What factors determine the intention to use and recommend public autonomous shuttles in a real-life setting?

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Received 13 July 2023
Revised 12 January 2024
4 March 2024
Accepted 6 March 2024

Abstract

Purpose – User acceptance is a necessary precondition to implementing self-driving buses as a solution to public transport challenges. Focusing on potential users in a real-life setting, this paper aims to analyze the factors that affect their willingness to use public autonomous shuttles (PASs) as well as their word-of-mouth (WOM) intentions.

Design/methodology/approach – Grounded on Unified Theory of Acceptance and Use of Technology (UTAUT2), the study was carried out on a sample of 318 potential users in a real-life setting. The hypothesized relationships were tested using partial least squares structural equation modeling (PLS-SEM).

Findings – The study reveals that performance expectancy, facilitating conditions, hedonic motivation and trust are significant predictors of PAS usage intention, which is, in turn, related to WOM communication. Additionally, the factors that impact the intention to use a PAS are found to exert an indirect effect on WOM, mediated by usage intention.

Practical implications – This study includes practical insights for transport decision-makers on PAS service design, marketing campaigns and WOM monitoring.

Originality/value – While extant research focuses on passengers who have tried autonomous shuttles in experimental settings, this article adopts the perspective of potential users who have no previous experience with these vehicles and identifies the link between usage intention and WOM communication in a real-life traffic environment.

Keywords Autonomous vehicle, Autonomous shuttle, Driverless shuttle, Self-driving bus, Technology adoption, Technology acceptance, Usage intention, Word-of-mouth, Sustainable mobility, Smart mobility, Robots, UTAUT2

Paper type Research paper

1. Introduction

Autonomous vehicles (AVs) are robotic automobiles that sense their surroundings and location and operate without a human driver (Kaur and Rampersad, 2018). Although there are

This work was funded by the Spanish Ministry of Science and Innovation (Funding Agency #1) (No: PID2020-113561RB-I00). This study benefited from the Professorship Excellence Program in accordance with the multi-year agreement signed by the Government of Madrid and the Autonomous University of Madrid (Line #3).

European Journal of Management and Business Economics
Vol. 35 No. 2, 2026
pp. 169-188
Emerald Publishing Limited
e-ISSN: 2444-8494
p-ISSN: 2444-8451
DOI 10.1108/EJMBE-07-2023-0224

still technical, legal and societal issues to be solved before autonomous driving becomes mainstream, this novel mode of transportation is expected to disrupt a wide variety of industries and have a transformative effect on society in the coming decades (Leminen *et al.*, 2022). The deployment of self-driving vehicles includes a host of options that range from privately owned AVs to AV pooling and public autonomous shuttles (PASs) (Paddeu *et al.*, 2020). While extensive research has been conducted on private self-driving cars, the number of studies that explore the adoption of public autonomous buses is comparatively small (Goldbach *et al.*, 2022; Golbabaei *et al.*, 2020).

Implementing PASs comes with several advantages: eased traffic congestion, lower parking space needs, reduced greenhouse gas, fewer noise emissions and more efficient mobility solutions in areas not easily served by traditional buses (Bucchiarone *et al.*, 2021; Jing *et al.*, 2020; Azad *et al.*, 2019). Prior studies dealing with PAS acceptance typically survey passengers who have been in contact with PASs in experimental settings, either through images and descriptions (e.g. Goldbach *et al.*, 2022; Moták *et al.*, 2017) or during short-term trials of public pilot projects (Kaye *et al.*, 2020). Despite their unquestionable merit, their results must be taken with caution since the controlled conditions of pilot trials can affect passengers' perception of the overall experience (Mouratidis and Cobeña-Serrano, 2021) and might lack high external validity. Regrettably, studies that deal with PAS services running as regular public transport lines (Nordoff *et al.*, 2021; Mouratidis and Cobeña-Serrano, 2021) are an exception and leave out important elements that contribute to PAS adoption. Among these elements, word-of-mouth (WOM) communication is particularly relevant since WOM is one of the most influential sources of information about products and services (Ruiz-Mafe *et al.*, 2020; Huete-Alcocer, 2017) and a powerful marketing tool (Yang, 2017).

Lacking an accurate and broad understanding of PAS adoption can affect the successful deployment of this technology private firms and public transport authorities, which might translate into substantially ineffective investments. Thus, this study aims to offer insights into the factors that affect PAS usage intention in real-life contexts, as well as users' willingness to share their opinions about PASs with others. To do so, this research proposes an extension of the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh *et al.*, 2003). Particularly, we study a PAS implementation at a university campus, where a free-of-charge autonomous shuttle had been running as a regular public transport option for more than a year before data collection. Since public acceptance is the precondition that will allow emerging PAS services to reach their forecasted benefit levels (Madigan *et al.*, 2017), we focus on individuals who have never used this means of transport before and, therefore, represent the target population of successful PAS adoption initiatives.

This study contributes to extant knowledge about the public acceptance of PASs in several ways. First, our research stands out for providing empirical evidence on PAS usage intention in a real-life setting. Second, the study goes beyond traditional measures of usage intention and investigates its link to passengers' willingness to engage in WOM about the driverless shuttle service. Third, our research specifically studies individuals who have no experience using PASs, offering the necessary insights to provide a practical guide to public and private entities seeking the deployment of PAS technology. In the next section we provide an overview of our research model and present its hypotheses. Subsequently, we describe our methodology and our findings. Finally, we discuss our results and present the conclusions and main limitations of the study.

2. Theoretical background

With the developments in AV technology, research on the acceptance of self-driving vehicles has increased in recent years (Choi and Ji, 2015; Buckley *et al.*, 2018). Previous studies have researched factors that impact AV adoption including perceived usefulness, ease of use,

social influence, trust (e.g.: Panagiotopoulos and Dimitrakopoulos, 2018; Zhang *et al.*, 2019), personality traits (Zhang *et al.*, 2020) and cybersecurity concerns (Kaur and Rampersad, 2018) among other topics. Nonetheless, findings from studies on driverless cars might not be directly transferable to public autonomous transport systems. For instance, factors that affect the AV market, such as the social pressure to own the newest technology, do not necessarily apply to PASs (Goldbach *et al.*, 2022). Despite this, research on the drivers of PAS acceptance has received significantly less attention than research on the factors that impact AV adoption (Liew *et al.*, 2023; Narayanan *et al.*, 2020).

Technology acceptance can be defined as the individual's willingness to use a technological solution for the job it is designed to support (Dillon and Morris, 1996). Technology acceptance theories that have been commonly used in the context of PAS include technology acceptance model (TAM) (Davis, 1989), theory of planned behavior (TPB) (Ajzen, 1991) and UTAUT (Venkatesh *et al.*, 2003) or its most recent consumer-oriented version UTAUT2 (Venkatesh *et al.*, 2012). Condensing previous frameworks to study technology acceptance, UTAUT2 posits that performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value and habit are constructs that influence consumer behavioral intentions towards technology use, While UTAUT constructs have been used as predictors of PAS acceptance in trial projects in several European countries including France, Germany, Greece, Switzerland, Belgium and Greece (Liew *et al.*, 2023), there is very limited evidence from UTAUT-based studies on established public bus lines (Table A1). As an exception, Nordoff *et al.* (2021) find that effort expectancy is the strongest predictor of PAS usage intention among users of a PAS service operating regularly in a mixed-traffic environment in Germany. Research on permanent PAS implementations based on other theoretical frameworks is also scarce (e.g.: Mouratidis and Cobeña-Serrano, 2021). Additionally, the fact that research ignores the behavioral intentions of individuals who have never boarded a PAS can be problematic, as the literature shows that experience impacts users' decision-making (Ajzen, 1991) and modifies their behavior (Venkatesh *et al.*, 2003). In the specific context of PAS, there is evidence that passengers' willingness to use this service is higher after experiencing a test ride (e.g.: Goldbach *et al.*, 2022; Dennis *et al.*, 2021), especially when the initial acceptance level is low or not stable (Wicki *et al.*, 2019).

2.1 Model overview

Departing from previous research that applies the UTAUT to study PAS usage intention (Table A1), we propose a new model that includes performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation and trust as predictors for PAS usage intention for people who have never ridden an autonomous minibus. Additionally, we include WOM as a consequence of PAS usage intention (Figure 1).

Performance expectancy refers to the degree to which a certain technology helps an individual improve at a given task. Effort expectancy captures the ease of use associated with technology. Social influence refers to if and how the opinion of a user's reference groups is important in their decision to use technology. Facilitating conditions include the available support to help an individual when using technology and hedonic motivation is the degree of enjoyment perceived by an individual when using technological solutions (Venkatesh *et al.*, 2003, 2012). While trust is not one of the constructs included in UTAUT, it is broadly recognized as an important predictor of technology acceptance and is often included in AV acceptance studies (Wu *et al.*, 2011). Trust captures the expectancy that an agent will help achieve an objective in a situation characterized by uncertainty and vulnerability (Lee and See, 2004). Finally, WOM is a non-transactional behavior that captures the degree to which individuals communicate with other parties about their evaluation of goods and services (Fan *et al.*, 2020).

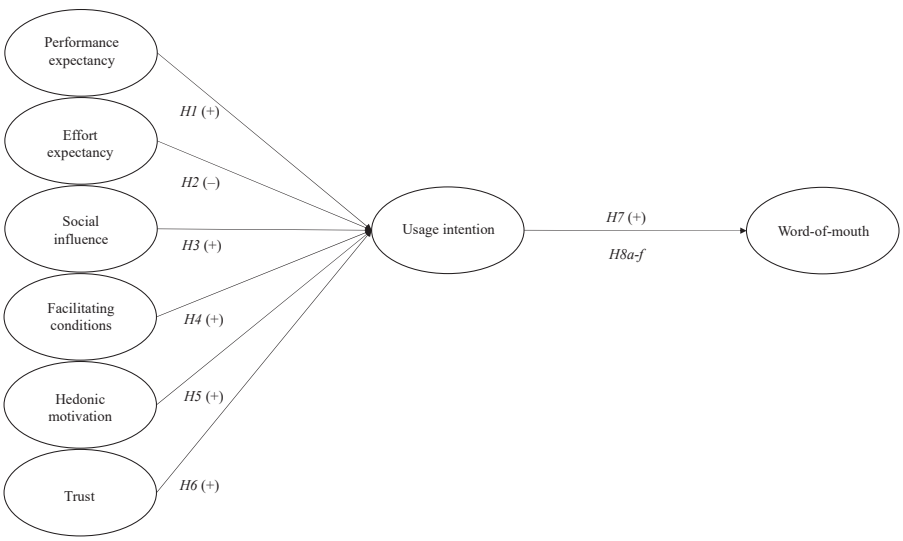

Figure 1.
Research model

Note(s): *H8a-f* correspond to mediating effects
Source(s): Figure by authors

Our proposal complements existing literature in several aspects, as delineated in Table A1: (1) scholars have focused primarily on PAS pilot projects whereas we analyze real-life implementations of a PAS service; (2) in contrast to our research, no PAS studies have explored WOM intentions; (3) prior studies survey passengers who have tried some form of PAS, while we study potential users with no PAS experience. Additionally, our study offers a comprehensive model while previous research does not cover all of UTAUT2's core constructs applicable to the PAS context.

2.2 Hypotheses development

2.2.1 Performance expectancy. Empirical research across different markets corroborates that consumers try and continue to use technological advancements that increase their performance of a task (Venkatesh *et al.*, 2003). Performance expectancy is a relevant predictor of autonomous car acceptance (Kettles and van Belle, 2019; Panagiotopoulos and Dimitrakopoulos, 2018; Kaur and Rampersad, 2018; Solbraa Bay, 2016) and a strong predictor of passengers' behavioral intentions towards PASs (Madigan *et al.*, 2017; Bernhard *et al.*, 2020; Nordhoff *et al.*, 2021). Performance expectancy for PASs is related to the degree to which individuals believe that using a driverless shuttle is convenient and helps them achieve their transport goals efficiently. We expect that individuals who have never ridden a PAS would be more likely to use these vehicles if they perceived that the shuttle helps them accomplish their daily commute. Thus, we formulate the following hypothesis:

H1. Performance expectancy is positively related to PAS usage intention among potential users.

2.2.2 Effort expectancy. Prior research has produced mixed results about the impact of effort expectancy on the adoption of self-driving vehicles. Whilst several studies find that effort expectancy is indeed a strong predictor of both AV and PAS usage intention (Buckley *et al.*, 2018; Panagiotopoulos and Dimitrakopoulos, 2018; Zhang *et al.*, 2019; Rombaut *et al.*, 2020;

Bernhard *et al.*, 2020), other studies conclude that effort expectancy does not affect the intention to use PASs (Madigan *et al.*, 2017; Nordhoff *et al.*, 2021). Thus, the relationship between effort expectancy and behavioral intention towards autonomous shuttles remains unclear. We consider that individuals who have no previous experience with PASs might feel that using the shuttle requires some degree of physical or mental effort that prevents them from boarding it. We hence hypothesize:

H2. Effort expectancy is negatively related to PAS usage intention among potential users.

2.2.3 Social influence. Generally, individuals embrace the values of their reference group during socialization processes and tend to behave according to what the group thinks they should do. This type of peer pressure has a positive and significant effect on people's intentions to accept technology innovations and is stronger when the influence occurs publicly rather than privately (Kulviwat *et al.*, 2009). Likewise, AV pilot projects show that social influence is a significant predictor of the intention to use autonomous cars (Leicht *et al.*, 2018; Kettles and van Belle, 2019) and public shuttles (Madigan *et al.*, 2017; Nordhoff *et al.*, 2020). Since the opinion of others about the usefulness of the PAS is likely to influence users who have not yet experienced the shuttle service, we hypothesize:

H3. Social influence is positively related to PAS usage intention among potential users.

2.2.4 Facilitating conditions. Facilitating conditions include environmental and a technological element (Jewer, 2018). The environmental component refers to persons or machines that the user can rely on for help. The technological component refers to the user's abilities when performing a certain task without external support. The extant literature on PAS acceptance identifies that facilitating conditions are a predictor of individuals' behavioral intentions in pilot projects (Madigan *et al.*, 2017; Nordhoff *et al.*, 2020), suggesting that the resources provided to support the implementation of PASs (e.g.: a safety operator on board, appropriate human-machine interface) influence usage intention. We consider that in a real-life setting, users who feel they don't have the necessary skills to ride a PAS will be more inclined to use the shuttle if they know there are facilitating conditions available to them. Thus, we formulate the following hypothesis:

H4. Facilitating conditions are positively related to PAS usage intention among non-users.

2.2.5 Hedonic motivation. Prior research supports the role of hedonic motivation on AV acceptance. For instance, Zhang *et al.* (2020) studied the influence of sensation-seeking traits on AV adoption. They confirmed that people who enjoy novelty and adventure display a higher intention to use AVs. In the context of pilot PAS tests, Madigan *et al.* (2017) showed that the perceived enjoyment of the transport system has a positive effect on passengers' usage intention. Feys *et al.* (2020) came to the same conclusion and established that the more enjoyable the ride, the higher the usage intention. We consider that, while potential users may find it difficult to assess whether a PAS ride is an enjoyable experience, they can still perceive PASs as innovative and technologically advanced. Thus, the association of PASs with novelty might increase non-users' willingness to use the PAS service. Therefore, we hypothesize that:

H5. Hedonic motivation is positively related to PAS usage intention among potential users.

2.2.6 Trust. Trust is one of the most important enablers of automated technological solutions (Paddeu *et al.*, 2020). People tend to rely on automation that they trust, which is especially relevant when complex situations make it impractical for individuals to comprehensively

evaluate automation (Lee and See, 2004). Extant research identifies trust – including safety, privacy and security aspects – as a significant predictor of users' positive attitudes toward self-driving cars (Choi and Ji, 2015; Buckley *et al.*, 2018; Panagiotopoulos and Dimitrakopoulos, 2018; Zhang *et al.*, 2019; Hong *et al.*, 2021). Particularly, trust in PASs implies that the passengers are willing to place themselves in a vulnerable position by boarding the driverless shuttle (Kaur and Rampersad, 2018; Kaye *et al.*, 2020; Paddeu *et al.*, 2020; Nordhoff *et al.*, 2021). As PASs are completely controlled by a built-in automated system, individuals who have no previous experience with PASs might instinctively feel that boarding the shuttle poses a risk to them. However, we expect that trust, if present, can neutralize these concerns. Accordingly, we hypothesize:

H6. Trust is positively related to PAS usage intention among potential users.

2.2.7 Usage intention. WOM communication helps to disseminate information about innovative goods and services and is often perceived as more trustworthy than conventional advertising (Villanueva *et al.*, 2008; López and Sicilia, 2013). Empirical studies across different industries corroborate that technology adopters tend to engage in WOM communication, particularly if they trust the technology (Barreda *et al.*, 2015; Yang, 2017; Kalinić *et al.*, 2020; Shaker *et al.*, 2023). For instance, shoppers who benefit from in-store technologies share positive messages about the retail companies that deploy such technology (Inman and Nikolova, 2017). Similarly, Molinillo *et al.* (2023) found that the intention to use voice assistants significantly influences positive WOM about these devices. Extending these findings, we hypothesize:

H7. PAS usage intention is positively related to WOM among potential users.

Given that performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation and trust might influence usage intention and that usage intention might lead to WOM, we hypothesize that the drivers of usage intention can also affect WOM behaviors. Previous research does not directly test such relationships. However, hedonic and utilitarian elements are known to influence WOM about other disruptive technologies (Mishra *et al.*, 2022). In this regard, it is plausible that topics relative to the antecedents of usage intention that are included in our model could be incorporated into potential users' conversations about the PAS service. The more relevant to passengers these factors are, the more likely to appear in their WOM communication. Hence, we propose that:

H8. Performance expectancy (a), effort expectancy (b), social influence (c), facilitating conditions (d), hedonic motivation € and trust (f) are related to WOM among PAS potential users, via usage intention.

3. Methodology

3.1 Sampling and measurement

Data was collected at the main campus of Universidad Autónoma de Madrid. As indicated by prior studies, university campuses offer a complex context for passenger transport services and thus represent an interesting real-life scenario for AV research (Attard *et al.*, 2020). The above-mentioned university launched a PAS in October 2020 that travels the campus streets, where more than 6,000 vehicles and almost 30,000 people circulate every day (see Plate 1). The PAS connects the main locations of the campus through seven bus stops and can transport up to twelve passengers. An onboard operator assists users if necessary.

To collect the data, a link to an anonymous Qualtrics online survey was distributed among undergraduate students employing a non-probability convenience sampling method. Students represent the core target users of the campus PAS (about 89% of potential users). We employed

Source(s): Image courtesy of Alsa

Plate 1.
Public autonomous shuttle at Universidad Autónoma de Madrid (Spain)

scales from the extant literature and implemented them as 7-point Likert items (see Table A2). We ensured that participants had never used a PAS before by introducing a filtering question at the beginning of our survey, reaching a final sample of 318 valid responses. The participants' mean age was 20.3 years; 50% were female and 50% were male.

3.2 Data analysis

We tested our hypotheses using partial least squares structural equation modeling (PLS-SEM) by applying SmartPLS v. 4.0.9.8 (Ringle *et al.*, 2023). This technique aims to maximize the variance explained in target outcomes (McLeay *et al.*, 2022), being appropriate for structural models that explore theoretical extensions of established theories. Our research specifically extends the UTAUT2 model by integrating trust and WOM. Additionally, our sample size encourages us to use this procedure over covariance-based structural equation models. Finally, PLS-SEM allows for assessing the practical relevance of a model, that is, whether the model can produce adequate predictions (Hair *et al.*, 2019a, b). More specifically, we first assessed the measurement model. Next, we estimated our structural model. Finally, we estimated an extended version of the proposed model to further analyze the indirect effect that our exogenous variables may exert on WOM, mediated by usage intention.

4. Results

4.1 Measurement model and common method bias

We first evaluated our measurement model (Table A2). All our variables achieved indicator loadings greater than 0.70, thereby supporting item reliability. Our measurement model also showed internal consistency reliability: Cronbach's alphas were between 0.71 and 0.95 (Nunnally, 1978); the composite reliability of our items was between 0.84 and 97, higher than 0.70 (Hair *et al.*, 2019a, b); Dijkstra–Henseler's ρ was between 0.73 and 0.95, that is, also higher than 0.70 (Dijkstra and Henseler, 2015). Next, we evaluated the average extracted variances (AVEs) of our constructs, which were above the recommended 0.5 threshold (Fornell and Larcker, 1981), indicating convergent validity. Additionally, our measurement model showed adequate discriminant validity, according to indicators' cross-loadings, together with the Fornell and Larcker Criterion and the heterotrait-monotrait ratio (HTMT) ratio (Table A3). All loadings were higher for their corresponding construct than for others. The AVEs of all

variables were higher than their squared correlations with other variables (Fornell and Larcker, 1981), while the HTMT ratios were lower than 0.85 (Kline, 2011). Finally, we evaluated if common method bias is present in our data following Kock and Lynn (2012). Particularly, we estimated a model in which all our latent constructs explain a random dummy variable and checked if full collinearity variance inflation factors (VIFs) were below 3.3. VIFs ranged between 1.31 and 2.40, thus indicating that common method bias is not a problem in our study.

