \*  $p < 0.1$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

**Table 7.** Value investing and performance

hypothesis 4. In the case of the interaction of the *price-to-cash* flow with *Roa*, only the linear coefficient is significant and *price-to-book* is not significant at all.

In addition, from models 4 to 6 we have included the Economic Moat provided by Morningstar to consider the effect of sustainable competitive advantages on future performance. The results of incorporating the economic moat in the previous models, which only included fundamental criteria, show that the variable is not significant in any of the three models (Table 7). Therefore, the consideration of value strategies based on companies with a good price-quality ratio seem to be a good strategy for reaping extraordinary returns, although the economic moat is not significant.

### 6. Robustness

In order to check the robustness of our findings, we included Table 8 (second column) with all the variables that were significant in the previous models and using the same period for the analysis (2007–2017). We can observe that the main variables indeed remain significant, showing the importance of these factors for explaining the performance of pension funds regardless of the period considered. Only the variable *Assets10* is not significant in the overall model although the sign does not change. Table 8 (third column) show the results of the same previous estimation using dummies for pension funds of Spain and Belgium, main variables indeed remain significant (only alphas results in this case not significance) This analysis allows us to overwhelm the challenges indicated by Ferson (2010) considering various regulatory context, competition, etc.

We have also recalculated the model using a Random Effects panel data model. As we can see in Table 9, the variables that are significant in the dynamic model remain so in the new estimated ones. In addition, the signs of the latter's coefficients are unchanged from the former's. The use of dummies for the most represented countries (Spain and Belgium) (third column of Table 9) induce similar results.

As can be seen in Table 10, all the coefficients in the hypothesis 1, 2 and 4 are significant and in line with our expectations. In general, the degree of active management the portfolio concentration and a good balance between Price and quality, measured by the interaction of

Variable	Overall	Dummies country
alpha5f_	-0.2403***	-0.0191
R <sup>2</sup> _	-0.0167***	-0.0131*
Assets10	0.0013	0.0003
ROAPER	0.0559**	0.0483***
ROAPERsq	-0.0004*	-0.0004**
Return_	0.0820***	0.0659***
Logassets	-0.0382	-0.0272
LossDev_	0.1604***	0.092
NetflowTA	0.6278	0.4732
Largeblend	0.1933	0.4221
Largegrowth	0.0604	0.1873
Largevalue	0.283	0.4388
Spain		-0.0689
Belgium		0.0000
_cons	0.6019	-1.533
N	227	227
hansen	0.991	0.972
ar2	-1.11	-0.91

Note(s): See Tables 5 and 7

**Table 8.** Model considering all the significant variables

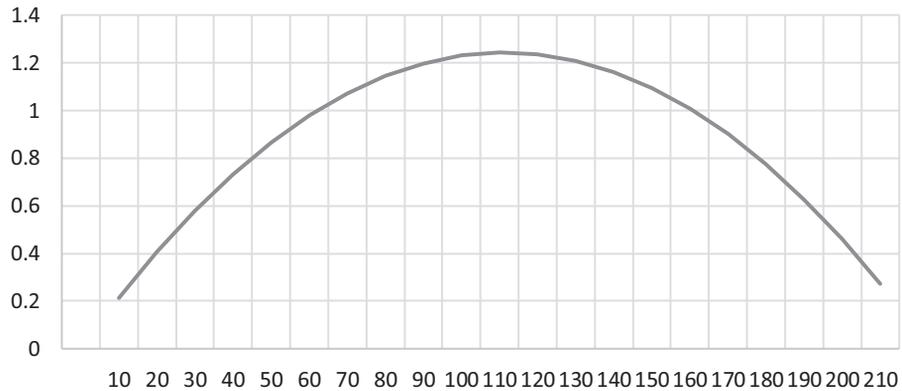
Variable	Random effects	Dummies country
$R^2$	-0.0117***	-0.0125***
Assets10	0.0007	0.0009
ROAPER	0.0447***	0.0448***
ROAPERSq	-0.0003**	-0.0003**
Return_	0.0578***	0.0595***
Logassets	0.0031	0.0005
LossDev_	0.0442	0.0487
NetflowTA	0.2153	0.1939
Largeblend	0.2142	0.2658*
Largegrowth	-0.0193	0.0781
Largevalue	0.2777**	0.3299***
_cons	0.000	0.0482
$N$	227	-0.4151*
$r^2_o$	0.7173	-1.8306***

**Note(s):** See Tables 5 and 7

**Table 9.**  
Model considering all  
the significant  
variables

Hypothesis	Results
H1	Significant -
H2	Significant +
H3	Significant U inverted
H4	Significant Yes +
	No

**Table 10.**  
Summary results of  
Testing Hypothesis



**Figure 1.**  
Performance and ROA  
to PER relationship

RoA and PER, has a positive effect on pension funds performance. Also, the number of assets and the economic moat were not significant.

Finally, we use the three-factor alpha and the four-factor alpha instead of the five-factor alpha in the previous estimations. The results achieved are very similar to those obtained in the case of the alpha of five factors.

## 7. Conclusions

The objective of this study is to analyze the effect of management type and the fundamentals of the investment portfolio on future performance. For this purpose, we use a sample composed of pension funds that invest in the Euro area and for which historical information exists for the period 2000–2017. In this way, it is a matter of seeing to what extent certain characteristics of pension funds serve to identify products that will perform better than their competitors and if they can really provide an excess of return.

The *management type* variable (Active / Passive) has yielded positive results in favor of portfolios that differ from the index. Likewise, the estimated regression model shows how the concentration strategy has a positive impact, supporting the strategies that choose to invest a relevant part of the portfolio in a few assets. This result could be related to the work of Gonzalez *et al.* (2020), Cremers and Pareek (2016) for pension funds or Cremers (2017) for mutual funds who believe that patient investment in assets, carried out by the manager who has a conviction in them, will provide better future performance. Likewise, the use of fundamental analysis criteria yields interesting results. The investment of funds with a balance between price (PER or price to free cash flow, PtoFCF) and quality (measured by the ROA) is the strategy that provides the best results. Therefore, compared to the most basic strategy, which consists of investing in cheap assets, the results support more expensive portfolios in terms of PER and PtoFCF and with high quality measured by the ROA; measure this in terms of the ROA. Finally, including the competitive advantages of the companies that make up the fund's portfolio has no effect on future results. As a result, it is confirmed that the selection of funds based on "Value Investing" can have a positive impact on future performance. Our results provide some light to the debatable when a growth or value style generates more wealth creation in the long term in the pension industry (see Sorensen and Fabozzi, 2008).

By way of conclusion, our research identifies factors that may be considered in the process of selecting pension funds. These results are useful for investors, financial advisors and product distributors interested in selecting the best assets in order to supplement the public pension with complementary saving products. We are aware of the different metrics that could be used to measure active management. Future research is necessary in relation to the effect of using different measures of risk-adjusted performance and alternative active management measures, such as active share. Finally, the use of more heterogeneous samples with a greater number of funds between different countries would help to confirm that the results are extensible to countries with different regulatory environments, competition, etc.

Future research will benefit from the Regulation of the European Parliament 2019/1238, of June 20, 2019 deals with the Pan-European Personal Pension Product (PEPP). EU member countries have a period to transpose it into their legal systems until June 2022 (three years from its approval). With the new Regulation, there will be a true single market for personal pensions and an EU passport to facilitate cross-border distribution. New regulation will impulse competition in returns and a reduction in fees due to greater economies of scale. For the research community, this new single market will allow a new category of equivalent pension fund products to which the analyzes carried out previously should be extended.

## Notes

1. For the models of fundamental analysis we use exclusively the information comprised between 2007–2017 because the data for most of the variables is only available for this period.
2. To be included in our sample, funds must be at least 12 months old to avoid the incubation bias. To prevent survivorship bias, we consider all mutual funds that meet the following criteria (surviving and not surviving funds): "Insurance and Pension Funds" with Global category "Europe Equity

Large Cap” or “Europe Equity Mid/Small Cap”, which produces more than 2,000 funds (primary class, surviving or not surviving). In these funds there are Exchange-Traded Funds, Open-End Fund, etc. We restrained our results to Insurance Product Funds and focus on funds that belong annually to the Morningstar Category EAA Insurance Eurozone Equity Large, Medium and Small Cap (to control currency effects on returns), obtaining the final sample (125 pension funds domiciled in Europe).

3. Fama/French (FF) European Factors are available at [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html). Weekly returns from which we calculate alphas are expressed in dollars. Since FF factors are from the perspective of an American investor, we express the five factor alpha calculated in dollars to euros using the official exchange rates (data from Morningstar, original source ECB).
4. The estimation of alphas, betas and  $R^2$  has been done through regressions using weekly returns and a rolling window of 52 weeks.
5. All the effects of the variables depend on the market, the geographical area and other external factors.

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# A study of employee acceptance of artificial intelligence technology

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## Abstract

**Purpose** – This study aims to reveal the role of artificial intelligence (AI) in the context of a front-line service meeting to understand how users accept AI technology-enabled service.

**Design/methodology/approach** – This study collected 454 Korean employees through online survey methods and used hierarchical regression to test the hypothesis empirically.

**Findings** – In the results, first, clarity of user and AI's roles, user's motivation to adopt AI-based technology and user's ability in the context of the adoption of AI-based technology increases their willingness to accept AI technology. Second, privacy concerns related to the use of AI-based technology weakens the relationship between role clarity and user's willingness to accept AI technology. And, trust related to the use of AI-based technology strengthens the relationship between ability and user's willingness to accept AI technology.

**Originality/value** – This study is the first one to reveal the role of AI in the context of a front-line service meeting to understand how users accept AI technology-enabled service.

**Keywords** Artificial intelligence, Clarity of role, Motivation, Ability, Willingness to accept AI technology

**Paper type** Research paper

## 1. Introduction

Employee self-service (ESS) technology is currently an open innovation of particular interest in the human resource management context because of anticipated cost savings and other efficiency-related benefits (Giovanis *et al.*, 2019; van Tonder *et al.*, 2020). It is a class of web-based technology that allows employees and managers to conduct much of their own data management and transaction processing rather than relying on human resource (HR) or administrative staff to perform these duties (Marler and Dulebohn, 2005). ESS technology can allow employees to update personal information, change their benefits selections or register for training. Shifting such duties to the individual employee enables the organization to devote fewer specialized resources to these activities, often allowing HR to focus on more strategic functions. Despite the intended benefits, the implementation of ESS technology poses many challenges. Because ESS technology functionality is typically not associated with the core functions of professional employees' jobs, these employees may be less motivated to learn and use the ESS technology (Brown, 2003; Marler and Dulebohn, 2005). However, the full adoption of ESS technology is necessary to realize the intended benefits and recoup the significant investments in technology. The history of technology has shown that there is much hype about new technologies, and after the initial inflated expectations, the trough of disillusionment usually follows (Gartner, 2016). Due to trade press and social media posts extolling the virtues of new technologies, managers are keen to jump on a new technology rollercoaster and adopt technological solutions without considering whether they are worth the effort and justify their mystique/novelty.



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Artificial intelligence (AI) is an example of technology that receives much attention worldwide in the media, academia and politics (Zhai *et al.*, 2020; Dhamija and Bag, 2020). However, international readers' attitudes toward AI range from a positive assessment of human physical labor and new business opportunities (Frank *et al.*, 2017) to a fear of making humans obsolete in a fully robotic society (Leonhard, 2016). Therefore, it is essential to understand the good deeds of AI-based ESS acceptance to increase the chances of success with the introduction of AI-based ESS. However, few researchers have examined how employees adopt AI-based ESS.

For this research gap, this study takes a closer look at the employees' perspective on how and why they embrace a narrow, business-based AI application when service occurs. Therefore, this study presents a conceptual framework based on previous reviews, practices and theories to identify the role of AI in the context of service encounters and explain the employee acceptance of AI in service research. This framework extends a range of AI beyond conventional configuration and self-service technology acceptance theories to include AI-specific variables such as privacy concerns and trust. A process model, organizing salient variables contributing to employee reaction to the introduction of technology to the service encounter, is proposed, and hypotheses testing the relationships between and among these variables are developed. This study concludes with research issues related to the framework that serve as catalysts for future research. It will be the first study to reveal the role of AI at a front-line service conference to understand how users accept services based on AI technology.

## 2. Theoretical background and hypothesis development

In service sectors, this study focuses on understanding and theoretically explaining the user acceptance of AI. Previous studies have experimentally investigated the antecedent of self-service technology (SST) adoption and include critical variables in this theoretical framework in the model (Wu and Wu, 2019; Wang *et al.*, 2019; Kelly *et al.*, 2019). In their work, the user adoption of Meuter *et al.* SST is user clarity (Do you know how to use and how to perform SST?), and motivation (Why use SST to induce the user to try?), and capabilities (Do you have the resources and ability to use SST?). This core configuration is influenced by the nature of the technology itself and by the user's differences. Later, the meta-analysis of SST acceptance explained the complexity of the variables affecting SST acceptance (Blut *et al.*, 2016). In addition to what we already know about SST acceptance, this study believes that the acceptance of AI in service meetings depends on other AI-specific variables other than those traditionally studied in SST studies. This set of variables includes privacy issues, technology and trust in the company, and awareness of the horror of the technology.

### 2.1 Core construct

Unlike SST, AI-based technology can also act as an independent agent, whether users are aware of AI behavior (Hoffman and Novak, 2017; Upadhyay and Khandelwal, 2019). For example, Google's spam filter, one of AI's first applications, detects and blocks 99.9% of spam and phishing messages without user input (Lardinois, 2017). Facebook recently introduced an AI-based suicide prevention tool that provides support, such as a proposal to surprise users who express suicidal thoughts, contact friends or family members, contact helplines and provide information on available help resources (Rosen, 2017). The concept of role clarity should be expanded to include clarity about the role of users and AI in the service process. During the access to AI support technology, users need to understand that both sides contribute to joint production services. The clarity of a role is remarkable from two perspectives. (1) Establishing responsibility sharing in joint services and (2) promoting user confidence in technology through transparency.

It is up to two actors (user and AI) to perform the part according to the design to achieve the desired service results. Role clarity is essential to ensure the successful integration of AI inputs with users. It ensures that the user understands the steps AI performs to design the service delivery steps and to provide seamless service performance. Misunderstanding or lack of role clarity can result in undesirable and tragic consequences when the stake is exceptionally high. For example, in 2013, the Asiana Airlines crash in San Francisco was a disastrous result of insufficient role clarity. The pilot, who relies on the plane's autopilot, expected the automatic control system to come out of its idle position on its own when the plane begins to lose speed. Users can be involved in AI but lack the role clarity when AI appears in the same context as self-driving cars. What activities does an AI-enabled vehicle carry out, and what does the user do? Role clarity can also indicate transparency about the nature of a meeting, which forms the basis of trust (Hengstler *et al.*, 2016). Because AI can act as an independent agent, the level of transparency in AI roles in meetings can affect user confidence in the technology. Failure to fully disclose the role of the AI agent and its behavior during and after the meeting may erode user confidence in the technology and service providers.

Therefore, role clarity can include questions about the data that AI collects during its interactions and how it uses the data during and after its occurrence. Amazon sent news when its criminal investigation ordered it to submit audio recordings made with personal echo devices as evidence (Heater, 2017). Many users were surprised to learn that their Alexa recorded and stored audio even if the owner of the device was not activated. Unroll.me, a free service that helps users unsubscribe from email subscription lists is another example of a lack of transparency that has caused user backlash. Users were angry when they learned that Unroll.me was scanning their email and selling third parties (Isaac and Lohr, 2017). Such cases where users lack clarity about AI's role raise concerns about data privacy and create barriers to the adoption of AI-based technology.

*P1.* Clarity of user and AI's roles is positively associated with the user's willingness to accept AI technology.

AI-based technology improves convenience, efficiency and service speed, providing tremendous value to users, increasing user motivation to embrace, adopt and use those technologies. Whether Alexa updates with related news, or Google Assistant notifies you about upcoming meetings and provides estimates of travel time based on actual traffic data, the information is readily available. It continuously learns the interaction data that these products collect and provides the ability to meet individual needs. For example, users can schedule the most thermostat. Still, when Nest gains insight into their assumptions and identifies relevant behavioral patterns, it will require independent measures to fine-tune their initial schedules to optimize energy efficiency while abiding by their temperature preferences. While AI-based technology can help you perform useful tasks, unlike most SSTs, AI-based technology can be a source of pleasure and enjoyment and provides acoustical value to users. Think of Xiaolce from Microsoft, a chatbot app that imitates human interaction with Alexa's jokes, her favorite songs, her intention to become virtual friends of people. Ever since Xiaolce was introduced to China, the friendly and friendly chatbot has captivated millions of Chinese users (Markoff and Mozur, 2015). According to Agarwal and Karahanna, the perceived absorption is the hedonic technique (Agarwal and Karahanna, 2000; Lowry *et al.*, 2013) and is an essential variable of intrinsic motivation in the context of adoption, which explains why a chatbot so attracts Xiaolce users.

*P2.* User's motivation to adopt AI-based technology is positively associated with the user's willingness to accept AI technology.

It refers to the ability of users to perform steps related to their interaction with SST within the SST framework. This configuration needs to be expanded in the context of an AI support service meeting. For example, voice-assisted AI devices can eliminate technology barriers, making it easier to interact with technology regardless of the user's technical capabilities. At the same time, users can evaluate whether AI or the role of technology in the context of the service experience is a user or a degree to which capabilities are enhanced or restricted. For example, users can consider AI as an extension of their ability or physical ability to improve service performance by integrating human and AI capabilities (Wilson and Daugherty, 2018). AI has the potential to democratize services by making them easier to use, but vice versa. Lack of technical expertise or adequate financial resources may prevent users from accessing AI-based technologies, limiting adoption. For example, PwC's Global Consumer Insights Survey recently showed that early AI adopters tend to be more tech-savvy and less price-sensitive than non-adopters (PwC's Global Consumer Insights Survey, 2018).

- P3. User's ability in the context of the adoption of AI-based technology is positively associated with the user's willingness to accept AI technology.

### 2.2 AI-specific moderators

Compare the success of Microsoft's XiaoIce with the failure of Microsoft's US-based chatbot Tay, which started as Twitter's social bot. The bot had to stop the tie shortly after launch because it interacted with other Twitter users to discuss divisive topics, political quickly and racially charged (Hunt, 2016). Taylor's failure and XiaoIce's success demonstrate the importance of training and achieving high levels of AI performance in the amount and quality of the data collected in the interaction. Users are willing to share their personal information for personalization, leading to the personalization privacy paradox (Lee and Rha, 2016). By limiting privacy disclosure, users need to find the right balance between maximizing the benefits of privacy and minimizing privacy risks. According to Genpact's study of 5,000 respondents in the United States, UK and Australia, privacy issues are one of the significant obstacles to user adoption of AI-based solutions (Genpact, 2017). More than 50% of the survey participants said they felt uncomfortable with the idea of companies using AI to access personal data.

In comparison, even if the user experience improves, 71% said they did not want to use AI to violate privacy protections (Genpact, 2017). At the same time, studies have shown that privacy considerations and awareness of privacy risks harm users' willingness to use personalized services. Still, the value of personal services may be more important than privacy concerns (Awad and Krisnan, 2006). According to a study by Lee and Rha (2016) regarding location-based mobile commerce, increasing confidence in service providers can help alleviate user awareness of privacy risks. So, privacy concern is an essential factor affecting user acceptance of AI-based technologies.

- P4. Privacy concerns related to the use of AI-based technology weaken the relationship between core constructs and the user's willingness to accept AI technology.

When discussing user confidence in AI-based technology, it can be obtained from existing research on automation and human interaction. Concerning automation, Lee and See (2004) define trust as attitudes that help counselors achieve personal goals in situations characterized by uncertainty and vulnerability. Both socio-psychology and marketing literature identify uncertainty. Vulnerabilities as an essential attribute that activates trust in relationships and organizational relationships; when a service meeting is unable to control the actions of a service provider, the vulnerability element occurs because uncertainty occurs, and the results of a meeting directly affect the user. Trust is especially important in the early stages of a relationship. The adoption of new technology when the situation is ambiguous is

uncertain. According to Lee and See (2004), trust connects the distance between the nature of automation and the individual's belief in its function and the individual's intention to use and rely on it. Concerning e-commerce, Pavlou (2003) distinguishes between trust in the supplier and trust in the trading medium. This differentiation also applies in the context of AI support service meetings. Trust in service providers and specific AI technologies will contribute to user confidence in AI support services (Flavian *et al.*, 2019; Hernandez-Fernandez and Lewis, 2019; Parra-Lopez *et al.*, 2018). Mayer *et al.* (1995) identified three key factors that determine the reliability of an organization: competence, integrity and mercy. Capabilities represent domain-specific expertise, skills and capabilities associated with service interactions.

Integrity evaluates whether the user can find and accept the principles that the provider follows. Mercy relates to the coordination between the supplier and the user's motives and intentions. Recent events involving Facebook and Cambridge Analytica have shown inappropriate integrity and charity in the eyes of Facebook users who have collected data without exposing or recognizing Facebook's business model (Rosenberg and Frenkel, 2018). It has caused a sharp drop in public confidence in Facebook (Weisbaum, 2018). In the context of automation, Lee and See (2004) define performance, processes and objectives as the basis for trust. Performance is similar to ability and represents the functionality of technology regardless of whether it is performed in a reliable, predictable and capable manner. The process (method) is to the extent that AI-enabled technologies are suitable for service meetings and can achieve user goals. Users will evaluate service providers' capabilities, integrity and philanthropy, and their experience before, during and after meeting the performance, processes and objectives of AI-enabled technologies. These factors will contribute to the overall level of confidence in new AI support services. The reliability or variability of trust depends on the number of contributors the user recognizes as reliable (McKnight *et al.*, 1998). Regarding the adoption of AI-based solutions in B2B services, Hengstler *et al.* (2016) found that the transparency of the development process and the gradual introduction of technology are important strategies to increase confidence in innovative development. Companies may be better off introducing new capabilities gradually, in a series of steps that engage users' curiosity and desire for novelty, instead of doing it in one big leap that may alarm users and come across as too big of a departure from more traditional service delivery alternatives.

*P5.* User's trust in AI-based technology strengthens the relationship between core constructs and the user's willingness to accept AI technology.

### 3. Methodology

#### 3.1 Sample and data collection

This study adopted an online survey method using a convenience sampling for data collection. It is instrumental in collecting data from a large number of individuals in a relatively short time and at a better cost. The survey company asked some of the target companies for the survey and acquired employees' email addresses through the human resources management department of target companies with their agreement.

The professional survey company initially contacted 11 employees in the target companies in Korea. Each first-level contact (or "sampling seed") was asked to forward the invitation email to their colleagues at their organization and to ask those recipients also to send the email to other staff. The potential maximum number of recipients could be assumed to include all employees of the target companies, which numbered over 500 at that time. The seeds of this respondent-driven sampling method (also known as snowball sampling) were diverse in demographic characteristics. However, this method has been challenged due to possible self-selection bias or bias that may arise when the topic of the survey is controversial

or when differences in the size of social networks is a factor. None of these reported biases was deemed to apply to the focus of the present study.

According to the theory of social research methodology, it can be said that the response rate is not a big deal as long as the representativeness of sample selection is secured. Of course, there are some prerequisites. Since the survey method of this study is a snowball method, the survey was designed to end when 500 people, 3% of the target company's employees, responded. It was considered reasonable considering the survey budget and sample size.

The professional survey company automatically gave an electronic gift card of the coffee voucher to respondents after completing this survey to increase the response rate and reduce the non-response bias for one month from January 1 to 31 in 2019. All participants received an email explaining the purpose of the survey, emphasizing voluntary participation and asking for an online survey, along with an email with confidence. Upon completing the survey, the participants received an electronic gift card of the coffee voucher as a token to participate in the study. Of the initial pool of participants surveyed, 500 individuals returned completed surveys, yielding a response rate of 100%. After the deletion of surveys with (1) no code identifiers, (2) an excessive number of missing cases, this study was left with a final sample of 454.

The participants are Korean and consist of men (47.6%) and women (52.4%). The age of them includes 20s (24.1%), 30s (25.7%), 40s (25.4%) and 50s (24.8%). The marital status includes unmarried (41.2%) and married (48.8%). The occupation includes office work (66.8%), research and development (33.2%). The level of their education includes middle school (0.6%), high school (16.3%), community college (21.0%), undergraduate (51.4%) and graduate school (10.7%). The income includes under 30,000 USD (27.1%), 30,000–50,000 USD (46.3%) and 50,000–100,000 USD (26.6%).

### 3.2 Survey instrument

The survey instrument used in this study consisted of two sections: demographic information and main questions. The demographic information section asked questions about gender, age, marital status, occupation, education and income. Regarding main questions, role clarity has five items adapted from Rizzo *et al.* (1970). Extrinsic motivation has six items and intrinsic motivation has six items adapted from Tyagi (1985). Ability has six items adapted from Jones (1986) and Oliver and Bearden (1985). The measures for privacy risk were adapted from Chellappa and Sin (2005) and Xu *et al.* (2011), using four questions concerning perceived risks from providing personal information for the use of AI. Trust has three items adapted from Jarvenpaa *et al.* (1999). Willingness to accept AI technology has three items adapted from Venkatesh *et al.* (2012) and Lu *et al.* (2019). All of the responses are measured with 5 Likert scales.

## 4. Analysis result

### 4.1 Verification of reliability and validity

The validity of variables was verified through the principal components method and factor analysis with the varimax method. The criteria for determining the number of factors is defined as a 1.0 eigenvalue. This study applied factors for analysis only if the factor loading was greater than 0.5 (factor loading represents the correlation scale between a factor and other variables). The reliability of variables was judged by internal consistency, as assessed by Cronbach's alpha. This study used surveys and regarded each as one measure only if their Cronbach's alpha values were 0.7 or higher. They are role clarity (0.86), extrinsic motivation (0.77), intrinsic motivation (0.81), ability (0.80), privacy concerns (0.74), trust (0.79) and willingness to accept AI technology (0.79).

4.2 Common method bias

As with all self-reported data, there is the potential for the occurrence of common method variance (CMV) (MacKenzie and Podsakoff, 2012; Podsakoff *et al.*, 2003). For alleviating and assessing the magnitude of common method bias, this study adopted several procedural and statistical remedies that Podsakoff *et al.* (2003) suggest. First, during the survey, respondents were guaranteed anonymity and confidentiality to reduce the evaluation apprehension. Further, this study paid careful attention to the wording of the items and developed the questionnaire carefully to minimize the item ambiguity. These procedures would make them less likely to edit their responses to be more socially desirable, acquiescent and consistent with how they think the researcher wants them to respond when answering the questionnaire (Podsakoff *et al.*, 2003). Second, this study conducted Harman’s one-factor test on all of the items. A principal component factor analysis revealed that the first factor only explained 34.1% of the variance. Thus, no single factor emerged, nor did one-factor account for most of the variance.