4.2 Structural model: hypotheses testing

We next evaluated our structural model. The adjusted-R^2 for usage intention and WOM was 0.41 and 0.30 (Table 1), respectively, signaling that our model features moderate explanatory power (e.g.: Henseler *et al.*, 2009). Focusing on usage intention as our key construct, we assessed our model's out-of-sample predictive power by employing the PLSpredict procedure (Table 2). Particularly we employed ten folds and ten repetitions (Shmueli *et al.*, 2019). We first evaluated the $Q^2_{predict}$ statistics of the usage intention indicators, which were all higher than zero (0.39 and 0.24). This provides initial evidence of predictive relevance. Second, we analyzed the skewness of the prediction errors, which indicated that their distributions were not highly non-symmetric. Consequently, we based our prediction power assessment on root mean squared errors. Third, we compared the root mean squared errors of our PLS model with the ones provided by a linear model. The prediction statistics of our model were all lower, thus indicating that our model features high out-of-sample predictive power.

Table 1 shows the path coefficients of our structural model. We assessed their significance level by employing a bootstrapping procedure of 10,000 subsamples with no sign change. Our results support H1, which states that performance expectancy is positively related to usage intention among potential users. Our findings also indicate that effort expectancy is negatively associated with usage intention, but not at a significant level. Thus, we reject H2.

	Estimate	f^2	*t*-statistic	Hypotheses
Performance expectancy → Usage intention	0.28	0.06	3.40 ***	H1 supported
Effort expectancy → Usage intention	−0.08	0.01	1.51	H2 not supported
Social influence → Usage intention	0.09	0.01	1.83 *	H3 not supported
Facilitating conditions → Usage intention	0.16	0.04	3.04 ***	H4 supported
Hedonic motivation → Usage intention	0.24	0.05	2.86 ***	H5 supported
Trust → Usage intention	0.12	0.01	2.10 **	H6 supported
Usage intention → WOM	0.55	0.44	12.33 ***	H7 supported
Constructs			Variance explained (adjusted-R^2)	
Usage intention			0.41	
WOM			0.30	

Table 1. Model results

Note(s): *: significant at a 90%; **: significant at a 95%; ***: significant at a 99% level
Source(s): Table by authors

	$Q^2_{predict}$	Skewness	PLS RMSE	LM RMSE	Difference
Using autonomous shuttles when they start to circulate in our environment will be not likely at all/very likely	0.39	−0.13	1.23	1.24	0.01
Using autonomous shuttles for short trips whenever they are available will be not likely at all/very likely	0.24	−0.78	1.34	1.36	0.02

Table 2. PLSpredict

Source(s): Table by authors

Likewise, we didn't find support for H3, which argues that social influence would increase usage intention among our sample of potential users. Social influence is positively related to usage intention, but only at a 90% confidence level. Our findings support H4, which states that facilitating conditions are positively related to usage intention. Moreover, our results confirmed H5 and H6, which respectively posit that hedonic motivation and trust have a positive impact on the intention to use PASs. H7 proposes that usage intention increases WOM—and indeed, our results indicate that higher usage intention is accompanied by higher WOM among our sample of potential users, thus supporting H7.

To test H8, we next evaluated whether performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation and trust indirectly affect WOM, mediated by usage intention. Particularly, we followed Zhao *et al.* (2010) and computed bias-corrected and accelerated confidence intervals for such relationships (Table 3). Four out of six confidence intervals did not contain the zero value; particularly, we can confirm that usage intention mediates the indirect influences of performance expectancy, social influence, facilitating conditions and hedonic motivation on WOM, hence accepting H8a,d,e,f. These

	Estimate	95% bias-corrected and accelerated confidence interval	Hypotheses
Research model: indirect effects			
Performance expectancy → WOM	0.16	(0.06, 0.25)	H8a supported
Effort expectancy → WOM	−0.05	(−0.11, 0.01)	H8b not supported
Social influence → WOM	0.05	(−0.002, 0.11)	H8c not supported
Facilitating conditions → WOM	0.09	(0.03, 0.15)	H8d supported
Hedonic motivation → WOM	0.13	(0.04, 0.23)	H8e supported
Trust → WOM	0.06	(0.01, 0.13)	H8f supported
Extended research model			
Direct effect performance expectancy → WOM	0.10	(−0.06, 0.26)	
Indirect effect performance expectancy → WOM	0.07	(0.03, 0.14)	
Direct effect effort expectancy → WOM	0.04	(−0.19, 0.02)	
Indirect effect effort expectancy → WOM	−0.02	(−0.06, 0.004)	
Direct effect social influence → WOM	0.03	(−0.09, 0.15)	
Indirect effect social influence → WOM	0.02	(0.001, 0.06)	
Direct effect facilitating conditions → WOM	0.04	(−0.07, 0.14)	
Indirect effect facilitating conditions → WOM	0.04	(0.01, 0.08)	
Direct effect hedonic motivation → WOM	0.16	(0.01, 0.30)	
Indirect effect hedonic motivation → WOM	0.06	(0.02, 0.13)	
Direct effect trust → WOM	0.23	(0.08, 0.37)	
Indirect effect trust → WOM	0.03	(0.04, 0.08)	

Source(s): Table by authors

Table 3.
Indirect effects

indirect effects are all positive. In contrast, effort expectancy and social influence do not indirectly affect WOM through the mediation of usage intention.

Beyond hypotheses testing, to shed further light on the indirect effect of usage intention drivers on WOM, we estimated an extended version of our model that included the direct effects of performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation and trust in WOM. Depending on the significance and sign of the product of the direct and indirect effects, the mediated relationship can be classified as indirect-only, complementary, or competitive (Zhao *et al.*, 2010). Except for hedonic motivation and trust, none of our exogenous variables demonstrated significant direct effects. Therefore, their effect on WOM is indirect only, that is, it occurs only through usage intention. This effect also indicates that other variables omitted in our model, beyond usage intention, can mediate the relationship between hedonic motivation and trust and WOM intention.

5. Discussion

Building on the UTAUT2 model, this research analyses the factors that drive potential users' future acceptance of PASs. Particularly, we study whether performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation and trust influence PAS usage intention among individuals who have no previous experience with PASs and if usage intention is then related to WOM communication. In line with previous literature (Madigan *et al.*, 2017; Bernhard *et al.*, 2020; Nordhoff *et al.*, 2021), our results indicate that respondents with higher levels of performance expectancy have a higher PAS usage intention, implying that potential users who may have witnessed that the PAS safely connects key campus locations find the technology useful and, consequently, are more likely to use it. Our results also indicate that the relationship between effort expectancy and usage intention is negative, but not significant. Extant research focused on individuals who have previous experience riding autonomous shuttles shows either a negative (Bernhard *et al.*, 2020; Rombaut *et al.*, 2020) or a null impact (Madigan *et al.*, 2017; Nordhoff *et al.*, 2021) of effort expectancy on the intention to use PASs.

Therefore, our findings support the studies that suggest that effort expectancy is not a key predictor of PAS usage intention. One possible explanation is that our study's participants felt unable to assess the effort required to use the PAS because they had never boarded it. Similarly, Bernhard *et al.* (2020) found that potential users feel skeptical about the ease of use of PASs, although that feeling becomes weaker after a first ride. Alternatively, this finding may also be related to the fact that PASs' potential users might not perceive that using the shuttle on campus requires any special skill (Madigan *et al.*, 2017). The presence of a safety operator is an additional possible reason for the lack of significance of the proposed relationship in the setting of the [*Anonymous University*]. Goldbach *et al.* (2022) found that effort expectancy significantly correlated with PAS usage intention only if the shuttle was fully autonomous. Their results show that when users know about the onboard operator, effort expectancy does not play a role in predicting their willingness to use the PAS.

The anticipated effect of social influence on PAS usage intention was not found to be significant. Most prior studies that deal with PAS trials conclude that if individuals perceive that their friends and family think positively about these vehicles, usage intention is higher (Madigan *et al.*, 2017; Nordhoff *et al.*, 2020). However, Goldbach *et al.* (2022) and Nordhoff *et al.* (2021) report that social influence is not a factor that affects PAS acceptance, suggesting that this relationship deserves further investigation. In an intermediate point, our data show that social influence is positively related to usage intention, but only at a 90% confidence level. A possible explanation is that the potential users who participated in our study felt their reference groups didn't know enough about PASs to have a qualified opinion since these vehicles are not widely available as a means of public transport yet.

Facilitating conditions increase usage intention among our sample, in line with Nordhoff *et al.* (2020)'s findings in a pilot project. Participants who feel they have the necessary support to start using the PAS service show a greater usage intention than those who feel that they need additional help before starting to use the shuttle. Interestingly, results from research focused on other real-life settings do not find a significant influence of facilitating conditions on willingness to use PASs (Nordhoff *et al.*, 2021). Our findings suggest that facilitating conditions appear to be most relevant in the early stages of the PAS adoption process. Our findings also suggest that people who have never used a PAS evaluate this innovative means of transportation not only for its utilitarian benefits but also for hedonic reasons. Following an early study by Madigan *et al.* (2017), who found that hedonic motivation was the strongest PAS usage intention predictor, we propose that potential users associate riding the PAS with fun and entertainment. Consistent with the literature on AV (e.g. Panagiotopoulos and Dimitrakopoulos, 2018; Zhang *et al.*, 2019; Kaye *et al.*, 2020; Paddeu *et al.*, 2020), we find that passengers' trust in the driverless shuttle is important for enhancing usage intention. Our respondents' trust perceptions are probably based on the PAS's reputation for smooth driving across the campus and lack of accidents since its launch.

Our results indicate that usage intention generates WOM, which supports previous research that examines WOM as an outcome variable in environments where users are not very familiar with the operation of a new technology (Molinillo *et al.*, 2023; Mishra *et al.*, 2022). We find that potential PAS users share information about the shuttle with others. The higher the willingness to use the PAS, the higher their intention to engage in WOM communication about it. We also find that the impact of the drivers of usage intention transfers to WOM communication among potential users, suggesting that the factors that impact the willingness to use PAS trigger discussions about these vehicles.

6. Conclusions

Building on the theoretical foundation of the UTAUT2 model (Venkatesh *et al.*, 2012), our study analyses PAS acceptance among potential users in a real setting. Our results indicate that usage intention is increased by the vehicle's performance expectancy, the existence of facilitating conditions, individuals' hedonic motivation and their trust in this technology. We also find that usage intention is positively related to PAS WOM communication. Thus, our findings offer relevant theoretical implications for research on AVs, as well as practical insights for public transport decision-makers.

6.1 Theoretical implications

This study offers several theoretical contributions. First, our results are relatively consistent with others that rely on pilot tests and analyze participants who have some experience with PASs. However, some differences are uncovered. For example, prior research focused on PAS users offers inconclusive results regarding the impact of effort expectancy on people's willingness to ride PASs (either negative or null). We find a non-significant relationship between the two variables. This suggests that previous experience can moderate the impact of the drivers of PAS usage intention. Particularly, effort expectancy might be more relevant for first-time users compared to passengers who use the service frequently. This might indicate a potential dynamic effect of effort expectancy on usage intention. Similarly, our results regarding social influence suggest that this variable stops being relevant when individuals become regular PAS users.

Second, in line with findings from other industries (Molinillo *et al.*, 2023), this study identifies a link between usage intention and WOM in the PAS context. Drivers of usage intention indirectly influence WOM intentions. Thus, our study encourages scrutiny toward

other positive outcomes of technology acceptance beyond behavioral intention, both for current users and potential users. Third, we find that usage intention fully mediates the impact of performance expectancy and facilitating conditions on WOM. We also find that usage intention partially mediates the influence of hedonic motivation and trust on WOM. Therefore, other variables beyond usage intention might mediate these partial indirect effects. Finally, our research shows the appropriateness of UTAUT-based models to analyze PAS usage intention. Researchers considering studying PAS adoption can rely on this model for future studies and they can extend it to accommodate other variables that are relevant to PAS adoption.

6.2 Practical implications

PASs are a potential solution to address the existing need to develop urban transport services that not only solve mobility problems but also ensure sustainability (Ruiz-Montañez, 2017; Mouratidis and Cobeña-Serrano, 2021). Based on our study's findings, we provide several recommendations to stakeholders involved with the sustainable development of transportation, which we organize around three aspects: the shuttle service design, marketing campaigns and WOM monitoring.

The self-driving shuttle service design needs to consider several elements. First, the service should meet the potential users' mobility needs. For example, the route layout and frequency of shuttles must be carefully established to ensure high levels of performance expectancy. Incorporating onboard staff, at least during the early stages of PAS implementation, would act as a facilitating condition and might increase usage intention. Furthermore, an onboard operator may help to increase their sense of security and therefore their trust in PASs, which would increase usage intention. Additionally, during the early stages of implementation, PAS staff should be available near the minibus stops to inform passersby who might consider boarding the shuttle for the first time.

Regarding marketing campaigns, they need to convey three important messages. First, using PASs is simple and easy and does not require any special skill. Second, using PASs is safe. Third, riding PASs is fun. These three messages appeal to the existence of facilitating conditions, trust and hedonic motivation, respectively. Companies must carefully evaluate how to disseminate such messages. Our results indicate a weak importance of social influence for PAS acceptance, which might be stronger in other implementation contexts. If so, opinion leaders could be utilized to help disseminate these messages via social media. Otherwise, mass media might be more appropriate. In addition, a key recommendation is to work to maintain high levels of customer enthusiasm regarding PASs over time, since it has been argued that the impact of hedonic motivation on usage intention will decrease when PASs become generally embedded in urban transportation (Madigan *et al.*, 2017). Campaigns based on gamification techniques may be a good option (Bucchiarone *et al.*, 2021). These tactics would also encourage positive WOM. Another possibility to increase WOM would be to develop referral marketing campaigns (e.g. to offer users free PAS tickets or small giveaways in exchange for referring new passengers to the PAS service).

6.3 Limitations and future research

This study features limitations that offer future research opportunities. First, this study employed a non-probabilistic sampling method. New research might replicate our study using a probabilistic sampling method to see if the results are representative of other populations of interest. Second, given our focus on a setting where using the PAS is free, we did not incorporate the UTAUT2 variable "price value" in our model. Further research focused on other contexts might incorporate this variable to better understand PAS usage intention. Third, our results indicate that the WOM links with trust and hedonic motivation

do not occur merely through usage intention. New studies about PAS adoption might contribute to identifying additional variables that explain these links further. Fourth, the study participants belong to Gen Z (people born between 1995 and 2010 (McKinsey & Company, 2018). Since their decision-making process might vary compared to other generational cohorts, further research could replicate our study with potential users from other generations. Finally, this study is conducted in a Western country. Given that the implementation of AVs in developing countries faces a host of unique challenges (Kumar *et al.*, 2022), future research should expand beyond countries with modern infrastructure and planned traffic.

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(The Appendix follows overleaf)

Appendix

Table A1.
UTAUT research on PAS adoption

	Independent variables						Dependent variables		
	Performance expectancy	Effort expectancy	Social influence	Facilitating conditions	Hedonic motivation	Trust	Usage intention	WOM	Sample
Bernhard *et al.* (2020)	✓	✓					✓		Pilot project users
Rombaut *et al.* (2020)	✓	✓			✓		✓		Pilot project users
Madigan *et al.* (2017)	✓	✓	✓				✓		Pilot project users
Goldbach *et al.* (2022)	✓	✓	✓			✓	✓		Potential users in a laboratory setting
Nordhoff *et al.* (2020)	✓	✓	✓	✓			✓		Pilot project users
Nordhoff *et al.* (2021)	✓	✓	✓	✓		✓	✓		Users in a real setting
Madigan *et al.* (2017)	✓	✓	✓	✓	✓		✓		Pilot project users
This study	✓	✓	✓	✓	✓	✓	✓	✓	Potential users in a real setting

Source(s): Table by authors

	Mean	Standard deviation	Excess kurtosis	Skewness
Performance expectancy ($\alpha = 0.84$; $\rho_A = 0.86$; CR = 0.9; AVE = 0.76) Adapted from Venkatesh *et al.* (2003)				
The autonomous shuttles will be a good option for my trips	4.30	1.57	−0.66	−0.07
The autonomous shuttle will allow me to move more comfortably	4.05	1.56	−0.64	0.21
Autonomous shuttle will reduce the number of accidents	3.94	1.74	−0.91	0.18
Effort expectancy ($\alpha = 0.91$; $\rho_A = 0.92$; CR = 0.94; AVE = 0.79) Adapted from Venkatesh *et al.* (2003)				
I think autonomous shuttles will be easy to use	4.67	1.36	−0.30	−0.20
Using autonomous shuttles will be easy	4.71	1.36	−0.12	−0.36
Traveling in autonomous shuttles will be easy	4.83	1.35	−0.05	−0.47
In general, I think that it will not be difficult to get around in autonomous shuttles	4.86	1.36	−0.17	−0.46
Social influence ($\alpha = 0.92$; $\rho_A = 0.92$; CR = 0.95; AVE = 0.86) Adapted from Venkatesh *et al.* (2003)				
Regarding me using autonomous shuttles in the future: My colleagues are totally against/agree with me using this means of transport	5.28	1.36	−0.29	−0.39
Regarding me using autonomous shuttles in the future: The people who are important to me are totally against/ agree with me using this means of transport	5.05	1.44	−0.06	−0.52
Regarding me using autonomous shuttles in the future: The people whose opinion I value are totally against/ agree with me using this means of transport	5.17	1.36	−0.45	−0.37
Facilitating conditions ($\alpha = 0.71$; $\rho_A = 0.73$; CR = 0.84; AVE = 0.63) Adapted from Venkatesh *et al.* (2003)				
I have the necessary knowledge to start getting around in an autonomous shuttle	3.34	1.73	−0.75	0.46
I can quickly learn to ride autonomous shuttles	5.70	1.25	0.55	−0.93
In my environment, there are people who can show me to use autonomous shuttles	2.95	1.80	−0.58	−0.67
Hedonic motivation ($\alpha = 0.86$; $\rho_A = 0.87$; CR = 0.91; AVE = 0.71) Adapted from Venkatesh *et al.* (2012)				
In the future, getting around in an autonomous shuttle will be nice	4.95	1.39	−0.55	−0.29
In the future, using an autonomous shuttle will be fun	4.86	1.50	−0.34	−0.45
In the future, autonomous shuttles will be comfortable	5.01	1.33	−0.47	−0.35
In the future, in global terms, I consider that autonomous shuttles will be a comfortable means of transport for my trips	4.76	1.49	−0.66	−0.28
Trust ($\alpha = 0.95$; $\rho_A = 0.95$; CR = 0.97; AVE = 0.90) Adapted from Choi and Ji (2015)				
The autonomous shuttle inspires me with confidence	3.82	1.59	−0.69	−0.02
The autonomous shuttle is reliable	4.07	1.43	−0.25	−0.06
I trust how the autonomous shuttle works	3.97	1.51	−0.60	−0.03
Usage intention ($\alpha = 0.76$; $\rho_A = 0.78$; CR = 0.89; AVE = 0.81) Adapted from Venkatesh *et al.* (2003)				
Using autonomous shuttles when they start to circulate in our environment will be not likely at all/very likely	4.51	1.55	−0.67	−0.22
Using autonomous shuttles for short trips whenever they are available will be not likely at all/very likely	5.18	1.53	0.02	−0.82

(*continued*)

Table A2. Model measurement

	Mean	Standard deviation	Excess kurtosis	Skewness
Word-of-mouth ($\alpha = 0.91$; $\rho_A = 0.91$; CR = 0.94; AVE = 0.84)				
Adapted from Inman and Nikolova (2017) and Fan *et al.* (2020)				
I will speak well to other people about the autonomous shuttle	4.64	1.34	0.08	−0.34
I will recommend the use of the autonomous shuttle to the university community	4.44	1.44	−0.33	−0.26
I will encourage other people to try the service	4.65	1.45	−0.25	−0.43

Note(s): All items are measured with a 7-point Likert scale anchoring strongly disagree (1) and strongly agree (7), α = Cronbach's alpha, CR = CR and AVE = Average variance extracted
Source(s): Table by authors

Table A2.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
*Fornell and Larcker's criterion**								
Performance expectancy (1)	*0.87*							
Effort expectancy (2)	0.50	*0.89*						
Social influence (3)	0.46	0.31	*0.93*					
Facilitating conditions (4)	0.32	0.31	0.30	*0.79*				
Hedonic motivation (5)	0.67	0.43	0.46	0.36	*0.84*			
Trust (6)	0.59	0.38	0.44	0.39	0.55	*0.95*		
Usage intention (7)	0.56	0.28	0.40	0.39	0.55	0.48	*0.90*	
WOM (8)	0.53	0.33	0.37	0.33	0.54	0.54	0.55	*0.92*
HTMT <0.90 criterion								
Performance expectancy (1)								
Effort expectancy (2)	0.56							
Social influence (3)	0.51	0.34						
Facilitating conditions (4)	0.40	0.38	0.37					
Hedonic motivation (5)	0.77	0.48	0.51	0.46				
Trust (6)	0.65	0.40	0.47	0.48	0.60			
Usage intention (7)	0.69	0.33	0.48	0.51	0.68	0.56		
WOM (8)	0.60	0.37	0.41	0.41	0.61	0.58	0.66	

Note(s): * Numbers on the diagonal (in italic) show the square root of the AVE; numbers below the diagonal represent construct correlations
Source(s): Table by authors

Table A3.
Discriminant validity

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Adaptation, compensation and disengagement: how ICT competences influence nascent entrepreneurs' strategies in a global crisis environment

Received 7 June 2023
Revised 14 November 2023
14 February 2024
Accepted 20 February 2024

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Abstract

Purpose – A global crisis like that caused by the COVID-19 pandemic threatens the survival of any business, but especially of nascent entrepreneurs, due to their vulnerable situation. At this stage of entrepreneurship, information and communication technology capabilities (ICTCs) are critical skills that help entrepreneurs develop their new businesses, fostering economic adaptability to counteract adverse effects. This study advances knowledge of how nascent entrepreneurs react in an environment of global crisis.

Design/methodology/approach – The study analyzes a sample of 331 Spanish nascent entrepreneurs to determine the mediating effect of ICTCs on the relationship between the impact of a global crisis (e.g. COVID-19) and the firm's strategic response.

Findings – The results suggest that crises influence adaptation and compensation strategies significantly and that ICTCs exert a total mediating effect on this relationship. The results do not, however, establish a clear relationship between the impact of the COVID-19 crisis and disengagement response, but rather a negative relationship, possibly influenced by government attempts to mitigate the pandemic's economic consequences (economic aid to maintain the workforce, financial support for business model survival).

Originality/value – The COVID-19 crisis revealed ICT as a key technology for continuing business operations. This study analyzes how ICTCs affect nascent entrepreneurs' strategies in crisis environments. Our analysis is important because these entrepreneurs have invested resources in their new project. We must determine their strategic response to crisis environments: adaptation, compensation or disengagement. The sample itself, collected during the pandemic, provides unique insights into the impact of the crisis on nascent business decisions.

Keywords Nascent entrepreneur, Adaptation, Compensation, Disengagement, Crisis

Paper type Research paper

1. Introduction

The recent COVID-19 pandemic was a new global health, social and economic crisis (Qadri *et al.*, 2021). It exemplifies how economic and disruptive crises impact many individuals, organizations and communities, frequently with large-scale global effects.

The authors thank the Conselleria of Education, Universities and Employment for financing this research through research project CIGE/2021/085.

Consent for publication: The authors hereby give their consent for the publication of this article.

Competing interests: There is no competing interests among the authors.

European Journal of Management and Business Economics
Vol. 35 No. 2, 2026
pp. 189-206
Emerald Publishing Limited
e-ISSN: 2444-8494
p-ISSN: 2444-8451
DOI 10.1108/EJMBE-06-2023-0174

The ongoing threat of invisible crises from both human and natural causes (i.e. global warming) has become society's new normal (Lee *et al.*, 2023).

Governments recognize crises' long-term consequences and implement measures to stimulate business development and employment, areas where entrepreneurship is key (Hakimi *et al.*, 2023). Factors such as entrepreneurial spirit, innovation, flexibility, self-efficacy and business resilience (among others) can significantly mitigate economic difficulties under such challenging circumstances (Korsgaard *et al.*, 2020).

Resource scarcity increases nascent entrepreneurs' vulnerability to crises (Barron *et al.*, 2012; Mayr *et al.*, 2017). We must study nascent entrepreneurs' vulnerability, as they have already invested time, work, effort and resources in their project's initial stages (Liñán and Jaén, 2020). Guo *et al.* (2020) argue, however, that crises provide a unique environment necessary for the emergence of entrepreneurial and prosperous organizations.

Dynamism, uncertainty and complexity of the business environment (including the disruptive change of the global crisis) are the main triggers of transformation in nascent entrepreneurs' strategic plans (Mhlanga and Moloi, 2020). Much research suggests that the adoption of digital technologies plays an important role in responding to crises (Guo *et al.*, 2020). The literature has studied the effect of crises on new ventures, but very few studies analyze its effect on nascent entrepreneurs (Guo *et al.*, 2020; Castro and Zermeño, 2020).

Entrepreneurs have promoted extensive use of information and communications technologies (ICTs) as a critical tool and alternative to continuing business development by counteracting the pandemic's adverse effects and promoting economic resilience (Atsuko and Karazhantva, 2020). ICT capabilities (ICTCs) are therefore essential capabilities in the incipient phase of business development.

This paper analyzes the following questions:

(1) How do nascent entrepreneurs choose their strategic responses to fight a global crisis?

(2) How might their ICTCs affect this response?

Drawing on Davidsson and Gordon (2016), we theorize that decreased opportunity confidence due to a crisis like COVID-19 produces three responses: disengagement, if decreased opportunity confidence makes other options more attractive, compensation, as increased resource inputs to restore opportunity confidence or adaptation, to make the venture idea more feasible in the new circumstances. Such responses help determine how nascent entrepreneurs handle global crises. We must also deepen our knowledge of the types of new initiatives influenced by the global crisis to consider whether they are less innovative or less growth-oriented. Our results suggest better ways to manage public aid or tax adjustments to help these entrepreneurs.

This study makes several important research contributions. First, current knowledge of entrepreneurship in times of crisis remains limited and fragmented due to a focus on a single type of crisis. We also lack understanding of entrepreneurs' weaknesses in choosing a strategy to survive in this environment.

Second, recently created firms' undergo a decision-making process involving the adoption of new strategic perspectives on change. Cortez and Johnston (2020) affirm that proactive strategic flexibility stresses effective management in situations of change in the competitive environment.

Further, correlations between ICTCs and recently created firms' responses are useful to better determine the implications of business spirit for the general socioeconomic system. Finally, our study provides more information on specific entrepreneurial attitudes that are beneficial in environments of global crisis. This information is relevant to policymakers, entrepreneurs and researchers.

2. Theoretical framework

2.1 Impact of crisis and nascent entrepreneurs' response strategies

Although "crisis" has been defined variously, most studies define it as a disruptive event that occurs unpredictably, significantly threatening the actor's (i.e. individuals', organization's and/or community's) normal functioning (Williams *et al.*, 2017). Rauch and Hulsink (2021) categorize the crises discussed in the entrepreneurship literature into different types based on two taxonomies: scope of impact and primary causes of the crisis. Each crisis is fundamentally heterogeneous, but some have common characteristics.

The recent COVID-19 crisis impacted economies globally, and all governments are trying to overcome its adverse consequences. This public health crisis has primarily slowed economic growth and affected employment, economic and social well-being (Galindo-Martín *et al.*, 2021). As one of the most significant recent crises (Alon *et al.*, 2020), the pandemic's disruptive characteristics and impact threaten the demand for products, services and performance and even question the prevailing business model (Batista Canino *et al.*, 2020; Ratten, 2021).

One significant post-pandemic change was a boost in digital change to enable online transactions. Transformational shifts toward the digital economy were clear before the pandemic but accelerated during it due to the need to conduct business online (Jamal and Budke, 2020).

According to the latest studies, new venture creation has positively affected the handling of various past crises (Heyden *et al.*, 2020). For Barba-Sánchez and Atienza-Sahuquillo (2018), the presence of entrepreneurial spirit enables societies to launch more ventures, positively impacting macroeconomic variables such as employment, development and innovation.

Nascent entrepreneurs are much more vulnerable to crises than entrepreneurs due to scarce resources (Barron *et al.*, 2012; Mayr *et al.*, 2017). The research on nascent entrepreneurs in a crisis environment voices two perspectives. One stresses nascent entrepreneurs' vulnerability due to their limited size and resources. The other confirms nascent entrepreneurs' resilience, flexibility and adaptability (Pal *et al.*, 2014; Smallbone *et al.*, 2012). The evidence supports both alternatives. The COVID-19 crisis imposed global changes on nascent entrepreneurs' operating conditions, requiring a search for opportunities to identify strategies enabling them to survive (Mhlanga and Moloi, 2020; Seetharaman, 2020).

Based on the concept of opportunity confidence developed by Dimov (2010) and analysis by Davidsson and Gordon (2016), we theorize that decreased opportunity confidence in a crisis produces three responses: disengagement, if the decrease makes other options more attractive, compensation, in increased resource inputs to restore opportunity confidence or adaptation, to make the venture idea more feasible in the new circumstances. Such responses help determine how nascent entrepreneurs cope with global crises.

Dimov (2010) introduced the notion of opportunity confidence as "nascent entrepreneurs' degree of conviction that successfully exploiting the venture idea they are pursuing is feasible" (p. 1124). Dimov found that opportunity confidence positively affects venture emergence and that, through it, entrepreneurial experience and early planning only indirectly affect venture emergence.

Arguably, nascent entrepreneurs' conviction that their venture idea is a real opportunity makes them marshal available resources to pursue the goal of creating a new business (Davidsson and Gordon, 2016).

The adaptation response is consistent with resilience. Tugade and Fredrickson (2004) define resilience as the ability effectively to adapt to and overcome difficult conditions. Masten (2001) demonstrated that business resilience is a business-wide term comprising crisis management and business continuity and represents the ability to adapt and respond rapidly to all types of risk. Resilience is commonly related to flexibility and adaptability. An adaptation strategy is defined as a pattern of behavior or actions planned by humans to meet

minimum requirements and solve problems (Putra, 2003). For Suharto (2009), adaptation strategy is a series of coping strategies, generally defined as people's ability to implement methods to overcome life problems (Kristiana *et al.*, 2021). Based on these arguments, nascent entrepreneurs could react to the negative effects of a crisis by adopting a strategy of adaptation. The more developed their project, the more strongly committed the nascent entrepreneur. Further, more resources are usually invested in the nascent stage of new ventures than in other steps.

Based on the foregoing, we propose the following hypothesis:

H1. The impact of a global crisis is positively related to nascent entrepreneurs' development of an adaptation response.

In disasters, however, nascent entrepreneurs' strategy response may be compensation (Liñán and Jaén, 2020). In new projects under ordinary conditions, nascent entrepreneurs typically focus on learning and increasing efficiency, responding to the situation by analyzing potential future challenges, changing strategies based on customer needs and increasing effort and resources to foster faster company development (Kryeziu *et al.*, 2022). For example, nascent entrepreneurs with relatively high human capital have better alternatives available and thus higher opportunity costs (Cassar, 2006). The larger the alternative compensation, the more attractive the expected reward associated with venturing (Amit *et al.*, 1995).

In a crisis environment, compensation response is based on increasing resource inputs to counteract the situation's negative impact. We thus expect the impact of a crisis to be positively related to nascent entrepreneurs' development of a compensation strategy.

Based on the foregoing, we formulate the following hypothesis:

H2. The impact of a global crisis is positively related to nascent entrepreneurs' development of a compensation response.

Finally, nascent entrepreneurs' specific vulnerability could lead them to disengage in response to crises, perhaps due to limited resources to mitigate the effects (Davidsson and Gordon, 2016). Disengagement responses are especially likely in founders whose opportunity confidence falls below a critical threshold (Gimeno *et al.*, 1997). Such situations occur when the variety of products or services is limited or when only a small market share is available and the new venture is in a very competitive sector. Similarly, de Figueiredo *et al.* (2019) demonstrate why a reduction in business scope in a crisis may be associated with a net loss for firms. We thus expect the impact of a crisis to be positively related to the disengagement response.

Based on the theoretical framework analyzed, we propose the following hypothesis:

H3. The impact of a global crisis is positively related to nascent entrepreneurs' development of a disengagement response.

2.2 ICT capabilities and nascent entrepreneurs

A crisis environment is unpredictable and highly uncertain, with widespread impact on new ventures. To respond effectively to these characteristics, various entrepreneurs have adopted new digital technologies (Modgil *et al.*, 2022; Papagiannidis *et al.*, 2020) or adapted those they already had. The COVID-19 pandemic was in fact a major accelerator of digitalization (Papagiannidis *et al.*, 2020; Zahra, 2021).

COVID-19 made ICT skills essential tools for entrepreneurs (Batista Canino *et al.*, 2020) – an alternative to combat the pandemic's adverse effects and a way to improve society and foster economic adaptability (Atsuko and Karazhantva, 2020).

Parida and Örtqvist (2015, p. 283) defined ICTC as "a firm's ability to strategically use a wide array of technologies for business purposes, ranging from basic to very sophisticated" (Mithas *et al.*, 2011; Tippins and Sohi, 2003).

Entrepreneurs can apply ICTCs via a wide range of technologies, from database programs to local area networks (Matlay and Addis, 2003). ICTCs for nascent entrepreneurs and small businesses include intranet, extranet, enterprise resource planning, supply chain management, e-commerce and other related technology applications (Kannabiran and Dharmalingam, 2012). For Nieto and Fernandez (2006), ICT reduces barriers to distant markets and helps firms find niche markets. A literature review by Parida and Örtqvist (2015) identified three key aspects of ICTC: (1) internal use (Fillis *et al.*, 2003; Levy *et al.*, 2001), (2) use for collaboration (Levy *et al.*, 2001; Sarshar and Isikdag, 2004) and (3) use for communication (Venkatraman, 1994). Our analysis of nascent entrepreneurs' abilities in this field is organized around these three issues.

The literature has documented ICTC support for adaptation of business models as one strategy used to respond to disruptive environmental change – specifically, technologies that help recently created firms identify new commercial practices (Richter, 2020). Nascent entrepreneurs' ICTCs thus respond well to the disruptions of the global crisis, the impact of which differs from changes driven by human innovation (Richter, 2020). Although some firms knew how to adapt creatively with digital technology support during the pandemic, the shift to digitalization was challenging for entrepreneurs in sectors not classified as essential (Seetharaman, 2020).

Based on the prior literature, we propose that ICTC influences the relationship between the impact of a global crisis and adaptation strategy, mediating the relationship between these variables.

H4. ICTC positively mediates the relationship between impact of a global crisis and nascent entrepreneurs' development of an adaptation strategy response.

Nascent entrepreneurs may instead implement a compensation strategy based on increased resource inputs (i.e. new human resources with ICTCs and new technology investment) to restore opportunity.

Parida and Örtqvist (2015) argue that ICTCs provide and increase external resources and enhance internal resource efficiency. These capabilities are integral to enhancing small firms' operations and performance (Nguyen *et al.*, 2015).

Expertise in ICT drives radical and incremental innovation performance in new ventures and nascent entrepreneurs. Technologically capable nascent entrepreneurs can obtain abundant, valuable information about markets and customers and thus better position the company to understand customers' needs and tailor products to those needs through improved internal processes (Polo Pena *et al.*, 2011). Because these arguments suggest various benefits associated with ICTCs, we affirm that they are important in increasing nascent entrepreneurs' investment in new resources.

Based on the foregoing, we propose the following hypothesis:

H5. ICTC positively mediates the relationship between impact of a global crisis and nascent entrepreneurs' development of a compensation strategy response.

Alternatively, Davidsson and Gordon (2016) argue that nascent entrepreneurs in a crisis environment may adopt a disengagement strategy due to limited resources. A disengagement strategy is based on decreased opportunity in the new venture when the items offered are scarce or the sector is very competitive. Haeussler *et al.* (2012) also argue that developing and using ICTCs can be complex, uncertain, costly and time-consuming for nascent entrepreneurs. Following Parida and Örtqvist (2015), we argue that this relationship depends largely on the type of investment and cost of new technologies in the crisis

environment, even though previous studies have observed a positive effect of ICTCs on innovation performance. Following Guerrero *et al.* (2023), the quality of ICT infrastructure and capabilities can significantly enhance nascent entrepreneurs' growth aspirations and limit their search for new opportunities in the context of global crises and in regional and local environments. Based on the foregoing, we argue that ICTCs could be used in a crisis environment to lead a disengagement response.

H6. ICTC inversely mediates the relationship between impact of a global crisis and nascent entrepreneurs' development of a disengagement strategy response.

Figure 1 presents our analysis.

3. Methodology

To test our hypothesis, we used the GEM-COVID study conducted by the GEM Spain Network (Batista Canino *et al.*, 2020) because this global crisis was unprecedented due to its rapidly changing pace and impact.

Our questionnaire was sent on April 20–30, 2020. It sought to analyze the impact of the COVID-19 crisis on the entrepreneurial fabric. The survey was completed by 4,000 entrepreneurs in Spain. We analyzed nascent entrepreneurs, defined as those who had actively devoted resources to starting a business but not yet paid wages or salaries for three months (including to themselves) (Neira *et al.*, 2021). The number of nascent entrepreneurs was 331, with an approximate response rate of 8.3% (for the full sample). Following Gem Spain (Neira *et al.*, 2021), we confirm that 2.4% of the total adult population in Spain are nascent entrepreneurs.

Despite seeming low, this rate is satisfactory. For Camelo *et al.* (2004), the rate of collaboration between university research and new ventures in Spain is low. The number of responses is also satisfactory, above the minimum threshold required to apply structural equation methodology and test the measurement scales' psychometric properties (Spector, 1992; Williams *et al.*, 2004).

To reduce common method bias (Podsakoff *et al.*, 2003), the questionnaire highlighted the study's commitment to complete confidentiality of responses.

The structural equations methodology was used to analyze the data with the partial least squares (PLS-SEM) technique (Fornell and Cha, 1994) and SmartPLS 3.0 software (Ringle *et al.*, 2015). The PLS model chosen is noted for its advantages in studying human behavior (Hair *et al.*, 2011), optimal predictive potential (Cepeda and Roldán, 2008; Poon and Tung, 2022) and suitability for small samples (Hair *et al.*, 2011).

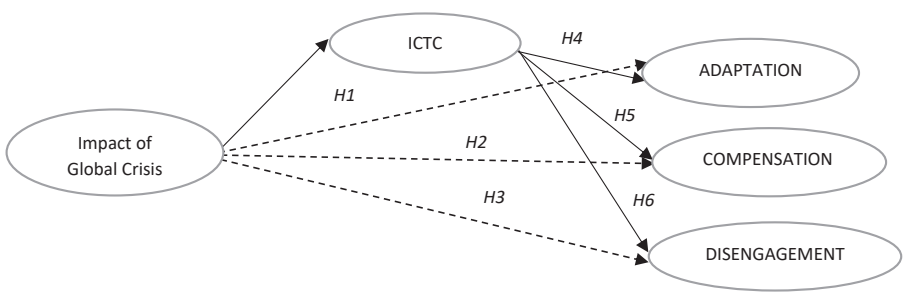

Figure 1.
Relationship between crisis impact and nascent entrepreneurs' response

Source(s): Own elaboration

Analysis of the sample's sociodemographic characteristics shows that 51.66% of respondents were men and 84.59% were under 50 years old. These data are consistent with the profile of nascent entrepreneurs in the GEM Spain report (Neira *et al.*, 2021).

3.1 Measures used

COVID-19 impact: Scales developed by Batista Canino *et al.* (2020) and Adžić and Al-Mansour (2021). The items composing this variable assess the impact of the COVID-19 crisis on nascent entrepreneurs' business models, demand for products and services and performance. Following Ventura and Satorra (2015), we adapted the evaluations provided to a Likert scale.

ICTC: The measurement of this item was adapted from the scale validated by Parida and Örtqvist (2015). Respondents were asked to evaluate the degree of utility for developing their businesses obtained from the digital tools available to them at the beginning of the pandemic, thus analyzing nascent entrepreneurs' ICTC situation when facing the impact of COVID-19. Following Ventura and Satorra (2015), the evaluations were adapted to a Likert scale.

Strategy responses: Based on Davidsson and Gordon (2016), we measured the various responses, considering the following items:

(1) *Adaptation:* Adapted from Dahlqvist and Wiklund's (2012) scale of nascent venture contexts and expanded to cover four forms of novelty: (1) product or service, (2) promotion or selling, (3) production or sourcing and (4) target market or customers.

(2) *Compensation:* Measured through an increase in work effort and investment in technology and other assets, considering increasing resource inputs to counteract the negative impact of the crisis.

(3) *Disengagement:* Scale adapted to measure responses related to closing or transferring the new venture.

All measures were captured on a Likert scale ranging from 1 to 5 (1 = Very unlikely, 5 = Very likely). All responses were measured during the pandemic period to assess the crisis' impact on nascent entrepreneurs' strategies.

For items used to measure the variables analyzed, see Appendix 1.

4. Results

Table 1 presents the results of the descriptive analysis of the data and the correlation matrix. We observe a good association between the model variables used.

After data collection, we validated the measurement instruments through exploratory analysis of reliability and dimensionality (Anderson and Gerbing, 1988).

We used the structural equations method to analyze the data, with the PLS-SEM technique (Fornell and Cha, 1994) and SmartPLS 3.0 software (Ringle *et al.*, 2015). Various

	Mean	s.d	1	2	3	4	5
Impact of COVID-19 (1)	2.42	0.77	1				
ICTC (2)	3.45	1.54	0.50***	1			
Adaptation (3)	2.38	1.36	0.17***	0.24***	1		
Compensation (4)	1.77	1.26	0.22***	0.27***	0.66***	1	
Disengagement (5)	1.50	1.27	−0.16***	−0.17***	0.34***	0.23***	1

Note(s): $N = 331$ Note: *$p < 0.05$; **$p < 0.01$ and ***$p < 0.001$
Source(s): Own elaboration

Table 1. Correlation among the variables analyzed

characteristics of PLS-SEM led to increased use by researchers in areas such as management, market research and strategy (Gruber *et al.*, 2010).