Furthermore, the measurement model was reassessed with the addition of a latent CMV factor (Podsakoff *et al.*, 2003). All indicator variables in the measurement model were loaded on this factor. The addition of the common variance factor did not improve the fit over the measurement model without that factor, with all indicators still remaining significant. These results do suggest that CMV is not of great concern in this study.

4.3 Relationship between variables

Table 1 summarizes the Pearson correlation test results between variables and reports the degree of multi-collinearity between independent variables. Role clarity ( $\beta = 0.021, p < 0.01$ ), extrinsic motivation ( $\beta = 0.011, p < 0.01$ ), intrinsic motivation ( $\beta = 0.012, p < 0.01$ ), ability ( $\beta = 0.012, p < 0.01$ ), privacy concerns ( $\beta = -0.111, p < 0.01$ ) and trust ( $\beta = 0.042, p < 0.01$ ) are significantly associated with willingness to accept AI technology. The minimum tolerance of 0.812 and the maximum variance inflation factor of 1.231 show that the statistical significance of the data analysis was not compromised by multi-collinearity.

4.4 Hypothesis testing

This study used hierarchical multiple regression analyses of SPSS 24.0 with three-steps to test the hypotheses. In the first step, demographic variables were controlled. Independents were entered in the second step. In the final step, the multiplicative interaction terms between independent factors and moderating variables were entered to test the current hypothesis about the moderating effect directly. Table 2 shows the results. First, among demographic variables, a man ( $\beta = 0.043, p < 0.05$ ) is positively related to the willingness to accept AI technology, and age ( $\beta = -0.048, p < 0.05$ ) is negatively related to the willingness to accept AI technology. Second, to analyze the relationship between independent variables

	1	2	3	4	5	6
1. Role clarity	1					
2. Extrinsic motivation	0.021	1				
3. Intrinsic motivation	0.012	0.024	1			
4. Ability	0.046	0.106	0.032	1		
5. Privacy concerns	-0.043	0.011	-0.088	0.032	1	
6. Trust	0.026	0.061	0.042	0.057	-0.051	1
7. Willingness to accept AI technology	0.021**	0.011**	0.012**	0.012**	-0.111**	0.042**

Table 1. Variables’ correlation coefficient

Note(s): \* $p < 0.05$ , \*\* $p < 0.01$

	Willingness to accept AI technology		
	Model 1	Model 2	Model 3
Gender	0.043*	0.037*	0.031*
Age	-0.048*	-0.031*	-0.024*
Marital status	0.021	0.005	0.003
Occupation	0.021	0.019	0.011
Education	-0.052	-0.042	-0.029
Income	0.013	0.009	0.003
Role clarity		0.031**	0.028**
Extrinsic motivation		0.019**	0.014**
Intrinsic motivation		0.008*	0.005*
Ability		0.017**	0.015**
Privacy concerns			-0.011*
Trust			0.012*
Role clarity × Privacy concerns			-0.063*
Extrinsic motivation × Privacy concerns			0.011
Intrinsic motivation × Privacy concerns			-0.014
Ability × Privacy concerns			0.101
Role clarity × Trust			0.033
Extrinsic motivation × Trust			0.101
Intrinsic motivation × Trust			0.011
Ability × Trust			0.041*
Adj. $R^2$	0.107	0.177	0.191
$F$	4.644**	10.978**	15.881**

Note(s): \* $p < 0.05$ , \*\* $p < 0.01$

Table 2.  
Analysis 1

and the willingness to accept AI technology, model 2 in Table 2 shows that some of the independent variables have statistical significance with game engagement. Role clarity ( $\beta = 0.031$ ,  $p < 0.01$ ) is positively related to willingness to accept AI technology. Extrinsic motivation ( $\beta = 0.019$ ,  $p < 0.01$ ) and intrinsic motivation ( $\beta = 0.008$ ,  $p < 0.01$ ) have positive relationships with willingness to accept AI technology. Ability ( $\beta = 0.017$ ,  $p < 0.01$ ) shows a positive association with willingness to accept AI technology. Therefore, P1–P3 are supported.

Lastly, model 3, consisting of moderators, shows the interactions between independent variables and moderating variables on game engagement. Privacy concerns were found to harm the relationship between role clarity and willingness to accept AI technology. ( $\beta = -0.063$ ,  $p < 0.05$ ). Privacy concerns were found to have no significance in the relationship between other independent variables and a willingness to accept AI technology. Trust was found to positively affect the relationship between ability and willingness to accept AI technology. ( $\beta = 0.041$ ,  $p < 0.05$ ). Trust was found to have no significance in the relationship between other independent variables and a willingness to accept AI technology. Therefore, P4 and P5 are partially supported (see Figure 1).

## 5. Discussion

The purpose of this study was to examine the employee acceptance of AI and explore the AI-specific moderators' effect on that process. The results show that the clarity of user and AI's roles, user's motivation to adopt AI-based technology and user's ability in the context of the adoption of AI-based technology increases their willingness to accept AI technology. And in the results, privacy concerns related to the use of AI-based technology weakens the relationship between role clarity and user's willingness to accept AI technology. And, trust

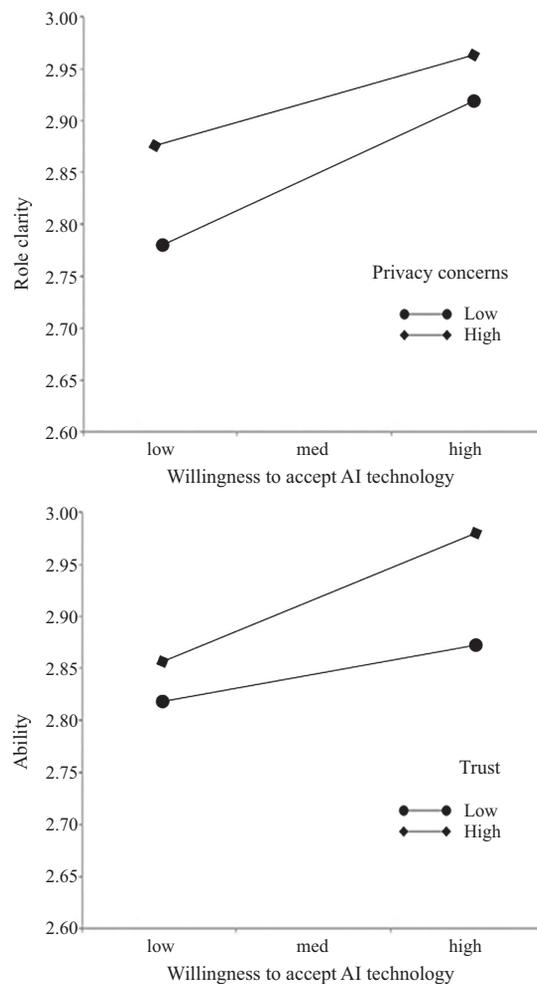


Figure 1.  
Interaction effect

pertaining to the use of AI-based technology strengthens the relationship between ability and user's willingness to accept AI technology.

The relevant studies have shown that privacy considerations and awareness of privacy risks harm users' willingness to use personalized services. The value of personal services may be more important than privacy concerns (Awad and Krisnan, 2006). According to a study by Lee and Rha (2016) regarding location-based mobile commerce, increasing confidence in service providers can help alleviate user awareness of privacy risks. So, this study suggested that privacy concern is an essential factor affecting user acceptance of AI-based technologies. The results show that privacy concerns related to the use of AI-based technology weaken the relationship between only role clarity and user's willingness to accept AI technology. In contrast, privacy concerns do not affect only other independent variables and the user's willingness to accept AI technology. These results mean that privacy concerns are related to the functional process of using AI devices, and user and AI's roles in using AI devices are in the functional process.

According to Lee and See (2004), trust connects the distance between the nature of automation and the individual's belief in its function and the individual's intention to use and rely on it. Concerning e-commerce, Pavlou (2003) distinguishes between two aspects: trust in the supplier and trust in the trading medium. This differentiation also applies in the context of AI support service meetings. This study suggested that trust in service providers and specific AI technologies will contribute to user confidence in AI support services. The results show that trust related to the use of AI-based technology strengthens the relationship between only ability and the user's willingness to accept AI technology. Simultaneously, privacy concerns do not affect only other independent variables and the user's willingness to accept AI technology. These results mean that trust is related to the psychological judgment of using AI devices, and user's ability in the context of the adoption of AI-based technology is in the psychological assessment.

## 6. Conclusion

For research contribution, first, this study is the first one to reveal the role of AI in the context of a front-line service meeting to understand how users accept AI technology-enabled service. Despite growing practical importance, there are few quantitative studies on individual factors that affect their willingness to accept AI technology. However, this study focused on the individual factors of participants directly and especially proposed a model that integrates individual factors rather than identifying fragmentary factors. Although these individual factors may not coexist or even show conflicts, this study showed that these individual factors could coexist in the context of AI use. This study revealed that people who use AI pursue the individual role, motivation and ability related to AI. Second, this study is the first one to understand AI-specific moderators. The results explained that privacy concerns are associated with the functional process of using AI devices, and user and AI's roles in using AI devices are in the functional process. And this study explained that trust is related to the psychological judgment of using AI devices, and user's ability in the context of the adoption of AI-based technology is in the psychological assessment.

For practical implications, first, the results of this study show that individual factors such as role, motivation and ability are important to enhance the acceptance of AI. Therefore, AI device developers need to make the AI users perceive that they experience a high level of role clarity, motivation and ability. For example, AI users need to use user interfaces that AI device developers made. Second, the results show that privacy concerns are related to the functional process of using AI devices, and user and AI's roles in using AI devices are in the functional process. Therefore, AI device operators need to make AI users perceive that they experience a high level of trust. For example, it would be a good idea to make the privacy process in the role of paly between users and AIs. For example, it would be a good idea to allow various communication (e.g. text, pictures, voice, video, etc.) between users and AIs.

By this research results, the present study could have several insights into the acceptance of users in AI. However, it should also acknowledge the following limitations of this research. First, the present study collected the responses from users in South Korea. There may exist some nation cultural issues in the research context. Future studies should re-test this in other countries to assure these results' reliability. Second, as the variables were all measured simultaneously, it cannot be sure that their relationships are constant. Although the survey questions occurred in reverse order of the analysis model to prevent additional issues, the existence of causal relationships between variables is a possibility. Therefore, future studies need to consider longitudinal studies. Finally, this study uses role clarity, motivation and ability as individual factors and explores privacy concerns and trust as AI-specific moderators. However, considering the characteristics of AI, future studies may find other

individual factors and other moderating factors. For example, as other personal factors, locus of control may be considered. Besides, the interaction from AI can be considered as a moderating factor.

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# On the relation between the crude oil market and pandemic Covid-19

The pandemic and oil market

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## Abstract

**Purpose** – The crude oil market has experienced an unprecedented overreaction in the first half of the pandemic year 2020. This study aims to show the performance of the global crude oil market amid Covid-19 and spillover relations with other asset classes.

**Design/methodology/approach** – The authors employ various pandemic outbreak indicators to show the overreaction of the crude oil market due to Covid-19 infection. The analysis also presents market connectedness and spillover relations between the crude oil market and other asset classes.

**Findings** – One of the essential findings the authors report is that the crude oil market remains more responsive to pandemic fake news. The shock of the global pandemic panic index and pandemic sentiment index appears to be more promising. It has also been noticed that the energy trader's sentiment (OVX and OIV) was measured at a too high level within the Covid-19 outbreak. Volatility spillover analysis shows that crude oil and other market are closely connected, and the total connectedness index directs on average 35% contribution from spillover. During the initial growth of the infection, other macroeconomic and political events remained to favor the market. The second phase amidst the pandemic outbreak harms the global crude oil market. The authors find that infectious diseases increase investor panic and anxiety.

**Practical implications** – The crude oil investors' sentiment index OVX indicates fear and panic due to infectious diseases and lack of hedge funds to protect energy investments. The unparalleled overreaction of the investors gauged in OVX indicates market participants have paid an excessive put option (protection) premium over the contagious outbreak of the infectious disease.

**Originality/value** – The empirical model and result reported amid Covid-19 are novel in terms of employing a news-based index of the pandemic, which are based on the content analysis and text search using natural processing language with the aid of computer algorithms.

**Keywords** Covid-19, Crude oil, Investors' sentiment, Pandemic, OVX, VIX

**Paper type** Research paper

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## 1. Introduction

The crude oil market has experienced an unprecedented overreaction in the first half of the pandemic year 2020, and the dynamic of the global crude oil has significantly transformed over the past decade. The inventions of alternative energy resources, discoveries and exploitation have controlled a large volume of new oil fields and further emergence of carbon substitute energies worldwide. Consequently, since the past one-decade energy market is no longer demand-driven, the market turned into supply-driven. Following the recent tail events, crude oil is struggling and finding the best global price. The pandemic outbreak Covid-19 has disrupted the global supply chain, and the contraction of the energy demand has caused

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global crude oil to fall historically low. Hence, the study aims to demonstrate oil price dynamics amid Covid-19 and spillover relations with other asset classes. We examine the oil prices responses to the pandemic shock measured in terms of various pandemic indices. For example, world coronavirus *pandemic* panic index (WCPI), world coronavirus *media* hype index (WCMHI), world coronavirus *fake* news index (WCFNI) and global pandemic-led *sentiment* index. Moreover, we show how crude oil prices react to the infectious pandemic diseases outbreak based on the Infectious Diseases Equity Market Volatility tracker (ID-EMV-COVID-19).

The novel coronavirus — which the Chinese administration first reported to the World Health Organization (WHO) on December 31, 2019, has exploded internationally. Moreover, the WHO announced novel coronavirus as a public health emergency on January 30, 2020, and on March 11, 2020, declared novel coronavirus (i.e. COVID-19) as a global pandemic outbreak. The virus has infected more than 14,439,253 people and caused about 605,110 deaths as of July 19, 2020 [1]. More than 8,564,108 individuals have recovered. Arezki and Nguyen (2020) examine pandemic shock to the oil prices in the major oil-producing countries. The authors emphasize two types of shock: administration should order and tailor their responses and concentrate on reacting to the health emergency and the accompanying risk of economic depression. Further, the authors depict negative supply and demand shock on global crude oil prices. The interruption in negotiations amid the Organization of the Petroleum Exporting Countries (OPEC) and its partners led to what will likely be a tenacious downfall in oil prices (Norouzi and Fani, 2020). Jhawar and Gopalakrishnan (2020) express their concern about the novel Covid-19 infectious disease and deteriorating economic activity, leading to an energy demand crisis. The oil sector has been particularly hit by the global financial crisis (GFC) 2008, and the worst price of crude traded historically below zero.

Brent oil prices have collapsed around 60% since the start of the year 2020, while US crude futures (WTI) have fallen around 130% to levels well below (-US\$37/b); this has led to drilling breaks and extreme expenditure cuts. Pellejero (2020) analyze the future status of the global crude oil and find that rising US crude oil inventories could hinder the retrieval in oil prices by 2021. Further, there is a concern about fuel consumption likely to remain tepid because of infectious coronavirus apprehensions. Hence, our research questions are threefold: (1) What contains the pandemic outbreak news to explain the oil market? (2) Are the oil market and other assets connected during the pandemic outbreak? (3) Does OVX measure the fear of the energy traders during the outbreak of pandemic? We employ various pandemic outbreak indicators to show the overreaction of the crude oil market due to Covid-19 infection. One of the essential findings we report is that the crude oil market remains more responsive to the pandemic fake news. Second, the global pandemic panic index and pandemic sentiment index's shock appear to be more promising. It has also been noticed that the energy trader's sentiment (OVX and OIV) was measured at an extremely high level within the Covid-19 outbreak. The crude oil investors' sentiment index OVX indicates fear and panic due to infectious diseases and lack of hedge funds to protect the energy investments. Volatility spillover analysis shows that the crude oil and other market are closely connected, and the total connectedness index (TCI) directs on average 35% contribution that comes from spillover.

Our study on the relationship between pandemic infection and news outbreak organized as Section 1 provides some exploratory observations about crude oil prices during the Covid-19 outbreak, Section 2 provides relevant recent literature evidence. Section 3 discusses the data sources and descriptions, along with preliminary statistical analysis. Section 4 explains the methodology and hypothesis development. Section 5 offers results and discussion, Section 6 presents robustness check and Section 7 ends with the conclusion.

## 2. Literature review

Some of the early studies in relation to pandemic infections and financial market performance include: Chen *et al.* (2007) find due to severe acute respiratory syndrome (SARS), Taiwan's hospitality stock fell by about 29%. Chen *et al.* (2009) report that SARS positively impacted the pharmaceutical and biotechnology stock on the Taiwan stock exchange. Further, Wang *et al.* (2013) extend work in terms of effects of pandemics such as Enterovirus 71, dengue fever, SARS and H1N1 on the biotechnology firms in Taiwan to uncover the impact on operational efficiency.

Studies on the pandemic and cognitive behavior (e.g. Lucey and Dowling, 2005; Cen and Yang, 2013; Baker and Wurgle, 2007) observe the influence of tail events on the investor's psychology and overconfidence, investors' biases, mood swings and anxiety on the market returns and volatility.

Numerous studies (e.g. Kamstra *et al.*, 2003; Kaplanski and Levy, 2012; Cen and Yang, 2013) find that sunshine, public holidays and investors' nervousness and attitude swings affect the returns and asset pricing. Furthermore, an additional constituent of tail event studies (e.g. Yuen and Lee, 2003; Kaplanski and Levy, 2010; Donadelli *et al.*, 2017) enlighten that unforeseen and natural events impact investors' sentiments; subsequently, it marks the risk-taking behavior and distress for trading and lowers the willingness to participate in a risky investment. On the other hand, disease outbreaks show a favorable outcome for pharmaceutical stocks. Henceforth, our study deliberates on pandemic information content explaining the energy market investors' sentiment, gauged in OVX and OIV.

Literature is booming to examine the effects of Covid-19 across various asset classes, e.g. currency market and exchange rates, equity market and cryptocurrency, global trade and carbon-constrained world. Salisu and Sikiru (2020) examine the effects of pandemic on the Asia-pacific Islamic stocks for the period August 2010 to September 2020 and find that Islamic stocks hold better hedging potential on the counterpart of conventional stocks during the pandemics and epidemics. Similarly, Gil-Alana and Claudio-Quiroga (2020) analyze the impact of Covid-19 on the Asian equity markets (KOSPI, Nikkei225 and Shanghai CSI300) to uncover permanent and transitory effects and report mean reversion for the Nikkei, while KOSPI and CSI are not, hence shocks are permanent. Further, He *et al.* (2020) explore the impact of Covid-19 on the Chinese stock market across various industries based on the event study approach and find an asymmetric impact on the industry, e.g. hard impact on the transportation, mining and energy, while health, education and information technology appear to be resilient. Studies reviewed herewith are based on the empirical convention that unexpected news, market overreact and a better understanding of the news among market participant results in market correction (Phan and Narayan, 2020).

On the other hand, studies, e.g. Paule-Vianez *et al.* (2020) and Chen *et al.* (2020), examine bitcoin price dynamics and find that during the uncertainty, bitcoin acts as a safe-haven asset, but through this pandemic, bitcoin has lost the title of a safe haven. Besides, there have been some recent studies (e.g. Bolaño-Ortiz *et al.*, 2020; Vidya and Prapheesh, 2020; Sovacool *et al.*, 2020) that present their concern about the likely impact of Covid-19 on atmospheric emission, disruption in the global trade networks and sustainability transitions in a carbon-constrained world. Further, Haldar and Sethi (2020) explain the importance of government intervention amid Covid-19, referring to ten counties' socio-economic indicators and report that demographic factors and government policies help in reducing the growth of pandemic infection. Unlike previous studies, e.g. Narayan (2020a, b) studies the effects of Covid-19 on the exchange rate and bubble activity for the major global currencies and find that the pandemic has changed the resistance of the yen to shocks and bubble activity detected for the major four exchange rates (Japanese yen, euro, British pound and Canadian dollar) during the Covid-19 infection period.

Bakas and Triantafyllou (2020) investigate the effects of pandemic uncertainty on commodity index and show a substantial adverse impact on the commodity market's volatility and also reveal that crude oil market experiences worst effects, while gold remain resilient. Likewise, Ali *et al.* (2020) examine the pandemic impact on the financial market and find that the global spread of novel coronavirus has first disrupted the European market and later the USA and even safer commodities. Further, Goodell (2020) highlights some of the contemporary issues amid Covid-19 in the finance discipline and studies positioning the likely impact of the large-scale event, epidemic and pandemics and their economic consequences, direct and indirect effects on the financial markets and institutions.

Haroon and Rizvi (2020) analyze the effects of media coverage of pandemic Covid-19 on equity markets and find that there has been an overwhelming panic caused by the news platforms that are associated with the rising volatility in the stock markets. More recently, Al-Awadhi *et al.* (2020) investigate the impact of an infectious disease outbreak on the Chinese stock market. Their model setting is in panel data. They find that daily Covid-19 cases and fatality influence the stock returns adversely, and it is true across all firms. Also, Zhang *et al.* (2020) examine the global impact of the pandemic Covid-19 on the global financial markets; the authors measure the effects of such pandemic in terms of country-specific risks, a systematic risk. They show that pandemic infections have created an unprecedented level of financial risk with a short horizon.

There have been many recent attempts that deal with the potential impact of Covid-19 on energy trading, diesel consumption, OPEC oil production and electricity demand. Salisu and Adediran (2020) examine the effects of uncertainty due to infectious diseases measured in terms of equity market volatility infectious diseases index (ID-EMV); their in-sample and out-of-sample analysis reveal that ID-EMV is a good predictor of the energy market volatility. Further, Polemis and Soursou (2020) examine Greek energy firms amid the Covid-19 pandemic based on the event study approach in a window of ten days before and after the lockdown and find that pandemic infection affected the returns of the majority of the energy firms adversely. Similarly, Ertuğrul *et al.* (2020) analyze the Turkish diesel consumption volatility dynamics amidst a pandemic outbreak and find that volatility remained higher during mid-April 2020 and reached the extreme level on May 24, 2020. The authors suggest that rearrangement of profit margin and tax exemption compensate for lost tax benefit. Also, Norouzia *et al.* (2020) study the impact of pandemic infection on the Chinese market's oil and electricity demand; their environmental analysis shows that Covid-19 impacted the fuel demand and electricity significantly. The elasticity of oil and electricity remain inverse, based on the number of people infected. Likewise, Qin *et al.* (2020) exhibit the essential role of Covid-19 on the oil market and show that oil demand is adversely associated with pandemic and causing a decrease in the oil prices based on the capital asset pricing model (CAPM) using the pandemic index (PDI). Further, Devpura and Narayan (2020) examine hourly oil price volatility considering Covid-19 infections. The important finding of the study is that number of Covid-19 cases and deaths increase oil price volatility ranging from 8 to 22%.

Recent work relating to Covid-19 and the global crude oil market (e.g. Narayan, 2020; Gil-Alana and Monge, 2020; Liu *et al.*, 2020; Apergis and Apergis, 2020) studies pandemic contagions and oil price news and political polarization, pandemic and volatility persistence and find that pandemic manifestation has dislocated the global crude oil prices and heightened in increased volatility and oil price battles. Hence, unlike the initial scholarly attempts, our study contributes to media coverage-based pandemic indices and the effects of such an outbreak of infection on the global crude oil prices. Moreover, our empirical work encompasses dynamic spillover and market connectedness among major asset classes, including crude oil.

### 3. Data sources, description and preliminary analysis

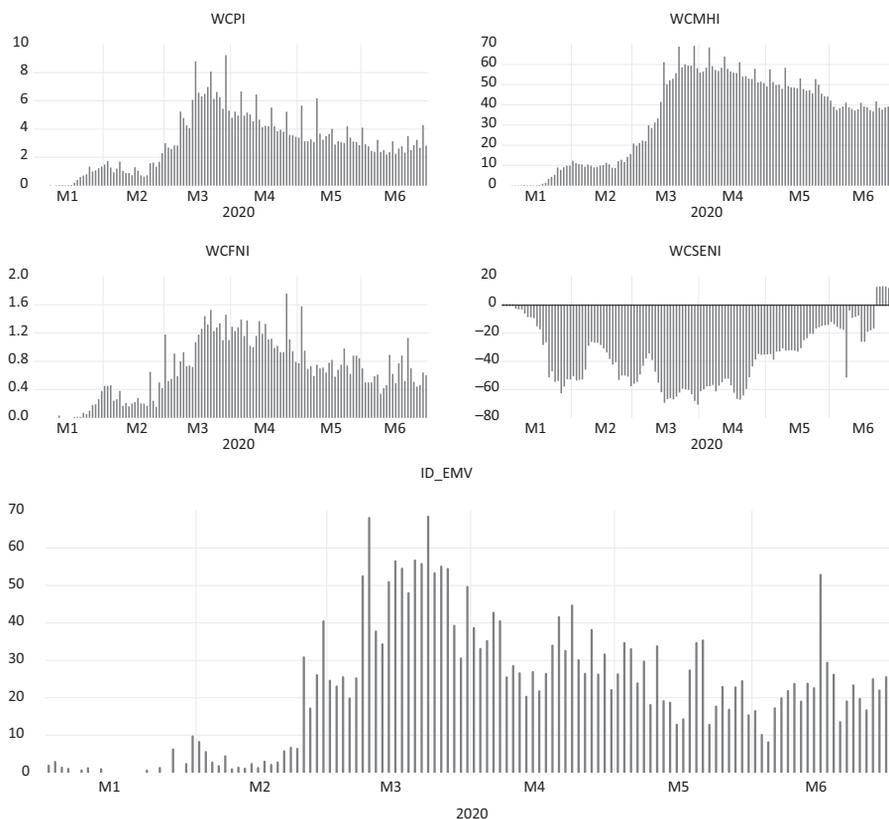
The pandemic disease Covid-19 and global crude oil market relation hold importance for the energy traders and policymakers. Hence, in this study, we consider the effects of the recent pandemic outbreak on global crude oil prices. Our study samples the daily prices of energy commodity, stock index, gold futures and US dollar index from January 2, 2018 to June 30, 2020. In the pandemic infection studies, the Covid-19 outbreak period ranges from January 1, 2020 to June 30, 2020. We explore the futures prices of the global crude oil in near terms, namely, West Texas Intermediate (WTI) and Brent. The crude oil WTI is US-based, while Brent acts as a global benchmark for crude oil and represents the OPEC partner countries. Also, we consider daily prices of Dow Jones Commodity Index (DJCI), SPX and Dow Jones Industrial Average (DJIA) equity index, gold futures (CME) and Dow Jones US dollar index (USDOLLAR). The dollar sneaked higher as concerns about the rise in new Covid-19 infections across the USA and other countries and emerging markets took the edge off the more massive market rally in recent months. Hence, we incorporate the US dollar index to control the global crude oil price in our empirical model.

Besides, our study takes into account the crude oil market sentiment index popularly known as OVX and OIV. OVX is the implied volatility index based on the options written on the United States Oil (USO) exchange-traded funds, and OIV represents the future market volatility of WTI futures-based options. OVX and OIV are the crude oil traders' fear and panic index expressed in percentage terms and available on a real-time basis. To examine the effects of the Covid-19 outbreak on the crude oil market, we consider the diseases and pandemic outbreak indices, e.g. WCPI, WCMHI, WCFNI and world coronavirus sentiment index (WCSENI) [2]. Moreover, we employ Baker *et al.* (2019, 2020a, b) pandemic infectious disease outbreak market tracker separated from equity market volatility (EMV) tracker know as Infectious Disease Equity Market Volatility tracker (ID-EMV) [3]. All the above-mentioned pandemic indices are calculated based on text mining and content analysis by referring to websites and leading newspapers. Hence, we aim to explore the effects of Covid-19 infection on the global crude oil prices by considering the pandemic indices and investor's fear and nervousness indices.

Figure 1 exhibits the temporal plot of the various pandemic indices constructed based on the natural language processing (NLP) architecture during the period of the Covid-19 outbreak. WCPI is the worldwide coronavirus pandemic index that ranges between 0 and 100 [4]. One can see that there has been a spike in the panic and Covid-19 news during March and April, and then it declines gradually and again, captivating a jump during June 2020. WCMHI is the worldwide coronavirus media hype index, which also falls between 0 and 100 [5], and it is apparent that the Covid-19 media hype was on the extreme level during March 2020 still. It ranges between 30 and 60%. Next, WCFNI is the worldwide coronavirus fake news index measured between 0 and 100 [6]; it is visible that the fake news index amidst Covid-19 spiked during the March–April period. Further, WCSENI is the worldwide coronavirus sentiment index scaled from –100 and 100 [7]. We can see that the index falls below zero through the entire pandemic session and improves marginally by the end of June 2020. The last figure is the infectious diseases market volatility tracker based on major newspaper archives – reporting news about the pandemic and contagious diseases. Higher values indicate greater pandemic coverage in print and online media, which interests the public (Haroon and Rizvi, 2020).

WCPI = world coronavirus pandemic panic index; WCMHI = world coronavirus media hype index; WCFNI = world coronavirus fake news index; WCSENI = world coronavirus sentiment index; ID\_EMV = infectious disease equity market volatility tracker

Table 1 shows the descriptive measures in relation to the various indicators of the Covid-19 pandemic outbreak. The average reading of the global pandemic panic index was found to be 3.02%, with a maximum value of 9.24% and a minimum of 0. The mean level of



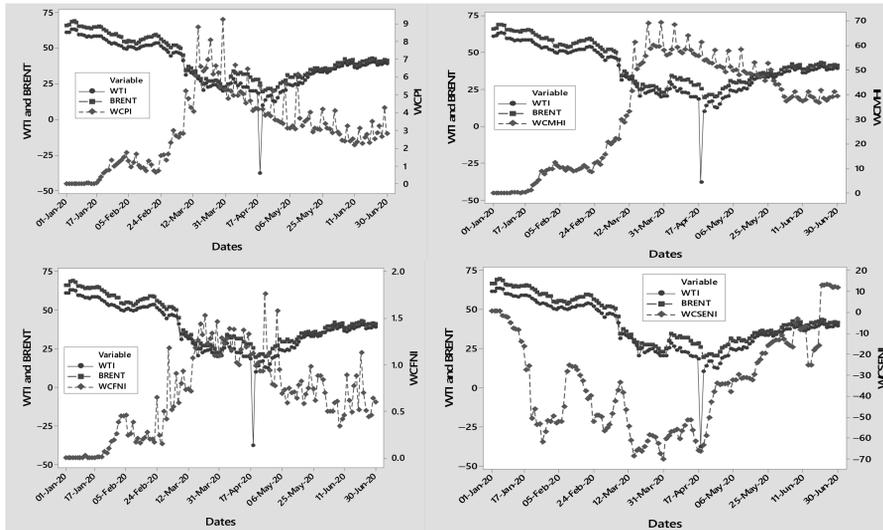
**Figure 1.**  
Covid-19-related PDIs

**Table 1.**  
Descriptive statistics of  
the PDIs

	WCPI	WCMHI	WCFNI	WCSENI	ID_EMV
Mean	3.0254	33.8379	0.6593	-34.2309	21.9336
Maximum	9.2400	69.2700	1.7600	12.9800	68.3700
Minimum	0.0000	0.0000	0.0000	-70.0000	0.0000
Std. dev	2.0616	21.5515	0.4433	22.6354	17.1277
Observations	130	130	130	130	130

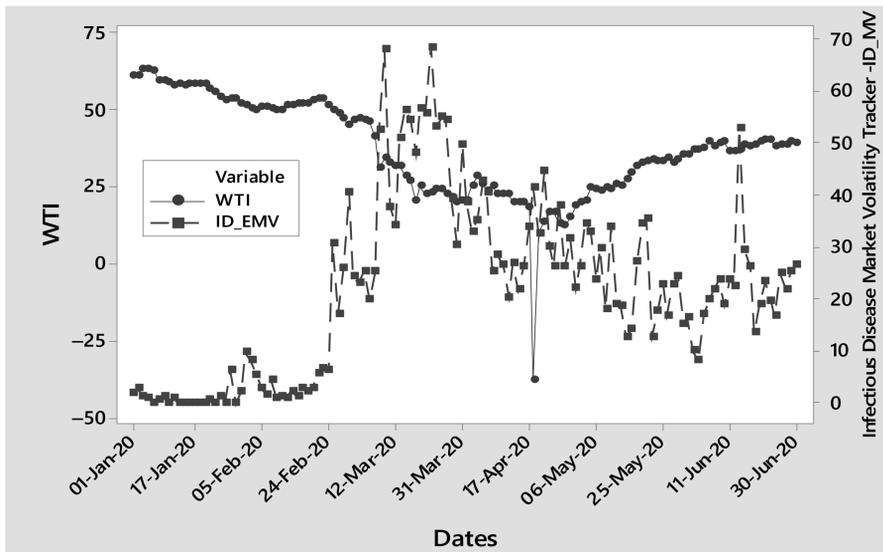
media hype was 33.83% along with a maximum point of 69.27% and a minimum level of 0. Here, zero indicates there is no media coverage of the pandemic outbreak, and it appears zero in initial days of pandemic infection. The average measure of fake news index is 0.66%, with maximum coverage of fake news 1.76%. The global sentiment amid pandemic appears -34.23 with a maximum value of 12.98, but the minimum level was -70.00. The infectious diseases market volatility tracker was found to be an average of 21.96 points during the pandemic period, with a peak value of 68.37. We can see that the WCSENI appears with a more significant amount of variability, second WCMHI, and third ID\_EMV.

Figure 2 displays the time-series plot of pairs of the WTI and Brent crude oil prices and pandemic outbreak. Now, one can see that WTI and Brent show similar patterns, but WTI is



**Figure 2.** WTI and Brent prices and Covid-19 pandemic outbreak

somehow more responsive to the pandemic infection with less than zero value. All four figures exhibit that crude oil prices and pandemic infection are adversely associated. The price of the WTI went negative first time in history amid the Covid-19 outbreak, measured at the peak level in terms of WCPI, WCMHI, WCFNI and shallow global sentiment. Figure 3 further expresses the same story. Global crude prices remain more volatile and start falling from US\$60 to minus US\$37 due to Covid-19 infections, which has resulted in the worldwide suspension of air travel, nationwide lockdown and social distancing. ID\_EMV gauges the



**Figure 3.** WTI prices and infectious disease EMV tracker

Covid-19 pandemic-associated movement (e.g. Salisu and Adediran, 2020), and we can see that infectious disease has adversely impacted the global crude oil market. Yet, WTI is searching for its best international price.

Table 2 demonstrates the various commodities and stock market indexes' prices and returns during the pandemic period. The mean level and returns (shown in parenthesis) of WTI and Brent were found to be 37.15 (0.88%) and 42.21 (−5.77), with maximum (minimum) level 83.27 (−37.63) and 68.9 (19.33). The statistics summary indicates that WTI yielded positive returns but experienced negative price and stood more volatile during the infection period. The DJCI also returns negative −2.94%, with stable returns volatility. The other asset class DJIA yield negative returns −1.23%, with maximum (min) level of 29,551.42 (18,591.93). But one can see that gold and US dollar appear to be more promising, with positive mean returns, respectively, 2.04 and 0.15% (Bakas and Triantafyllou, 2020). The US dollar continued strongly in recent years because the USA seemed to have an abundant robust economy, but the recent rise of the Covid-19 cases has hurt the currency. Hence, USD connected investors seeing healthier economic prospects in Europe and Asia that have controlled the pandemic more efficiently.

Figure 4 shows the relationship between expected crude oil market volatility (OVX) and global crude oil price. We can see that OVX – the investor's fear index – was below 50% up to February, but from March, it jumped amid Covid-19 news, and during April, it was plus 300%. During March–April 2020, the OVX reading was too high, with a historically low price of WTI. Figure 5 further deliberates on the relation between the gold price and global crude oil. Gold is the global safe-haven commodity, and risk-averse market participants prefer gold investment more during the financial crisis (Bakas and Triantafyllou, 2020). We can see that through the entire pandemic period, gold spiked. During January 2020, it was about in a range of US\$1,500–US\$1,600, but later, it was traded between US\$1,700 and US\$1,800. One can see that crude oil and gold price are inversely associated; it implies that due to an economic slowdown and pandemic outbreak, crude oil was low at all times, but gold was acting as a safe-haven traded at high volume price. Also, Figure 6 demonstrates the association between the US dollar index and crude oil prices. During the pandemic's peak, the US dollar index measured 12,900 plus, and WTI and Brent prices were below US\$25. It indicates that the global benchmark price of crude oil in terms of USD holds significance, a significant rise in the US dollar index causes decline in the oil price. But, we can see that the post-April 2020, the US dollar index goes down exponentially, and crude price gained their previous normal level.

Panel A: Crude oil prices and commodity index

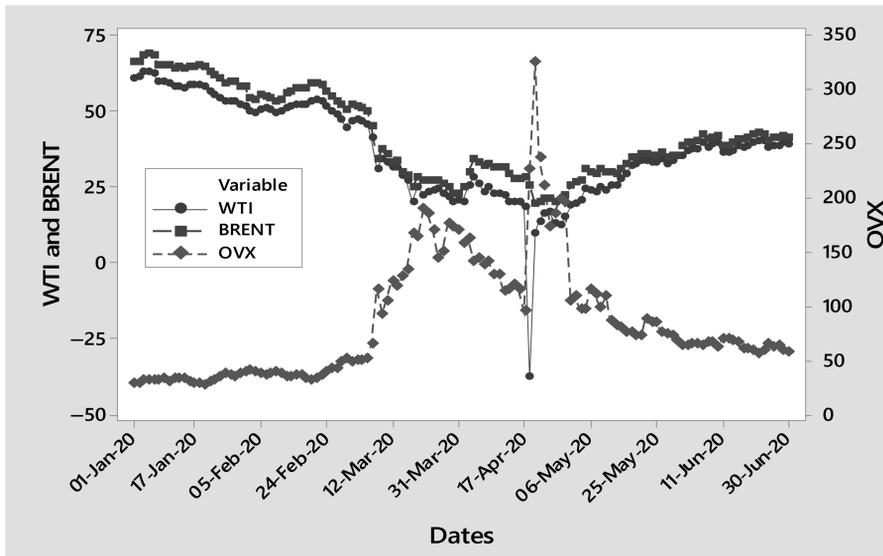
	WTI	Return	Brent	Return	DJCIT	Return
Mean	37.1538	<i>0.8842</i>	42.2060	<i>−5.7688</i>	233.0982	<i>−2.9415</i>
Maximum	63.2700	0.3196	68.9100	0.1908	289.1791	0.0421
Minimum	−37.6300	−0.2822	19.3300	−0.2798	184.3782	−0.0847
Std. dev	15.5545	0.0791	14.2478	0.0591	30.9939	0.0177

Panel B: Equity market, gold price and US dollar index

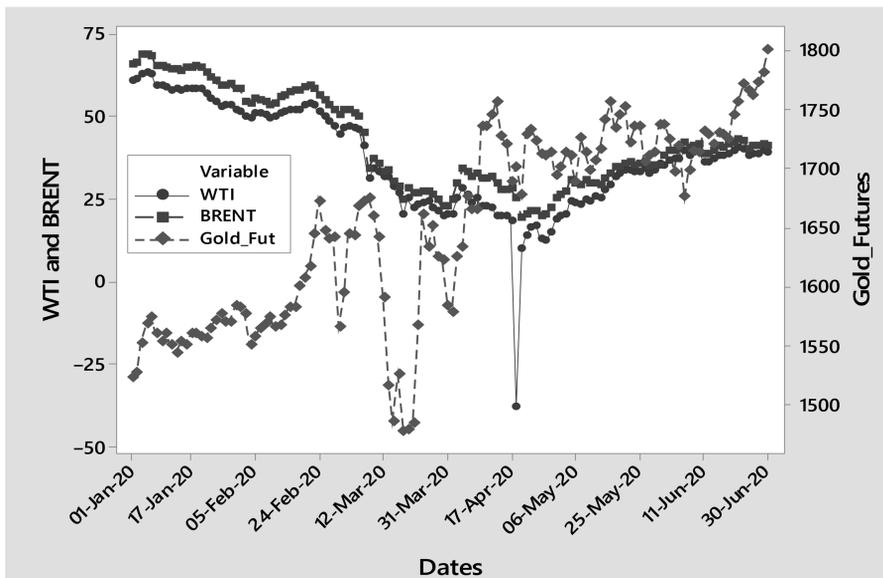
	DJIA	Return	GOLD_FUT	Return	USDOLLAR	Return
Mean	25613.9200	<i>−1.2255</i>	1650.8100	<i>2.0430</i>	12433.0000	<i>0.1505</i>
Maximum	29551.4200	0.1076	1800.5000	0.0578	12921.0500	0.0123
Minimum	18591.9300	−0.1384	1477.9000	−0.0474	12159.0900	−0.0105
Std. dev	2759.4950	0.0309	80.4195	0.0149	147.0477	0.0035
Observations	130	130	130	130	130	130

**Note(s):** values with a italic letter shows annualized percentage returns

**Table 2.**  
Descriptive statistics of  
crude oil prices and  
other assets

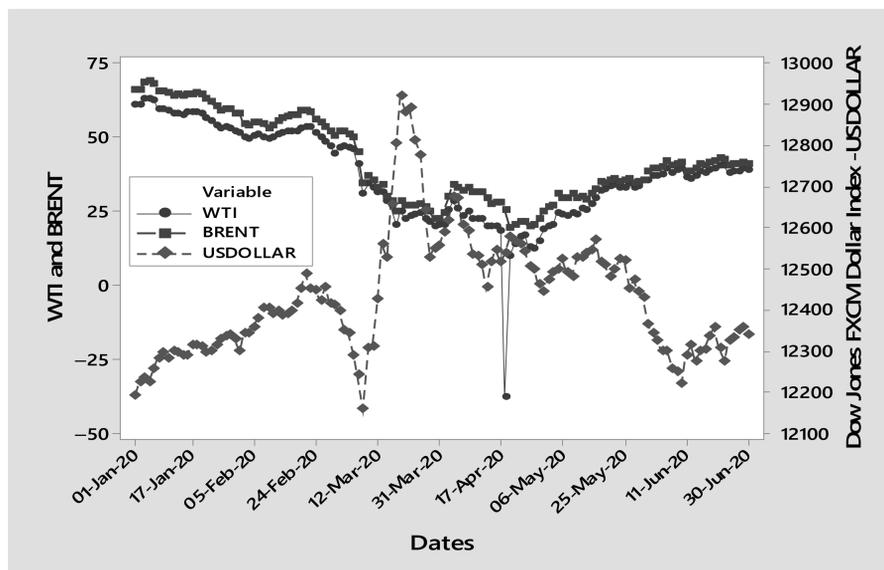


**Figure 4.** On the relation between oil market volatility and crude oil prices



**Figure 5.** Time-series plot of crude oil and gold prices during the pandemic period

Table 3 explains the behavior of the investor's fear and panic amid the pandemic outbreak. VIX is the registered trademark of the Chicago Board Options Exchange (CBOE), popularly regarded as a barometer of the investor's fear and anxiety due to tail events. Whaley (2000) considers VIX as the investor's fear index and calculates in percentage terms using observed options prices. Reading of VIX between 15 and 30% is found to be under control, but



**Figure 6.**  
Time-series plot of crude oil and US dollar index during the pandemic period

	OVX	OIV	VIX	VXD
Mean	85.4624	211.6292	32.4493	32.8595
Maximum	325.1500	1418.4700	82.6900	67.0700
Minimum	27.6600	27.4300	12.1000	11.4600
Std. dev	55.6785	241.2355	16.3535	15.0672
Observations	130	130	130	130

**Table 3.**  
Descriptive statistics of the oil and EMV indexes

measuring more than 30% indicates excessive uncertainty in the market. The average level of crude oil market volatility OVX (OIV) appears to be 85.46% (211.62%), which is relatively high from the normal range. The maximum and minimum level of OVX (OIV) was found, respectively, 325.15% (27.66) and 1418.47% (27.43%). One can see that in relation to EMV (VIX and VXD), crude oil market volatility seems to be very high, which indicate that there is a lack of risk management products like futures and options.

Table 4 summarizes the correlation matrix between crude oil prices and a pandemic outbreak. The association of oil with other asset classes, e.g. Tisdell (2020), discusses various economic, social and political issues amid Covid-19 and explains how economic activity affects the production and labor market and, eventually, impact the energy market. Panel A of Table 4 shows the correlation coefficient between crude oil price and pandemic indicators. We can see that global crude oil is adversely linked with the news related to the pandemic outbreak, and the WCSNI shows a positive impact on the oil. We document this statistical phenomenon in our regression model. Panel B describes the association of crude oil with other asset classes; one of the essential observations is that gold and US dollar are statistically significant and negatively associated. It implies that a fall in crude oil led to a rise in the gold price, and the US dollar becomes stronger. DJCI and global crude oil are closely associated. Hence, in our empirical model, we include some of the control variables: stock index, commodity and gold, and US dollar index. Panel C displays the market participant's

Panel A: crude oil and pandemic	WTI	Brent
WCPI	-0.8008	-0.8567
<i>p</i> -value	0.0000 <sup>a</sup>	0.0000 <sup>a</sup>
WCMHI	-0.9001	-0.9600
<i>p</i> -value	0.0000 <sup>a</sup>	0.0000 <sup>a</sup>
WCFNI	-0.8279	-0.8726
<i>p</i> -value	0.0000 <sup>a</sup>	0.0000 <sup>a</sup>
WCSENI	0.4067	0.3485
<i>p</i> -value	0.0000 <sup>a</sup>	0.0000 <sup>a</sup>
ID_EMV	-0.7121	-0.7711
<i>p</i> -value	0.0000 <sup>a</sup>	0.0000 <sup>a</sup>
<i>Panel B: crude oil and other assets</i>		
DJCIT	0.9065	0.9777
<i>p</i> -value	0.0000 <sup>a</sup>	0.0000 <sup>a</sup>
GOLD_FUT	-0.4733	-0.5215
<i>p</i> -value	0.0000 <sup>a</sup>	0.0000 <sup>a</sup>
USDOLLAR	-0.6386	-0.6634
<i>p</i> -value	0.0000 <sup>a</sup>	0.0000 <sup>a</sup>
<i>Panel C: crude oil and investor's sentiment</i>		
OVX	-0.8655	-0.8454
<i>p</i> -value	0.0000 <sup>a</sup>	0.0000 <sup>a</sup>
OIV	-0.6431	-0.6516
<i>p</i> -value	0.0000 <sup>a</sup>	0.0000 <sup>a</sup>
VIX	-0.6846	-0.7571
<i>p</i> -value	0.0000 <sup>a</sup>	0.0000 <sup>a</sup>
VXD	-0.7616	-0.8309
<i>p</i> -value	0.0000 <sup>a</sup>	0.0000 <sup>a</sup>
<b>Note(s):</b> Significant at <sup>a</sup> 1, <sup>b</sup> 5, <sup>c</sup> 10% level		

Table 4.  
Correlation coefficients

overreaction measured in terms of the volatility index (OVX, OIV, VIX, VXD) when some unexpected tail events happen in the market. One can see that crude oil and expected market volatility (both commodity and stock market) are significantly adversely associated.

#### 4. Empirical model and hypothesis development

##### 4.1 Pandemic and dynamic of global crude oil

Our empirical model on the pandemic infection is expressed in terms of ordinary least squares (OLS) and interaction dummy variables. Some of the statistical evidence presented in the previous section represents that global crude oil prices appear to be more volatile during the period of the pandemic outbreak (e.g. Al-Awadhi *et al.*, 2020; Apergis and Apergis, 2020; Haroon and Rizvi, 2020; Zhang *et al.*, 2020). In our regression model, we consider log-transformed returns of the prices of WTI and Brent. Besides, we consider pandemic indices and log-transformed returns of other asset classes. The infectious pandemic specification is:

$$R_t^i = \beta_0 + \beta_{j1} D_{jt} X_t + \beta_{k2} Z_t + e_t \quad (1)$$

where  $R_t^i$  = is the returns associated with WTI and Brent crude oil prices.  $\beta_0$  = is the intercept coefficient that measures the other economic and health crises for the sample period.  $D_{jt}$  = is the dummy variable that assumes 1 for Q1(Q2), otherwise 0 (here, Q1 regarded as Phase I of the pandemic outbreak and Q2 Phase II).  $X_t$  = is the vector of various pandemic indices, and here we take the log transformation of (1 + Pandemic index) (Haroon and Rizvi, 2020; Salisu

and Akanni, 2020).  $\beta_{j1}$  = is the slope coefficient measure the effects of the Covid-19 outbreak on the crude oil market during the first and second quarter of 2020. If pandemic infection affecting adversely than a variant of  $\beta_{j1}$  should appear negative and statistically significant. The coefficient associated with the WCSENI should appear positive if sentiment improves.  $Z_t$  = is the vector of various control and other asset class associated with the crude oil market.  $\beta_{k2}$  = is the slope that measures the changes in the other commodities, gold price, US dollar and equity market.

$$\log\text{IMPVOL}_t^i = \delta_0 + \delta_{j1}D_{jt}X_t + \delta_{k2}R_t^{\text{Underlying}} + e'_t \quad (2)$$

where  $\log\text{IMPVOL}_t^i$  = is the log-transformed values of volatility indexes (OVX and OIV).  $\delta_0$  = is the intercept coefficient that should appear positive and statistically significant if other relevant events occur, such as economic, political and health emergency.  $D_{jt}X_t$  = is the pandemic interaction term, as explained in the previous paragraph.  $\delta_{j1}$  = is the infectious pandemic coefficient, should be measured positive and statistically significant, by conventions pandemic news disrupt the investor's sentiment and increases the panic.  $R_t^{\text{Underlying}}$  = is the control variable chosen as underlying of the OVX and OIV, the respective underlying on which crude oil options are written, USO and WTI.  $\delta_{k2}$  = is the slope coefficient explaining the relation between volatility and returns; it should be calculated negative and significant.

Our general empirical hypothesis is: (1) equation (1) attempts to test  $H_1$  "pandemic and global crude oil prices are adversely associated." (2) Equation (2) sets to test  $H_2$  "crude oil market volatility (investor's sentiment) and pandemic news and infection growth are positively associated."

#### 4.2 Spillover and connectedness studies

Diebold and Yilmaz (2009) framework explains the mechanism of vector autoregressions (VARs) developed for the volatility spillover measure based on forecast error variance decompositions. Diebold and Yilmaz (2012) outstretched their earlier work and examine daily volatility spillovers across the equity market, bond, foreign exchange and markets of commodities concerning GFC 2008–2009. VAR allows us to calculate the impulse response function and variance decomposition. Diebold and Yilmaz encompass their work to decay the total spillover in directional spillover using generalized VAR (GVAR). To transact with market connectedness amid Covid-19, we employ the Diebold and Yilmaz GVAR framework in which error variance decompositions are invariant among variable ordering and allow us to discover directional volatility spillover (i.e. *TO* and *FROM*). To prob into connectedness and volatility spillover, we analyze log-transformed returns calculated for the WTI, Brent, gold, US dollar index, DJIA and volatilities are articulated as absolute values of returns. For example, prominent studies (Taylor, 1986; McKenzie, 1999; Ederington and Guan, 2000) frequently use absolute returns for the various asset classes and show that it gives improved volatility forecasts than models based on squared returns.