Next, we analyzed the measurement model's validity and reliability to confirm whether the manifest variables measured the different theoretical concepts accurately.

To evaluate the individual reliability of the items, we measured the loadings (λ) of the indicators on their respective constructs (Carmines and Zeller, 1979). Moreover, the average variance extracted (AVE) was above 0.50 for all constructs (Fornell and Larcker, 1981). Table 2 displays the information obtained from analyzing the variables.

Next, we used the heterotrait-monotrait ratio to confirm discriminant validity (Henseler *et al.*, 2015). Table 3 displays the information on discriminant validity.

In evaluating the variance of the dependent latent variables explained by the constructs that predict them (R^2), we observed that it was greater than 0.1 (Falk and Miller, 1992). In analyzing the size of R^2 as a criterion of predictive relevance, we also applied the sampling reuse technique proposed by Stone (1974) and Geisser (1975). Finally, we applied a bootstrapping procedure to evaluate the significance of the structural relationships.

Table 4 presents the results for the interaction of the mediating effect of the variable impact of the COVID-19 crisis, measured as follows: First, we assessed the Direct Model (I), which analyzes the relationship between the impact of COVID-19 on adaptation, compensation and disengagement to validate H1, H2 and H3. Second, the Mediation Model (II) shows the variable ICTC's effect on validating H4.

		Factor loading	CA	CR	AVE
Impact of COVID-19	IC1	0.74	0.70	0.82	0.61
	IC2	0.80			
	IC 3	0.77			
ICTC	I1	0.90	0.70	0.78	0.64
	I2	0.70			
Adaptation	A1	0.89	0.83	0.88	0.66
	A2	0.93			
	A3	0.91			
Compensation	C1	0.89	0.78	0.90	0.82
	C2	0.91			
Disengagement	D1	0.79	0.7	0.83	0.71
	D2	0.88			

Table 2.
Analysis of measurement model variables

Note(s): *$p < 0.05$; **$p < 0.01$ and ***$p < 0.001$ $N = 331$; Cronbach's alpha coefficient (α) and composite reliability (CR), take values above the required threshold of 0.7
Source: Own elaboration; Nunnally (1978), Fornell and Larcker (1981), Hair *et al.* (2011)

	1	2	3	4	5
Adaptation	0.817				
Compensation	0.692	0.906			
Disengagement	0.257	0.233	1		
Impact of COVID-19	0.225	0.229	−0.235	0.779	
ICTC	0.284	0.295	−0.158	0.522	0.801

Table 3.
Discriminant validity

Note(s): $N = 331$
Source(s): Own elaboration

	Direct Model I		Mediation Model II	
	Standardized beta	*t*-value bootstrap	Standardized beta	*t*-value bootstrap
Impact COVID-19 – Adaptation	0.25	5.57***	0.10	1.48
Impact COVID-19 – Compensation	0.24	4.42***	0.10	1.32
Impact COVID-19 – Disengagement	−0.25	4.45***	−0.21	3.40***
Impact COVID-19 crisis – ICTC			0.52	13.04***
ICTC – Adaptation			0.23	3.66***
ICTC – Compensation			0.24	3.53***
ICTC – Disengagement			−0.04	0.77
R^2 (Adaptation)	0.05		0.08	
R^2 (Compensation)	0.05		0.09	
R^2 (Disengagement)	0.06		0.05	
R^2 (ICTC)			0.27	
Q^2 (Adaptation)	0.03		0.05	
Q^2 (Compensation)	0.04		0.07	
Q^2 (Disengagement)	0.06		0.05	
Q^2 (ICTC)			0.17	

Note(s): $N = 331$ Note: *$p < 0.05$; **$p < 0.01$ and ***$p < 0.001$
Source(s): Own elaboration

Table 4.
Analysis of mediating interaction effect

In the first model (Direct Model I), the data are significantly related to the impact of COVID-19 on adaptation and compensation strategy responses ($\beta = 0.25$ and $\beta = 0.24$, respectively; $p < 0.01$). The relationship between the impact of COVID-19 and disengagement responses, however, is inverse ($\beta = -0.25$; $p < 0.01$), indicating that a high impact of the global crisis on nascent entrepreneurs' projects can produce strategy responses that increase resource inputs to restore opportunity confidence or reorient the project. The greater impact of the COVID-19 crisis is not positively related to the disengagement response; however, possibly due to government attempts to mitigate the pandemic's economic consequences (economic aid to maintain the workforce, financial support for business model survival). These entrepreneurs may also have adopted a "wait-and-see" response (Stephan *et al.*, 2022) to the uncertainty the crisis created. This information supports H1 and H2, but not H3.

To confirm H4, H5 and H6, we follow the analysis in Baron and Kenny (1986). First, the independent variable must affect the dependent variable significantly. Second, the independent variable must affect the mediating variable significantly and the mediating variable must affect the dependent variable significantly.

The Mediation Model (II) confirms the fulfillment of this condition for adaptation and compensation strategy responses only. We find no mediation effect for the disengagement strategy response.

In the first situation, the relationship between the impact of COVID-19 and ICTC is positive and significant ($\beta = 0.52$; $p < 0.001$), as are the relationships of ICTC to adaptation and compensation responses ($\beta = 0.23$ and $\beta = 0.24$; $p < 0.001$). The relationships between the impact of COVID-19 and these variables are not, however, significant ($\beta = 0.10$ in both cases).

The results for disengagement response show that it is not significantly related to ICTC ($\beta = -0.04$). The relationship between the impact of COVID-19 and disengagement response, however, is negative and significant ($\beta = -0.21$; $p < 0.001$).

Finally, this study analyzes the significance of the indirect effect, following the analysis by Preacher and Hayes (2008), as the Sobel test (1982) is not appropriate for either small samples

or standardized coefficients. This analysis yields a t-value >2.58 in the first case, confirming a significant indirect effect and indicating total mediation for adaptation and compensation responses. Calculating the influence of the independent variable on the dependent variable confirms that the latter ceases to be significant (t-value <2.58) and that mediation is total according to this criterion.

The disengagement response shows no mediating effect, indicating that ICTC is not a crucial resource in such a strategic response. The disengagement response is especially likely to affect founders whose opportunity confidence falls below a critical threshold (Gimeno *et al.*, 1997; Davidsson and Gordon, 2016). Based on the data from this second model, we support H4 and H5, but reject H6.

Finally, the proposed model presents a good fit according to most indicators considered.

5. Discussion

This study analyzes how an environment of global crisis influences entrepreneurs' strategic responses, given their influence on the development of the economy and employment.

To understand how the pandemic crisis influenced nascent entrepreneurs' strategies, this study analyzes the types of responses with which these entrepreneurs face the situation: adaptation, compensation or disengagement (Davidsson and Gordon, 2016). Since the COVID-19 crisis revealed ICT as a key technology in continuing business operations, we also analyze how ICTCs affect nascent entrepreneurs' strategies. Moreover, the sample, collected during the pandemic, provides unique information on the recent impact of an economic crisis on nascent entrepreneurial decisions.

The results show a positive relationship between the impact of crises on compensation and adaptation strategies, with a similar and significant effect on both strategies. The results do not, however, establish a clear relationship between crisis impact and disengagement response, but rather a negative relationship, possibly influenced by government attempts to mitigate the economic consequences of a crisis like the COVID-19 pandemic (economic aid to maintain the workforce, financial support for business model survival).

Another reason for this effect could be nascent entrepreneurs' being in an early stage of the business life cycle, a more flexible and adaptable (product or service) stage that tends not to disengage in a crisis environment. This result supports studies confirming that resilience and flexibility are the most important qualities for nascent entrepreneurs in uncertain environments (Williams *et al.*, 2017).

Other authors argue that entrepreneurial agility as a mechanism of resilience is not the only possible crisis response (Klyver and Nielsen, 2021). Analyzing threat-rigidity theory, Staw *et al.* (1981) suggest that entrepreneurs in crises focus more internally on the business and conserve their resources, considering only a narrow set of actions. Rather than adapt, entrepreneurs show more rigidity and adopt a "wait-and-see" attitude. This "low agility approach" could enable entrepreneurs to preserve opportunity and confidence in adversity. Low agility can also mitigate the impact of a crisis on entrepreneurial flexibility by preventing entrepreneurs from trying to adapt to an uncertain and ever-changing situation (Stephan *et al.*, 2022).

The results obtained also show that ICTC fully mediates the relationship between the impact of crises on compensation and adaptation strategy responses. This result suggests that nascent entrepreneurs use their ICTCs to perform the abovementioned strategy responses. The findings also help demonstrate ICTCs' importance as a key instrument for competing in a post-crisis environment, highlighting the importance of ICTCs and resources.

ICTCs not only affect such areas as efficiency through more efficient communications or reductions in production costs but also they create new entrepreneurial opportunities for nascent entrepreneurs, for example, by enabling expansion into new markets and new ways

to create and capture value, generating new business models (Bertschek *et al.*, 2023). Research shows that nascent entrepreneurs who develop ICTCs recognize and exploit emerging opportunities differently from others (Kreuzer *et al.*, 2022). ICTCs also increase nascent entrepreneurs' flexibility to react to unknown situations, challenges and opportunities. Adaptability through reprogramming and scalability makes it easy to adjust products, services, internal processes and business models to new situations (Lyytinen *et al.*, 2016). Similarly, research from economic and financial crises shows that highly digitalized firms are more flexible, better able to implement process innovation and maintain high-level productivity throughout the crisis (Bertschek *et al.*, 2019) and thus more resilient.

Finally, ICTCs do not mediate the relationship between the impact of COVID-19 and disengagement responses.

6. Conclusions

Our results show that the sample analyzed seems more confident when facing a crisis and more inclined to decision-making related to product/service adaptation or increased work effort than to disengagement responses.

These results support Nassif *et al.* (2020), who argued that some nascent entrepreneurs are more persistent and resilient than others (Hoang and Gimeno, 2010; Bullough *et al.*, 2014). These factors could explain their survival and ability to overcome obstacles by responding positively to crises. Some analyses of resilience have found it to be associated with greater flexibility and adaptability in business founders who have survived difficult circumstances through intelligent, economic and adaptive strategies and tactics (Sarasvathy *et al.*, 2008).

According to the effectuation logic decision-making approach (Sarasvathy, 2001), nascent entrepreneurs react to crises, since effectuation uses the means available in the environment to improve the robustness of the business model. Effectuation uses flexibility and experimentation to create new opportunities, products and markets (Sarasvathy, 2001; Sarasvathy *et al.*, 2008). Similarly, our findings suggest that some nascent entrepreneurs perceive crises as a challenge in searching for new opportunities and generate a decision-making process that involves the adoption of new strategic perspectives on change. These strategies are based on nascent entrepreneurs' responses (compensation, adaptation and disengagement) to an uncertain situation, and ICTCs play a significant role in facilitating both a compensation strategy response and adaptation.

7. Implications for theory and practice

These reflections have implications for nascent entrepreneurs. They provide information on how these entrepreneurs continually search for and adapt to new opportunities in complex environments, such as those caused by the pandemic and aggravated by resource scarcity (Nassif *et al.*, 2020). Disruptive changes in the environment also generate new business models and ways of competing in the market. Crises accentuate the firm's need for strategic adaptation through innovation in the redesign of existing products, new product design, alternative digital services and the search for new distribution channels.

A disruptive situation like COVID-19 presents an opportunity to improve policy systems and implement new public support through business incubators and startup support programs. Our results suggest that such public spending would be justified, especially for nascent ventures.

Moreover, our study findings highlight the need to establish policies to support nascent entrepreneurship, promote new technology adoption in recently created firms and facilitate the acquisition of digital skills. Digital skills help nascent entrepreneurs adapt their strategies

faster than they would with other resources and with less associated cost. It is thus important to include these strategies in entrepreneurial learning to improve nascent entrepreneurs' adoption of digital technologies.

8. Limitations and future research

Although this study advances understanding of the entrepreneurial fabric's adaptation capability in uncertain situations like those caused by COVID-19, tackling additional questions could extend our results. As this study focuses on nascent entrepreneurs, further research must be performed on small businesses and other types of firms, such as SMEs and large firms. Future studies could also analyze which type of founder is most likely to show which response. A second line, due to our focus on nascent entrepreneurs in Spain, could analyze different countries' entrepreneurial fabric as well as the influence of culture and education. Finally, advanced analysis could compare the data obtained with different types of crises in the entrepreneurship literature to determine similarities and differences.

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(The Appendix follows overleaf)

Appendix

Table A1.
Items used to measured variables analyzed

Variable	Item
Impact of COVID-19:	
Effect of COVID-19 on nascent entrepreneurs' activity	– Continue working in person – Continue teleworking – Closed temporarily due to an administrative decision – Closed temporarily although I am authorized to continue activity – Closed permanently – Transferred it
Has the effect on access to financing been affected by the health crisis?	– Yes – No, we continue to receive the financing planned – Our financial resources have increased – We did not have any type of financing planned
Has the demand for your products/services been affected during lockdown?	– Increased considerably – Increased slightly – Remained constant – Significantly reduced – No demand because my business remains completely closed
ICTCs	
Technological media used in the new venture during the pandemic	– Video conferencing – Cloud file sharing platforms – Virtual internal network – Same technology as in the face-to-face situation – Others
Degree of digitalization in during the COVID-19 pandemic	– Yes, it has been decisive – No
The extent to which the crisis once over will	
Strategy response – Adaptation Affect your business plans	– Launch new products/services – Enter new markets – Work with new clients
Strategy response – Compensation Affect your business plans	– Hire new employees – Invest in infrastructure/technology/other investments
Strategy response – Disengagement Affect your business plans	– Reduce staff – Close or transfer the activity – Change our main activity

Source(s): Own elaboration based on Batista Canino *et al.* (2020)

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Twitter's capacity to forecast tourism demand: the case of way of Saint James

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Received 12 September 2023
Revised 9 January 2024
10 February 2024
20 February 2024
Accepted 20 February 2024

Abstract

Purpose – Radical changes in consumer habits induced by the coronavirus disease (COVID-19) pandemic suggest that the usual demand forecasting techniques based on historical series are questionable. This is particularly true for hospitality demand, which has been dramatically affected by the pandemic. Accordingly, we investigate the suitability of tourists' activity on Twitter as a predictor of hospitality demand in the Way of Saint James – an important pilgrimage tourism destination.

Design/methodology/approach – This study compares the predictive performance of the seasonal autoregressive integrated moving average (SARIMA) time-series model with that of the SARIMA with an exogenous variables (SARIMAX) model to forecast hotel tourism demand. For this, 110,456 tweets posted on Twitter between January 2018 and September 2022 are used as exogenous variables.

Findings – The results confirm that the predictions of traditional time-series models for tourist demand can be significantly improved by including tourist activity on Twitter. Twitter data could be an effective tool for improving the forecasting accuracy of tourism demand in real-time, which has relevant implications for tourism management. This study also provides a better understanding of tourists' digital footprints in pilgrimage tourism.

Originality/value – This study contributes to the scarce literature on the digitalisation of pilgrimage tourism and forecasting hotel demand using a new methodological framework based on Twitter user-generated content. This can enable hospitality industry practitioners to convert social media data into relevant information for hospitality management.

Keywords Hotel demand forecasting, Social media, Big data, Twitter, Pilgrimage tourism

Paper type Research paper

1. Introduction

Research on the use of social media and social networking sites in hospitality and tourism has proliferated in recent years (Buhalis *et al.*, 2017; Jamil *et al.*, 2023; Kozak *et al.*, 2018; Leung *et al.*, 2021; Sigala, 2015). Social media information enables the analysis of user behaviour

Funding: This work was supported by the National University of Distance Education (Spain) under Grant [BICI N.3, October 21, 2019].

European Journal of Management and Business Economics
Vol. 35 No. 2, 2026
pp. 207-224
Emerald Publishing Limited
e-ISSN: 2444-8494
p-ISSN: 2444-8451
DOI 10.1108/EJMBE-09-2023-0295

(Bigne *et al.*, 2016; Küster Boluda *et al.*, 2024; Navío-Marco *et al.*, 2018; Payntar *et al.*, 2021), accelerates the knowledge transfer process, provides a direct link between users and knowledge (Abdollahi *et al.*, 2023; Rita *et al.*, 2022) and helps analyse the relationship between brand equity and social media intensity (Stojanovic *et al.*, 2018).

Lately, it has been used as a data source for estimating tourism demand in a very incipient way. Li *et al.* (2021), in their review of tourism and hospitality forecasting research using Internet data, have identified only ten studies adopting social media data for forecasting. Since then, studies using social media data to improve predictions in the field of tourism have been increasing (e.g. Hu *et al.*, 2022; Li *et al.*, 2022; Sulong *et al.*, 2022). Regarding Twitter, Bigné *et al.* (2019) have extracted important relevant information from this application to determine how destination marketing organisation (DMO) activities on Twitter affect hotel occupancy forecasting.

Assaf *et al.* (2022), in their investigation to establish an expert-informed agenda for future research on tourism after COVID-19, have considered forecasting an area in which to progress, including the use of scenario forecasts using judgemental and econometric methods based on big data, tourism portals and social media. Several scholars have observed that during and after the pandemic, tourist demand was seriously impacted and the traditional methods of forecasting in these industries have become obsolete (Song and Li, 2021; Utkarsh and Sigala, 2021). Researchers have now begun to seek the best methods to predict the recovery of tourism from the devastating effects of COVID-19 (Polyzos *et al.*, 2020; Zhang *et al.*, 2021).

The relationship between tourism and pilgrimages has been studied in a fragmentary manner (Caber *et al.*, 2021), despite the growing economic importance of this kind of tourism [1]. While motivations and experiences have been analysed (Terzidou *et al.*, 2018), limited attention has been paid to behaviour on online platforms and digital devices (de Ascaniis *et al.*, 2019).

Accordingly, this study aims to fill the gap in the scarce literature on pilgrims' use of social networks and the suitability of user-generated data for accurately predicting hotel demand. The contribution of this research is threefold. First, it evaluates Twitter as a tool for predicting demand – in this case, for pilgrimage tourism to "the Way" – and provides insights into the time lag between tweets and demand manifestation. Second, it sheds light on the changes in hospitality demand and explores new forecasting approaches for estimating tourism demand during tumultuous times. Additionally, it provides new data on the digital footprint of pilgrimage tourism, an area where research is also very scarce.

As a research question, this study examines how hotel demand at a tourist destination can be accurately predicted using Twitter data. Particularly, this study analyses an international destination of special interest for pilgrimage tourism, namely, Santiago de Compostela, Spain. Accordingly, we assess the predictive performance of the seasonal autoregressive integrated moving average (SARIMA) time-series model with and without including the Twitter activity of pilgrims, considering the lagged effect of Twitter data and external factors, such as the Jubilee year in Santiago de Compostela. Accordingly, this study predicts tourism demand from January 2018 to September 2022 (using 110,456 tweets posted).

The remainder of this study is structured as follows: Section 2 briefly reviews the literature on techniques for forecasting tourism demand, use of social network data for forecasting and digital footprint of pilgrimage tourism. Section 3 presents the empirical analysis, including descriptions of the data and methodology. Section 4 presents and discusses the results. Finally, Section 5 presents the conclusion, major theoretical and managerial implications, study limitations and new avenues for future research.

2. Literature review

2.1 Tourism demand forecasting

Demand forecasting is essential for the hospitality and tourism sectors because of the transient nature of tourism. Therefore, growing interest in tourism demand forecasting is

reflected in the literature. Several studies have assessed the performance of different sources of big data generated on the internet for forecasting tourism demand (Li *et al.*, 2021; Mariani and Baggio, 2022; Stylos *et al.*, 2021).

Tourism demand forecasting studies have predominantly applied time-series and econometric models. The most popular time-series analysis methods are autoregressive with exogenous variables (ARX) (Choi and Varian, 2012; Li *et al.*, 2017), autoregressive integrated moving average (ARIMA) (Artola *et al.*, 2015; Li *et al.*, 2018), SARIMA (Qiu *et al.*, 2021; Wickramasinghe and Ratnasiri, 2021) and SARIMAX (Hu *et al.*, 2022; Park *et al.*, 2021) models. Moreover, autoregressive distributed lag (ARDL) (Husein and Kara, 2020; Li *et al.*, 2020), time-varying parameter (TVP) (Smeral and Song, 2015) and dynamic factor (DFM) (Camacho and Pacce, 2017) econometric models have also been widely employed in tourism demand forecasting.

Time-series models have maintained increasing acceptance in the literature on tourism demand forecasting studies (Huang and Zheng, 2023; Teixeira and Gunter, 2023; Wu *et al.*, 2023). This is mainly because of their ability to forecast future time series by identifying historical patterns and capturing seasonality and trends in time series (Ma *et al.*, 2023). However, in recent literature, a trend has emerged to incorporate exogenous explanatory variables into time-series models for predicting tourism demand (Hu *et al.*, 2023; Jiao and Chen, 2019; Li *et al.*, 2023a). Thus, SARIMAX models have gained importance among academics, especially after the COVID-19 pandemic. They improve the performance of pure time-series forecasting models during turbulent periods and allow the incorporation of exogenous variables with real-time information. For example, researchers have compared the performance of SARIMA models with exogenous variables using information collected from search engines (Li *et al.*, 2023b; Wickramasinghe and Ratnasiri, 2021), online news (Park *et al.*, 2021) and online reviews (Hu *et al.*, 2022; Li *et al.*, 2023a, b). The results confirm that the incorporation of this type of big data generated on the internet is useful for forecasting tourist demand for destinations or companies.