### 5. Results and discussion

Table 5 shows the regression output concerning pandemic infection in the crude oil markets. We present analysis in two phases, Phase I (2020Q1) is the initial stage of the pandemic outbreak started from the Wuhan city of China, and then it spread across the globe. Phase II (2020Q2) is the nationwide health emergency status in which administration became more active with three Ts, trace, test and treatment; moreover, government bailout package for the industry, lockdown, social distancing and international travel ban. Phase I appears to be more uncertain about the uncontained impact of Covid-19 on economic activity. Hence, investors

	Phase I (2020Q1)			Phase II (2020Q2)		
	WTI	Brent	WTI	Brent	WTI	Brent
	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate
	t-stat	t-stat	t-stat	t-stat	t-stat	t-stat
<i>Panel A: WCP1 and crude oil market</i>						
Intercept	0.0017	0.0009	1.23	Intercept	-0.0003	-0.0004
WCP1 * Q1	-0.0058	-0.0067	-3.22 <sup>a</sup>	WCP1 * Q2	0.0098	0.0051
R <sub>DJCT</sub>	3.1157	2.6795	16.10 <sup>a</sup>	R <sub>DJCT</sub>	3.1520	2.7221
R <sub>GOLDFUT</sub>	-0.0968	-0.2850	-2.81 <sup>a</sup>	R <sub>GOLDFUT</sub>	-0.1290	-0.3069
R <sub>USD</sub>	2.3797	1.5206	3.27 <sup>a</sup>	R <sub>USD</sub>	2.3969	1.5111
R <sub>DJIA</sub>	-0.1537	-0.0394	-0.50	R <sub>DJIA</sub>	-0.1656	-0.0434
<i>Panel B: WCMHI and crude oil market</i>						
Intercept	0.0017	0.0009	1.16	Intercept	-0.0004	-0.0004
WCMHI * Q1	-0.0022	-0.0025	-2.64 <sup>a</sup>	WCMHI * Q2	0.0040	0.0019
R <sub>DJCT</sub>	3.1233	2.6887	16.20 <sup>a</sup>	R <sub>DJCT</sub>	3.1432	2.7182
R <sub>GOLDFUT</sub>	-0.0962	-0.2845	-2.74 <sup>a</sup>	R <sub>GOLDFUT</sub>	-0.1254	-0.3039
R <sub>USD</sub>	2.3734	1.5130	3.26 <sup>a</sup>	R <sub>USD</sub>	2.3983	1.5092
R <sub>DJIA</sub>	-0.1538	-0.0394	-0.49	R <sub>DJIA</sub>	-0.1616	-0.0407
<i>Panel C: WCFNI and crude oil market</i>						
Intercept	0.0017	0.0009	1.21	Intercept	-0.0002	-0.0005
WCFNI * Q1	-0.0161	-0.0181	-3.74 <sup>a</sup>	WCFNI * Q2	0.0228	0.0137
R <sub>DJCT</sub>	3.1192	2.6847	16.14 <sup>a</sup>	R <sub>DJCT</sub>	3.1602	2.7270
R <sub>GOLDFUT</sub>	-0.0878	-0.2751	-2.74 <sup>a</sup>	R <sub>GOLDFUT</sub>	-0.1301	-0.3095
R <sub>USD</sub>	2.3873	1.5281	3.29 <sup>a</sup>	R <sub>USD</sub>	2.3872	1.5090
R <sub>DJIA</sub>	-0.1521	-0.0375	-0.48	R <sub>DJIA</sub>	-0.1692	-0.0468
<i>Panel D: WCSENI and crude oil market</i>						
Intercept	0.0016	0.0008	0.99	Intercept	-0.0003	-0.0003
WCSENI * Q1	0.0001	0.0001	1.78 <sup>c</sup>	WCSENI * Q2	-0.0006	-0.0002
R <sub>DJCT</sub>	3.1315	2.6975	16.11 <sup>a</sup>	R <sub>DJCT</sub>	3.1857	2.7364
R <sub>GOLDFUT</sub>	-0.1002	-0.2888	-2.71 <sup>a</sup>	R <sub>GOLDFUT</sub>	-0.1479	-0.3124
R <sub>USD</sub>	2.3716	1.5115	3.23 <sup>a</sup>	R <sub>USD</sub>	2.3423	1.4837
R <sub>DJIA</sub>	-0.1526	-0.0380	-0.46	R <sub>DJIA</sub>	-0.1802	-0.0480

(continued)

**Table 5.**  
Covid-19 pandemic outbreak and crude oil market

Table 5.

	Phase I (2020Q1)			Phase II (2020Q2)		
	WTI	Brent	WTI	WTI	Brent	WTI
	Estimate	Estimate	Estimate	Estimate	Estimate	Estimate
	t-stat	t-stat	t-stat	t-stat	t-stat	t-stat
<i>Panel E: ID_EMV tracker and crude oil market</i>						
Intercept	0.0017	0.0009	Intercept	-0.0004	-0.0004	-0.70
ID_EMV * Q1	-0.0027	-0.0031	ID_EMV * Q2	0.0049	0.0023	1.26
R_DJCT	3.1203	2.6852	R_DJCT	3.1464	2.7196	15.52 <sup>a</sup>
R_GOLDFUT	-0.1016	-0.2906	R_GOLDFUT	-0.1315	-0.3067	-3.02 <sup>a</sup>
R_USD	2.3721	1.5115	R_USD	2.3930	1.5068	3.25 <sup>a</sup>
R_DJIA	-0.1553	-0.0411	R_DJIA	-0.1624	-0.0411	-0.48

**Note(s):** [Table shows the regression results on the relation between pandemic disease outbreak and crude oil market based on the equation  $R_t^i = \beta_0 + \beta_1 D_{it} X_t + \beta_{i2} + e_t$ . Standard errors and covariance are consistent with autocorrelation and heteroskedasticity of Newey–West. Significant at <sup>a</sup>1, <sup>b</sup>5, <sup>c</sup>10% level]

are more concerned about their portfolio rebalancing and risk management. Our study considers various pandemic indicators; Panel A of Table 5 shows the impact of Covid-19 in terms of the WCPI. It is evident that the slope coefficient of  $WCPI * Q1$  (an interaction dummy term) appears to be  $-0.0056$  ( $-0.0067$ ), with significant  $t$ -statistic, which implies that during the first phase of an infection outbreak, WTI and Brent phased an adverse market movement and traded historically low. But, it seemed that WTI and Brent were marginally improving in the second phase of the pandemic growth. Also, Panel B exhibits the effects of media hype created during the first and second phases. WCMHI seems to be impacting negatively crude oil markets and gradually showing a positive effect in the second phase of the virus outbreak. Markets are efficient, and asset prices impound the latest market-relevant information, irrespective of the nature of good news or fake news. Panel C explains the crude oil market behavior during pandemic fake news spread. WCFNI (e.g. Haroon and Rizvi, 2020) measures the amount of flow of fake news about Covid-19. One can see that during the first phase of the Covid-19 infections, the oil market pays close attention to the fake news, and oil prices responded adversely.

Table 5, Panel D demonstrates the statistical evidence concerning Covid-19 world sentiment influencing the commodity markets. WCSENI speaks about the general confidence among the people about future saving and investment, which is quite visible in terms of global commodity prices. During the first phase of the pandemic outbreak, WCSENI does not significantly explain the crude oil market, but amidst the second phase, it shows an adverse impact on the oil market. It implies that market participants are still worried and have a panic about future consumption and investment. Panel E brings some novel evidence based on the infectious disease market volatility tracker (ID-EMV). In particular, the tracker analyzes the news published in the major financial and economic press, and it is obvious market participants refer to that news and revise their future investment strategies accordingly. We can see that estimates of  $ID-EMV * Q2$  appear to be  $-0.0027$  ( $-0.0031$ ), with significant  $t$ -statistics at 5 and 1% level. It indicates that infectious disease impacts the crude oil market and yields negative returns during the first phase of pandemic development. Further, one can see that during the second phase, the ID-EMV index falls (Figure 1) and shows a positive impact on the crude oil market. For example, Saefong and Watts (2020) report a recent oil demand has improved because of enabling lockdown restrictions, production cuts by OPEC + may be premature given the state of the worldwide economy and increasing coronavirus cases in the USA.

Table 5 shows that the intercept coefficient was positive in the first phase and negative in the second phase across all the panels. It implies that during the initial growth of the Covid-19, other macroeconomic and political events were in favor of the market. Simultaneously, during the second phase amidst pandemic outbreak, lockdown, lack of energy demand, excess supply of crude oil and ban on international travel hurt the global crude oil market. Still, economic activities are not in a normalcy state, and crude is struggling for the best global price. Looking at the control variables, the DJCIT index and the US dollar index showed a positive impact. By contrast, the DJIA and gold price showed an adverse effect across both phases of Covid-19 infection.

Table 6 exhibits the behavior of the oil market volatility amid Covid-19 infection; OVX and OIV are the oil volatility indices; the preceding one is based on the options written on the USO oil fund, and next one options on WTI futures. OVX and OIV measure the investor's panic subject to tail events in the crude oil markets; both the indices are available in real time and expressed in percentage term. Looking at the first three pandemic indices (WCPI, WCMHPI, WCFNI – Phase I), the slope coefficients are, respectively, 0.23 (0.25), 0.09 (0.10) and 0.63 (0.66) with significant  $t$ -statistics. It means the pandemic has increased the expected crude oil market volatility, and fake news does contain some disruptive elements to distract the energy traders. On the other hand (Phase II), the respective estimates of OVX(OIV) are 0.31 (0.62), 0.11 (0.25) and 0.75 (1.47)

**Table 6.**  
Covid-19 pandemic  
outbreak and crude oil  
market volatility

	Phase I (2020Q1)			Phase II (2020Q2)		
	OVX	OIV	OIV	OVX	OIV	OIV
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
<i>Panel A: WCPI and crude oil market volatility</i>						
Intercept	1.5406	81.80 <sup>a</sup>	1.5825	47.64 <sup>a</sup>	1.5155	106.63 <sup>a</sup>
WCPI * Q1	0.2329	5.14 <sup>a</sup>	0.2479	5.88 <sup>a</sup>	0.3054	13.00 <sup>a</sup>
R <sub>USO</sub> /R <sub>W</sub>	-0.8149	-1.07	1.2870	1.94 <sup>c</sup>	-1.2981	-5.13 <sup>a</sup>
<i>Panel B: WCMHI and crude oil market volatility</i>						
Intercept	1.5412	81.30 <sup>a</sup>	1.5838	47.17 <sup>a</sup>	1.5155	106.36 <sup>a</sup>
WCMHI * Q1	0.0925	3.41 <sup>a</sup>	0.0965	3.46 <sup>a</sup>	0.1191	10.54 <sup>a</sup>
R <sub>USO</sub> /R <sub>W</sub>	-0.9287	-1.26	1.1996	1.78 <sup>c</sup>	-1.3346	-5.06 <sup>a</sup>
<i>Panel C: WCFNI and crude oil market</i>						
Intercept	1.5416	82.95 <sup>a</sup>	1.5840	48.01 <sup>a</sup>	1.5166	107.09 <sup>a</sup>
WCFNI * Q1	0.6297	6.02 <sup>a</sup>	0.6605	6.51 <sup>a</sup>	0.7523	16.63 <sup>a</sup>
R <sub>USO</sub> /R <sub>W</sub>	-0.8651	-1.16	1.2360	1.83 <sup>c</sup>	-1.2428	-5.03 <sup>a</sup>
<i>Panel D: WCSENI and crude oil market volatility</i>						
Intercept	1.5429	81.46 <sup>a</sup>	1.5861	47.02 <sup>a</sup>	1.5508	86.27 <sup>a</sup>
WCSENI * Q1	-0.0050	-2.64 <sup>a</sup>	-0.0051	-2.61 <sup>a</sup>	-0.0032	-1.45
R <sub>USO</sub> /R <sub>W</sub>	-1.0199	-1.43	1.1326	1.64 <sup>c</sup>	-1.2715	-2.72 <sup>a</sup>
<i>Panel E: ID_EMV tracker and crude oil market volatility</i>						
Intercept	1.5415	82.04 <sup>a</sup>	1.5837	47.66 <sup>a</sup>	1.5157	106.44 <sup>a</sup>
ID_EMV * Q1	0.1053	4.02 <sup>a</sup>	0.1112	4.44 <sup>a</sup>	0.1430	10.71 <sup>a</sup>
R <sub>USO</sub> /R <sub>W</sub>	-0.8676	-1.16	1.2471	1.87 <sup>c</sup>	-1.2919	-5.01 <sup>a</sup>

**Note(s):** [Table shows the regression results on the relation between pandemic disease outbreak and crude oil market volatility based on the equation  $\log(\text{MPVOI}_t^i = \delta_0 + \delta_1 D_{jt} X_t + \delta_2 R_{t, \text{underlying}} + \epsilon_t^i$ . Standard errors and covariance are consistent with autocorrelation and heteroskedasticity of Newey–West. Significant at <sup>a</sup>1, <sup>b</sup>5, <sup>c</sup>10% level]

with significant *t*-score; it implies that both the phases of pandemic outbreak disrupt the investor sentiment. Still, impacts are more visible in the second phase of the pandemic infection. The fourth world pandemic sentiment index seems to decay the implied volatility in both the phases of the Covid-19 outbreak. Last, the effects of pandemic infection gauged in terms of ID-EMV show an adverse impact on the oil volatility index. The significant positive slope indicates that infectious diseases increase the investor panic and anxiety; eventually, it led to a rush for the over-reliance on the hedge funds (here, options) with an extra premium. The slope of the Brent (OIV) appears more significant than the WTI (OIV), which indicates that there is a shortage of put options to protect the future oil trading uncertainty.

Table 7 shows the volatility spillover across the crude oil market, gold, US dollar and equity markets. There have been several pieces of evidence in the literature (e.g. Diebold and Yilmaz, 2009; Diebold and Yilmaz, 2012; Antonakakis, 2012; Antonakakis and Gabauer, 2017; Antonakakis *et al.*, 2018 and Hung, 2019) that establish the directional volatility relation and market connectedness among various financial assets. Hence, we model the returns-based volatility for the commodities and equity market to see the spillover and market connectedness between those assets. Based on the Diebold and Yilmaz (2012) framework, we fit the GVAR model to decompose the pandemic shock *TO* and *FROM* based on the impulse response functions and variance decomposition (Table 7). The crude oil volatility spillover dynamics are presented using a rolling sample in terms of total spillovers, directional spillovers and net spillover (Figures A1, A2 and A3). Table 7 is to be designated as a volatility spillover table. Table 7 represents *ij*th entry estimated contribution *TO* the forecast error variance that is market *i* coming *FROM* shocks to market *j*. The table provides the decomposition of the total volatility spillover index in an input–output mechanism. The sum of the off-diagonal elements (columns) shows contributions *TO* others, while the sum of the row’s contributions *FROM* others and the “from minus to” show *net* spillovers (the last row of the table). The TCI is shown on the right-side corner.

First, we look at the contribution *FROM* others (sum of the off-diagonal rows); it seems that the highest directional spillover was received by WTI with 47.45% during the pandemic period, while second-largest spillover in Brent. Further, we can see the contribution *TO* others (sum of the off-diagonal columns) the gross directions spillover contributed by Brent 53.92% *TO* others and second considerable directional spillover from equity market 43.78% *TO* other asset classes. Moreover, looking at the *Net* directional spillovers (Figures A1, A2 and A3), it was found to be largest for the equity market DJIA 14.9% = (43.779–28.879) and from others to the gold market – 16.42% = (13.625 – 30.07). The non-directional volatility contributions shown in the right-lower corner, which appears to be 34.53%, indicate that, on average, the 35% volatility forecast error variance contributed from spillover in the crude oil market, gold, US dollar and equity market.

	WTI	Brent	DJIA	Gold	USDOLLAR	Contribution from others
WTI	52.548	32.767	9.605	2.576	2.503	47.452
BRENT	27.37	58.047	9.125	1.894	3.563	41.953
DJIA	4.728	10.711	71.121	4.962	8.478	28.879
Gold	4.12	6.131	11.357	69.93	8.461	30.07
US-DOLLAR	2.094	4.312	13.692	4.22	75.682	24.318
Contribution TO others	38.312	53.922	43.779	13.652	23.006	172.671
Contribution including own	90.86	111.969	114.9	83.582	98.688	TCI = 34.534
Net spillovers	-9.14	11.969	14.9	-16.418	-1.312	

**Table 7.** Volatility spillover and market connectedness

**6. Robustness check**

Table 8 shows further validation of the empirical results reported in the above sections. In this table, we set monthly dummies from January to June 2020, e.g. for the pandemic month of January, D1 = 1, otherwise 0, and similarly for other months. In our regression model, we add month-wise interaction terms with various indices of a pandemic outbreak. During regression estimation, we allow dummies February–June; hence, the intercept coefficient measures the effects of January. We can see that the WCPI, WCMHI and WCFNI show an adverse impact on the future energy market volatility (OVX). The changes in the OVX during January and March were found to be positive and showed more fear among the energy traders. Further, the WCSeni exhibits an asymmetric impact on the expected oil market volatility, lower the sentiment higher fear among the energy traders. Moreover, the infectious diseases market volatility index also depicts an adverse investor sentiment (OVX) in the energy market.

**7. Conclusion**

The global benchmark of crude oil WTI and Brent has perceived an unprecedented overreaction during the first quarter of the pandemic year 2020. The dynamics of global crude oil have been extremely transformed over the past decade. Hence, an analysis has been presented in two phases. Phase I (2020Q1) is the initial stage of the pandemic outbreak started from the Wuhan city of China, and then it spread across the globe. Phase II (2020Q2) is the state nationwide health emergency in which administration becomes more active with three Ts: trace, test and treatment. Moreover, the administration’s bailout package for the industry, lockdown, social distancing and international travel ban has decreased global energy demand. Our empirical model and result reported amid Covid-19 are novel in terms of

2020	January	February	March	April	May	June	Underlying return
WCPI	D1 *	D2 * WCPI	D3 *	D4 *	D5 *	D6 *	Return
Estimate	1.0598	-0.1919	2.3156	-0.3989	-0.8937	-0.2991	-165.6608
t-stat	2.12 b	-0.33	3.02 a	-0.09	-1.17	-0.92	-2.78 a
WCMHI	D1 *	D2 *	D3 *	D4 *	D5 *	D6 *	Return
Estimate	0.3499	-0.0777	1.1434	-0.4539	-0.3430	-0.1054	-164.9771
t-stat	2.19 a	-0.46	3.14 a	-0.23	-1.07	-0.89	-2.79 a
WCFNI	D1 *	D2 *	D3 *	D4 *	D5 *	D6 *	Return
Estimate	3.3156	-0.6053	5.5733	-0.8415	-2.5748	-0.6768	-167.0732
t-stat	1.69 c	-0.31	2.85 a	-0.09	-1.29	-0.74	-2.82 a
WCSeni	D1 *	D2 *	D3 *	D4 *	D5 *	D6 *	Return
Estimate	-0.0137	0.0048	-0.0709	-0.0186	0.0548	0.0219	-167.9182
t-stat	-2.50 a	0.44	-3.40 a	-0.12	1.15	0.62	-2.84 a
ID_EMV	D1 *	D2 *	D3 *	D4 *	D5 *	D6 *	Return
Estimate	0.9088	-0.1110	1.1426	-0.4173	-0.3988	-0.1480	-165.5831
t-stat	2.09 a	-0.40	3.21 a	-0.18	-1.11	-1.14	-2.79 a

**Table 8.** Oil markets’ expected volatility (OVX) amid Covid-19

**Note(s):** [Table shows the regression results on the relation between pandemic disease outbreak and crude oil market volatility based on monthly dummies D1–D6. An interaction term has been added with various pandemic indices with monthly dummies. Standard errors and covariance are consistent with autocorrelation and heteroskedasticity of Newey–West. Significant at <sup>a</sup>1, <sup>b</sup>5, <sup>c</sup>10% level]

employing a news-based index of the pandemic, which are based on the content analysis and text search using NLP with the aid of computer algorithms.

Empirical evidence shows that EMV (VIX and VXD) crude oil market volatility (OVX and OIV) seem to be very high, indicating a lack of risk management products like futures and options. It is apparent from the study that global crude oil is adversely linked with the news related to the pandemic outbreak, and the WCSNI shows a positive impact on the oil market. Phase I appear to be more uncertain about the uncontained effect of Covid-19 on the economic activity, and market agents are more concerned about their portfolio rebalancing and risk management. The WCFNI during the first phase of the Covid-19 infections, the oil market paid close attention to the *fake* news, and oil prices responded adversely. Interestingly, we have observed that infectious disease impacts the crude oil market and yield negative returns during the first phase of pandemic development. We have noticed that during the initial growth of the Covid-19 infection, other macroeconomic and political events were remaining in favor of the market. At the same time, during the second phase amidst the pandemic outbreak, it hurts the global crude oil market. We find that infectious diseases increase investor panic and anxiety. Eventually, it led to a rush for the over-reliance on the hedge funds (e.g. options) with an extra premium.

For the first time in the past decade, Brent traded at its low US\$19.33/b. Looking at the global environment where we can see Covid-19 still spreading but global demand continuing to pick up due to relaxation in the travel and lockdown conditions, one can expect oil by the end of this year and into next year touching towards the US\$50/b range. The recent recovery of the global crude is due to production cuts from Russia and OPEC negotiations. A resurrection of Covid-19 cases in the USA and a gloomy economic forecast, with oil prices on track to hit their most significant historical decline and again in near future excess supply and weak demand, will be the main concern for the energy traders. The sustainable global prices of WTI and Brent depending upon the edge due to increasing US and European tension with China. Most of the countries' economic activities are on track amidst increased cases of Covid-19 and planning to fight for the second wave by the end of 2020. Hence, OPEC plus has recognized that further-production cut could be a dangerous call if the second wave of Covid-19 outbreaks.

#### Notes

1. <https://coronavirus.ravenpack.com/worldwide/cases> Accessed on July 19, 2020.
2. <https://coronavirus.ravenpack.com/worldwide/panic> and other covid-19 related indexes.
3. [http://www.policyuncertainty.com/infectious\\_EMV.html](http://www.policyuncertainty.com/infectious_EMV.html).
4. The coronavirus panic index measures the level of news chatter that makes reference to panic or hysteria and coronavirus. Values range between 0 and 100, where a value of 7.00 indicates that 7% of all news globally is talking about panic and Covid-19. The higher the index value, the more references to panic found in the media.
5. The coronavirus media hype index measures the percentage of news talking about the novel coronavirus. Values range between 0 and 100, where a value of 75.00 indicates that 75% of all news globally is talking about Covid-19.
6. The coronavirus fake news index measures the level of media chatter about the novel virus that makes reference to *misinformation* or *fake* news alongside Covid-19. Values range between 0 and 100, where a value of 2.00 indicates that 2% of all news globally is talking about fake news and Covid-19. The higher the index value, the more references to fake news found in the media.
7. The coronavirus sentiment index measures the level of *sentiment* across all entities mentioned in the news alongside the coronavirus. The index ranges between -100 and 100, where a value of 100 is the most positive sentiment, -100 is the most negative and 0 is neutral.

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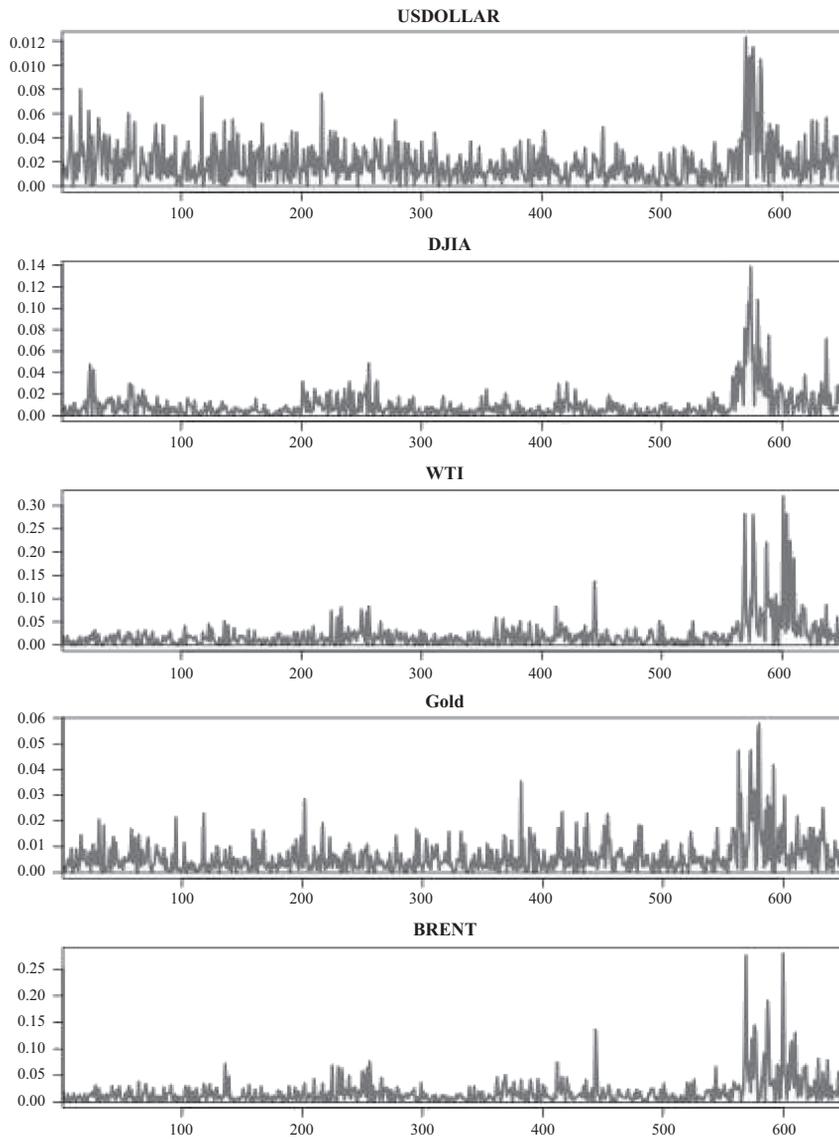


Figure A1.  
Absolute returns  
volatility

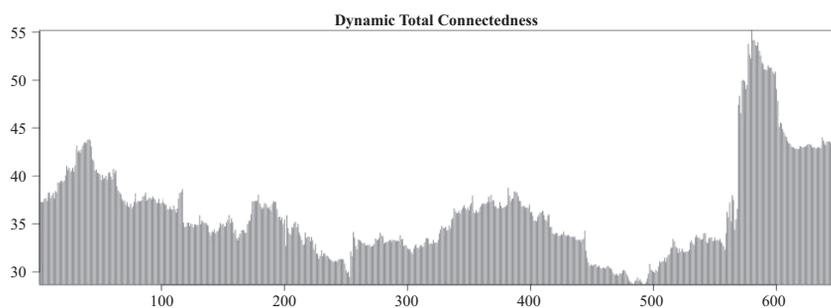


Figure A2.  
Dynamic total  
connectedness

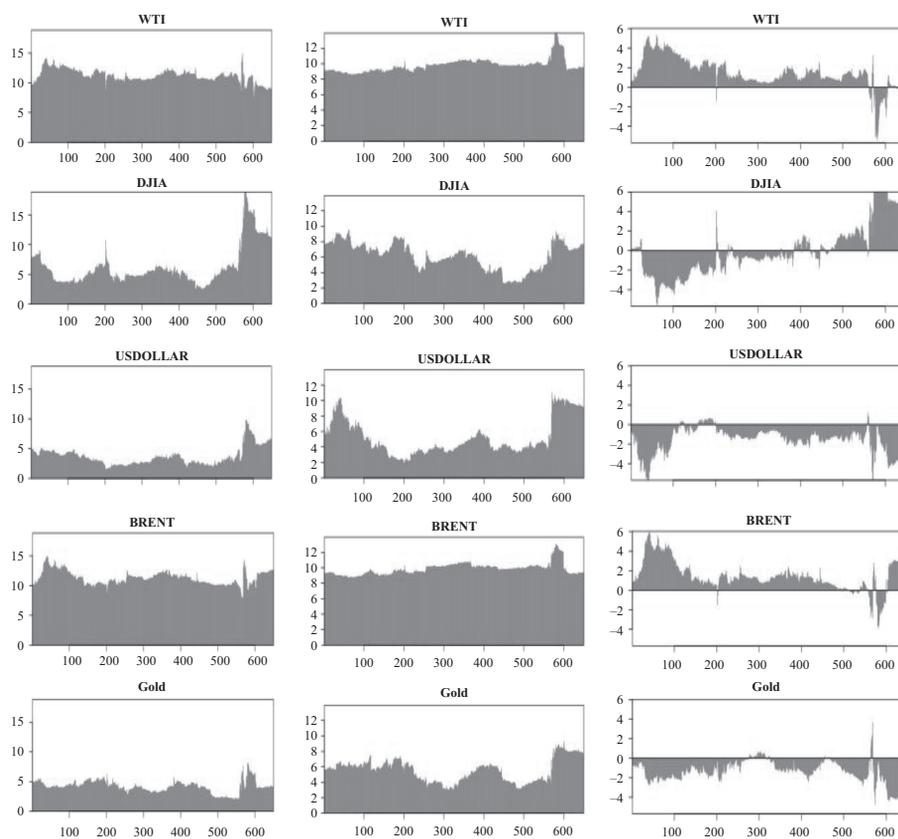


Figure A3.  
Volatility spillover  
FROM, TO and Net

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EJMBE  
30,3

**About the author**

Dr Imlak Shaikh is an Assistant Professor of Accounting and Finance at MDI Gurgaon. Previously, he served as an Assistant Professor at the Birla Institute of Technology and Science, BITS Pilani. Shaikh has also taught at IIM Rohtak as an Adjunct Faculty in FPM program. Shaikh received his post-graduation degree in commerce from the Veer Narmad South Gujarat University Surat; his PhD from the Indian Institute of Technology Bombay (IIT-Bombay). Shaikh has been awarded with “PhD Thesis Excellence Award” from IIT-Bombay. He has recently published in *North American Journal of Economics and Finance*, *Engineering Economics*, *Journal of Business Economics and Management*, *Economic Change and Restructuring*, *Borsa Istanbul Review*, *Journal of Economic Studies* and so on. Imlak Shaikh can be contacted at: [imlak786@gmail.com](mailto:imlak786@gmail.com)

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# Capital markets and performance of strategic corporate M&A – an investigation of value drivers

Performance of  
strategic  
corporate  
M&A

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## Abstract

**Purpose** – The paper investigates the market performance of strategic acquisitions for growth in the fifth and sixth merger waves and outlines the major determinants that affect the performance of acquiring companies in these most complex and most challenging corporate transactions.

**Design/methodology/approach** – To perform the quantitative analysis a unique data sample was built out of acquisitions performed in the 5th and 6th merger waves with an only single purpose – strategic growth. Their performance was first analyzed using the method of market-based event study. In addition, the impact of several non-accounting determinants identified through a thorough literature review was tested using univariate/multivariate regression analysis.

**Findings** – The new findings of the study state that strategic acquisitions for growth created more value for acquiring companies if they were completed internationally and involved an acquisition of a middle-sized company. Moreover, the acquisition of targets in the less related industries (2-SIC) led to stronger performance of acquirers, especially in the international settings.

**Research limitations/implications** – The study suggests additional directions for future research. The future analysis can investigate the post-merger acquisition performance of strategic acquirers and can focus on additional financial (accounting) determinants in the evaluation of performance. This perspective can not only address the limitations imposed by the assumption of efficient capital markets but also provide additional insights.

**Practical implications** – The results of current study have important implications for executives performing M&A for growth. They show that the market reaction to M&A announcement can be at least partially anticipated and help managers to plan their strategic moves based on a defined set of variables.

**Social implications** – The study contributes to the sustainable, value-creating growth dynamics and encourages Executives to “lead for value.”

**Originality/value** – (1) In contrast to the existing studies that do not differentiate between the transaction rationale in their analysis, this paper focuses explicitly only on those acquisitions that have strategic growth as their primary objective and responses therefore, to the problem stated by Halpern (1983). This approach helps to mitigate the distortion of results and make a reliable assessment of the strategic move. (2) The results of quantitative analysis also outline that acquisition of mid-sized targets and larger degree of diversification (2-SIC, international focus) code were associated with higher value creation.

**Keywords** M&A, Value creation, Shareholder value, Corporate growth, Strategic financial decision making

**Paper type** Research paper

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## 1. Introduction

The topic of corporate M&A has experienced a prolific research throughout last decades (e.g., Kaneko *et al.*, 2020; Tao *et al.*, 2019; Arikan and Stulz, 2016; Campbell *et al.*, 2016; Demijan *et al.*, 2015). Indeed, the high interest of academia can be explained by a steep return of the corporate world to merger activity in the last years and increasing volume of transactions. At the same time, numerous empirical financial studies (e.g., Wangerin, 2019; Malmendier *et al.*, 2018; Mortal and Schill, 2015; Di Guili, 2013; Alexandris *et al.*, 2012; Martynova and Renneboog, 2011) and newly developed theories (Arikan and Stulz, 2016; Martin, 2016; Hackbarth and Morellac, 2008; Margsiri *et al.*, 2008) try to describe and to analyze the rationale behind mergers and their performance, contribute to better understanding of different corporate strategies but provide rather vague results. It is not surprisingly that some researchers claim that the field of M&A develops into a “theory of single cases” (Halpern, 1983) rather than organized knowledge on how to grow externally. The only fact that remains stable is that M&A is often the most effective way to grow a company. This trend strengthens with the increasing size of the firm – the larger companies get, the more they rely on M&A to grow (Rehm *et al.*, 2012). As a result of response to the increasing expectations of shareholders and fast-changing environment, the complexity, goals and focus of corporate deals are also changing. So, the most of transactions announced over the last years relied on growth and enhancement of strategic advantage, compared to restructuring and seizing cost synergies. Innovation, disruption and the need for growth were also the major contributors to the M&A activity in 2019. Simultaneously, the awareness of CEOs of transaction performance has increased. Most of them focus on the revision of business structure and additional value created and prefer quality to quantity, improving their discipline in creating value (JPMorgan, 2019; Cogman, 2014).

Despite this remarkable growth in value and transaction activity, the empirical research provides almost no evidence on strategic transactions – the existing academic studies analyze M&A performance without differentiating between the rationales for the deal. Recent most influential empirical studies focused on the analysis of the transaction in the fifth merger wave (e.g., Martynova and Renneboog, 2011; Alexandris *et al.*, 2012, 2010; Dutta *et al.*, 2013; Korican *et al.*, 2014). It was particularly characterized through international expansion and motivated by overvaluation of the acquirers and management overconfidence. As a result, it was marked by overpayment and significant value destruction for the acquiring firms (e.g., Alexandris *et al.*, 2010). Also the analyses of the sixth merger wave report the value destruction on a large scale. Higher cash balances and lower optimism of investors explain these results (Alexandris *et al.*, 2012). Further studies analyzing the recent development are devoted to the previous collaboration of participants (He *et al.*, 2020), the role of managerial incentives (Hillier *et al.*, 2020), structure of the board (Tao *et al.*, 2019), industry development (Ahern and Harford, 2014), Keil and Laamanen (2011) and the number of bidders (Akdogu, 2011). All of the mentioned studies look, however, at transactions of a specific wave in general and focus on the analysis of the trend without differentiating between the rationales behind the decision in favor of acquisition, which may distort the results considerably (Halpern, 1983). The present paper aims to address this shortcoming and investigates exclusively strategic acquisitions for growth.

The major purpose of this paper is to carry out the in-depth analysis of the value created by acquiring companies participating in *strategic acquisitions for growth*. In my previous publications I developed and explicitly outlined the major differences between this type of transactions and other types, such as takeovers, restructuring acquisitions, etc. To achieve my objective, I build a sample of strategic acquirers performing transactions worldwide between 2000 and 2010 (fifth and sixth merger wave). I estimate abnormal returns of acquiring companies around the transaction announcement and investigate the performance determinants. To make this study comparable to the existing empirical capital market-based studies in M&A, I focus only on non-financial (exogenous) determinants. I also examine the differences in national and international transactions. In comparison to national acquisitions,

which are mostly associated with assets growth or responses to industry shocks (e.g., Keil and Laamanen, 2011; Koričan *et al.*, 2014), international transactions are expected to create new business opportunities and are generally considered to be a strategic move (Danbolt and Maciver, 2012; Francis *et al.*, 2008). I investigate whether and to what extent the international diversification influences the anticipated profitability of transaction.

The study contributes to the existing research in three ways. First, it addresses the most urgent issue of strategic growth and concerns of Halpern (1983) and focuses solely on friendly strategic acquisitions with the intent of growth, excluding any other aims for transaction from the side of acquiring company. As a result, it helps better understand the impact of chosen determinants on the success of growth strategy. Second, it contributes to the empirical financial studies on mergers in the 5th and 6th merger waves and empirically investigates and outlines the major non-financial value drivers of success in strategic transactions for growth of this period. It also extends them through the analysis of difference in returns' performance of acquirers in US and European markets, taking into consideration different capital market- and corporate governance structures in both regions. Third, it contributes to the academic discussion about the role of international expansion in strategic growth and shows whether exogenous (e.g., method of payment, focus, etc.) variables have different impact on national and international acquirers. In the nutshell, it aims to give answers to following questions: Does the performance of acquiring companies in strategic acquisitions for growth differ from previous general studies? Can the impact of non-financial variables on the transaction performance be empirically confirmed? What are the major factors influencing the value created for the shareholders of acquiring companies?

The remainder of the paper is structured as following. Section 2 is devoted to the definition of non-financial determinants in M&A and offers a short overview of the existent literature and major drivers. Section 3 outlines shortly the data sample and methodology applied. Section 4 presents the results of empirical analysis of overall performance of acquirers around the day of announcement. Section 5 divides the data sample into sub-groups and analyzes the impact of chosen variables on the investment reaction and stock returns of acquirers. Section 6 shows the results of regression analysis. Section 7 concludes.

## 2. Value creation and major value drivers in strategic M&A

The existing empirical studies outline a variety of factors influencing the success of transactions. Among the most important ones are usually mentioned transaction currency, deal size, strategic relatedness of transaction participants, economic factors, market structure, number of competitors in the market, personal/psychological characteristics of CEO, etc.

Without doubt, the most influential and most widely analyzed determinant is *method of payment*. The earlier studies (e.g., Ben-David *et al.*, 2015; Martynova and Renneboog, 2011) stated that transactions that are financed with cash showed superior or at least less negative performance in both short- and long-term. This means of payment has remained the most favorable also in the recent years, even though the latest academic studies highlight the changing trends in the transaction currency and the increasing number of mixed deals. According to Boone *et al.* (2014), the fraction of mixed payments has tripled since 2000 from 10% to 30%, while fraction of stock payments was around 60% before the turn of the century and has decreased to less than 20% during the last decade. The cash payments contributed less than 25% in 1990s but have doubled to more than 50% in the recent years. Huang *et al.* (2016) investigate the changes in M&A payment trends in cross-border transactions and also confirm that the usage of cash as transaction currency has significantly decreased, which helps the acquirers to avoid overpayment but at the same time, leads to a lower probability of deal completion.

Another important determinant is the *size* of transaction. Acquirers of smaller targets do not only spend less, they also create more value. So, Bayazitova *et al.* (2012) states that large

acquisitions are mostly driven by the managerial motives and weak corporate governance and therefore destroy more value than they create. Another statement with concern of the target size is increased complexity of the combined company and difficulty to achieve planned synergies (Alexandries *et al.*, 2012). This is also confirmed by empirical studies. Oswal and Goel (2020), outline a strong negative relationship between the deal size in terms of price paid and bidder's returns around the announcement of transaction and in the days following it. Dell'Acqua *et al.* (2018) confirm these findings for both developed and emerging markets outlining a significant positive relationship between relative size of bidder and target and abnormal returns of acquiring company.

The decision about the industrial and geographic *diversification or focus*, or relatedness, has an important impact on the overall performance of acquiring company as well. The resource-based theory of the firm presents the "relatedness hypothesis," saying that M&A between strategically related firms create the highest returns for the acquiring company because the participants are able to achieve higher synergies. Focused transactions are generally priced better than industrial diversification and earn higher returns also in the long-run. Meggison *et al.* (2004), state that focus-decreasing (FD) mergers result in significantly negative long-term performance, presented through over 18% loss in stockholders' wealth and 9% loss in value as well as significant declines in operating cash flows in the post-merger years. Lim and Lee (2016) investigate the effect of industry relatedness on cross-border acquisition completion and conclude that transactions with higher degree of relatedness between acquiring and target company lead to more success. Cefis *et al.* (2020) outline, however, the curvilinear inverted - U relationship between the relatedness and post-acquisition operating performance. Internal R&D experience of acquirers and size of target help to achieve the right balance between the novelty and exploitation of synergies. However, a strong deviation from an optimal level of relatedness leads to increased rigidity and poorer performance. *International diversification* is one of the essential decisions to be made in strategic acquisitions for growth. It is clear that companies pursuing international growth strategy encounter often a variety of challenges, for instance, differences in financial, accounting, legal systems (Bris and Cabolis, 2008) as well as cultural and language differences (Weber *et al.*, 2011). However, although cross-border acquisitions are likely to be more costly and complex to execute, Danbolt and Maciver (2012) claim that abnormal returns of both targets and bidders are significantly higher in cross-border transactions compared to domestic ones. In their study of UK companies, the authors identified the cross-border effect of 10.1% points for targets and 1.5% points for bidders. Adnan (2018) compared the short-term abnormal returns for national and international transactions performed by UK companies. The research results show that domestic acquirers earned significant positive returns around the announcement, however, their post-event performance turned negative. International transactions experienced slightly positive returns around the announcement, which improved even further in the post-event period although the results were insignificant.

Overall *macroeconomic conditions* influence strongly the performance of bidding companies. The neoclassical economic theory says that any external shock – economic, technical or regulatory – can transform the industries and lead to the creation of merger waves (Harford, 2005). In the economically weak years strong companies use the opportunity to strengthen their position through M&A. The relationship between the macroeconomic variables and merger activity is described for instance by Madura *et al.* (2012), who claim that industry growth and capital liquidity affect the demand for target firms and explain the variation in takeover premiums. Cerrato *et al.* (2016), investigate how the economic crisis influences the merger activity in Italy in the period 2007–2010. Their results show that economic downturn leads to a lower number of non-related and cross-border acquisitions. Firms prefer to focus on their core business and do not diversify in new geographical and industrial markets. Nevertheless, the authors claim that cross-border acquisition have a

positive impact on short-term accounting performance of acquirers, even though it is weaker than in non-crisis times.

If someone investigates the capital market reaction to M&A, it is logically to assume that specifics of *capital market* in different countries themselves can cause differences in market reaction to M&A transactions. Bagella *et al.* (2005), present the differences between European and US financial markets. Differences in risk, dividend policies, and expected growth rates influence the investors' sentiment and their expectations about the transaction in different ways. Active investors in US market are usually well-informed and build their expectations based on the fundamental values of the firm, which they are able to calculate and to identify whether the stock is over- or undervalued. At the same time, in less developed and more risky markets with lack of prohibition on insider trading and limited availability of mutual funds, investors are less informed and show the behavior of "noise, liquidity or near-rational" traders. A large number of institutional investors and activists increase the transparency of US/UK markets and lead to the conclusions that they are better informed and can assess the M&A strategy of bidding company easier.

Apart from economic variables, there are a number of other factors that can play an important role in M&A performance. Akdogu (2011), outlines the importance of competitions among bidders and their number for the agreeing on transaction premium – the acquirers do often overpay, just in order not to lose a valuable target to competitors. It is intuitively understandable that the bids with less bidding companies earn, as a result, significantly higher returns and experience better performance (Magi Tarasovich, 2014). Another factor is based on the behavioral considerations. Ferris *et al.* (2013), show that CEO overconfidence is an important determinant in the evaluation of M&A activity and influence the number of offers made, frequencies of diversifying and non-diversifying transactions and method of payment.

The outlined factors are the result of general analysis of multiple empirical financial studies and do not always prevail in all data samples analyzed. The impact of these factors on the performance of strategic acquisitions has not been analyzed so far and is a major goal of this paper. Based on the results from previous academic studies, I have chosen six most important variables (structure of capital markets, macroeconomic situation, international diversification, size of transaction, method of payment, industrial diversification) to test their significance for the value creation by acquiring firms in strategic acquisitions for growth. With the focus on the unlocking value in the transaction, I look exclusively at a set of economic factors and those that are under management control. A short summary of the key exogenous determinants analyzed in the paper is presented in Table 1.

The major research questions of this study are: do non-financial variables impact the performance of strategic transactions and can this impact be empirically confirmed? What are the major factors influencing the value creation of the shareholders of acquiring companies?

### 3. Data sample and methodology applied

The data sample of strategic acquisitions for growth was built using Thomson Reuters One Banker SDC, Bloomberg and Lexis/Nexis databases and includes international public companies that undertook at least one transaction with strategic growth intent (as verified by Thomson Reuters One and MergerStat) in the period from 2000 till 2010 and whose financial data was available in Worldscope and DataStream database. The data sample includes the transactions from 5th and 6th merger waves for two major reasons. First, these two merger waves were characterized by strong focus on growth, which perfectly suits the goal of the paper. Second, this period is well studied in the literature, which allows good comparison of results with previous studies. The identified acquisitions were completed both nationally and internationally and include all industries apart from financial services and real estate. None of the target was acquired in a hostile way.

Factor	Key empirical findings	Example of studies
Means of payment	Cash acquirers earn better returns than stock acquirers	Martynova and Renneboog (2011): bidders who pay in cash or use at least mixed means of payment earn higher abnormal returns. Targets which were paid in cash experienced higher increase in share price Ben-David <i>et al.</i> (2015): strongly mis- or overvalued acquirers are significantly more likely to use stock financing. These deals earn lower long-run stock returns and long-run operating performance compared to cash acquirers
Size of transaction	Acquirers of smaller targets create more value	Bayazitova <i>et al.</i> (2012) : mega-mergers destroy value for acquirers. Value destruction is driven by managerial motives and weak corporate governance Dell'Acqua <i>et al.</i> (2018): there is a significant positive relationship between the relative size of bidder and target and abnormal returns of acquiring company in both developed and emerging countries
Industrial focus/diversification	Focused acquirers earn in the long-run higher returns	Lim and Lee (2016): transactions with higher degree of relatedness between acquiring and target company lead to more success in cross-border acquisitions Cefis <i>et al.</i> (2020): unrelated acquisition can enhance post-acquisition innovative performance up to a certain point (curvilinear inverted -U relationship), but after that point it leads to rigidities
Geographical diversification	Cross-border acquisitions create more value	Danbolt and Maciver (2012): abnormal returns of both targets and bidders are significantly higher in cross-border transactions compared to domestic ones Adnan (2018): international acquirers experience positive returns around the announcement and improve this performance in the post-event period
Macroeconomic situation	Macroeconomic shocks drive merger waves and influence transaction terms	Madura <i>et al.</i> (2012): macroeconomic factors (industry growth and capital liquidity) influence demand for target firms and explain the variation in takeover premiums over time Cerrato <i>et al.</i> (2016): economic downturn leads to a lower number of non-related and cross-border acquisitions
Capital market structure	Specifics of capital market cause differences in market reaction to M&A transactions	Bagella <i>et al.</i> (2005): differences in risk, dividend policies, and expected growth rates influence the investors' sentiment and their expectations to the transaction Martynova and Renneboog (2011): the authors outline the necessity to evaluate separately the UK and Continental Europe transactions due to capital market specifics

**Table 1.**  
Overview of the major determinants presented in the recent literature

To measure market reaction on the announcement a standard event-study methodology was applied. Following the market-adjusted approach for daily returns (Brown and Warner, 1980), the pre-announcement shareholder returns were calculated for the estimation period starting 181 trading days and ending 20 days before the announcement. All OLS-regression models were controlled for autocorrelation using the Durbin–Watson statistic and multi-collinearity using tolerances intervals for individual variables. The expected returns were approximated by the use of returns of the proxy market portfolio ( $R_{mt}$ ) on each event day  $t$ . The market portfolio selection took into account the geographical distribution of the firms and the individual stock price performance was measured in comparison to the most appropriate principal local index. For calculation of  $R_{mt}$ , national Morgan Stanley Capital International (“MSCI”) Standard Market Index for each security was used as the market return proxy for acquirers in the sample. Following the study of Cybo-Ottone and Murgia (2000), also the DataStream Regional Industrial Index was applied, however, the results did not show any significant differences in calculated returns except of companies from energy sector, where it was used as a major return proxy. The event date is the day the public is first informed of the transaction, according to Thomson One SDC. These dates were also crosschecked using the MergerStat database.

The abnormal returns of stock around the announcement are calculated as a difference between the expected stock return  $R_{jt}$  and actual stock return  $R_{it}$  in each day in the event window as shown in the following formula:

$$AR_{jt} = R_{jt} - R_{it} \quad (1)$$

where

$AR_{jt}$  = abnormal return of security  $j$  on the day  $t$

$R_{jt}$  = expected return, calculated using OLS regression

$R_{it}$  = actual returns

To take into consideration the cross-sectional dependence as well as event clustering and an increase in variance over the event period in the next step, excess returns were standardized and afterwards tested by means of an adjusted  $z$ -statistic according to the method introduced by Mikkelsen and Partch (1986). The actual standardized abnormal returns were calculated for each of the firms in the sample for every day during the event window.

To make results comparable to other event studies the cumulative abnormal returns were computed for different event-windows within  $(-10;10)$  interval and presented for both a short-term event window of two days  $(0;1)$  and a longer one  $(-1;10)$ . The longer post-event windows are used to adjust the results for possible time lags in the capital markets and delayed market reaction to the transaction announcement. The average abnormal return for event day  $t$  and cumulative abnormal returns for event window  $T$  were calculated as follows:

$$AR_t = \frac{1}{N} \sum_{i=1}^N AR_{it} \quad (2)$$

where

$AR_t$  = average abnormal returns on the day  $t$  ( $t$  is a day in the event window)

$N$  = number of analyzed securities

$t$  = point of time to analyze,  $t T$

$AR_{it}$  = abnormal returns of a security  $i$  on the day  $t$  ( $t$  is a day in the event window)

Cumulative abnormal returns (CAR) for any interval ( $t_1; t_2$ ) during the event window  $T$  were calculated as follows:

$$CAR_{[t_1, t_2]} = \sum_{t=t_1}^{t_2} AR_t \quad (3)$$

where

$CAR_{[t_1, t_2]}$  = cumulative average abnormal returns in the period ( $t_1, t_2$ )

$t$  = point of time to analyze,  $t \notin T$

$AR_{jt}$  = average abnormal returns on the day  $t$  ( $t$  is a day in the event window)

Tests of statistical significance are based on standardized prediction errors, similar to the method applied by Ismail and Davidson (2005). In order to assess whether the means of two paired subsamples X and Y within the univariate analysis of various determinants of transaction success are statistically different from each other,  $t$ -statistics following Beitel *et al.* (2004), were used. Under the null hypothesis that there are no differences in the abnormal returns between the analyzed subsamples,  $t$ -statistics follow a student- $t$  distribution. As this study is focused on the evaluation of the performance of acquiring companies, no abnormal returns for the shareholders of the target companies were calculated and no conclusion was drawn on the combined creation and distribution of shareholder value in the transactions.

In addition to calculation of abnormal returns, I perform the univariate analysis with mean-difference test and relate the abnormal returns of acquiring companies to the chosen variables investigating their impact on the acquirers' abnormal returns. For this reason, I divide the entire data sample into several sub-samples according to the key determinants identified in the previous section, which are then analyzed individually and compared to each other. Additionally to the entire data sample, the analyses were performed for national and international acquirers separately. Following sections describe the results.

#### 4. Results of the capital market based event study

The cumulative abnormal returns (CAR) for shareholders of acquiring companies for the entire data sample are presented in Table 2. Consistent with the majority of previous studies, shareholders of acquiring companies in strategic acquisitions for growth suffered negative returns on the announcement day as well as in the short period of time around it. The negative market reaction remains constant through all the analyzed time intervals, however the losses are the largest on the announcement day and in the shortest event window ( $-1;1$ ). The CAR of acquiring companies in these intervals are  $-0.757\%$  and  $-0.515\%$  respectively. Although there are some acquirers who experienced positive market reaction, the number of those with negative share price development is relatively higher for all event windows, with the largest difference between the positive and negative results on the day of announcement with 36 and 65 acquirers respectively.

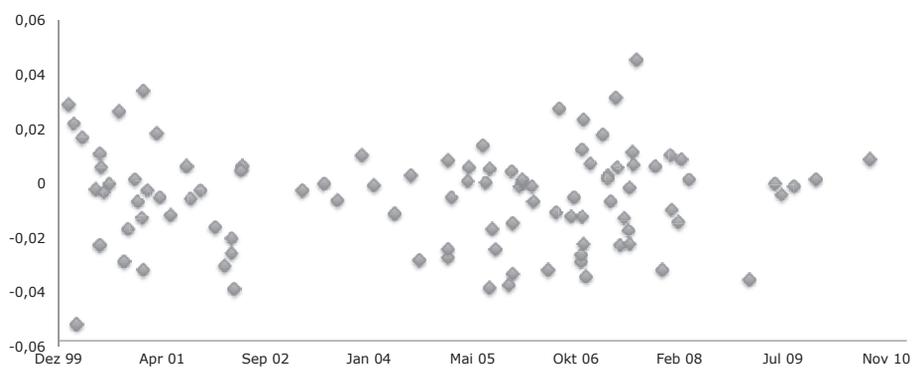
While on the announcement day the majority of acquiring companies generated significant negative returns, in the event window ( $-1;1$ ) this number improves slightly and is reflected in higher values of CAR. Nevertheless, the number of acquirers with negative CAR remains almost two-third of the total data sample. At the same time, the CAR for the event period ( $-1;1$ ) are largely scattered, varying in a broad range from  $-5.17\%$  to  $+4.56\%$ . Figure 1 illustrates the distribution of CARs for the event window ( $-1;1$ ).