2.2 Social media as a source of prediction data

Studies have demonstrated that social media data measures people's attention and sentiments and provides real-time insights to predict consumer demand in different research areas, including economics and management. The main areas covered include the following: (a) stock market performance accurately predicted based on investors' opinions on social media (Guan *et al.*, 2022; Nofer and Hinz, 2015; Yang *et al.*, 2020), (b) transport and power demand predicted using real-time data from social media (Luna, Nunez-del-Prado, Talavera and Holguin, 2017; Punel and Ermagun, 2018; Roy *et al.*, 2021) and (c) crude oil prices predicted with social media data during periods of sharp fluctuations caused by conflicts or political instability (Elshendy *et al.*, 2017; Wu *et al.*, 2021).

Regarding Internet-structured data in tourism, search engine data (Bangwayo-Skeete and Skeete, 2015; Choi and Varian, 2012; Wu *et al.*, 2022) and web traffic data (Gunter and Önder, 2016) have been widely used to forecast tourism demand. Conversely, social media data are unstructured and require crawler tools to collect and apply big data techniques for extracting useful information from online textual data or images, thereby making them relatively less popular (Li *et al.*, 2021).

Focusing on Twitter, tourism studies have utilised this data source for sentiment analysis to identify tourist preferences and opinions on tourist services (Nadeau *et al.*, 2022; Philander and Zhong, 2016), geographic information (Chua *et al.*, 2016; Piramanayagam and Seal, 2022; Xin and MacEachren, 2020), promotion of tourist attractions (Bokunewicz and Shulman, 2017; Meehan *et al.*, 2016) and international trade show organisation (Geldres-Weiss *et al.*, 2023). However, only a few studies have analysed the usefulness of big data from Twitter to

analyse tourism demand (e.g. Bigné *et al.*, 2019; Sulong *et al.*, 2022; Yang *et al.*, 2022) and define management approaches and business responses to the COVID-19 pandemic in real-time (Chen *et al.*, 2023; Yang and Han, 2021).

Previous literature has recognised Twitter's representativeness as a concern (Beninger and Lepps, 2014), but some authors recognise its interest if a contextual interpretation is made (Tromble, 2019). Twitter data differ in nature from data collected through traditional quantitative methods, such as surveys or experiments (Chen *et al.*, 2022). Survey data are controlled and designed by researchers, while social media data can be considered organic data (Groves, 2011). The concept of organic data refers to data that are not collected following an explicit research design but documented using a technology that collects natural "digital footprints" of human activities, such as data from sensor devices, mobile applications or online social networks (Xu *et al.*, 2020).

According to Xu *et al.* (2020), the advantages of these data coexist with challenges regarding data quality that researchers must consider because of their organic nature. First, data quality is more likely to be guaranteed in surveys and experiments because researchers have more control over which participants are recruited and what questions to ask. However, the emergent nature of social media discussions offers researchers opportunities to identify new perspectives and frameworks not previously identified (Klašnja *et al.*, 2018). Although researchers have more control over the data generation process in surveys and experiments, it is expensive to collect surveys. Furthermore, organic data generated on social networks allows information to be extracted in real-time. Traditionally, hotel demand forecasts have been based solely on government statistical reports published annually or monthly (Huang *et al.*, 2017). Nevertheless, hospitality industry professionals need up-to-date information to adjust to changes in tourism demand in real-time and achieve greater efficiency in the sector.

Newness is a strength of social media data, which is especially useful for studying emerging topics. The novelty of the data brings with it a data quality challenge that requires researchers to develop methods to indirectly assess user characteristics, such as user identity and motivations. Similarly, numerous authors have indicated that the pandemic has called into question traditional forecasting methods because data from official sources with guaranteed representativeness are not available in real-time, which makes it even more interesting to explore new data sources that are open and original, as done in this study.

2.3 Pilgrimage tourism's digital footprint

Literature on the digital aspects of pilgrimage tourism is scarce, recent and focused on human mobility (Barnett *et al.*, 2016). De Ascaniis *et al.* (2019) have reviewed 13 academic papers and identified the following four themes: the adoption of information and communication technology (ICT) by religious travellers, usage and functionalities of mobile applications, online travel reviews to understand visitors' experiences at religious sites and online transmission of religious mass events. Research interest in religious tourists' behaviour on digital platforms, such as social media and social networking sites, remains incipient. Caber *et al.* (2021) have identified a few early works, such as Haq and Jackson (2009) investigating the impact of ICTs on religious tourists' perceptions and Park *et al.* (2015) surveying American participants to gauge their interest in visiting pilgrimage destinations and willingness to share their experiences on social networking sites.

"The Way" is a pilgrimage tourism destination that generates both religious and tourist interest worldwide (López *et al.*, 2017). Vila *et al.* (2020) have indicated that religious or spiritual motivation is present but interlinked with other motivations, such as heritage, culture and experience. "The Way" is an international and multiconfessional space where pilgrims and tourists interact to co-create the route's postmodern identity and personality (López and Lois González, 2020). Pilgrims in "the Way" benefit from using mobile phones

while walking (Antunes and Amaro, 2016; Nickerson *et al.*, 2014). Fernández-Poyatos *et al.* (2012) have studied the presence of "the Way" on regional tourism websites in Spain, while Vázquez *et al.* (2020) have analysed the usage and effectiveness of Facebook fan pages of institutions in Spanish regions through which the French Way of Saint James passes for tourism promotion. No other research has been conducted on social media use pertaining to this topic.

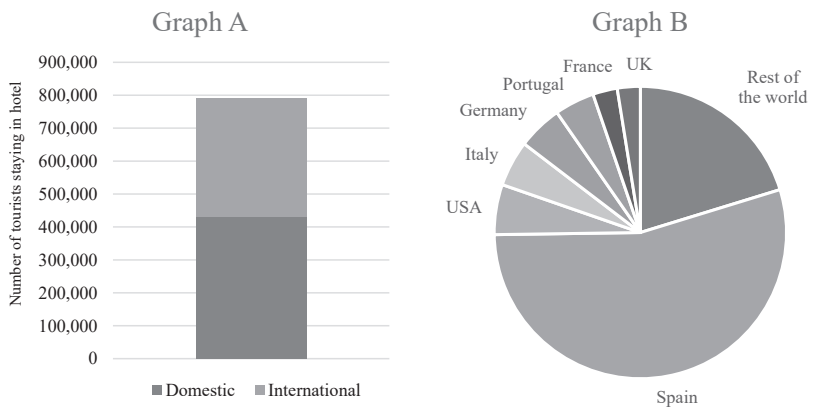
Pilgrimage tourism, gaining popularity since the COVID-19 outbreak, has demonstrated great resilience during the pandemic (Lin and Hsieh, 2022; Mittal and Sinha, 2021). As outdoor activities, pilgrimage routes can provide a safe environment and improve tourist well-being, offering an alternative to mass tourism (Lin *et al.*, 2022). Therefore, tourist destinations have used religious tourism as a key market segment to mitigate disruptions in tourism demand caused by the COVID-19 pandemic (Mittal and Sinha, 2021). In fact, pilgrimage tourism is positioned as a novel travel trend in tourism in the "new normal" (Campos *et al.*, 2022). This makes research that combines tourist demand, social media and pilgrimage tourism particularly interesting.

3. Empirical analysis

3.1 Data

Pilgrimage tourism is in a state of rejuvenation and is gaining importance among various tourism segments (Collins-Kreiner, 2020). This empirical analysis investigates the relationship between the digital footprint of pilgrims on "the Way" and hotel tourism demand for Santiago de Compostela. This is a major European pilgrimage itinerary recognised as the first European Cultural Route by the Council of Europe. Figure 1 presents the international dimensions of Santiago de Compostela as a tourist destination in 2019 (the year before the COVID-19 pandemic). Graph A reveals that foreign tourism represents 45.5% of the total hospitality demand, whereas Graph B reveals the distribution of international tourism demand by country of origin. The USA, Italy, Germany, Portugal, France and the UK generated 55.5% of international tourism demand.

Figure 2 depicts the framework used in this study to predict tourism demand in Santiago de Compostela based on big data generated on Twitter by pilgrims to the Saint James Way. It presents the data sources, data collection, model specifications and processes used in the empirical analysis.



Note(s): Data: Hotel Occupancy Survey (INE)
Source(s): Figure by authors

Figure 1.
Volume and distribution of tourism demand in Santiago de Compostela in 2019 (pre-COVID-19)

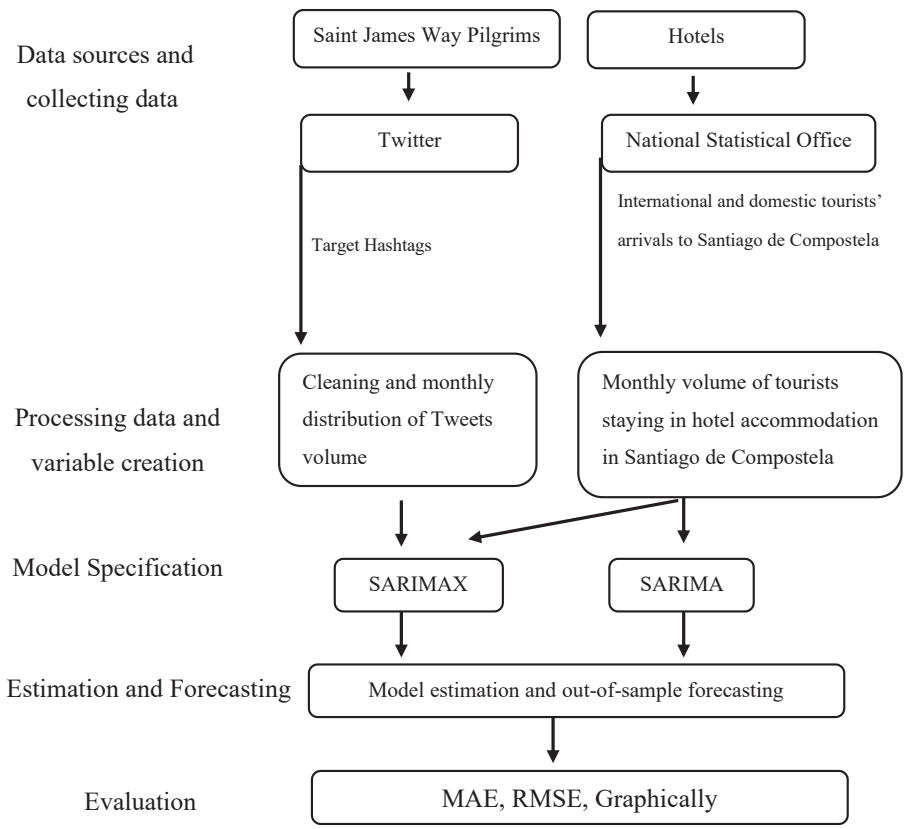


Figure 2.
Framework for tourism demand predictions based on Twitter data

Source(s): Figure by authors

As shown in Figure 2, the tourism demand for Santiago de Compostela is measured using the total number of tourists staying in hotel accommodations (TOUR). Monthly tourist arrivals are collected from the Hotel Occupancy Survey (HOS), published by the Spanish National Statistics Institute (INE) since 1996. It provides disaggregated information on travellers by country of origin and destination (regions, provinces and tourist sites). This measure includes the total number of travellers arriving by any means of transportation and staying in an establishment that provides hotel accommodation services (hotels, aparthotels, motels, hostels, B&Bs, pensions and guesthouses).

Figure 2 shows the digital footprint of tourists on Twitter as a secondary source of data. A crawler created with the programming language Python is used to extract the digital footprints of tourists on Twitter. Specifically, a script is designed to collate tweets posted with target hashtags using Twitter API V2. As Santiago de Compostela is an international pilgrimage destination, the decision to use hashtags was supported by an exhaustive search for hashtags related to tourism. Previous literature has supported the idea that the use of hashtags on Twitter is a powerful and helpful source of data (Geldres-Weiss *et al.*, 2023; Wang *et al.*, 2016). According to Carvache-Franco *et al.* (2023), using hashtags to gather information is advantageous because it allows the concentration of users' opinions on a specific topic. Although the use of hashtags may exclude some data, it also helps avoid irrelevant data.

Twitter is a massive platform with a large amount of noisy and irrelevant data. Using hashtags helps categorise topics, making it easier to identify users who are talking about the same topic (Bruns and Burgess, 2011). Using hashtags also allows us to filter this noise and focus on the data most relevant to our study.

All hashtags included in tweets published during the study period that contained the key search "Santiago de Compostela" were identified. By comparing the most repeated hashtags related to tourism for this destination, the following categories were identified:

(1) "Saint James Way",

(2) "Pilgrims" and "Pilgrimage" and

(3) "Xacobeo" and "Jacobeo".

We excluded hashtags related to "Pilgrims" and "Pilgrimage" because they could include tweets pertaining to other pilgrimage destinations. However, tweets pertaining to St. James Way and Xacobeo were exclusive to tourism in Santiago de Compostela. Therefore, a combination of the 20 most published hashtags related to categories (1) and (3) in Spanish, English, German, French and Portuguese was selected (Table 1). These languages were selected because countries with these languages as their native languages represented 75% of hotel tourism demand in Santiago de Compostela in 2019.

After eliminating duplicate retweets, 110,456 tweets remained, based on which the monthly number of tweets was used to derive the explanatory variable – Twitter Data (TD). According to Guizzardi and Mazzocchi (2010), factors that occur at a specific moment in time, such as the Jubilee Year, can determine short- or long-term modifications in tourist flow. Therefore, a temporary dummy was created to control the effect of an extraordinary increase in tourism demand in 2021 and 2022, the Jubilee years in Santiago de Compostela (Compostela Holy Year, Xacobeo Year or Jacobeo Year). This variable takes the value of one for 2021 and 2022 and zero otherwise.

Language	Hashtag
Spanish	#CAMINODESANTIAGO
	#ELCAMINODESANTIAGO
	#BUENCAMINO
	#JACOBEO
	#XACOBEO
English	#WAYOFSTJAMES
	#THEWAYOFSAINTJAMES
	#WAYOFSAINTJAMES
	#SAINTJAMESWAY
	#SANTIAGOWAY
	#WAYOFSANTIAGO
	#WALKCAMINO
German	#JAKOBSWEG
	#DERJAKOBWEB
	#DERWEGNACHSANTIAGO
French	#CHEMINDESAINTJACQUES
	#LECHEMINDESAINTJACQUES
	#SAINTJACQUESCHEMIN
Portuguese	#OCAMINHODESANTIAGO
	#CAMINHODESANTIAGO

Source(s): Table by authors

Table 1.
Selected hashtags

3.2 Methodology

In this study, we compare two ARIMA-based forecasting models (SARIMA and SARIMAX models) to evaluate the appropriateness of using user-generated content on social media to improve the predictive capacity of time-series models in turmoil stages. In this exploratory case, we forecast monthly tourism demand for the internationally known destination of Santiago de Compostela.

The comparison of the SARIMA models in our time-series prediction methodology aligns with the goal of achieving accurate predictions, considering the specific characteristics of our dataset. We aim to capture the effects of exogenous shocks as part of the SARIMA model. To achieve this, we compare the predictive capacity of the SARIMA pure time-series forecasting and SARIMA models with exogenous variables (SARIMAX).

The SARIMA model was selected because of its various statistical advantages, supported by previous research on tourism demand forecasting (Qiu *et al.*, 2021; Song *et al.*, 2019). According to Song *et al.* (2019), the SARIMA model is the most commonly used model in tourism research because it considers the trends and/or seasonality components of a time series. Additionally, the parsimonious structure of the SARIMA models balances complexity and performance (Lama *et al.*, 2022; Saz, 2011).

The SARIMA (p,d,q) (P,D,Q) model is as follows:

$$\Phi(B^m)\phi(B)(1-B^m)^D(1-B)^d y_t = \Theta(B^m)\theta(B)\,\varepsilon_t \tag{1}$$

where y_t expresses the tourism demand at time t; the autoregressive (AR) and moving average (MA) components are represented by ϕ and θ of orders p and q, respectively; $\Phi(B^m)$ and $\Theta(B^m)$ denote the seasonal AR(P) and seasonal MA(Q) components, respectively; $(1-B)^d$ and $(1-B^m)^D$ represent the difference and seasonal difference indicators, respectively; ε_t expresses the white noise error term.

Using a linear regression, external variables can be added to the SARIMA model to create a SARIMAX model. Eq. (2) indicates that SARIMAX is a regression model with SARIMA errors where the regression is first conducted.

$$\Phi(B^m)\phi(B)(1-B^m)^D(1-B)^d y_t = \mu + \sum_{k=1}^{n}\beta^k \cdot X_t^k + \Theta(B^m)\theta(B)\,\varepsilon_t \tag{2}$$

where X_t^k is the exogenous variable at time t and β^k is the corresponding coefficient of the exogenous variable added to the parameters of the aforementioned SARIMA model described.

To validate the models and assess their respective predictive capacities, we fit the models with data from January 2018 to December 2021 and use those from January 2022 to September 2022 to test the accuracy of the predictions. To evaluate the forecast accuracy of the models, we use the following common evaluation measures from tourism and hospitality forecasting research: the mean absolute error (MAE) and root mean square error (RMSE), calculated using Eq. (3) and (4).

$$MAE = \frac{1}{N}\sum_{t=1}^{N}|\widehat{y}_t - y_t| \tag{3}$$

$$RMSE = \sqrt{\frac{1}{N}\sum_{t=1}^{N}(\widehat{y}_t - y_t)^2} \tag{4}$$

where $\widehat{y}_t$ and y_t are the predicted and actual values representing tourism demand in Santiago de Compostela, respectively.

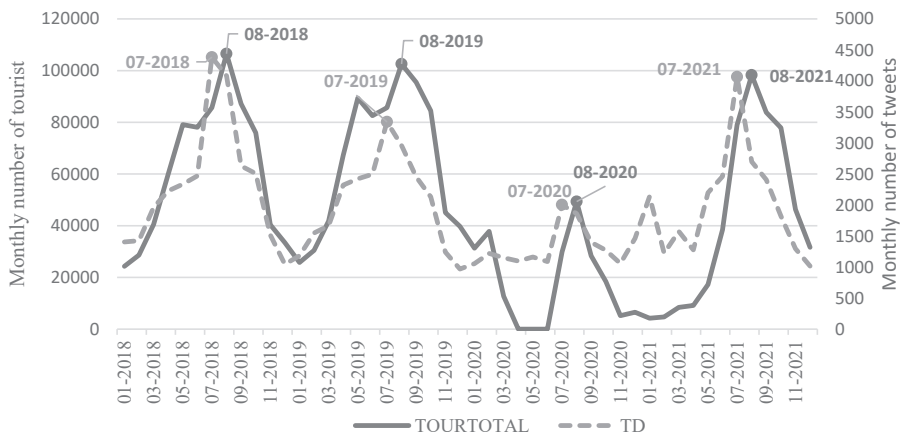
4. Results and discussion

An exploratory analysis during the fitting period reveals that the variable TD displays the same trend as the variable TOUR, which denotes the volume of tourists staying in hotels in Santiago de Compostela; however, the peaks of the former occur one month earlier than those of the latter (see Figure 3). This indicates that tourists' Twitter activity is a good predictor of hotel demand.

Tourism demand has a high seasonal component, which is adjusted according to the model specifications. The augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests confirm the presence of a unit root in the dependent and independent variables at the 1% significance level. Therefore, the first differences of all the variables are considered to ensure a stationary series. Correlograms and partial autocorrelation functions are examined to determine the appropriate order of the AR and MA components.

To analyse Twitter data's dynamic structure to forecast tourism demand, we use the Akaike information criterion (AIC) and Schwartz Bayesian information criterion (SBIC) to determine the monthly lagged distribution of the explanatory variable. The results indicate that the optimal lag length for the independent variable is two months. Additionally, the Granger causality test confirms a causal relationship between hotel demand and tourists' Twitter activity.

Table 2 presents the forecast errors of the in-sample estimation and improvement achieved in the final SARIMAX model compared to the SARIMA model [2]. The results indicate that including exogenous variables improves the SARIMA model's fit by 5.75 and 9.05% for the MAE and RMSE evaluation measures, respectively.



Note(s): Data: Hotel Occupancy Survey (INE) and Twitter
Source(s): Figure by authors

Figure 3. Volume and evolution of tourist arrivals and generated tweets in Santiago de Compostela (fitting period: Jan 2018–Dec 2021)

Evaluation metrics	SARIMA	SARIMAX	Improvement (%)
MAE	10466.18	*9864.05*	5.75
RMSE	13900.89	*12642.22*	9.05

Note(s): The values in italic indicate the model with the best evaluation metric
Source(s): Table by authors

Table 2. Estimation results for in-sample predictions of SARIMA and SARIMAX models (January 2018–December 2021)

The performance of the out-of-sample prediction summarised in Table 3 confirms a significant improvement in the SARIMAX model by 20.3 and 18.0% when using the MAE and RMSE evaluation measures, respectively. The robustness of the analysis is tested by modifying the fitting periods of the models and comparing their predictive performance after including Twitter data. This analysis confirmed the goodness of fit of the results.