The positive cumulative abnormal returns are distributed between the maximum value of  $+4.560\%$  and the minimum value of  $+0.014\%$ . The mean is almost twice as high as the median, which suggests a strong difference in values at the upper- and lower end. The value

Event window	CAR(%)	Pos. (N)	Neg. (N)	Z-statistics	p-value
<i>Panel A: Before the announcement</i>					
(-10;-1)	-0.077	52	49	-0.772	0.22006
(-5;-1)	-0.110	50	51	-1.108	0.13393
(-3;-1)	-0.052	50	51	-0.521	0.30118
<i>Panel B: On the day of announcement</i>					
(0;0)	-0.757***	36	65	-7.610	<0.00000
(0;1)	-0.608***	43	58	-6.111	<0.00000
<i>Panel C: After the announcement</i>					
(1;3)	-0.068	52	49	-0.685	0.24667
(1;5)	-0.013	54	47	-0.134	0.44670
(1;10)	-0.055	47	54	-0.551	0.29081
<i>Panel D: Around the announcement</i>					
(-10;10)	-0.256***	43	58	-2.573	0.01069
(-5;5)	-0.312***	41	60	-3.132	0.00175
(-3;3)	-0.365***	42	59	-3.666	0.00024
(-1;1)	-0.515***	41	60	-5.179	<0.00000

**Note(s):** This table shows the cumulative abnormal returns for 101 acquirers during the period from 2000 till 2010. Cumulative abnormal returns are calculated employing the standard market model, using an estimation period of 180 trading days prior to the event window [-20, 20] and the Morgan Stanley Regional Industrial Index to measure market returns. Reported *t*-statistic is based on the two-tailed *t*-test. \*, \*\* and \*\*\* denote the statistical significance at 10%, 5% and 1% level, respectively

**Table 2.** Cumulative standardized abnormal returns for different event windows



**Figure 1.** AR for each transaction within (-1;1) event window

for standard deviation is indeed relatively high with 1.075%. Similar results can be found for the negative values. The lowest value is -5.172%, while the maximum value is -0.008%. The mean and median values here are however much closer, although standard deviation remains pretty high with 1.281%. Figure 1 outlines that positive values for CAR are almost evenly divided through the analyzed merger waves in the time period from 2000 to 2010.

The statistical distribution of cumulative abnormal returns for the short (0;1) and a long (-1;10) event window are presented in Table 3.

Although the number of acquiring companies that earned positive and negative CAR in these both event windows is equal, the CAR improved in the longer event window with the values of -0.608% and -0.278%, respectively, which are significant at 1% level. The numbers confirm that the standard deviation in the event-window (-1;10) is lower and

therefore the performance of acquiring companies is more homogenous compared to the shortest event window (0;1).

Extending the length of the pre- and post-announcement periods yields less negative returns. It is striking that the CAR have very close values in the event windows (-5;5) and (-1;5) as well as (-10;10) and (-1;10). The most important changes in CAR happen on the day of the announcement and the following day. CAR of the acquirers in the event windows following the announcement with the values of -0.068% in (1;3) and -0.013% in (1;5) do not differ significantly from 0. Similar results show CAR in the event windows before the announcement. Looking at the performance of acquiring companies in the longer event windows, it can be stated that it improves significantly, so in the event windows (-10;10) and (-1;10) acquirers earn -0.256% and -0.278%, respectively. The difference in the number of companies with positive versus negative returns is here the lowest with 43 vs. 58 acquirers respectively.

These results support the semi-efficient market hypothesis and importance of considering both a short-term event window and some additional days around the announcement for a thorough evaluation of results. For this reason, univariate analysis of the abnormal returns presents results for two different event-windows. First, for the shortest event window (0;1), where the CAR show statistically significant results and which is commonly used in the financial studies, which allows comparison of results with the prior academic research, and second, for (-1;10) in order to adjust for any lags in the market reaction. The consideration of additional event windows did not bring any additional significant explanatory power. In case there are noteworthy significant results for other event windows, they are mentioned in the analysis explicitly.

## 5. Results of the analysis of different sub-samples

### 5.1 Geographical diversification vs. focus

To analyze the impact of geographical diversification, the sample was divided into two groups according to their strategy and a binary variable was built to reflect whether a transaction was national or international. Using this classification, 72 national and 29 international transactions were identified and examined. Table 4 reports the results for both individual sub-samples, their mean-difference test and their statistics of significance. Additional event-windows are shown to consider statistically significant results around the announcement day and to reflect the development of CAR in the longer event-windows.

It is striking that acquirers pursuing national acquisitions underperformed acquirers pursuing international acquisitions in the short period of time around the announcement day. Their abnormal returns in short event windows do not significantly differentiate from zero. For the event windows (-1;1) and (0;0) in the sample this difference in performance is almost three times as large, with CAR of -0.650%/-0.182% and -0.904%/-0.393%, respectively. While the *t*-statistic is significant for the results in all event windows that include the announcement day for national acquirers, it is significant only for the event windows (0;0),

<i>N</i> = 101)	Event window (0;1)		Event window (-1;10)	
	Positive CAR(%)	Negative CAR(%)	Positive CAR(%)	Negative CAR(%)
<i>N</i> (absolute)	43	58	43	58
Maximum	6.443	-5.240	2.688	-3.749
Minimum	0.014	-0.015	0.008	-0.015
Mean	1.167	-1.924	0.753	-1.043
Median	0.644	-1.558	0.753	-0.964
Std. deviation	1.328	1.478	0.580	0.811

**Table 3.**  
Statistical distribution  
of CAR for the key  
event windows

Event window	National			International			Difference						
	(N) (72)	Pos	Neg	Z-statistic	p-value	(N)	Pos	Neg	Z-statistic	p-value	(Nat-Int)	t-statistic	p-value
<i>Panel A: Before the announcement</i>													
(-10;-1)	-0.053	37	35	-0.449	(0.327)	-0.136	15	14	-0.732	(0.232)	0.083	0.352	(0.726)
(-5;-1)	-0.030	37	35	-0.251	(0.401)	-0.311**	13	16	-1.672	(0.047)	0.281	1.237	(0.219)
(-3;-1)	0.033	36	36	0.278	(0.609)	-0.262*	14	15	-1.410	(0.079)	0.295	1.250	(0.214)
<i>Panel B: On the day of announcement</i>													
(0)	-0.904***	23	49	-7.670	(0.000)	-0.393***	13	16	-2.117	(0.034)	-0.511*	-1.677	(0.097)
(0;1)	-0.796***	29	43	-7.750	(0.000)	-0.143	14	15	-0.769	(0.442)	-0.653***	-2.050	(0.043)
<i>Panel C: After the announcement</i>													
(1;3)	-0.115	39	33	-0.972	(0.166)	0.047	13	16	0.253	(0.600)	-0.162	-0.615	(0.540)
(1;5)	-0.054	39	33	-0.461	(0.322)	0.089	15	14	0.476	(0.683)	-0.143	-0.561	(0.576)
(1;10)	-0.015	36	36	-0.127	(0.449)	-0.154	11	18	-0.828	(0.204)	0.139	0.607	(0.545)
<i>Panel D: Around the announcement</i>													
(-10;10)	-0.244**	31	41	-2.071	(0.039)	-0.286	12	17	-1.538	(0.124)	0.042	0.175	(0.861)
(-5;5)	-0.329***	27	45	-2.729	(0.005)	-0.268	14	15	-1.445	(0.148)	-0.061	-0.247	(0.805)
(-3;3)	-0.395***	31	41	-3.353	(0.001)	-0.289	11	18	-1.557	(0.119)	-0.106	-0.409	(0.683)
(-1;1)	-0.650***	25	47	-5.512	(0.000)	-0.182	16	13	-0.982	(0.326)	-0.468	-1.579	(0.118)

**Note(s):** The Table shows the standardized cumulative abnormal returns of acquiring companies pursuing national vs. international transactions. The CARs are calculated employing the standard market model, using an estimation period of 181 trading days prior to the event window (-20;20) and the Morgan Stanley Regional Industrial Index to measure market returns. The reported t-statistic is based on the two-tailed t-test. \*denotes significance at 10% \*\*denotes significance at 5% \*\*\*denotes significance at 1%

**Table 4.**  
CAR in national vs.  
international  
transactions

(-5;-1) and (-3;-1) for international acquirers. This means that CAR of acquirers in cross-border transactions increase when the information becomes public. In the event windows following the announcement, CAR are even positive with +0.047% and +0.089% in the event windows (1;3) and (1;5), respectively. The *t*-statistic for mean-difference test shows statistically significant explanatory power for the event windows (0;0) and (0;1) at the 10 and 5% level, respectively. Following these findings, it can be concluded that in the time period analyzed international expansion through strategic acquisition for growth was considered more value-creating than acquisitions in the domestic market. However, with the extending length of event windows, CAR for both national and international acquirers show almost equal values with 0.275% and -0.265% in the event-window (-10;10), respectively. One possible explanation of the strong underperformance of national acquirers in the short- and middle-term event-windows is general developments in 5th–6th merger waves. The acquirers of this period focused on geographical diversification and believed that international deals represent the best opportunity for business risk reduction and future growth. It is not surprising that these strategies were also considered the best choice during the financial crisis of 2008. These findings are in line with studies of Adnan (2018), Alexandris *et al.* (2010).

#### *5.2 Structure of capital markets: US vs. Europe*

Despite the high importance of international diversification and its strong impact on the abnormal returns of acquirers, the home capital markets of bidders and their structure can influence the abnormal returns around the acquisitions announcement. To analyze the influence of this factor more thoroughly, the data sample was divided into two sub-samples with 72 American acquirers (listed on NASDAQ or NYSE) and 25 European acquires (listed on other exchanges inside Europe). The Japanese acquirers were excluded from this analysis. CAR are summarized separately for two subgroups in different event-windows in Table 5.

The results show that on the announcement day American acquirers experienced twice as high decrease in their share price compared to their European peers. These results remain almost unchanged throughout all event- windows analyzed with only a slight improvement in the long-term event windows (-10;10). CAR of European acquirers are -0.477% on the announcement day (0), with -0.499% in the event window (-1;1) and -0.189% in the event window (-10;10), showing the worst performance in the observed values only on the day of announcement.

Contrary to that, the returns of American acquirers are the lowest on the day of announcement and during the short-event window with -0.864% and -0.543% for (0;0) and (-1;1), respectively but gradually improve with the length of the window and are -0.390% and -0.299% for the event window (-3;3) and (-10;10), respectively. Compared to their European peers, their values vary strongly with the length of event-window, representing the reaction of investors on the new information that becomes available. Again, the days of the announcement (0) and (0;1) have the largest impact on returns. All abnormal returns of American acquirers in these short event-windows, including are statistically significant with the highest significance level (1%) on the day of announcement and up to five days around it. This indicates the difference in both the efficiency of capital markets and investors sentiments.

Taking into consideration a strong difference between the reaction of shareholders on national and international transactions, the impact of geographical diversification was also tested separately for European and American acquirers. Both European and American shareholders considered international diversification more value-creating. CAR of acquiring companies for both markets are strongly negative for national transactions in two-day event window (0;1) with -0.829% and -1.251% for US and European markets, respectively. These values, however, improve in both markets in longer event-windows and are positive in the

Event window N	US market			EU market			Difference	
	All 72	National (1) 61	International (2) 11	All 25	National (1) 7	International (2) 18	Difference (1)– (2)	(AllUS– AllEU) t-statistic
<i>Panel A: Before the announcement</i>								
(-10;-1)	-0.100 (0.394)	-0.103 (0.421)	-0.086 (0.773)	0.014 (0.946)	0.475 (0.209)	-0.166 (0.481)	0.641 (0.221)	-0.114 -0.460 (0.646)
(-5;-1)	-0.081 (0.491)	-0.061 (0.638)	-0.197 (0.514)	-0.136 (0.496)	0.491 (0.194)	-0.380 (0.107)	0.871 (0.068)*	0.055 0.227 (0.821)
(-3;-1)	0.036 (0.760)	0.033 (0.796)	0.053 (0.861)	-0.264 (0.187)	0.225 (0.553)	-0.454*** (0.054)	0.679 (0.189)	0.300 1.192 (0.236)
<i>Panel B: On the day of announcement</i>								
(0)	-0.864*** (>0.000)	-0.981*** (>0.000)	-0.219 (-0.728)	-0.477** (0.017)	-0.421 (0.197)	-0.499** (0.034)	0.078 (0.898)	-0.387 -1.188 (0.238)
(0;1)	-0.711*** (>0.000)	-0.829*** (>0.000)	-0.062 (0.836)	-0.767*** (0.097)	-1.251*** (0.001)	-0.192 (0.416)	-1.059 (0.172)	-0.222 -0.658 (0.512)
<i>Panel C: After the announcement</i>								
(1;3)	-0.134 (0.257)	-0.116 (0.364)	-0.231 (0.444)	0.020 (0.922)	-0.488 (0.197)	0.217 (0.358)	-0.705 (0.309)	-0.154 -0.562 (0.575)
(1;5)	-0.070 (0.551)	-0.095 (0.456)	0.069 (0.820)	-0.019 (0.924)	-0.326 (0.388)	0.101 (0.670)	-0.427 (0.506)	-0.051 -0.191 (0.849)
(1;10)	-0.060 (0.612)	-0.059 (0.648)	-0.067 (0.826)	-0.137 (0.495)	0.045 (0.905)	-0.207 (0.379)	0.252 (0.630)	0.077 0.316 (0.753)
<i>Panel D: Around the announcement</i>								
(-10;10)	-0.299** (0.011)	-0.325** (0.011)	-0.154 (0.611)	-0.189 (0.345)	0.267 (0.480)	-0.367 (0.120)	0.634 (0.268)	-0.110 -0.441 (0.660)
(-5;5)	-0.363*** (0.002)	-0.401*** (0.002)	-0.153 (0.613)	-0.249 (0.214)	-0.016 (0.967)	-0.339 (0.150)	0.323 (0.559)	-0.114 -0.441 (0.660)
(-3;3)	-0.390*** (0.001)	-0.425*** (0.001)	-0.200 (0.508)	-0.340* (0.089)	-0.331 (0.381)	-0.344 (0.144)	0.013 (0.983)	-0.050 -0.187 (0.852)
(-1;1)	-0.543*** (>0.000)	-0.670*** (>0.000)	0.158 (0.601)	-0.499*** (0.013)	-0.776* (0.040)	-0.390 (0.098)	-0.386 (0.571)	-0.044 -0.139 (0.890)

**Note(s):** The Table shows the standardized cumulative abnormal returns of acquiring companies according to their international diversification strategy and home capital market. The CARs are calculated employing the standard market model, using an estimation period of 181 trading days prior to the event window (-20;20) and the Morgan Stanley Regional Industrial Index to measure market returns. The reported t-statistic is based on the two-tailed t-test. \*, \*\*, \*\*\* denote 10%, 5% and 1% respectively

**Table 5.**  
CAR for US/EU  
acquirers

event-windows before the acquisition announcement. The acquirers in international transactions perform much better in the event window (0;1), showing the CAR of  $-0.062\%$  and  $-0.192\%$  for US and European market, respectively. Their performance in both markets improves strongly after the acquisition announcement, so in the event-window (1;5) the values are positive with  $+0.069\%$  and  $+0.101\%$  for US and European markets, respectively. Nevertheless, international acquirers in EU market strongly underperformed on the days preceding the transaction announcement. The mean-difference test shows significant results for American acquirers in the event-window (0;1) at 10% level.

### 5.3 Transaction volume

To analyze the difference in the abnormal returns of acquirers according to the transaction volume, the entire data sample was divided into three groups – large transactions with volume over US\$5 billion, middle-sized transactions with volume US\$1-5 billion and small transactions with volume <US\$1 billion. The summary of analysis is presented in Table 6.

The results show that acquirers of middle-sized targets created the largest value for shareholders of acquiring companies. CAR for both short-term and long-term event-windows are positive with  $+0.066\%$  and  $+0.033\%$ , respectively. The acquisitions of large targets were the least value-creating. Here, CAR for the short-term event window (0;1) are strongly negative with  $-1.708\%$ . This number improves slightly in the long-term event-window ( $-1;10$ ) but still remains negative with  $-0.847\%$ . The mean-difference test shows significant results at 1% level.

The performance in large transactions remains negative for both national and international acquirers, even though the national acquirers strongly underperform. Both sub-groups earn negative CAR with  $-2.112\%$  and  $-0.719\%$  for the event window (0;1), respectively. The returns of national acquirers stay significantly negative also in the long-term event-window ( $-1;10$ ) with  $-1.105\%$ , which are significant at 1% level. The middle-sized acquisitions bring insignificantly negative CAR of  $-0.053\%$  for national acquirers in the event window (0;1), but increase considerably in the long-term event-window ( $-1;10$ ) to the positive value of  $+0.263\%$ . CAR of the international acquirers show an opposite development. The returns are positive in the event-window (0;1) with  $+0.296\%$  and significantly negative in the event window ( $-1;10$ ) with  $-0.411\%$ . Small transactions bring less value than mid-sized ones for both sub-samples. The returns are quite similar for the event-window (0;1) with  $-0.441\%$  and  $-0.421\%$ , respectively and improve inconsiderably in the event-window ( $-1;10$ ) to  $-0.148\%$  and  $-0.040\%$ , respectively.

These results support the statement that investors react cautiously to large deals that are mostly paid with stock and are often too complex to be managed properly and to realize the synergies planned. Being a subject to overpayment, mega-deals are often understood by investors as too risky to be successful and this reaction is reflected in the share price development on the day of announcement. These findings are in line with Bayazitova *et al.*, (2012), Dell'Acqua *et al.* (2018).

### 5.4 Method of payment

To analyze the impact of method of payment on value created for shareholders of acquiring companies the data sample was divided into three groups according to the chosen form of payment. The results are presented in Table 7 and show that for 56% of transactions in the sample the major transaction currency was cash.

Among them, 42% were international deals. The lowest number of transactions in the data sample was financed with stock (19%). The remaining acquirers (25%) decided in favor of the combined method of payment. Almost all of them were firms pursuing national acquisitions.

Event window	Large (1)		Middle-sized (2)		Small (3)		Mean-difference test		
	CAR (%)	Z-statistic (p-value)	CAR (%)	Z-statistic (p-value)	CAR (%)	Z-statistic (p-value)	(1)-(2) (p-value)	(1)-(3) (p-value)	(2)-(3) (p-value)
<i>Panel A: All Transactions</i>									
(0;1)	-1.708***	-5.569 (>0.000)	0.066	0.436 (0.669)	-0.437	-2.230 (0.129)	-1.774*** (>0.000)	-1.271*** (0.010)	0.503** (0.025)
(-1;10)	-0.847***	-4.175 (>0.000)	0.033	0.222 (0.588)	-0.127	-0.648 (0.258)	-0.880** (0.014)	-0.720* (0.078)	0.160 (0.505)
(N)	(31)		(44)		(26)				
<i>Panel B: National</i>									
(0;1)	-2.112***	-5.999 (>0.000)	-0.053	0.286 (0.613)	-0.441	-2.021 (0.216)	-2.059*** (>0.000)	-1.671*** (0.001)	0.388*** (0.008)
(-1;10)	-1.105***	-4.583 (>0.000)	0.263	1.419 (0.922)	-0.148	-0.677 (0.249)	-1.368** (0.003)	-0.957* (0.038)	0.411 (0.131)
(N)	(22)		(29)		(21)				
<i>Panel C: International</i>									
(0;1)	-0.719**	-2.156 (0.016)	0.296	1.145 (0.874)	-0.421	-0.942 (0.173)	-1.015* (0.074)	-0.298 (0.667)	0.717 (0.251)
(-1;10)	-0.216	-0.648 (0.258)	-0.411*	-1.593 (0.056)	-0.040	-0.089 (0.465)	0.195 (0.611)	-0.176 (0.714)	-0.371 (0.469)
(N)	(9)		(15)		(5)				

**Note(s):** The Table shows the standardized cumulative abnormal returns of acquiring companies according to the size of transaction. The CARs are calculated employing the standard market model, using an estimation period of 181 trading days prior to the event window (-20;20) and Morgan Stanley Regional Industrial Index to measure market returns. The reported *t*-statistic is based on the two-tailed *t*-test, *p*-values are presented in parentheses below the statistics-values. \* denotes significance at 10% \*\* denotes significance at 5% \*\*\* denotes significance at 1%

**Table 6.**  
CAR according to the  
size of transaction

**Table 7.**  
CAR according to the  
method of payment

Event window	Cash (1)		Stock (2)		Combo (3)		Mean-difference test	
	CAR (%)	Z-statistic (p-value)	CAR (%)	Z-statistic (p-value)	CAR (%)	Z-statistic (p-value)	(1)-(2) (p-value)	(2)-(3) (p-value)
<i>Panel A: All Transactions</i>								
(0;1)	-0.273 <sup>***</sup>	-2.027 (0.021)	-0.976 <sup>***</sup>	-4.363 (>0.000)	-1.033 <sup>***</sup>	-5.270 (>0.000)	0.703* (0.072)	0.760 <sup>**</sup> (0.033)
(-1;10)	-0.070	-0.522 (0.301)	-0.664 <sup>***</sup>	-2.971 (0.001)	-0.420 <sup>***</sup>	-2.143 (0.016)	0.594 <sup>***</sup> (0.033)	0.350 (0.168)
(N)	(56)		(20)		(26)			-0.244 (0.493)
<i>Panel B: National</i>								
(0;1)	-0.493 <sup>***</sup>	-2.788 (0.003)	-0.961 <sup>***</sup>	-3.964 (>0.000)	-1.094 <sup>***</sup>	-5.246 (>0.000)	0.468 (0.264)	0.601 (0.116)
(-1;10)	0.022	0.124 (0.549)	-0.699 <sup>***</sup>	-2.883 (0.002)	-0.373 <sup>***</sup>	-1.790 (0.037)	0.721 <sup>***</sup> (0.000)	0.395 <sup>***</sup> (0.006)
(N)	(32)		(17)		(23)			-0.326* (0.092)
<i>Panel C: international</i>								
(0;1)	0.082	0.154 (0.561)	-1.056 <sup>**</sup>	-1.829 (0.034)	-0.570	-0.988 (0.162)	1.088 (0.307)	0.602 (0.563)
(-1;10)	-0.199	-0.952 (0.171)	-0.467	-0.809 (0.209)	-0.782*	-1.354 (0.088)	0.268 (0.698)	0.583 (0.409)
(N)	(23)		(3)		(3)			-0.486 (0.820)

**Note(s):** The table shows the standardized cumulative abnormal returns of acquiring companies according to the method of payment. The CARs are calculated employing the standard market model, using an estimation period of 181 trading days prior to the event window (-20;20) and Morgan Stanley Regional Industrial Index to measure market returns. The reported *t*-statistic is based on the two-tailed *t*-test, *p*-values are presented in parentheses below the statistics-values  
\* denotes significance at 10% \*\* denotes significance at 5% \*\*\* denotes significance at 1%

From the results received I can conclude that in line with the existing research, acquirers who paid for their transactions in cash strongly outperformed those who paid with stock or used mixed method of payment. Their CAR in the event-window (0;1) were about four times higher than those of the firms that paid with stock with  $-0.273\%$  and  $-0.976\%$ , respectively. The acquirers of international targets experienced even slightly positive returns in the event-window (0;1) with CAR of  $+0.032\%$ . For the event-window  $(-1;10)$  the results of national acquirers are even better. Here, the cash-payers show the performance that is much better than the performance of stock-payers with CAR of  $+0.022\%$  and  $-0.699\%$ , respectively. The returns of international acquirers become slightly negative with  $-0.199\%$ .

The acquirers using the combined method of payment seem to create the least value and to experience the lowest abnormal returns through both event-windows analyzed. Their CAR for the entire data sample are  $-1.033\%$  in the event-window (0;1) and are about seventy times lower than CAR of cash-payers and slightly lower than those of stock-payers. In the international acquisitions, mixed payments were valued better than stock payments. CAR for the event-window (0;1) are  $-0.570\%$  and  $-1.056\%$ , respectively. For the event-window  $(-1;10)$  the results improve slightly for national acquirers. Those who used the mixed payment performed two times better than those who used stock with  $-0.373\%$  and  $-0.699\%$ , respectively. The mean-difference test is significant for the entire data sample in both event-windows for the group cash-payers vs. stock-payers with the values of 10 and 5% level, respectively. For the group cash-payers vs. combo-payers it shows significant results for the event window (0;1) at 5% level. The mean-difference test for the national sub-group is also significant at the 1% for the long-term event-window. These results strongly support the finding of previous research (e.g., Boone *et al.*, 2014; Ben-David *et al.*, 2015) saying that decision to pay in cash influences positively the reaction of investors for both national and international deals.

### 5.5 Industrial diversification vs. focus

Contradictorily to the known statement that investors do not value conglomerate acquisitions, the results of the analysis show that for the entire data sample acquisitions of non-related targets destroy less value than acquisitions of related targets. CAR for the entire data sample in the event -window (0;1) are  $-0.377\%$  and  $-0.648\%$ , respectively. These results improve even further in the days following the announcement. So, for the event window  $(-1;10)$  the returns are  $+0.135\%$  and  $-0.350\%$ , respectively. However, these results seem to be completely different for national and international acquirers. Table 8 summarizes the key findings.

National acquirers of the national non-related targets underperformed in the event-windows (0;1) compared to acquirers of related targets with  $-0.950\%$  and  $-0.771\%$ , respectively and experienced the lowest CAR in the data sample in this event-window. The values improve almost three times for the event-window  $(-1;10)$  for diversifying companies that outperform their peers participating in related acquisitions. CAR for the event-window  $(-1;10)$  are  $-0.067\%$  and  $-0.308\%$ , respectively. Contrarily, acquirers of international non-related targets show the best positive CAR in both event-windows with  $+0.768\%$  and  $+0.540\%$ , respectively. Therefore, they strongly outperform those acquirers who purchase international targets in related industries. Here, the abnormal returns are negative with the value of  $-0.333\%$  for the event-window (0;1). The mean-difference test for international sub-group is significant for both event-windows at 10% level. These findings allow conclusion that future benefits from simultaneous geographic and industrial diversification outweigh those proposed only by single synergy hypothesis. The number of analyzed transactions is however too low to draw a general conclusion and requires further investigation.

Event window	Related (1)		Non-related (2)		Mean-difference test		
	CAR (%)	Z-statistic (p-value)	CAR (%)	Z-statistic (p-value)	(1)-(2)	t-test	p-value
<i>Panel A: All Transactions</i>							
(0;1)	-0.648***	-5.798 (>0.000)	-0.377*	-1.461 (0.072)	-0.271	-1.040	0.301
(-1; 10)	-0.350***	-4.159 (>0.000)	0.135	0.523 (0.700)	-0.485***	-2.815	0.006
(N)	(87)		(14)				
<i>Panel B: National</i>							
(0;1)	-0.771***	-5.891 (>0.000)	-0.950***	-3.004 (0.001)	0.179	1.104	0.273
(-1;10)	-0.308***	-3.447 (0.000)	-0.067***	-2.642 (0.004)	-0.241	-1.003	0.319
(N)	(62)		(10)				
<i>Panel C: international</i>							
(0;1)	-0.333*	-1.630 (0.052)	0.768	1.718 (0.957)	-1.101*	-1.730	0.095
(-1;10)	-0.456***	-2.333 (0.010)	0.540	2.644 (0.996)	-0.996*	-1.729	0.095
(N)	(25)		(4)				

**Note(s):** The Table shows the standardized cumulative abnormal returns of acquiring companies according to the industrial diversification. The CARs are calculated employing the standard market model, using an estimation period of 181 trading days prior to the event window (-20;20) and Morgan Stanley Regional industrial index to measure market returns. The reported t-statistic is based on the two-tailed t-test, p-values are presented in parentheses below the statistics-values. \*denotes significance at 10% \*\*denotes significance at 5% \*\*\*denotes significance at 1%

**Table 8.**  
CAR according the  
international  
diversification

However, taking a closer look at the related acquisitions and splitting them according to their 2, 3-, and 4-digit SIC-code relatedness brings slightly different results, which are summarized in Table 9.

All panels show the worst performance for acquirers of closely related targets (4-digit SIC-code relatedness). CAR for the entire sample are -0.950% and -0.601% for event windows (0;1) and (-1;10), respectively. These results are the lowest for national acquirers with -1.125% and -0.675%, respectively and significant at 1% level. In the international transactions returns are similar, with -0.315% and -0.347% for event window (0;1) and (-1;10), respectively. With the decreasing relatedness of transaction participants the performance of acquiring companies improves constantly and is the best for the acquisitions of 2-SIC targets with -0.511% for national and +0.105% for international transactions in the event-window (0;1). This trend remains for national acquirers in the event-window (-1;10), where CAR increase to positive +0.136% for the national acquirers but have an opposite development for the international acquirers, where CAR deteriorate to -0.416%. The mean-difference test shows significant results for national acquirers. These findings imply that lower focus was generally associated by investors with higher value-creation, even though this was realized by investors in the days following the announcement, especially for national transactions.

#### 5.6 Economic situation and merger waves

Taking into consideration strong economic changes during the analyzed period, the entire data sample was divided into three time periods that represent different economic circumstances and therefore expectations of investors. While the first sub-period (from 2000 till 2004) is the time of the fifth merger wave and the beginning of the sixth merger wave with its peak in the mid-2000s, the second sub-period of the analysis (from 2005 till 2007) represents the peak of the sixth merger wave and belongs to the time when deals had rather modest positive effect for their shareholders with the dramatically higher P/E ratios of this

Event window	4-SIC(1)		3-SIC(2)		2-SIC(3)		Mean-difference test		
	CAR (%)	Z-statistic (p-value)	CAR (%)	Z-statistic (p-value)	CAR (%)	Z-statistic (p-value)	(1)-(2) (p-value)	(1)-(3) (p-value)	(2)-(3) (p-value)
<i>Panel A: All Transactions</i>									
(-0;1)	-0.950 <sup>***</sup>	-5.839 (>0.000)	-0.770 <sup>***</sup>	-2.880(0.002)	-0.251	-1.095 (0.137)	-0.180 (0.482)	-0.698 <sup>**</sup> (0.016)	-0.519 (0.292)
(-1;10)	-0.601 <sup>***</sup>	-3.800 (>0.000)	-0.300	-1.124 (0.131)	-0.096	-0.419 (0.338)	-0.301 <sup>**</sup> (0.036)	-0.505 <sup>*</sup> (0.010)	-0.204 (0.507)
(N)	(40)		(14)		(19)				
<i>Panel B: National</i>									
(-0;1)	-1.125 <sup>***</sup>	-5.992 (>0.000)	-0.830 <sup>***</sup>	-2.491 (0.006)	-0.511 <sup>**</sup>	-1.694 (0.045)	-0.295 (0.324)	-0.614 <sup>*</sup> (0.077)	-0.319 (0.607)
(-1;10)	-0.675 <sup>***</sup>	-4.554 (>0.000)	-0.238	-0.708 (0.239)	0.136	-0.615 (0.269)	-0.437 <sup>**</sup> (0.033)	-0.811 <sup>**</sup> (0.001)	-0.374 (0.392)
(N)	(31)		(9)		(11)				
<i>Panel C: International</i>									
(-0;1)	-0.315	-0.944 (0.173)	-0.661 <sup>*</sup>	-1.477 (0.070)	0.105	0.298 (0.617)	0.346 (0.738)	-0.420 (0.688)	-0.766 (0.559)
(-1;10)	-0.347 <sup>**</sup>	-1.657 (0.049)	-0.413	-0.792 (0.214)	-0.416	-0.145 (0.442)	0.066 (0.902)	0.069 (0.898)	0.003 (0.995)
(N)	(9)		(5)		(8)				

**Note(s):** The Table shows the standardized cumulative abnormal returns of acquiring companies according to the degree of industrial diversification. The CARs are calculated employing the standard market model, using an estimation period of 181 trading days prior to the event window (-20;20) and Morgan Stanley Regional Industrial Index to measure market returns. The reported *t*-statistic is based on the two-tailed *t*-test, *p*-values are presented in parentheses below the statistics-values. \*denotes significance at 10% \*\*denotes significance at 5% \*\*\*denotes significance at 1%

**Table 9.**  
CAR according to the  
SIC-code

period. However, both the fifth and the sixth merger waves are considered to be the “global merger waves” when the key strategic reason for transactions was external growth. This development was interrupted by the global economic crisis starting in 2008, which has completely changed the existing M&A landscape. Due to the weak global economic situation, profitability challenges and lack of financing the M&A activity decreased strongly. Only those companies that had large amounts of cash available were able to pursue further acquisitions. They were the winners of crisis that managed to grow under the tough economic conditions and to expand their business on favorable terms. The period 2008–2010 is the third sub-sample in the analysis. The results are summarized in Table 10.

Examining the cumulative abnormal returns of acquirers for the entire data sample reveals that the end of the 5th and the beginning of the 6th wave was the period when the acquiring companies performed best. Even though the entire sample experiences negative returns of  $-0.397\%$  in the short event-window (0;1), national acquirers could achieve the highest results with returns of  $-0.031\%$  in the event-window  $(-1;10)$ . The least value was created in the sixth merger wave as well as in the time of economic recession following the financial crisis of 2008. In both time periods acquiring companies suffered the worst results with significant abnormal returns of  $-0.626\%$  and  $-1.293\%$  in the short event period (0;1), respectively. These findings are in line with Alexandris *et al.* (2010) who report that despite the good economic conditions and decisive approach of CEOs, the acquisitions of the 6th merger wave largely destroyed value. The end of the 5th and the beginning of the 6th wave were the period when acquiring companies performed best.

Nevertheless, if I take a closer look into different sub-samples, I can recognize striking differences between national and international acquirers. In the period of sixth merger wave (between 2005 and 2007), national acquirers performed better in the longer event-window. Here, CAR are  $-0.284\%$  compared to the relatively worse performance of international acquirers with  $-0.446\%$ . For the short event-window however, international acquirers outperformed national with CAR of  $-0.200\%$  compared to  $-0.761\%$  of national ones. In the time period between 2008 and 2010 national acquirers earned the worst CAR in both event-windows with  $-1.630\%$  and  $-0.910\%$ , respectively. The international acquirers however, strongly outperformed with positive results of  $+0.224\%$  and  $+0.484\%$  for the event windows (0;1) and  $(-1;10)$ , respectively. The number of companies in this sub-sample is however not large enough to draw statistically significant conclusions. Additional analyses are needed to analyze this relationship.

## 6. Results of regression analysis

### 6.1 Description of independent variables

The results of univariate analysis outline the difference in performance of acquiring companies with different characteristics of transactions. The present section aims to reassess these results through OLS-regression analysis as well as to explore which of the effect documented in the previous section dominates in a multivariate framework.

The regression analysis focuses only on those factors that are under management control and can be influenced/adjusted by executives. Method of payment, industrial and international diversification are presented as binary dummy variables, the relative size of target is a nominal variable calculated as a relationship between logarithm of total acquirers assets and target assets one year prior to announcement. The proposed variables adjust for high premiums paid which is included in the transaction volume and give more precise information about the impact of size on abnormal returns of acquirers. The definition of independent variables and results of correlation analysis are reported in Tables 11 and 12.

Event window	2000–2004 (1)		2005–2007 (2)		2008–2010 (3)		Mean-difference test		
	CAR (%)	Z-statistic (p-value)	CAR (%)	Z-statistic (p-value)	CAR (%)	Z-statistic (p-value)	(1)–(2) (p-value)	(1)–(3) (p-value)	(2)–(3) (p-value)
<i>Panel A: All Transactions</i>									
(0;1)	-0.397***	-2.511 (0.006)	-0.626***	-4.428 (>0.000)	-1.293***	-4.288 (>0.000)	0.229 (0.185)	0.896*** (0.008)	0.667*** (0.002)
(-1;10)	-0.118	-0.745 (0.228)	-0.323**	-2.283 (0.011)	-0.657**	-2.178 (0.015)	0.205 (0.129)	0.539 (0.183)	0.334 (0.147)
(N)	(40)		(50)		(11)				
<i>Panel B: National</i>									
(0;1)	-0.548***	-2.739 (0.003)	-0.761***	-4.690 (>0.000)	-1.630***	-4.890 (>0.000)	0.213 (0.492)	1.082* (0.096)	0.869*** (0.002)
(-1;10)	-0.031	-0.157 (0.438)	-0.284**	-1.751 (0.040)	-0.910***	-2.731 (0.003)	0.253 (0.163)	0.879*** (0.007)	0.626** (0.020)
(N)	(25)		(38)		(9)				
<i>Panel C: International</i>									
(0;1)	-0.146	-0.565 (0.286)	-0.200	-0.693 (0.244)	0.224	0.316 (0.624)	0.054 (0.877)	-0.370 (0.637)	-0.424 (0.436)
(-1;10)	-0.262	-1.014 (0.155)	-0.446*	-1.546 (0.061)	0.484	0.684 (0.753)	0.184 (0.365)	-0.746 (0.162)	-0.930** (0.030)
(N)	(15)		(12)		(2)				

**Note(s):** The table shows the standardized cumulative abnormal returns of acquiring companies according to the economic situation. The CARs are calculated employing the standard market model, using an estimation period of 181 trading days prior to the event window (-20;20) and Morgan Stanley Regional Industrial Index to measure market returns. The reported *t*-statistic is based on the two-tailed *t*-test, *p*-values are presented in parentheses below the statistics-values

\* denotes significance at 10%  
\*\* denotes significance at 5%  
\*\*\* denotes significance at 1%

**Table 10.**  
CAR according to the  
economic situation

6.2 Results of OLS-regression analysis

I first analyze the impact of single variables on the cumulative abnormal returns of acquiring companies for a short two- day-event-window (0;1) and a long (-1;10) event-window. The results of analysis are summarized in Table 13.

Generally, the results of single regressions confirm the findings from the univariate analysis. Two variables – method of payment and relative size of target to acquirer – show statistically significant impact on the performance of acquirers. The *F*-statistic for the method of payment is 4,628 with adjusted *R*<sup>2</sup> of 3.50% and coefficient of 0.767, which are statistically significant at 5% level. The results for the relative size are close to the first variable, being statistically significant at 5% level with *F*-statistic equivalent to 4,464, adjusted *R*<sup>2</sup> of 3.40% and coefficient of -3,743. These results remain significant at 5% also in a longer event-window (-1;10). The international diversification does not show strong impact on the abnormal returns of acquirers in either of two analyzed event windows. The results for both regressions remain insignificant with adjusted *R*<sup>2</sup> of around 0%. The impact of industrial diversification increases to a statistically significant level in a longer event window (-1;10), where the regression values are 3,689 for *F*-statistic and 0.463 for coefficient with significance at 10%. The results from a shorter event window remain negative with adjusted *R*<sup>2</sup> of 1.1%.

6.3 Results of multiple regression analysis

In the next step, I investigate which variables have the strongest impact in multivariate contest. For this reason, I perform multivariate regression analysis. Taking into consideration the correlation between international diversification and method of payment shown in Table 13 and in order to rule out the possibility that the results are driven by multicollinearity amongst the control variables, I re-examine all the regression models excluding one of the control variables at a time. The results of analysis are presented in Table 14.

**Table 11.**  
Description of variables

Variable	Abbreviation	Definition
Method of payment	METHODP	Binary dummy variable with 1 = for payment in cash and 0 = stock or mixed method of payment
Industrial diversification	INDDIV	Binary dummy variable with 1 = for non-related transactions (0 or 1- SIC are equivalent) and 0 = related transactions (2 or more SIC- numbers are equivalent)
International diversification	INTDIV	Binary dummy variable with 1 = for international transactions and 0 = for national transactions
Relative size of target to acquirer	LN_RSIZ	Absolute variable, calculated as a natural logarithm of relationship of Total Assets (WC02999) of target divided through Total Assets of acquirer

**Table 12.**  
Pearson correlation of independent variables

	Method of payment	Industrial diversification	LN_RelativeSize	International diversification
Method of payment (Sign. 2-tailed)		0.122 (0.223)	-0.238 (0.017)	0.317 (0.001)
Industrial diversification (Sign. 2-tailed)			-0.119 (0.239)	-0.051 (0.614)
LN_RelativeSize (Sign. 2-tailed)				-0.084 (0.407)

	(0:1)			(-1:1:0)				
	METHODP	INDDIV	INTDIV	LN_RSIZ	METHODP	INDDIV	INTDIV	LN_RSIZ
Intercept	-0.933*** (0.001)	-0.677*** (0.002)	-0.650*** (0.003)	2.721* (0.081)	-3.164 (0.002)	-0.412*** (0.002)	-0.275** (0.046)	1.646* (0.095)
METHODP	0.767*** (0.034)				0.456** (0.046)			
INDDIV		0.583 (0.150)				0.483* (0.058)		
INTDIV			0.467 (0.244)				-0.012 (0.962)	
LN_RSIZ				-3.743*** (0.037)				-2.224** (0.050)
N	101	101	101	100	101	101	101	100
Adj. R in %	35.0%***	1.10%	0.40%	3.40%***	3.00%***	2.60%*	0	2.90%***
F-statistic	4.628	2.104	1.371	4.464	4.092	3.689	0.002	3.944
p-value	0.034	0.150	0.244	0.037	0.046	0.058	0.962	0.05

**Note(s):** The table reports results of OLS-regressions presenting the relationship between the cumulative abnormal returns of acquiring companies (CAR) and independent variables - method of payment (METHODP), industrial diversification (INDDIV), international diversification (INTDIV) and relative size of target to acquirer (LN\_RSIZ). The description of variables is presented in Table 11

\*Significance at 10% level, using two-tailed test  
 \*\*Significance at 5% level, using two-tailed test  
 \*\*\*Significance at 1% level, using two-tailed test

**Table 13.**  
Results of OLS-  
regression analysis

**Table 14.**  
Results of multiple  
regression analysis

	(0;1)		(-1;10)	
	Regression 1	t-value (p-value)	Regression 1	t-value p (p-value)
Intercept	1.508	0.914 (0.363)	0.841	0.810 (0.429)
METHODP	0.574	1.557 (0.123)	0.330	1.421 (0.159)
INDDIV	0.435	1.087 (0.280)	0.398	1.578 (0.118)
INTDIV				
LN_RSIZ	-2.841	-1.567 (0.120)	-1.628	-1.428 (0.157)
N	100	100	100	100
Adj. R in %	5.30%***	4.00%*	5.80%***	3.80%*
F-statistic	2.852	2.376	3.033	2.321
p-value	0.041	0.075	0.033	0.08

**Note(s):** The table reports results of multiple OLS-regression analysis presenting the relationship between the cumulative abnormal returns of acquiring companies (CAR) and independent variables – method of payment (METHODP), industrial diversification (INDDIV), international diversification (INTDIV) and relative size of target to acquirer (LN\_RSIZ). The description of variables is presented in Table 11

\*Significance at 10% level, using two-tailed test \*\*Significance at 5% level, using two-tailed test \*\*\*Significance at 1% level, using two-tailed test

Overall, I can conclude that most of the results from the multivariate regression are consistent with univariate analysis findings. Two variables – method of payment and relative size of target to acquirer – remain statistically significant in all performed regressions as well as in those when they are applied independently. The first regression model is statistically significant at 5% level in the event window (0;1) with  $F$ -value of 2,852 and adjusted  $R^2$  of 5.30%. It has similar results also for the event-window (-1;10). The model that excludes method of payment but contains international diversification is statistically significant at 10% with  $F$ -value of 2,376 and adjusted  $R^2$  of 4.00%. It shows also similar outcome in the longer event-window of (-1;10). These findings stay therefore in line with the existing academic research (e.g. Martynova/Renneboog, 2011; Bayazitova *et al.*, 2012; Boone *et al.*, 2014). Industrial diversification, which shows no statistically significant results in the short event-window (0;1) but has a stronger impact in a longer event-window (-1;10) with coefficient of 0.433 and significance at 10% level, outlines the strategy of acquiring smaller companies in the non-related industries. International diversification does not show significant results in either of the regression models for analyzed event windows, despite the difference in absolute numbers presented in the univariate analysis on the days around the announcement.

## 7. Conclusions

The goal of this paper was to identify the key determinants and to analyze how they influence the performance of acquiring companies participating in *strategic acquisitions for growth* during the 5th and 6th merger waves. For this reason, I built a data sample that contains purely strategic acquisitions for growth, identified six variables based on the literature review and tested their contribution to value creation of acquirers, using event-study method, comparative statistics with mean-difference tests and OLS-regression analysis.

Overall, the study shows systematic variations in performance of acquiring companies as a result of impact of analyzed factors. In line with existing academic research, the acquirers in the data sample earn negative abnormal returns around the transaction announcement. The results are statistically significant for all event-windows around the announcement, but are the lowest on the day of announcement and in the two-day event-window with -0.757% and -0.608%, respectively. A number of non-financial variables show significantly explanatory power in explaining these outcomes. Broadly, they can be distinguished between those that are under management control and those that are not. Among the first group, the structure of capital markets and economic situation around the acquisition influence the performance of acquirers, which is in line with existing academic research. The US acquirers experience stronger reaction of shareholders on deal announcement than EU companies, which expresses the difference in corporate governance and strategies in both markets. These results are similar to the findings of Martynova and Renneboog (2011), and extend the study. The study also proves that macroeconomic situation around the announcement impacts the acquirers' value creation. Contrary to the Cerrate *et al.* (2016), however, the results show that strategic acquisitions performed during the “challenging” years experienced positive reaction of investors.

The study presents also a range of influential variables, which are under management control. First, the study shows that investors react more positively to the international diversification than national transactions. This certainly can be explained with the focus of the 5th and 6th merger waves on geographical expansion as well as the fact that weak economic situation in the USA and Europe during the financial crises in 2008–2010 pushed acquirers to look for business opportunities abroad to diversify their risks. These findings are in line with studies of Alexandris *et al.* (2012), Danbolt and Maciver (2012). Second variable with statistically significant explanatory power is the method of payment. Those

acquirers that paid for their acquisitions in cash performed significantly better than those which paid with stock. Contrary to Dutta *et al.* (2013), cash was also the method of payment in 80% of international transactions in the data sample. The acquirers in such transactions achieved relatively better returns than in transactions paid in stock. These results strongly support existing research (Martynova and Renneboog, 2011; Ben-David *et al.*, 2015) and confirm that decision to pay in cash influences positively the reaction of investors for both national and international deals. Third, acquirers pursuing middle-sized transactions outperformed their peers that participated in large- or small-sized transactions. These results support the statement (Bayazitova *et al.*, 2012) that investors react cautiously to the large deals, which are mostly paid with stock and are often too complex to realize the synergies planned. Being a subject to overpayment, mega-deals are often understood by investors as too risky to be successful, which is reflected in the share price development on the day of announcement. Another factor that has impact on investors' reaction is relatedness of acquirers and targets. Acquirers of less-related targets (2-SIC), especially in international acquisitions, performed better. These results contradict the findings of Lim and Lee (2016), however, should be evaluated with caution because of a small number of international un-related transactions in the sample. Additional analysis of this determinant can shed more light on its impact.

The results of current study have important implications for executives performing M&A for growth. They show that the market reaction to M&A announcement can be at least partially anticipated and help managers to plan their strategic moves based on a defined set of variables. Even though the extend of market reaction for European and US companies may differ, the impact of variables remains stable independently of the market structure. The results outline that strong performance of acquirers before the acquisition expressed through their ability to pay in cash, financial discipline (acquisition of medium-sized targets) and the right degree of diversification can increase the value a firm creates through strategic transactions. The ability to choose right variables and create the right strategic mix helps executives make sound value-based decisions and improves overall value of acquiring company.

The existing study suggest s additional directions for future research. The future analysis can investigate the post-merger acquisition performance of strategic acquirers and focus on additional financial (accounting) determinants in the evaluation of performance. This perspective can not only address the limitations imposed by the assumption of efficient capital markets, but also provide additional insights into the value creation dynamics.

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# The impact of accessibility of mobile devices on the intention to post online reviews

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## Abstract

**Purpose** – The purpose of this paper is to investigate how the characteristic of mobile devices, particularly high accessibility, influences a consumer's intention to post an online review depending on the valence of consumption experiences.

**Design/methodology/approach** – This paper employs a between-subject design of experimental study based on different scenarios with 378 participants. A pretest is conducted to confirm that participants perceive the experimental scenarios as intended prior to proceeding with the main experimental study.

**Findings** – The authors' experimental analysis shows that the intention to post a review of extreme positive and negative experiences is significantly higher when the level of accessibility for review-posting is high. By contrast, the intention to post a review of neutral consumption experiences is neither higher nor lower regardless of the level of accessibility.

**Originality/value** – The findings of this paper contribute to a better understanding of online reviews by demonstrating how high accessibility for review-posting have differential influences on the intentions to post online reviews depending on the valence of consumer experiences. The findings provide important theoretical and managerial implications.

**Keywords** Online review, Mobile devices, Accessibility, Social exchange theory, Review-posting behavior

**Paper type** Research paper

## 1. Introduction

Online reviews are one of the easily accessible information sources for consumers (Agnihotri and Bhattacharya, 2016), and they acquire information from the online reviews to reduce potential risks when making purchase decisions (Nusair *et al.*, 2013). This results in that online reviews significantly influence other consumers' purchase decisions (Jiménez-Barreto and Campo-Martínez, 2018; Kostyra *et al.*, 2016; Burch *et al.*, 2018; Kim *et al.*, 2020). Online reviews can also help firms improve quality of products or services by identifying consumer complaints (Fuentes-Medina *et al.*, 2018).

The volume of online reviews is on the rise with the advancement of mobile technologies (Agnihotri and Bhattacharya, 2016; Mariani *et al.*, 2019) because of the distinguishing characteristics of mobile devices which is of greater accessibility compared to non-mobile devices (Hoffman and Novak, 2012; Shankar and Balasubramanian, 2009; März *et al.*, 2017; Ransbotham *et al.*, 2019; Kim *et al.*, 2020). It enables customers to post online reviews during



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or immediately following consumption experiences (Ransbotham *et al.*, 2019). Since mobile devices have different characteristics than nonmobile devices, mobile reviews have also been found to have to be different. For example, given the development of mobile technology, online reviews posted via mobile devices tend to exhibit consumption recency and provide a more accurate representation of the reviewer's experiences (Burtch and Hong, 2014). More recently, differences have been noted between mobile reviews and nonmobile reviews in terms of their content and the perceived value of the content to consumers (Ransbotham *et al.*, 2019).

The review-posting behaviors have been explained with the social exchange theory in the extant literature (Kankanhalli *et al.*, 2005; Lee *et al.*, 2006; Liang *et al.*, 2008; Osatuyi 2013; Wu *et al.*, 2014; Kim *et al.*, 2020). The theory posits that a self-interest analysis of the costs and benefits is important for individuals to decide on whether they share information or not (Blau, 1964; Emerson, 1962; Homans, 1958; Molm, 2001). That is, when involved in the social exchange process, individuals try to maximize their benefits while minimizing their costs (Molm, 1997, 2001). In this regard, drawing on the theory, it is found that mobile devices influence the perceived costs in terms of time as high accessibility reduces the time spent to access the devices for review-posting (Kim *et al.*, 2020). That is, as the benefits of posting reviews are different depending on the valence of the consumption experiences (Constant *et al.*, 1996; Yoo and Gretzel, 2008; Hennig-Tuarau *et al.*, 2004), the high accessibility of mobile devices which is found to reduce the cost for review-posting is expected to result in different levels of review-posting intentions based on the cost-benefit analysis of social exchange theory. In this light, the main objective of the current study is to examine how the high accessibility of mobile devices affect review-posting behaviors, particularly intentions to post online reviews, depending on the valence of different consumption experiences. To this end, we develop two hypotheses based on the social exchange theory.

Prior studies have also empirically attempted and confirm the social exchange theory's self-interest analysis of the costs and benefits in online environment (e.g. Yan *et al.*, 2016; Surma, 2016; Liu *et al.*, 2016). However, existing literature mainly focuses on the effect of increasing benefits such as financial incentives during the exchange process on review-posting behaviors (e.g. Chen *et al.*, 2010; Fradkin *et al.*, 2015; Cabral and Li, 2015; Burtch *et al.*, 2018). Literature that pays attention to the cost aspect is very limited. Recently, Kim *et al.* (2020) show the changes in perceived costs for review-posting in terms of time and cognitive efforts can make differences in overall distributions of mobile reviews and non-mobile reviews for the same consumption experiences.

To test the proposed hypotheses, we conduct an experimental study by employing a scenario research method to manipulate the valence of experiences and the level of accessibility of devices to post online reviews. The results show that the intention to post a review of extreme positive and negative consumption experiences is higher when the level of accessibility for review-posting is high. On the contrary, the intention to post a review of neutral consumption experiences is neither higher nor lower regardless of the level of accessibility.

We believe that this study contributes to extant literature by demonstrating how the characteristic of mobile devices, particularly high accessibility, changes the review-posting behavior of consumers in terms of the intention to post a review. This can provide a better understanding of the contextual impacts on review-posting behaviors of consumers. In addition, our findings can provide useful insights for practitioners on developing strategies to encourage consumers to post more helpful reviews, resulting in increasing the value of firms. In the next section, we cover the theoretical background of this study. Following this, we develop the hypothesis and present the experimental study and its results. Finally, we discuss the contributions of our findings, the limitations of this study, and suggestions for future research.