Consistent with Yang and Han (2021), this study provides novel perspectives for practitioners to gain relevant hospitality business insights using social media data. Our results' alignment with those of previous studies verifies the utility of using Twitter to improve hotel demand forecasts, as in Bigné *et al.* (2019), and confirms a significant improvement in prediction accuracy, even during the pandemic, with the inclusion of new real-time data sources. Similarly, incorporating online review data improves the MAE forecast models by 2.97 and 6.19% and the RMSE between −3.41 and 7.98%, following Hu *et al.* (2022).

Moreover, our results confirm the importance of the lag structure of data sources in forecasting research, allowing tourism companies and policymakers to accurately anticipate future tourism demand. According to the results of our research, the Twitter activity of pilgrims from the previous two months can help hospitality companies predict the tourism demand for the Saint James Way.

Figures 4 and 5 illustrate the actual and predicted tourism demand for Santiago de Compostela using the SARIMA and SARIMAX models, respectively. The evaluation measures of the SARIMA model and prediction accuracy shown in Figure 4 confirm that pure autoregressive models are inefficient in forecasting tourism demand during and after the pandemic. Therefore, we propose that researchers and stakeholders use Twitter activity data to accurately predict tourism demand (see Figure 5).

Table 3.
Forecast performance of the out-of-sample predictions of SARIMA and SARIMAX models (January 2022–September 2022)

Evaluation metrics	SARIMA	SARIMAX	Improvement
MAE	9165.62	*7301.54*	20.3%
RMSE	11535.76	*9450.42*	18.0%

Note(s): The values in italic indicate the model with the best evaluation metric
Source(s): Table by authors

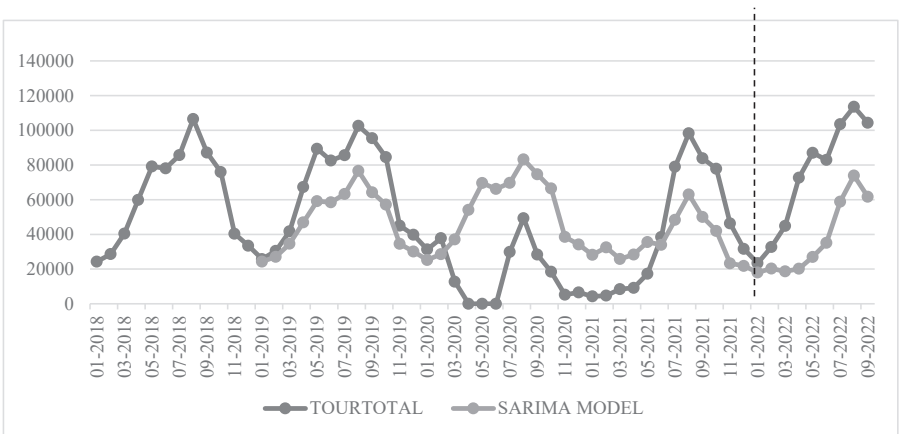
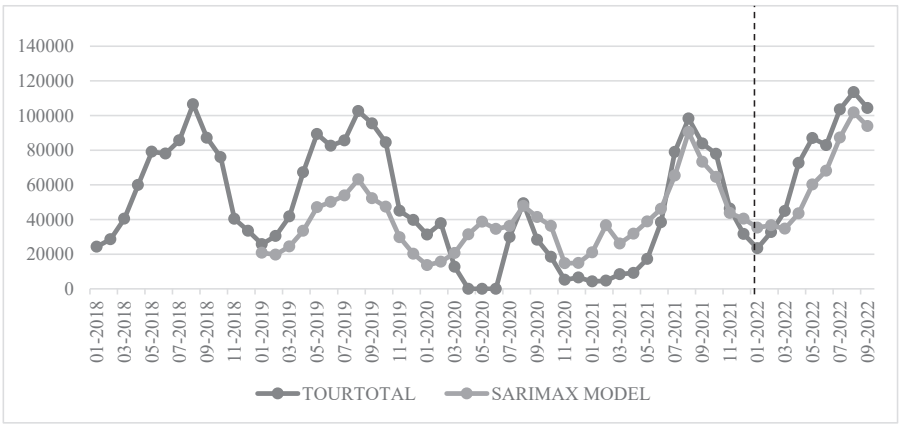


Figure 4.
Forecast of tourist demand using SARIMA model

Source(s): Figure by authors



Source(s): Figure by authors

Figure 5.
Forecast of tourist demand using SARIMAX model with Twitter data

Our findings answer the research questions and confirm our initial assumptions. With an improvement of between 18.0 and 20.3%, depending on the evaluation metric, pilgrim-generated digital content on social media can be used to improve the predictive capacity of time-series models. We agree with Zhang *et al.* (2021) in that hospitality companies' business planning, including budgeting, resource allocation and marketing, is based on demand forecasts. Consistent with Li *et al.* (2022), we avoid inaccurate predictions that could result in a supply-demand mismatch of tourism services, significantly affecting management, efficiency, productivity and the tourism sector's profitability. Therefore, this study makes a timely contribution to model development in tourism demand forecasting by proposing Twitter data as an exogenous variable to generate more accurate forecasts. Additionally, the results verify the lag-time structure of Twitter data, enabling the anticipation of changes in tourism demand during uncertain periods.

5. Conclusions

The pilgrim's footprint when walking "the Way" becomes a digital footprint in the 21st century. Our investigation contributes both to the scarce literature on digital pilgrimage tourism and research on forecasting hotel demand by proposing a new methodological framework based on user-generated content on Twitter for the case of the internationally known pilgrimage destination "the Way of Saint James".

This study demonstrates the importance of regularly refining forecasting methods using new data sources available in the digital world for effective forecasting. Thus, some theoretical implications are derived from this study. First, it improves our understanding of the usefulness of social networks, particularly Twitter, in forecasting tourism models. Second, it identifies the time lag between user information generated on Twitter and consumer demand. Third, it connects the digitalisation of pilgrimage tourists with the use of social networks and digital footprints.

We agree with Gunter and Önder (2015), suggesting that an accurate prediction of the number of tourists visiting a destination has implications for tourism management, such as sustaining tourism demand and efficient planning to accommodate tourists. This study has three primary managerial implications. First, the possibility of accurately predicting tourism demand from publicly shared information by pilgrims can improve hotel management efficiency at tourist destinations and prevent hotel oversupply or undersupply. Second, our

findings indicate that content published on Twitter during the previous two months is significant for forecasting hotel demand in Santiago de Compostela. Consistent with Huang *et al.* (2017) and Liu *et al.* (2018), the lag time structure of the data enables a better prediction of the demand and management of tourist destinations. This is because it allows the number of visitors to a destination to be known before they arrive. Finally, the COVID-19 pandemic has generated instability in tourism demand, induced by perceived health risks and government-imposed mobility restrictions, forcing managers to modify demand predictions frequently. Therefore, this study provides stakeholders with a methodological framework to accurately forecast real-time tourism demand and anticipate changes during times of crisis and instability.

In summary, Twitter offers two primary practical advantages for tourism management in Santiago de Compostela. First, it provides real-time information, which is particularly important during periods of uncertainty and volatility, such as those caused by the COVID-19 pandemic. Second, it helps accurately predict tourism demand, which can improve the tourism industry's efficiency. Therefore, this study recommends that stakeholders and decision-makers use Twitter as a new source of big data because it can serve as a leading indicator of changes in tourism demand.

This study has some limitations, the main one being its exploratory nature because it is limited to a single destination. One limitation of sampling our data using hashtags is that tweets related to elections without a hashtag would be ignored. However, the results obtained make it advisable to replicate the study in other tourism environments to observe the feasibility of using Twitter as a source for forecasting tourism demand, especially considering some of the trends found in this study are promising.

Nevertheless, the exploratory nature of this study does not detract from the relevance of its results, in which we are able to identify opportunities for Santiago de Compostela hotel demand planning. Furthermore, this study is limited to the pilgrimage destination of the Saint James Way and the results for other destinations should be cross-checked in future studies. Thus, the application of the Twitter-based forecasting method to other destinations is a clear avenue for future research.

In any case, we consider that our findings represent a step forward in the search for new forecasting methods that work even in the event of strong demand shocks, such as those caused by the COVID-19 pandemic and in understanding the relationship between social media data and pilgrimage tourism demand.

Notes

1. The United Nations World Tourism Organization estimates that 330 m people travel for religious reasons each year (https://www.unwto.org). Additionally, it is estimated that global income from religious tourism will increase from a total of $15.1 bn in 2023 to approximately $41 bn in 2033, according to the market analysis firm Future Market Insights (https://www.futuremarketinsights.com).
2. The improvement achieved using Twitter data are measured as follows:
$$Improvement = \frac{Evaluation\ Metric\ (SARIMA) - Evaluation\ Metric\ (SARIMAX)}{Evaluation\ Metric\ (SARIMA)}$$

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https://www.emerald.com/insight/2444-8494.htm

The dark side of co-worker friendship in the restaurant context: roles of gender and promotion focus

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Received 19 May 2023
Revised 4 January 2024
24 February 2024
Accepted 18 March 2024

Abstract

Purpose – This paper investigates the focal role of close co-worker friendship in reducing incivility. Furthermore, this paper examines negative workplace gossip as a mediator and gender and promotion focus as moderators.

Design/methodology/approach – Using a time-lagged approach, 553 full-service restaurant front-line co-workers in Greater Cairo responded. Further, the data were analyzed using SmartPLS v.4.

Findings – Promotion focus weakened close co-workers' friendships, causing them to speak negatively about each other with other co-workers. Multi-group analysis showed that males were more likely to spread negative gossip about their close co-workers and thus were subjected to incivility-related behaviors by their co-workers.

Originality/value – This paper is an early attempt to explore the focal role of promotion focus in the full-service restaurant context. This paper adds to affective events theory (AET) with a limited understanding of explaining and predicting co-worker incivility.

Keywords Co-worker friendship, Affective event theory, Gender, Negative gossip, Promotion focus, Incivility

Paper type Research paper

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CRediT author statement: Muhammad Haroon Shoukat: Writing-Original Draft, Resources, Validation, Writing-Review & Editing; Kareem M. Selem: Data Curation, Software, Conceptualization, and Formal Analysis; Mukaram Ali Khan: Investigation, Validation, Resources, and Writing-Original Draft; Ali Elsayed Shehata: Methodology, Conceptualization, Supervision, and Project Administration.

European Journal of Management and Business Economics
Vol. 35 No. 2, 2026
pp. 225-243
Emerald Publishing Limited
e-ISSN: 2444-8494
p-ISSN: 2444-8451
DOI 10.1108/EJMBE-05-2023-0149

Introduction

Over the past 50 years, restaurant businesses have experienced significant growth (Khan *et al.*, 2023a), contributing billions of dollars to every country's global economy by employing millions of people in the restaurant network (Yadav and Dhar, 2021). International financing organizations from developing countries see investment in this sector as a viable strategy (Khan *et al.*, 2023b). However, restaurant practitioners recognize that in a highly competitive market (Selem *et al.*, 2023c). While some restaurant practitioners prioritize commercial outcomes over civilized behaviors of front-line employees, there is growing interest in creating an environmentally friendly work environment in the restaurant sector (Khan *et al.*, 2023c).

Front-line restaurant employees, particularly co-workers, are being studied for various reasons. First, the restaurant service requires constant employee-customer interaction (Ugwu *et al.*, 2022). Second, the restaurant industry is highly service-oriented, with employees' behavior changing regularly (Chen *et al.*, 2021). Co-worker friendship is an important concept that differs from other types of friendships in that it is voluntary and comprehensive (Khan *et al.*, 2023c). Hence, co-workers can establish workplace friendships, posing more interactive potential than those with individualized or highly supervised practices. The emergence of work-related problems, including problems with supervisors, leads to employees sourcing relevant support from their co-workers (Guo *et al.*, 2022), contributing to closer relationships (Ugwu *et al.*, 2022). Co-workers spend most of their time in the workplace in social discussions, where negative gossip can alter their focus (Khan *et al.*, 2023a).

In the context of co-worker friendship, gossip is a natural social phenomenon affecting people's hearts, minds, and actions (Khan *et al.*, 2023b). Gossip is an unavoidable social phenomenon affecting social settings. When two people communicate, incivility frequently arises (Khan *et al.*, 2023c), whether they are co-workers, supervisors, or customers (Ugwu *et al.*, 2022). Although empirical research on workplace incivility is expanding, the reasons behind co-worker incivility in the restaurant industry have not received much attention (Khan *et al.*, 2023b). Despite the ubiquity of unsavory behavior in the hospitality industry, workplace characteristics capable of mitigating its influence have yet to be researched. Ugwu *et al.* (2022) demonstrated that half of employees are perceived as leaving their occupations because some try to avoid troublemakers.

Despite existing studies on the moderating influence of promotion on co-worker friendship-incivility relationships (Neubert *et al.*, 2008), there is a significant gap in the literature. While previous research has highlighted the impact of a promotion-focused orientation on employee performance outcomes, particularly creativity, and willingness to assist others, it frequently overlooks the nuanced dynamics introduced by promotion focus to workplace interpersonal relationships. Our research fills this void by highlighting the potential negative impact of a promotion focus on co-worker friendships, in which individuals may prioritize personal advancement over nurturing close relationships. In addition, despite acknowledging the diversity among hotel employees (Boo *et al.*, 2013), the research landscape lacks an in-depth investigation of how gender moderates the relationship between negative gossip and co-worker incivility.

Our paper contributes to a more thorough understanding of complex workplace dynamics by introducing gender as a critical moderating factor in the co-worker friendship-incivility dynamic, paving the way for future investigations into the combined impact of promotion focus and gender on interpersonal relationships and incivility in diverse professional environments (Yadav and Dhar, 2021). The following questions are addressed in this paper: (1) To what extent does close co-worker friendship influence negative workplace gossip? (2) What role does negative workplace gossip play in developing and increasing workplace incivility? (3) To what extent does negative workplace gossip mediate the relationship between incivility and close co-worker friendship? (4) Does the relationship between co-

worker friendship and negative gossip differ depending on individual differences in promotion emphasis? (5) How does gender influence the relationship between workplace gossip and co-worker incivility?

Lastly, this paper contributes to the current knowledge on co-worker incivility influenced by negative gossip about close co-workers. First, negative gossip has rarely been discussed in other contexts. Thus, studying negative workplace gossip can predict hostile restaurant employee behavior (Ugwu *et al.*, 2022). Second, adding promotion focus and gender as moderators is the potential contribution of the study due to the increased importance of better service under the umbrella of affective events theory (AET). Accordingly, this paper adds to AET with a limited understanding of explaining and predicting co-worker incivility.

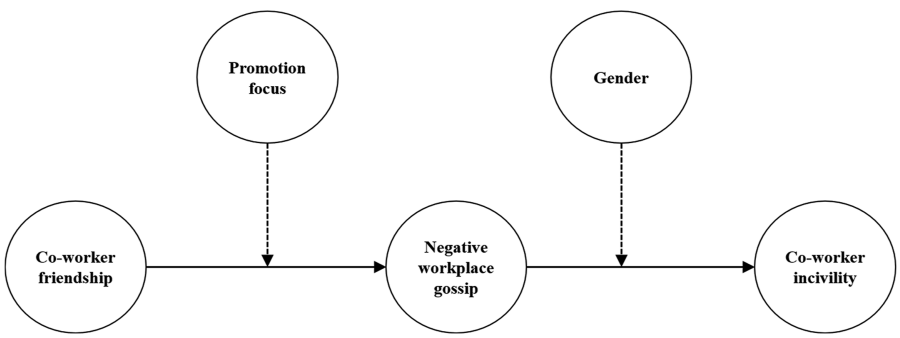
Literature review

Underpinning theories

In supporting our hypotheses, we utilized the AET introduced by Weiss and Cropanzano (1996). This theoretical framework has been previously applied in diverse contexts. While AET has been extensively employed in organizational studies to explain employee behavior, its application as a standalone theory for understanding individual behavior within the hospitality sector is relatively uncommon. AET posits that individuals' emotional states fluctuate over time, with work-related activities as immediate precursors. Moreover, it suggests that changes in a person's emotions can play a pivotal role in shaping behavioral responses (Weiss and Cropanzano, 1996). AET underscores the interplay between dispositional traits, situational factors, work-related events, and affective responses.

AET is also instrumental in examining co-worker friendship relationships and incivility in the hospitality industry (Khan *et al.*, 2023b). According to AET, the reciprocal relationship between individuals and their circumstances significantly influences their responses to events (Weiss and Cropanzano, 1996). Previous research has demonstrated that co-worker friendship can induce lifestyle changes and foster social bonding, resulting in civil behaviors (Ugwu *et al.*, 2022). In our study, Employees who are the subject of unfavorable rumors at work struggle with an unethical workplace culture and run into unethical behaviors from close co-workers. Figure 1 illustrates the proposed links in our model, aiming to elucidate how co-worker friendship influences negative gossip and incivility among close co-workers in a restaurant setting.

Even though emotions play a crucial role in AET, this paper aimed to investigate how interpersonal dynamics and work-related events might cascade into negative workplace behaviors (Khan *et al.*, 2023a). Although our study does not explicitly measure emotions, we



Source(s): Prepared by authors

Figure 1.
Proposed model

believe that emotions are intrinsically linked to the notions being studied. For example, negative workplace gossip can elicit various emotional reactions, and co-worker incivility is probably affected by the emotional states of those engaged in the workplace (Selem *et al.*, 2023c).

Co-worker friendship

Recognition of the significance of workplace relationships to organizational processes within the hospitality domain is well-established in hospitality scholarship (Ugwu *et al.*, 2022; Yang *et al.*, 2021). Co-worker friendship, a pertinent aspect of these relationships, emerges as workplace interactions between co-workers evolve into meaningful connections (Sias *et al.*, 2012). Potgieter (2019) diligently explored the initiation and progression of workplace friendships, emphasizing the impact of individual and environmental factors.

Khan *et al.* (2023c) assert that a combination of individual and environmental factors influences the development of co-worker friendships. Individual features, such as personality traits and perceived similarities, are crucial in forming these connections (Khan *et al.*, 2023a). Individuals naturally gravitate towards others with similar interests and exhibit admirable personalities (Khan *et al.*, 2023c). Furthermore, co-worker relationships often deepen when employees seek support from their colleagues during work-related challenges, fostering a more robust bond (Chen *et al.*, 2021).

This paper defines co-worker friendship based on individual characteristics (e.g. personality and perceived similarities) and environmental factors (e.g. work-life events, shared activities, and socializing). Throughout different phases of relationship formation, personal and contextual factors influence workplace friendships (Khan *et al.*, 2023a). Noteworthy elements contributing to initiating workplace relationships encompass proximity, perceived resemblance, shared tasks, personality traits, and social interactions—all relevant to this study's scope (Sias *et al.*, 2012).

Negative workplace gossip

In the absence of a third party, workplace gossip involves official and informal co-worker conversations (Sias *et al.*, 2012). Gossip is "evaluative" and maybe both positive and negative (Khan *et al.*, 2023c). A social comparison technique called gossip evaluates a person's characteristics. As a result, employees are said to utilize gossip as one of the fundamental techniques for empowering informal ties in organizations.

The severity of these informal interactions may promote or discourage cooperation inside formal work teams and across the whole business (Ugwu *et al.*, 2022). This paper focuses on negative workplace gossip since co-workers gossip negatively about each other due to the competition among them (Wu *et al.*, 2018; Potgieter, 2019). Negative workplace gossip is more about ridiculing co-workers and disrespecting their opinions through gossip.

Otherwise, negative workplace gossip can have comparable implications to victimization, such as restricting organizational achievement and sabotaging the basic psychological urge to belong (Cheng *et al.*, 2022). Employees who have been victimized often struggle to cognitively regulate their social surroundings by trusting other people (Brady *et al.*, 2017). Negative workplace gossip is an informal discourse about another co-worker who is not there.

Gossip and interpersonal friendship links are fundamental to informal organizational relationships (Khan *et al.*, 2023c). These links are vital to formal organizations since prior studies have shown that employees are more collaborative and effective when informal ties follow official contacts (Yang *et al.*, 2021). Drawing on AET, this relationship holds significant importance since negative workplace gossip is caused by negative emotions (Weiss and Cropanzano, 1996); however, negative emotions may be reduced in the presence of a co-worker's friendship. Hence, this paper proposes that:

H1. Close co-worker friendship negatively affects negative workplace gossip.

Co-worker incivility

Workplace incivility is characterized or defined as an increase in the exchange of activities between employees (Khan *et al.*, 2023c), leading to more severe behaviors like abusive behaviors, violence, noncompliance, or antisocial behaviors (Cortina *et al.*, 2001). While most examples of unproductive workplace behaviors focus on the perpetrators, research on workplace incivility focuses mainly on victims' negative job-related psychological and physical effects (Khan *et al.*, 2023c). However, research on antecedents is scarce.

Low-level interpersonal mistreatment constitutes impoliteness (Selem *et al.*, 2023a). Incivility would be at the lower end of a spectrum of psychological deviance's level or intensity if such a continuum existed (Khan *et al.*, 2023b). Accordingly, moderate-intensity hostility, such as unpleasant remarks and condescending language against a co-worker, would be considered impolite, while higher-intensity aggression would not. Cheng *et al.* (2022) argue that negative workplace gossip activates co-worker disparagement and increases stress. The AET principles can help us comprehend how an individual's internal variations of work-related event experiences (i.e. negative workplace gossip) throughout a day may potentially influence their subsequent behaviors (i.e. co-workers' incivility) (Khan *et al.*, 2023c). Hence, this paper proposes that:

H2. Negative workplace gossip positively affects co-worker incivility.

To answer the question, "How does co-worker incivility behave when friendship among front-line co-workers of a restaurant increases in the presence of negative workplace gossip?" We employed AET with various justifications to allow front-line restaurant employees to partake in workplace gossip depending on their relationships and interactions. We argue that employee behaviors are shaped by social settings, particularly those based on some event. These social situations include employee interpersonal relationships based on emotions (Khan *et al.*, 2023b). The hospitality sector is a competitive industry, and tasks are completed through interactions between people (Yang *et al.*, 2021). Employees come from various backgrounds, resulting in friendly exchange among multiple stakeholders (Ugwu *et al.*, 2022).

Co-worker friendships are established based on shared interests and lifestyles in these situations. This friendship in the hotel sector allows employees to engage with one another, and it is through this interaction that workplace gossip occurs (Chen *et al.*, 2021). Yang *et al.* (2021) argued that co-worker friendship significantly affects hotel employee behaviors. Most workplace gossip concentrates on the effect of a particular aspect of gossip on behavioral outcomes (Khan *et al.*, 2023c).

Chen *et al.* (2021) proposed that negative gossip about close co-workers has severe effects, such as undermining the fundamental psychological need to belong and encouraging co-worker incivility. According to Guo *et al.* (2022), employees subjected to gossip were less likely to have strong working connections with their co-workers and were more likely to quit their jobs. Therefore, this paper proposes that:

H3. Negative workplace gossip mediates the co-worker friendship-incivility relationship.

Promotion focus and gender as moderators

Our study hypothesizes moderating effects at two links to investigate the temporal dynamics of co-worker friendship and incivility. This choice is based on the contemporary nature of workplace processes and how different moderating factors may exert influence at various stages (Chang and Teng, 2017; Yadav and Dhar, 2021). Schabram *et al.* (2023) emphasize the importance of considering temporal variations in moderating effects within dynamic workplace settings.

Self-regulation theory can explain the relationship between promotion focus and negative workplace gossip (Higgins, 1997). Promotion-seeking individuals are motivated by aspirations for advancement. A promotion-focused mindset in co-worker friendships may lead individuals to gossip to promote their goals or gain a competitive advantage (Ferris *et al.*, 2008). According to the literature on self-regulation and workplace behaviors, promotion focus can shape interpersonal interactions, including the spread of negative workplace gossip.

Schabram *et al.* (2023) and Yadav and Dhar (2021) argue that promotion-focused employees offer various potential solutions, whereas prevention-focused employees want to prevent destructive workplace behaviors. In sum, employees with a promotion focus evaluate the issue from different angles and develop various ideas to address it. For instance, promotion-focused co-workers may create negative emotions (e.g. selfish behaviors to get promotions) (Schabram *et al.*, 2023), leading them to gossip negatively with others about their immediate co-workers. Hence, we assume that:

H4. Promotion focus moderates the association between co-worker friendship and negative gossip.

Gender as a potential moderator of incivility stems from research on gender differences in communication styles and conflict resolution strategies (Selem *et al.*, 2023a). Gender may influence the perception and expression of incivility in workplace interactions, according to these studies. We believe that by including gender as a moderator, we can better understand how gender dynamics shape the occurrence and consequences of incivility among restaurant employees. Recent scholars argue that gender can influence individual appraisals of emotional reactions (Boo *et al.*, 2013; Yadav and Dhar, 2021). Men and women have distinct perspectives on work and life, which causes differences in their actions, accomplishments, and outputs (Guo *et al.*, 2022). Men are considered analytical, risk-taking, and choosy, while women are deemed unselfish, caring, and all-inclusive (Boo *et al.*, 2013).

Similarly, these gender variances are reflected in how people approach their work, formulate their strategies, and handle grievances (Selem *et al.*, 2023a). Generally, it is empirically supported that women tend to be more frequently subjected to uncivil behaviors than men (Cortina, 2008); however, organizational culture can play a crucial role in shaping the uncivil behaviors between men and women (Greer and Peters, 2022). For instance, organizations that actively embrace female participation may demonstrate lower incidences of uncivil behaviors compared to male-dominated environments (Saxena *et al.*, 2019). Hence, we assume that:

H5. Gender moderates the linkage between negative gossip and co-worker incivility.

Methods

Research context

Egypt is distinguished by its hospitality business and unique institutional environment characteristics (Selem *et al.*, 2023c). However, prior crises posed unprecedented obstacles to managing restaurants in Egypt, most related to employee behaviors (Khan *et al.*, 2023b). For instance, the negative approach to dealing with co-workers, such as bullying, gossip, ostracism, and moral harassment, whether verbal or sexual (Yang *et al.*, 2021), is still pending to address them as they stem from the inherent friendship among close co-workers in the Egyptian restaurant context.

Procedure and data collection

The reverse translation procedure was utilized to convert the questionnaire into Arabic two weeks before data collection to fit the Egyptian dialect of full-service restaurant personnel in

Greater Cairo. Subsequently, six language specialists and industry experts translated this survey into English. The primary data was collected from workers on the same shift to confirm the existence of workplace friendships. We used simple random sampling to gather data from employees at 46 full-service restaurants in Greater Cairo. We chose this sampling method for two reasons: first, it is an excellent sampling method for this research methodology because it ensures that each restaurant in the population has an equal chance of being chosen. This method improves the sample's representativeness, permitting more generalizable findings about the larger population of restaurants.

We increase the likelihood that the characteristics of the selected restaurants reflect those of the entire restaurant population by using a random sampling technique, which improves the external validity. Second, simple random sampling reduces sampling bias, which is essential in research involving restaurant employees. This method aids in the avoidance of systematic errors in the selection process, ensuring that each restaurant has an equal chance of being included. This reduction in bias contributes to our findings' validity because the sample is less likely to over-represent or underrepresent specific types of restaurants, resulting in more accurate and unbiased insights into the issues confronting restaurant employees.

This city was chosen for several reasons. First, this city is considered Egypt's capital and home to the most residents, with visitors expected from other domestic towns and tourist-exporting countries. Second, this city has the most significant number of full-service restaurants. Third, this city is charming; its streets and walls tell the history of the Egyptian people and their ancient civilization that has affected humanity throughout the ages. This is characterized by Egypt's most famous tourist attractions, such as the pyramids, the Sphinx, and the Cairo Tower.

Following verbal approval from restaurant management, the participants' WhatsApp groups were reached with the assistance of some restaurant managers and chefs. A link prepared for the intended questionnaire was sent to these participants via Google Forms. As a result, a time-delay approach was used to collect data across three waves. Initially, participants were informed of the need to focus on close co-workers who have the qualities of sincerity and courage and agree with them in most opinions, and vice versa. It was agreed with the participants that they should ensure that their answers related only to the friendship of the close co-worker and not to any other co-worker. Therefore, the dataset was collected for the same shift.

Although their participation was voluntary and no rewards were offered in exchange for participating, the custom author sent 46 boxes of energy chocolate to the restaurants participating in the intended survey as a noble gift for their employees after completing the data analysis process. In Wave 1, employees were questioned on the depth of their friendship with a close co-worker, and 571 responded from 10–22 October 2022. Participants were asked about their ability to talk badly about a close co-worker to another co-worker and how much they liked a close co-worker in Wave 2 from 25 October to 4 November 2022. Thus, 566 participants responded to the questionnaire items presented in this prompt.

From 9–18 November 2022, participants were asked to share their thoughts about the degree of their self-blame for the abuse they had inflicted on a close co-worker. Hence, 559 participants responded, representing Wave 3 of the data collection process. As such, outliers and missing values were checked in three waves, and a sample size free of these distorting values of 553 was reached.

Instruments

The robust validity and reliability demonstrated by each instrument in previous research drove the selection of scales in our study. For example, a 22-item co-worker friendship scale

included five dimensions developed by Sias *et al.* (2012), as Table A1 shows. The negative gossip scale, consisting of five items (see Table A2) created by Brady *et al.* (2017), has demonstrated high levels of validity and reliability in capturing co-worker friendship and negative workplace gossip constructs. These scales have been widely used and validated in various organizational settings, ensuring that our study benefits from the instruments' established psychometric properties (Cortina *et al.*, 2001). The selected scales align closely with the theoretical framework of our investigation and the specific research objectives.

The co-worker incivility scale, comprised of seven items (see Table A3) adapted from Cortina *et al.* (2001), has been chosen for its comprehensive assessment of uncivil behaviors in the workplace, directly addressing our focus on co-worker incivility. Likewise, the promotion focus questionnaire, comprised of seven items (see Table A4) adopted from Neubert *et al.* (2008), is well-suited for measuring promotion focus, a critical moderating variable in our conceptual framework. The careful selection of scales that align conceptually with our research ensures that our measurements.

Analysis strategy

Partial least-squares structural equation modeling (PLS-SEM) was chosen as the analytical approach for this paper using SmartPLS v.4. Higher-order and reflective-reflective constructs (e.g. co-worker friendship) were utilized in this paper based on PLS-SEM (Sarstedt *et al.*, 2019). This approach does not necessitate normally distributed data and moderation effects analysis (Khan *et al.*, 2023c). This approach may be utilized to examine the potential correlations between a set of constructs in the hospitality context (Shoukat *et al.*, 2024).

Results

Non-response bias and respondent characteristics

Social sciences research often has a non-response bias (Selem *et al.*, 2023c). Findings might not be relevant if the perspectives of participants and non-participants are drastically different (Sarstedt *et al.*, 2019). In the current paper, the non-response bias was investigated using Levene's equality variance test; valid responses in Waves 1 (313 early and 258 late responses), Waves 2 (286 early and 280 late responses), and Waves 3 (297 early and 262 late responses) were not significantly different from each other.

G*Power was run to identify an appropriate sample size (Khan *et al.*, 2023c). Hence, an *F*-test with multiple linear regressions for a fixed model in G*Power 3.1 software is run with the following settings: 0.1 effect size, 0.01 error probability, 0.95 power, and eight predictors. Thus, the final sample size is adequate. Respondents' profiles showed that males comprised 53.7% and married people comprised 51.5%. Regarding age, most employees were between 21 and 29 years old (70.7%). Most respondents (47.2%) held a bachelor's degree, followed by those with a diploma (30.6%). Lastly, 36.4% of respondents had 4 to below 7 years of career experience.

Common-method variation (CMV)

Two more tests were conducted in reaction to Harman's widely criticized single-factor test. First, the confirmatory factor analysis model that associated all items with a single factor was tested using the AMOS v.23 software. This model resulted in much-reduced factor loadings and inadequate fit: [$\chi^2(139, N = 553) = 519, 731$, $p < 0.001$, normed $\chi^2 = 3.216 > 3$, SRMR = 0.042, CFI = 0.986, RMSEA = 0.057].

Second, a single-method, single-factor strategy was used, simultaneously loading all items on their respective theoretical constructs and establishing a new mutual first-order factor. According to Table 2, this common factor can only explain 25.957% of the total variance in the first factor, while the rest of the variance was loaded on the other seven factors as follows:

negative workplace gossip (14.13%), personality (9.25%), promotion focus (5.24%), shared tasks (4.28%), similarity (3.49%), socializing (3.15%), and work/life events (2.75%). In addition, VIF was conducted in PLS-SEM to assess CMV. Because the VIF values were all less than 3.3 (see Table 1), we concluded that CMV bias did not exist in the dataset.

First-order constructs	Second-order constructs	Items	Factor loadings	VIF values
	Co-worker friendship (CR = 0.893; AVE = 0.627)	Personality	0.756	1.783
		Shared tasks	0.802	1.567
		Similarity	0.789	1.569
		Socializing	0.798	1.892
		Work/life events	0.811	1.871
Personality (CR = 0.890; AVE = 0.669)		PER1	0.800	1.672
		PER2	0.818	1.810
		PER3	0.821	2.090
		PER4	0.831	1.997
Shared tasks (CR = 0.937; AVE = 0.681)		SRT1	0.824	1.678
		SRT2	0.839	1.652
		SRT3	0.815	1.748
Similarity (CR = 0.895; AVE = 0.680)		SMT1	0.839	1.973
		SMT2	0.804	1.999
		SMT3	0.839	2.029
		SMT4	0.817	1.838
Socializing (CR = 0.893; AVE = 0.676)		SCZ1	0.836	2.098
		SCZ2	0.825	2.072
		SCZ3	0.811	2.142
		SCZ4	0.816	2.025
Work/life events (CR = 0.926; AVE = 0.675)		WLE1	0.827	2.257
		WLE2	0.812	2.118
		WLE3	0.833	2.308
		WLE4	0.814	2.144
		WLE5	0.832	2.327
		WLE6	0.812	2.278
Negative workplace gossip (CR = 0.911; AVE = 0.671)		NWG1	0.824	2.235
		NWG2	0.801	2.310
		NWG3	0.810	2.066
		NWG4	0.821	2.317
		NWG5	0.839	2.176
Co-worker incivility (CR = 0.924; AVE = 0.634)		CIN1	0.821	2.196
		CIN2	0.805	2.152
		CIN3	0.785	2.111
		CIN4	0.815	2.270
		CIN5	0.797	2.137
		CIN6	0.805	2.160
		CIN7	0.742	1.814
Promotion focus (CR = 0.929; AVE = 0.650)		PMF1	0.828	2.215
		PMF2	0.817	2.280
		PMF3	0.773	2.363
		PMF4	0.803	2.275
		PMF5	0.813	2.161
		PMF6	0.820	2.219
		PMF7	0.790	2.036

Source(s): Prepared by authors

Table 1. Item reliability and multicollinearity testing

Second-order construct	1	2	3	4
1. Co-worker friendship				
2. Co-worker incivility	0.455			
3. Negative workplace gossip	−0.185	−0.423		
4. Promotion focus	0.132	0.234	−0.255	

First-order construct	1	2	3	4	5	6	7	8
1. Co-worker incivility								
2. Negative workplace gossip	0.209	−0.214						
3. Personality	−0.281	0.111						
4. Promotion focus	−0.175	0.198	0.482					
5. Shared tasks	−0.318	0.208	0.524	0.563				
6. Similarity	−0.266	0.177	0.519	0.584	0.389			
7. Socializing	−0.312	0.356	0.475	0.593	0.421	0.562		
8. Work/life events	−0.258	0.219	0.327	0.433	0.562	0.466	0.503	

Harman test findings for latent constructs (CMV)	Extraction sums of squared loadings		
	Total	%Variance explanation	Cumulative
Co-worker incivility	10.902	25.957	25.957
Negative workplace gossip	5.933	14.126	40.083
Personality	3.884	9.249	49.331
Promotion focus	2.202	5.243	54.575
Shared tasks	1.798	4.281	58.856
Similarity	1.464	3.486	62.342
Socializing	1.322	3.148	65.490
Work/life events	1.155	2.751	68.241

Source(s): Prepared by authors

Table 2. Discriminant validity (HTMT)

Measurement model

Initially, composite reliability (CR) was performed to assess internal consistency reliability (Sarstedt *et al.*, 2019), indicating that all CR exceeded 0.70 (see Table 1). Second, Table 2 demonstrates that all items with factor loadings exceeding 0.708 were kept. Next, the average variance extracted (AVE) values were higher than the threshold of 0.50 (see Table 1), indicating the convergent validity of all constructs. Moreover, the heterotrait-monotrait (HTMT) ratio is a more stringent discriminant validity criterion (Sarstedt *et al.*, 2019). Hence, this ratio fell below the 0.85 cut-offs for reflecting first- and second-order measures, enhancing the model's discriminant validity (see Table 2).

Structural model

Utilizing the PLS technique, our Q^2 values were more significant than 0 (Q^2 negative workplace gossip = 0.234 and Q^2 co-worker incivility = 0.218). According to Chin (1998), R^2 also illustrates how much variance in dependent constructs can be explained. This model can explain 29.7 and 29.4% of the variance in negative workplace gossip and co-worker incivility, respectively. As a result, the structural model in this work was somewhat predictive.

Table 3 shows the direct and indirect path coefficients. Hence, close co-worker friendship significantly negatively affects workplace gossip ($\beta = -0.444$, t = 9.679, $p < 0.001$). Therefore, hypothesis H1 was supported. Meanwhile, findings found that negative workplace gossip significantly positively affects co-worker incivility ($\beta = 0.441$, t = 10.385, $p < 0.001$), supporting hypothesis H2. Table 3 revealed that co-worker friendship indirectly affects co-worker incivility through negative workplace gossip ($\beta = -0.196$, t = 6.359, CI = [−0.264, −0.138]), supporting

Paths	β	*t-value*	Sig	$_{f}2$	Decision
Direct effects					
H1: Co-worker friendship → Negative workplace gossip	-0.444^{***}	9.679	0.000	0.246	Supported
H2: Negative workplace gossip → Co-worker incivility	0.441^{***}	10.385	0.000	0.241	Supported

Indirect effects Path	β	*t-value*	Sig	Confidence interval	Decision
H3: Co-worker friendship → Negative workplace gossip → Co-worker incivility	-0.196^{***}	6.359	0.000	[−0.264, −0.138]	Partial mediation

Model fit assessment Construct	Negative workplace gossip	Co-worker incivility
R^2	0.297	0.294
Q^2	0.234	0.218

Source(s): Prepared by authors

Table 3.
Structured hypotheses testing findings

hypothesis H3. Thus, negative workplace gossip toward close co-workers achieved partial mediation.

Multi-group analysis

Our findings demonstrated compositional invariance by showing that the score of the constructs derived in one group perfectly correlated with the other group's constructs. Partial invariance was established nonetheless, as all variance scores fell within the confidence interval. Significant differences existed in the nexus of negative gossip and incivility among the two groups. Hence, the effect of negative gossip on co-worker incivility among males came to be more robust ($\beta = 0.509$, $p < 0.01$) as compared with females ($\beta = 0.395$, $p < 0.01$), supporting hypothesis H5 (see Table 4). This finding suggests that males react more negatively to a close co-worker's abusive reaction when talking negatively about him in his absence with other co-workers. In contrast, females may blame this co-worker for not repeating her actions.

Moderation analysis

A two-stage technique was used to calculate the moderating effect of promotion focus. Table 3 demonstrates that promotion focus significantly modifies negative workplace gossip ($\beta = 0.277$, $p < 0.01$). Furthermore, the interaction effect of promotion focus × co-worker friendship ($\beta = 0.252$, $p < 0.01$) on negative gossip is statistically significant (see Table 4). The moderation slope plot (see Figure 2) proves that the negative association between friendship and negative gossip among close co-workers is weaker when they have a higher job promotion focus and thus negatively talk about their close co-workers with less related co-workers to tarnish their image in front of others for getting job promotion. Accordingly, promotion focus dampened the co-worker friendship and negative workplace gossip relationship, supporting hypothesis H4.

Discussion

This paper examines how friendship indirectly affects incivility among close co-workers through negative gossip. We investigated the moderation effect of promotion focus in the

Two-stage approach Relationships	β	STDEV	*t*-value	*p*-value	Remark
Stag1: Co-worker friendship → Negative workplace gossip	−0.361***	0.042	10.819	0.000	
Stage2: Promotion focus → Negative workplace gossip	0.277**	0.036	9.456	0.003	
H4: Promotion focus × Co-worker friendship → Negative workplace gossip	0.252**	0.029	7.435	0.007	Supported

Multi-group analysis Relationship	Male	Female	*p*-value	Remark
H5: Negative workplace gossip → Co-worker incivility	0.509**	0.395**	0.008	Supported

Table 4.
Moderation effect and multi-group analysis

Source(s): Prepared by authors

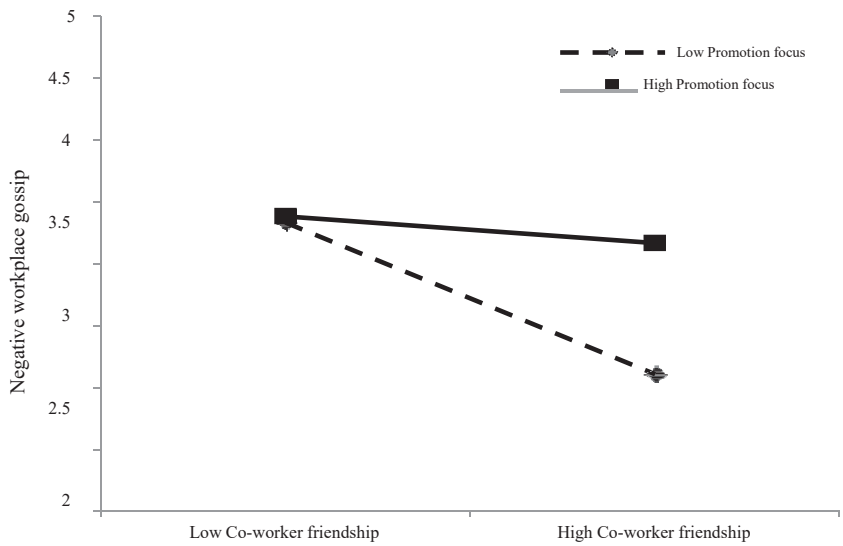


Figure 2.
Moderation effect of promotion focus

Source(s): Prepared by authors

restaurant context. Moreover, we discussed how gender (male/female) affects the nexus between negative gossip and co-worker incivility. Over the years, workplace friendship has drawn more attention, but there has not been much study on how friendly employees are (Cheng *et al.*, 2022; Guo *et al.*, 2022). Our findings add significant theoretical support to the literature.