## 2. Theoretical background and hypothesis development

### 2.1 Social exchange theory and online reviews as information sharing behavior

Social exchange theory explains reciprocal behavior in human beings (Blau, 1964). It suggests that individuals contribute and exchange their knowledge with others, with the expectation of some future return (Lee *et al.*, 2006; Kankanhalli *et al.*, 2005). Social exchanges differ from economic exchanges in that the obligations to return in the social exchange are not clearly specified (Kankanhalli *et al.*, 2005). Therefore, social exchange assumes relatively long-term exchange relationships of interest, contrary to on-off exchange relationships (Molm, 1997) as is the case with economic exchanges.

Previous studies have tried to explain the information-sharing behavior of consumers in the online environment by employing social exchange theory (Kankanhalli *et al.*, 2005; Lee *et al.*, 2006; Liang *et al.*, 2008; Osatuyi, 2013; Wu *et al.*, 2014; Kim *et al.*, 2020). Consumers share their consumption experiences and knowledge of certain products or services with other consumers through social exchanges. Consumers who provide the information expect that they can obtain information from others via social exchange relationships.

According to social exchange theory, individuals regulate their social exchange behaviors based on a self-interest analysis of the costs and benefits (Blau, 1964; Emerson, 1962; Homans, 1958; Molm, 2001). That is, when involved in the social exchange process, they try to maximize their benefits while minimizing their costs (Molm, 1997, 2001). Prior studies empirically confirm the social exchange theory's self-interest analysis of the costs and benefits in online communities such as online health communities, Facebook pages and online micro-blogging (e.g. Yan *et al.*, 2016; Surma, 2016; Liu *et al.*, 2016). These benefits can be either intrinsic or extrinsic (Vallerand, 1997). According to previous studies, the intrinsic benefits of online information sharing are the enjoyment drawn from helping others and self-gratification borne of reaffirming one's own intelligence. The extrinsic benefits are reward, image/reputation and reciprocity (Kankanhalli *et al.*, 2005; Wasko and Faraj, 2005; Lee *et al.*, 2006). The costs incurred during the exchange process include the time and effort spent on accomplishing the purpose of the exchange process (Molm, 1997; Kankanhalli *et al.*, 2005; Lee *et al.*, 2006).

Thus, the decision to share information hinges on the benefits derived from the information sharing process (Osatuyi, 2013). For example, financial incentives are found to be effective in motivating customers to provide feedback on eBay (Cabral and Li, 2015). The provision of financial incentives, other benefits and existing social norms, each have differential effects on customers' review posting patterns, in terms of both review volume and review length (Burtch *et al.*, 2018).

Drawing on social exchange theory and prior studies, we also expect that changes in both perceived costs and benefits in posting online reviews can lead consumers to exhibit different review patterns. Consequently, to regulate review-posting behavior, it is not only important to maximize benefits, but also to minimize costs. However, existing literature mainly focuses on the effect that increasing benefits during the exchange process has on review-posting behaviors (e.g. Chen *et al.*, 2010; Fradkin *et al.*, 2015; Cabral and Li, 2015; Burtch *et al.*, 2018), and literature that pays attention to the cost aspect is very limited (e.g. Kim *et al.*, 2020). In this regard, we examine how reduced time costs due to the accessibility of mobile devices affect review-posting behaviors, particularly intentions to post online reviews.

### 2.2 Hypothesis development

The users of mobile devices can post online reviews regardless of location at any time they want, providing the benefit of immediacy (Ransbotham *et al.*, 2019; Kim *et al.*, 2020). As the characteristics of mobile devices can have potential impacts on the review posting behaviors of consumers, researchers have paid attentions to the influences of mobile devices. For

example, Mariani *et al.* (2019) find that the valence of mobile reviews is higher than the valence of non-mobile reviews. Kim *et al.* (2020) find that the relative ratio of distribution for mobile reviews are more extreme compared to those for non-mobile reviews. Other studies have paid attentions to difference in perceived helpfulness for mobile and non-mobile reviews and found that mobile reviews are perceived less helpful than nonmobile reviews (Lurie *et al.*, 2014; März *et al.*, 2017).

The one of the more distinctive characteristics of mobile devices, the high accessibility, is found to reduce the perceived cost of review posting, as it can save consumers the time required to access a review site when compared to low accessibility of nonmobile devices (Kim *et al.*, 2020). Earlier studies examine the impact of the high accessibility of mobile devices in this regard. For example, studies have examined the effects of high accessibility of mobile devices on the contents of online reviews (Burtch and Hong, 2014; Lurie *et al.*, 2014). They find that online reviews submitted via a mobile device tend to contain signs of consumption recency and provide a more accurate representation of the reviewer's experiences. More recently, Ransbotham *et al.* (2019) find that mobile review contents are more affective and more concrete. By contrast, our focus is on examining how consumers' intention to post reviews using mobile devices is different from when they use non-mobile devices, due to the differing levels of accessibility in each case.

According to the previous studies, online reviews might not be representative of the general consensus due to the under-reporting bias (Hu *et al.*, 2006; Koh *et al.*, 2010). This bias indicates that consumers with extreme satisfaction or dissatisfaction are highly motivated to voice their opinions. This causes the distribution of online reviews to be asymmetrically J-shaped by pushing review scores to extremes (Hu *et al.*, 2006, 2009; Koh *et al.*, 2010).

Drawing on social exchange theory, we expect that consumers with extreme consumption experiences are more motivated to post reviews because they can benefit from posting about those extreme experiences. This is because people pay more attention to extreme reviews compared to moderate reviews (Hu *et al.*, 2009), and they find reviews of extreme experiences more useful and helpful (Pavlou and Dimoka, 2006; Forman *et al.*, 2008; Mudambi and Schuff, 2010). This provides the reviewers with the benefit of gaining reputation or knowledge self-efficacy and confirms their ability to provide information that is considered useful (Constant *et al.*, 1996). Furthermore, posting extremely positive or negative reviews, compared to posting moderate reviews, can also reward or punish companies by recommending in their favor or warning other consumers (Yoo and Gretzel, 2008; Hennig-Tuarau *et al.*, 2004).

As more benefits from review posting will accrue as a result of consumer posts that contain extreme reviews, we expect that the perception of reduced cost in terms of time to post a review due to the high accessibility of mobile devices may have differential impacts on consumers with different satisfaction levels. This is because, according to social exchange theory, information-sharing behavior in the social exchange process is dependent on the analysis of costs and benefits. The perception of reduced cost in terms of time is constant for all potential reviewers, but the perceived benefits of review posting are higher for customers with extreme experiences than for those with moderate experiences. We expect this will likely lead consumers with extreme experiences to show higher intentions to post reviews when they use mobile devices compared to non-mobile devices. Thus, we hypothesize the following.

- H1.* Consumers with extremely positive or negative consumption experiences will show higher intentions to post reviews due to the high accessibility for review-posting.

On the contrary to the consumers with extreme experiences, consumers with moderate experiences are less motivated to exert the time and effort to post reviews about their experiences (Hu *et al.*, 2009). This results in a low relative ratio of review ratings that fall in-between, compared to that of clearly positive or negative review ratings. Since consumers with moderate experiences are not sufficiently motivated to post reviews, it is expected that

the time reduced due to the high accessibility of mobile devices does not have a significant impact on their behavior. It is because the consumers with moderate experiences does not still clearly see the benefits of posting online reviews as a result of the cost and benefits analysis in spite of reduced costs in terms of time for review-posting. That is, the high accessibility of mobile devices is not likely to lead consumers with moderate experiences to show higher or lesser intentions to post a review compared to when they use non-mobile devices. Therefore, we propose the following hypothesis:

*H2.* Consumers with moderate consumption experiences will not show different levels of intentions to post reviews regardless of the level of accessibility for review-posting.

Figure 1 shows the research framework of the current study in that how the high accessibility for review-posting result in different levels of intentions for review-posting depending on the valence of consumer experiences based on the self-interest analysis of the costs and benefits for review-posting.

### 3. Method

The main objective of the experiment is to investigate the differential impact of accessibility on the review posting intentions of consumers with extreme consumption experiences compared with that of consumers with neutral consumption experiences. To this end, we needed to ensure that we isolate the effect of different levels of accessibility on review-posting intentions. Thus, we employed a scenario method so that we can manipulate only the level of accessibility and the valence of consumption experiences. It allowed us to rule out any possible compounding effects on review-posting intentions, which can be caused by other characteristics of mobile devices. We first conducted the pre-test to confirm participants can perceive the scenarios of different consumption experiences and different levels of accessibility as intended. Then, we proceeded to the main test to show the differential effects of accessibility on review-posting behaviors depending on the valence of consumption experiences.

#### 3.1 Pretest

We used a 3 (positive vs. negative vs. neutral hotel experience) \* 2 (high vs. low accessibility) between-subjects design. In order to manipulate three types of hotel experiences, we adapted scenarios for different valences of hotel experiences based on the previous literature (Kim *et al.*, 2020). Before proceeding with the main study, a pretest was conducted to ensure that respondents clearly understood the experimental scenarios. As shown in Table 1, each of the three scenarios is similar in length, so the amount of content delivered is not significantly different. A total of 49 respondents were recruited for the pretest on Amazon Mturk (male: 69%, female: 31%, age: 20s = 24.5%, 30s = 49.5%, 40s = 13.7%, over 50s = 12.3%). Amazon

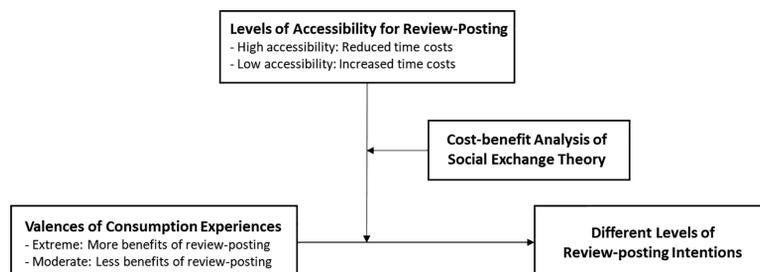


Figure 1.  
Research framework

Positive experience	<p>You stay at a hotel during a long-planned family trip, so you arrive at the hotel enthusiastically. The front desk staff welcomes you and the staff is very kind and helpful. Fortunately, the hotel upgrades the room even if it is the peak season right now. When you go to the room, they prepare a plate of fresh fruits on the table with a hand writing welcome message card. The room is really clean, spacious, and the amenities in bathroom are a premium brand that you like</p> <p>The next day in the morning, you go downstairs to have a hotel breakfast. The restaurant is next to a hotel garden so you enjoy flowers and trees. Of course the breakfast is delicious, too. Besides, they pack bread and fruit for your lunch. It is a very pleasant and satisfying hotel. Everything you and your family experience at this hotel far exceeds your expectation</p>
Negative Experience	<p>You stay at a hotel during a long-planned family trip, so you arrive at the hotel enthusiastically. However, unfortunately, since the room you originally booked is under construction, the hotel gives you another type of room. When you go to the room, the room smells of cigarettes. Besides, the bathroom is very small and not clean. You called the front desk to complain and change the room, but the staff at the front desk rudely explained that they said that they could not change the room because the hotel is full. So, only if you pay more, they can upgrade your room. You are very disappointed to stay in and have no choice but to stay in a haunting and outdated room</p> <p>The next day in the morning, you go downstairs to have a hotel breakfast. The restaurant is next to a construction site so it is noisy and the view is bad. It must be the worst hotel ever. Everything your family experience at this hotel was far below your expectations</p>
Neutral Experience	<p>You stay at a hotel during a long-planned family trip, so you arrive at the hotel enthusiastically. The front desk staff helps you to check into the room that you made a reservation for. When you enter your room, you find it suitably sized. It also matches the pictures shown online when you first booked the room. The bathroom is a bit small, but adequate. Amenities are not luxurious brands, but they provide everything you need and the quality is okay</p> <p>The next morning, you go downstairs to have breakfast at the hotel. Similar to most hotels, the hotel restaurant serves several kinds of pasties and fruits. The view is not particularly good, but the food quality is okay. The hotel's quality is just right for the price. Your experience at the hotel is neither satisfied nor dissatisfied</p>
High Accessibility	<p>After you checked-out, you got a message from the hotel booking agency, asking you to post a review about the hotel. You are able to post a review at any time you wish no matter where you are</p>
Low Accessibility	<p>After you checked-out, you got a message from the hotel booking agency, asking you to post a review about the hotel. You are unable to post a review right now. It will take quite a long time before you are able to post a review</p>

**Table 1.**  
Experimental scenarios

MTurk is a crowdsourcing marketplace that offers researchers access to a diverse, on-demand survey panels through a flexible user interface. Accordingly, researchers provide panels who participate in their surveys with small monetary incentives. Since Amazon MTurk has been often used for data collection, it is important to confirm whether the data collected from Mturk is credible in a field of academic research. In this regard, several previous studies confirm the reliability of the data source. For example, Buhrmester *et al.* (2016) and Holden *et al.* (2013) confirmed that data collected through MTurk is reliable and have strong test-retest reliability.

Each participant reads all three scenarios for hotel experience (positive, negative, and neutral experience) and answered questions about the extent to which they perceive the scenarios as positive or negative on a seven-point Likert scale (ranging from extremely negative = 1 to extremely positive = 7). Additionally, they read two scenarios for accessibility (high and low) and answered questions about the extent to which they perceive the scenarios as highly or rarely accessible.

As shown in Tables 2 and 3, the results show that respondents could successfully imagine the positive or negative experiences of the hotel services and the level of accessibility to post a review. The result of Levene’s test shows the null hypothesis that the error variance of the dependent variable is equal across groups is not rejected ( $p = 0.169$ ). Accordingly, a one-way analysis of variance yielded a main effect for the valence of experience,  $F(2, 144) = 490.747$ ,  $p < 0.00$ , indicating a significant difference between positive experiences ( $M = 6.65$ ,  $SD = 1.56$ ), negative experiences ( $M = 1.52$ ,  $SD = 1.77$ ), and neutral experiences ( $M = 4.57$ ,  $SD = 1.65$ ).

As for the level of accessibility to post a review, we conducted an independent sample  $t$ -test to examine the manipulation checks. The result of Levene’s test shows the null hypothesis that the error variance of the dependent variable is equal across groups is rejected ( $p = 0.004$ ). The means of two groups are significantly different ( $M_{\text{high}} = 6.10$ ,  $SD = 0.95$  vs.  $M_{\text{low}} = 2.34$ ,  $SD = 1.67$ ;  $t = 13.62$ ,  $p < 0.00$ ), indicating that participants also perceived the different level of accessibility from the scenarios as intended.

### 3.2 Main test

For the main test, we recruited 378 respondents using a small monetary incentive on Amazon Mturk (male: 54.8%, female: 45.2%, average age = 36.7). Participants were asked to read one of six conditions (three levels of hotel experience scenarios with high or low accessibility conditions). After reading the assigned scenarios, participants were asked to answer the dependent variable which is the degree of their intention to post a review of the hotel experience using a seven-point Likert scale (ranging from extremely unlikely = 1 to extremely likely = 7). We adapted the measurement items from a previous study (Arpaci *et al.*, 2018) and modified them for the purpose of our study. The measure includes two items: “How likely is it that you would post a review for this hotel experience?” and “How likely is it that you would let other people know about this hotel experience by posting a review?” The correlation between the two items was 0.91 ( $p < 0.01$ ). We used the average score of the items for the main analysis.

### 3.3 Results

The assumption of homogeneity of variance was first tested before conducting the ANOVA to confirm the proposed hypotheses. The Levene’s  $F$  test,  $F(5, 372) = 2.177$ ,  $p = 0.056$  showed

**Table 2.**  
Pretest: The result of  $t$ -test for valence of experience

		N	1	Subset 2	3
Dimension	Negative	49	1.523		
	Neutral	49		4.578	
	Positive	49			6.653

**Table 3.**  
Pretest: The result of  $t$ -test for level of accessibility

	$T$	df	Sig. (2-tailed)	Mean difference	95% confidence interval of the difference	
					Lower	Upper
Accessibility*	13.627	76.347	0.000	3.75510	3.20632	4.30388

**Note(s):** \*Equal variances not assumed

that our data met the assumption of homogeneity of variance. Then, we proceeded to conduct the two-way ANOVA. The results showed the main effect for the valence of experience,  $F(2, 372) = 47.696, p < 0.00$ , indicating a significant difference between positive experiences ( $M = 5.64, SD = 1.56$ ), negative experiences ( $M = 5.35, SD = 1.77$ ), and neutral experiences ( $M = 3.79, SD = 1.65$ ). The main effect of accessibility was also significant  $F(1, 372) = 12.66, p < 0.00$ , indicating a significant difference between high accessibility ( $M = 5.17, SD = 1.74$ ) and low accessibility ( $M = 4.61, SD = 1.91$ ) conditions (see Figure 2). However, the interaction effect was non-significant,  $F(2, 372) = 0.290, p = 0.748$ .

Since we did not have a statistically significant interaction, we interpreted the post hoc test results for the different levels of valence, which can be found in the multiple comparisons.

Post-hoc analyses using the Tukey post-hoc criterion for significance indicated that the intention to post was significantly different between the two extreme conditions (positive and negative) and the neutral condition ( $p < 0.000$ ). As shown in Tables 4 and 5, means for positive and negative conditions are displayed in homogeneous subsets and means for neutral condition is displayed in a different subset. Intentions to post reviews was higher in both

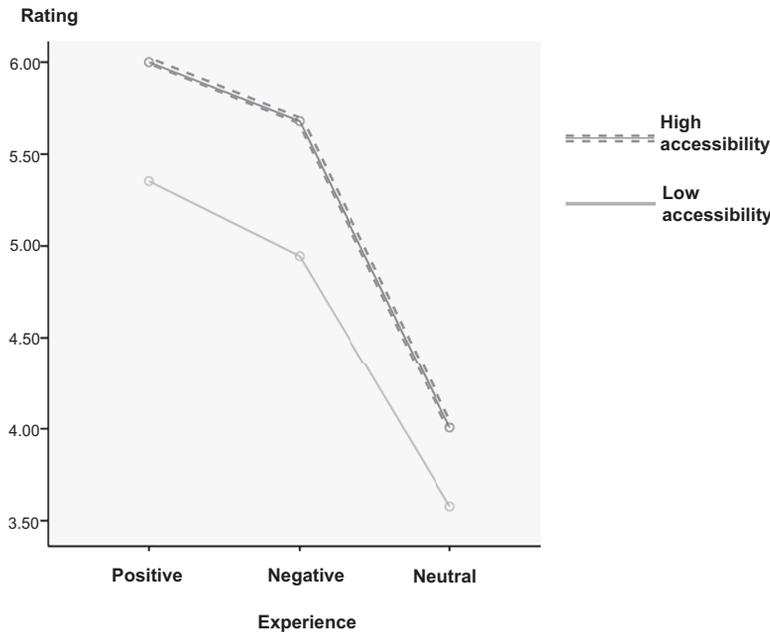


Figure 2. The result of ANOVA test

		Mean difference	Std. Error	Sig	95% confidence interval	
					Lower bound	Upper bound
Positive	Negative	0.2939	0.20994	0.342	-0.2001	0.7879
	Neutral	1.8482*	0.20509	0.000	1.3656	2.3308
Negative	Positive	-0.2939	0.20994	0.342	-0.7879	0.2001
	Neutral	1.5542*	0.20640	0.000	1.0686	2.0399
Neutral	Positive	-1.8482*	0.20509	0.000	-2.3308	-1.3656
	Negative	-1.5542*	0.20640	0.000	-2.0399	-1.0686

Table 4. The result of multiple comparisons

extremely positive ( $M = 5.64, SD = 1.46$ ) and negative ( $M = 5.35, SD = 1.72$ ) conditions than in the neutral condition ( $M = 3.79, SD = 1.65$ ).

To more specifically we examine the mean difference between hotel experience conditions depending on the level of accessibility, we conducted a *t-test* between groups in which we were interested. Participants in the case of positive and negative experience scenarios indicated significantly varied intention to post, depending on the level of accessibility (Positive:  $M_{high} = 6.00, M_{low} = 5.35, t = 2.338$  and negative:  $M_{high} = 5.67, M_{low} = 4.94, t = 2.247$ ). However, those in the neutral experience scenario indicate a similar degree of intention to post regardless of the accessibility level (neutral:  $M_{high} = 4.00, M_{low} = 3.57, t = 1.510$ ).

The results suggest that when consumers are extremely satisfied or dissatisfied, the level of accessibility positively affects their intention to post a review in supporting H1. On the contrary, when consumers are neither satisfied nor dissatisfied, the level of accessibility does not affect their intention to post a review in supporting H2.

#### 4. General discussion

##### 4.1 Theoretical contributions

As previous studies argue, online reviews are one of the most easily accessible information sources (Agnihotri and Bhattacharya, 2016), and they have a significant impact on other consumers' purchase decisions (Kostyra *et al.*, 2016; Burch *et al.*, 2018; Kim *et al.*, 2020). With the advancement of mobile technology, online reviews posted via mobile devices are on the rise and mobile reviews are fundamentally different from non-mobile reviews (Lurie *et al.*, 2014; März *et al.*, 2017; Mariani *et al.*, 2019; Ransbotham *et al.*, 2019; Kim *et al.*, 2020). That is, it is important to delve into examining the influences of different characteristics of mobile devices in order to provide a better understanding. Additionally, a prior study also emphasizes the significance of investigating the effects of situational heterogeneity on review-posting behavior (Winer and Fader, 2016).

Thus, we aim at examining how one of the distinguished characteristics of mobile devices, high accessibility for review-posting, influence a consumer's intention to post an online review depending on the valence of consumption experiences. Since high accessibility of mobile devices reduces time cost for review posting (Kim *et al.*, 2020), it can influence the cost-benefit analysis for review-posting. It is expected to result in different levels of intentions to post a review depending on valences of experiences as the benefits of posting reviews are different depending on the valence of the consumption experiences (Constant *et al.*, 1996; Yoo and Gretzel, 2008; Hennig-Tuarau *et al.*, 2004). We develop two hypotheses based on the arguments. First, consumers with extreme experiences will show higher intentions to post reviews due to the high accessibility for review-posting. Second, consumers with moderate consumption experiences will not show different levels of intentions to post reviews regardless of the level of accessibility for review-posting.

We employ a scenario method for our experimental study to manipulate only the level of accessibility for review-posting and the valence of experiences, which allows us to isolate the effects of different levels of accessibility for review-posting. As a result, we find that the intention to post a review of extreme positive and negative consumption experiences is

		N	Subset 1	2
Table 5. The result of Tukey test	Dimension	Neutral	133	3.7970
		Negative	121	5.3512
		Positive	124	5.6452

significantly higher when consumers have high accessibility for review-posting. On the contrary, the intention to post a review of moderate consumption experiences is neither higher nor lower regardless of the level of accessibility. We believe that the findings contribute the literature in that, to the best of our knowledge, there is no extant literature showing the relationship between the level of accessibility for review-posting and intentions to post reviews.

In addition, our findings confirm the importance of perceived costs in cost-benefit analysis of the social exchange theory for review-posting behaviors. Kim *et al.* (2020) suggest that the high accessibility for review-posting reduces the perceived costs in terms of time spent to post reviews. We develop our hypotheses based on the logic that how the reduced costs can have differential impacts on intentions to post depending on the valence of consumer experiences.

By drawing on the social exchange theory, both perceived benefits and costs for review-posting behaviors are expected to be important determinants for building intentions to post online reviews, as the decision to share information is based on a self-interest analysis of costs and benefits (Blau, 1964; Emerson, 1962; Homans, 1958; Molm, 2001). However, most existing literature focuses on the effects of providing external benefits, such as financial incentives, on review-posting behaviors (e.g. Chen *et al.*, 2010; Fradkin *et al.*, 2015; Cabral and Li, 2015; Burtch *et al.*, 2018). As only limited literature pays attention to cost aspects in cost-benefit analysis for review-posting considering the importance of understanding consumers' review-posting behaviors, we believe our findings contribute to existing knowledge.

#### 4.2 Managerial contributions

Providing helpful online reviews is elementary for e-commerce companies (März *et al.*, 2017). As certain online reviews are perceived more helpful than other online reviews, simply providing online reviews is no longer adequate (Schlosser, 2011). The perceived value of customer reviews is measured through "helpfulness votes". Providing helpful reviews is important because the overload of online customer reviews and conflicting information can negatively influence the efficiency of other consumers' decision-making processes (Chen and Tseng, 2011; Hong *et al.*, 2017). In addition, providing helpful reviews can improve the value of companies (Lee *et al.*, 2018). In this regard, our research findings provide useful managerial implications.

Prior literature finds that the valence of review ratings is an important determinant for the perception of review helpfulness. More particularly, consumers find the online reviews with extreme positive or negative ratings more helpful than online reviews with moderating ratings (Pavlou and Dimoka, 2006; Forman *et al.*, 2008; Mudambi and Schuff, 2010). Our findings show that consumers with extreme consumption experiences have higher intentions to post reviews when they use mobile devices compared to non-mobile devices. This means that e-commerce companies can increase the volume of the more helpful reviews by directing consumers to mobile device for review-posting, which results in enabling them to attract and retain more consumers.

#### 4.3 Limitations and future research

Although we believe that this study makes contributions, our findings are subject to some limitations. First, our study examines only the effects of high accessibility as the characteristics of mobile devices on review-posting intentions. However, previous studies suggest that there are other distinguished characteristics of mobile devices such as smaller device size, less visible screens, and smaller keyboards. They argued that these characteristics are likely to increase the perceived costs for review-posting (Chae and Kim, 2004; Raptis *et al.*, 2014; Sweeney and Crestani, 2006). Further studies might want to incorporate these into research design to provide a more comprehensive understanding of how the characteristics of mobile devices influence review-posting behaviors.

Second, we employ a scenario method to manipulate the different level of accessibility to avoid any possible compounding effects from having participants use actual mobile devices for our experiment. Further studies will need to confirm this by different research designs that involve actual mobile devices. Third, we collect our data for the experiment from registered panels of Mturk in exchange of small monetary incentives. Although previous studies confirm the reliability of the data source (Holden *et al.*, 2013; Buhrmester *et al.*, 2016), it can still be considered convenience samples. As it can rise the generalizability issue of the findings, further study might want to employ different sampling methods to address the issue. Finally, as the scenarios of online reviews on only hotel services were used as stimuli for our experiment, future studies may explore other types of product to more deeply and comprehensively understand review-posting behaviors of consumers.

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