For hypothesis H1, co-worker friendship and negative workplace gossip have a negative association; our findings supported this notion, resulting in a negative relationship among co-workers on these two streams. According to AET, affective events play a significant role between the gossip target and gossipers in the workplace when gossipers disclose substantial data about the gossip target. This demonstrates how co-workers' behaviors are influenced by their emotions (Khan *et al.*, 2023a). Employees who think others will formally evaluate them

become more nervous about delivering. This is because informal evaluation is comparable to involving the public (Chen *et al.*, 2021), finally presenting a chance to build connections with co-workers and significantly increasing performance pressure (Khan *et al.*, 2023a).

Additionally, AET contributes to explaining the continued fortification of these bonds by acting as a mediator between the nasty workplace gossip and the camaraderie among co-workers. This article demonstrates how emotions influence co-workers. When getting promoted, unpleasant feelings can take center stage and lead to talking about one another, eventually portraying selfish behaviors (Cheng *et al.*, 2022). Additionally, deviant behaviors such as unfavorable gossiping might harm co-worker incivility and undermine business performance in the hospitality context (Khan *et al.*, 2023c).

H2 is also accepted, indicating that negative gossip negatively affects co-worker incivility. This relationship is explained through AET, which assumes that co-workers with negative emotions tend to interact with each other. In pursuit of negative workplace gossip as an event, they tend to show deviant behaviors (Guo *et al.*, 2022), one of the major causes of poor performance in the hospitality industry (Selem *et al.*, 2023b). Being co-workers yet of massive importance in terms of front-line workers, such types of behaviors are critical (Khan *et al.*, 2023a), and incivility may cause severe damage to such organizational setups (Khan *et al.*, 2023c). Furthermore, the moderation effect of gender in linking negative gossip with co-worker incivility is substantial since males and females engaging in negative workplace gossip further strengthen co-worker incivility. Findings concur with those of Khan *et al.* (2023a), who found that workaholics are more likely to encounter more significant levels of workplace incivility.

Despite the close-fitting connection between two co-workers, gossip could be unfavorable to their interests (i.e. promotion focus). The victim of this gossip may confront the offender in various ways, depending on the gender involved. Hence, men are typically more eager to exact revenge and will do so by engaging the offender in a hostile manner, making derogatory comments in response to their co-worker's actions, or even physically and psychologically abusing them. While females are less vulnerable to each other's emotional reactions, they may only be satisfied with harsh criticism and refrain from reiterating these behaviors. This is because they believe these behaviors may have resulted from their egotism and feminism.

Theoretical implications

The interactive nature of restaurants adds new dimensions to the nexus between co-workers—both friendship and incivility. The first contribution of this paper is to advance our understanding of AET by investigating several events rather than a single event, as Chen *et al.* (2021) proposed. We explored interpersonal dynamics and work-related events in AET by adding psychological variables (negative workplace gossip) as an intervening variable between co-worker friendship and incivility and discovered a significant mechanism. Though AET focuses on the interaction of dispositional traits, situational factors, work-related events, and affective responses, this paper broadens the theory by examining how interpersonal dynamics and work-related events lead to negative workplace behaviors (Khan *et al.*, 2023a). This paper focuses on how co-worker friendship influences negative gossip and incivility among close co-workers in a restaurant setting, highlighting the complexities of workplace relationships and their impact on employee behavior.

Prior studies have shown the importance of emotions in AET, and this paper goes beyond emotions to examine how interpersonal dynamics and work-related events (i.e. co-worker friendship) contribute to negative workplace behaviors (Khan *et al.*, 2023a). By focusing on the role of co-worker friendship in shaping workplace behaviors, this paper offers a more nuanced understanding of the factors that contribute to negative gossip and incivility in the hospitality industry. Hence, workplace gossip significantly impacts co-worker incivility

(Khan *et al.*, 2023c; Ugwu *et al.*, 2022). The combined effect of workshop gossip on shaping the employee behaviors of front-line restaurant co-workers in terms of their friendship-incivility relationship indicates a gap in the literature (Khan *et al.*, 2023b). By doing so, our paper addressed this gap in the literature and contributed to a psychological theory, particularly AET.

This paper's second contribution is the relatively uncommon application of AET as a standalone theory for comprehending individual behavior in the hospitality industry. AET has been widely conducted in organizational studies by previous researchers to explain employee behavior, but its use in the hospitality sector is limited (Weiss and Cropanzano, 1996). Drawing on AET, we chose gender and promotion focus as the paper's proxy factors. Restaurant settings have gained popularity as research contexts in recent decades, but little is known about the setting or its function. This study, one of the first, adds to our knowledge of the restaurant environment.

Practical implications

Our findings have several implications for restaurant owners and managers. First, our results have some applications that can assist organizations and workers in managing friendships at work. To begin with, workers should understand that although friendships at work offer many advantages and can significantly improve our professional lives, they also carry some risks and negative consequences. Employees must be aware of the drawbacks of workplace friendships to manage their social relationships at work. To achieve this, it might be crucial to establish guidelines for professional interactions with co-workers. For instance, demonstrating that it is a part of one's professional duty to challenge one another in meetings can ease worries about offending a co-worker.

From a practitioner perspective, restaurant managers should explicitly design the local operating instructions (LOPs) for the restaurant's front-line personnel to talk and exchange positive information about co-workers while avoiding negative information about irrelevant activities during working hours. As a result, restaurant managers should implement a "zero tolerance" policy for disseminating public gossip. Providing timely and comprehensive information sharing and creating efficient channels for information exchange, such as holding frequent team meetings, setting open door rules, and promoting candid and open discussion to reduce negative gossip.

Further, restaurant managers should use an informal approach, such as fostering a warm, transparent, and inspiring workplace, rewarding and praising positive behavior, and offering professional and career growth opportunities. Moreover, managers may provide prompt psychological treatment to people who have been the targets of unfavorable workplace gossip. For instance, managers can refute rumors about them openly to give a particular employee their right to paid vacation.

Lastly, our findings suggest that pleasant co-worker friendships among front-line restaurant employees can lower incivility. Co-worker friendship is a modern phenomenon in the hospitality industry. Managers can devise measures to reduce uncivil employee conduct by establishing a healthy social environment in restaurants. This may be accomplished if managers develop and implement additional abilities to foster workplace friendship. For instance, restaurant managers should organize personality enhancement training programs and counseling to deal with challenges and workplace stress.

Limitations and future research

The current paper, like previous ones, has a set of research limitations. First, the research sample consisted of front-line employees, and we employed a time-lagged technique in three separate waves to control for CMB. The same respondents measured the significant

components. However, such biases may still impact our findings (Selem *et al.*, 2023b). Respondents are likely swayed by social desirability and may struggle to respond honestly since workplace gossip and co-worker incivility are sensitive issues. Future researchers may employ other research designs, such as multi-source data (supervisors and co-workers). Moreover, although our study does not explicitly measure emotions, we believe emotions are intrinsically linked to the studied notions. Negative workplace gossip, for example, can elicit various emotional reactions, and co-worker incivility is probably affected by the emotional states of those engaged. However, we recognize that further study may explicitly explore these categories' emotional aspects and interactions in greater detail according to the AET principles.

Conclusion

This paper's purpose was to investigate the potential hazards and consequences of workplace friendships among co-workers, how they affect office rumors, and how gossip affects co-worker impoliteness. Furthermore, the mediating function of unfavorable workplace rumors in the linkage between co-worker friendship and incivility was examined. The current study focuses on how promotion focus moderates the nexus between workplace incivility and friendship. Promotion-focused orientation has been tested as a mediator between co-worker friendship and incivility among co-workers. By helping develop interpersonal skills and team-building activities that support these positive relationships, managers can create a friendly and supportive workplace that improves their work culture and eliminates incivility.

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Appendix

Construct	Items	Sources
Personality	PER1: My close co-worker's personality appeals to me	Prepared by Sias *et al.* (2012)
	PER2: My close co-worker is a pleasant individual	
	PER3: My close co-worker was appealing to me	
	PER4: I am drawn to the personality of one of my co-workers	
Shared tasks	My close co-worker and I _____	
	SRT1: I have the same job	
	SRT2: Are splitting up duties	
	SRT3: Assist one another with duties	
Similarity	SMT1: My close co-worker and I have beliefs and interests in common	
	SMT2: My close co-worker and I have beliefs and attitudes comparable to ours	
	SMT3: My close co-worker and I have many interests	
	SMT4: My close co-worker is quite similar to me	
Socializing	SCZ1: My close co-worker and I socialize after work or on weekends	
	SCZ2: After work, my close co-worker and I socialize	
	SCZ3: Outside the workplace, my close co-worker and I spend time together	
	SCZ4: My close co-worker and I have begun socializing outside the workplace	
Work/life events	My close co-worker and I _____	
	WLE1: Are you having issues with a manager or another co-worker	
	WLE2: Are involved in office politics/problems	
	WLE3: Are having work-related issues	
	WLE4: Are dealing with personal problems/issues	
	WLE5: We have experienced significant upheavals in our personal lives	
	WLE6: I have more personal occasions coming up	

Table A1.
Measurement items of co-worker friendship

Table A2.
Measurement items of negative workplace gossip

Construct	Items	Sources
NWG1	I asked a co-worker whether they had a bad opinion of anything my close co-worker had done	Prepared by Brady *et al.* (2017)
NWG2	I questioned my close co-worker's skills while chatting with a co-worker	
NWG3	While speaking with a co-worker, I ridiculed my close co-worker	
NWG4	I told a co-worker about what my close co-worker had done	
NWG5	While talking to a co-worker, I recounted an unpleasant anecdote about my close co-worker	

Table A3.
Measurement items of co-worker incivility

Construct	Items	Sources
CIN1	My close co-worker made fun of me or was condescending to me in any way	Prepared by Cortina *et al.* (2001)
CIN2	My close co-worker paid little attention to my comments and seemed uninterested in my thoughts	
CIN3	My close co-worker made insulting remarks about me	
CIN4	My close co-worker addressed me in a disrespectful tone	
CIN5	My close co-worker neglected or excluded me from business networking	
CIN6	My close co-worker questions my judgment on an issue I am responsible for	
CIN7	My close co-worker made unwelcome attempts to engage me in a personal discussion	

Table A4.
Measurement items of promotion focus

Construct	Items	Sources
PMF1	I take chances at work to achieve my advancement objectives	Prepared by Neubert *et al.* (2008)
PMF2	I frequently take chances to succeed at work	
PMF3	If I could not succeed in my current position, I would probably look for another one	
PMF4	I devote my efforts to completing work duties that will develop my career	
PMF5	I spend a lot of time thinking about how I can achieve my goals	
PMF6	A clear vision of who I want to become affects my job priorities	
PMF7	My aspirations and hopes serve as my driving forces at work	

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Received 9 January 2023
Revised 2 July 2023
13 October 2023
4 January 2024
Accepted 18 February 2024

Employee job security and job performance: the mediating role of well-being and the moderating role of perceived organizational support and psychological capital

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Abstract

Purpose – Grounded in social cognitive career theory, this study investigates how employees' perceptions of job security and well-being affected their performance during the COVID-19 pandemic. It also examines the moderating effects of perceived organizational support and psychological capital on well-being and performance.
Design/methodology/approach – Using a two-wave time-lagged design, data were collected from 279 frontline employees in public service organizations in Saudi Arabia.
Findings – The study's results show that perceived job security significantly affects job performance. Employee well-being significantly and positively influences job performance and partially mediates the relationship between perceived job security and job performance. Additionally, perceived organizational support and psychological capital positively moderated the relationship between employee well-being and job performance during the pandemic.
Practical implications – This study suggests that policymakers and practitioners need to prioritize addressing the job security concerns and well-being of frontline employees during a pandemic to enhance employee performance.
Originality/value – Our findings present significant implications for policymakers in the context of job security and performance within public organizations in emerging countries.

Keywords Job security, Employee well-being, Job performance, Perceived organizational support, Psychological capital, Saudi Arabia, COVID-19

Paper type Research paper

The authors acknowledge financial support from Abu Dhabi University's Office of Research and Sponsored Programs Grant number: 19300768.

Moza Tahnoon Al Nahyan: Writing –review, editing, Writing –original draft, revising the document (Revision 1, Revision 2 and Revision 3), Methodology, Data curation, Conceptualization. Fauzia Jabeen: Writing –original draft, Methodology, Data curation, Conceptualization, Writing –review and editing. 3. Ibrahim Alhosani: Writing –original draft, Methodology, Data curation, Conceptualization. Mesheal Alabdulrahman: Validation, Methodology, Conceptualization. Jawaher Majdi Al Ahbabi: Writing –original draft, Methodology, Data curation, Conceptualization. Sherine Farouk: Methodology, Data curation, Conceptualization.

European Journal of Management and Business Economics
Vol. 35 No. 2, 2026
pp. 244-265
Emerald Publishing Limited
e-ISSN: 2444-8494
p-ISSN: 2444-8451
DOI 10.1108/EJMBE-01-2023-0011

1. Introduction

The COVID-19 pandemic has triggered a high degree of uncertainty into the business landscape (Charoensukmongkol and Pandey, 2023). Tuzovic and Kabadayi (2021) suggest that the service sector has experienced significant disruption, with companies struggling to maintain their viability. While many individuals lost their jobs, those who remained employed had to grapple with the pandemic's psychological impacts while working remotely. The pandemic has severely disrupted service delivery channels, causing many companies to struggle to maintain service continuity (Suthatorn and Charoensukmongkol, 2023). This high level of business environment volatility during the pandemic provides a backdrop for studying employee behavior and its outcomes in service organizations.

Job (in)security presents an invisible problem for organizations and is a distraction that impacts individual performance (Jones *et al.*, 1998). Witte's seminal study (1999) validated that job (in)security is a catalyst for diminishing employee well-being. While the benefits of various employee-related practices were explored in many contexts before the pandemic (Haque, 2023), the pandemic's impacts have posed challenges for all organizations (Charoensukmongkol and Pandey, 2023). The pandemic has significantly altered employee behavior and disrupted work outcomes (Mehmood *et al.*, 2023) and hence, the perceived job security of public sector employees in an emerging Arab country, where the pandemic has altered employment dynamics and made them as vulnerable to job loss as their private sector counterparts, warrants further examination (Mehmood *et al.*, 2022).

It is crucial to determine whether the quality of organizational support is adequate to alleviate employees' job security concerns (AlHashmi *et al.*, 2019). Another factor that could impact employees during the pandemic is the management of work within the organization (Puyod and Charoensukmongkol, 2021). Essentially, perceived organizational support (POS) and psychological capital (PsyCap) lay the groundwork for adding resources that enhance the workforce's collective mindset and encourage excellence in their respective workplaces (Froman, 2010). Understanding employees' challenges regarding their POS and PsyCap is critical to improving their overall well-being during and after the COVID-19 pandemic. Moreover, social distancing measures hinder resource and emotional support that rely on the organization's culture (Jabeen and Isakovic, 2018), playing a significant role in fostering positive psychology, which is vital for optimal employee productivity.

Furthermore, employee reactions can vary based on organizational and external environmental factors (Morgeson *et al.*, 2015). Rapid changes in job categories (Kramer and Kramer, 2020) and employees' acceptance of remote work (Akgunduz *et al.*, 2018) can lead to job insecurity (Blustein *et al.*, 2020). In a recent study, Aguiar-Quintana *et al.* (2021) highlighted that the employees' job security did not affect their performance. However, some studies (Staufenbiel and König, 2010) reported a positive relationship between job insecurity and job performance and related it to the suppressor effect on employees' performance. According to them, employees with high job insecurity will be motivated to work harder to prove their worth to the organization. However, the impact of these reactions on performance is not adequately documented in the context of developing countries during the COVID-19 pandemic. Hence, such varying findings advocate the existence of some mediating and moderating variables that could alleviate or even converse the influence of job (in)security on job performance.

Social cognitive career theory (SCCT) provides a framework for predicting changes in human and cognitive behaviors (Duffy *et al.*, 2014). Human behaviors are shaped by the interplay of internal feelings, emotions, and surroundings (Chang and Edwards, 2015). SCCT helps construct a research framework that articulates the relationship between work activities, environmental factors, and psychological needs (Jemini-Gashi *et al.*, 2021). Therefore, this study, grounded in SCCT, aims to explore the influence of employees' perceptions of job security and well-being on their performance during the COVID-19 pandemic. Consequently, this study seeks to answer the following research questions:

RQ1. How does job security and employee well-being affect job performance during social distancing protocols?

RQ2. How does the mediating effect of employee well-being affect perceived job security and job performance?

RQ3. How does POS moderate the role of employee well-being and job performance such that the relationship strengthens as POS increases?

RQ4. How does PsyCap moderate the role of employee well-being and job performance such that the relationship strengthens as PsyCap increases?

This study offers three significant contributions to the existing literature. First, we base our research model on the theoretical foundations of the SCCT framework, a novel approach in COVID-19 research. A comprehensive understanding of SCCT factors can significantly improve employee performance, even after a pandemic. Second, we examine the moderating role of PsyCap and POS, demonstrating how to enhance employee job performance. Lastly, our study concentrates on frontline employees in public organizations in Saudi Arabia, a context that has previously received insufficient academic attention. The study findings shall provide insights to the service organizations to establish a work environment to improve their employee's well-being and performance.

2. Literature review and hypotheses development

2.1 Employee's well-being versus job performance

Employee well-being pertains to their optimal mental and physical health, which is influenced by organizational dynamics and occasionally extends to factors beyond the workplace. The enhancement of employee well-being is a primary task for many global employers and leaders, because it directly impacts individual and organizational performance (Johari *et al.*, 2019). Usman (2017) further emphasizes that an employee's mental state is a critical determinant of job performance. Given the pandemic's impact on well-being, researchers have focused on exploring the organizational factors that affect employees' work and psychological outcomes (Puyod and Charoensukmongkol, 2021). The psychological well-being of employees encompasses various organizational factors such as innovation, creativity, and engagement in organizational roles and job-related activities, all of which promote improved individual performance.

Kundi *et al.* (2020) underscore the importance of promoting psychological well-being, while García-Cabrera *et al.* (2018) suggest that a healthy organization stems from the enhancement of employees' mental well-being, leading to improved job performance. This context clarifies the necessity for employees to maintain robust mental and physical health to positively impact both individual and organizational performance. Workplace culture, encompassing various facets of employer-employee interactions, can foster greater job satisfaction (Jabeen *et al.*, 2018). When employees are satisfied with their specific job duties, it facilitates higher individual job performance, thereby boosting overall organizational performance. However, the social distancing measures imposed due to the COVID-19 pandemic have created conditions that challenge employees' ability to sustain a psychological state conducive to fulfilling their organizational roles effectively (Kundi *et al.*, 2020). In essence, the shift to remote work, necessitated by pandemic protocols, has disrupted employees' engagement with workplace culture, a critical factor in their psychological and physical well-being. Therefore, we propose the following:

H1. Employee well-being positively affects job performance during social distancing protocols.

2.2 Perceived job security and job performance

An organization can cultivate a workplace culture that promotes intrinsic motivation among employees, which is rooted in employee-employer relationships and interactions. Gerhart and Fang (2015) argue that this intrinsic motivation significantly impacts employee performance through various micro-factors. An individual's intrinsic perspectives, emotions, and environment play a role in shaping their behavior (Chang and Edwards, 2015). SCCT has become a crucial framework for illustrating the interplay between cognitive, environmental, and behavioral factors (Liguori *et al.*, 2020). This theory helps structure an investigation into the significance of environmental influences, psychological factors, and work activities. These elements encompass individual differences in self-perception and personality, variations in temperament, decision-making processes, workplace interaction, and consultative skills.

Ganta (2014) argued that workplace motivation significantly shapes employees' sense of job fulfillment. This suggests that during remote work, the absence of the workplace culture fostered by the broader organizational culture could potentially impact employees' perceived job security, thereby inducing stress (Gerhart and Fang, 2015; Jabeen *et al.*, 2020). Employees under stress often demonstrate reduced performance, leading to diminished organizational output. Moreover, fears about job security typically arise when employees are required to alter their work schedules, resulting in decreased performance. This is because employees may view themselves as dispensable, given the organization's apparent capacity to operate effectively with a smaller workforce.

Darvishmotevali and Ali (2020) argue that job security boosts employee well-being, which in turn influences long-term performance. Cheng and Chan (2008) found that job security positively impacts employees' mental and physical health. These conditions affect job security, which subsequently influences overall well-being and performance. Lowe (2020) contends that the foundation of healthy organizations is employee well-being. Prior research supports the importance of examining employee well-being to understand the relationships between various HR dimensions and employee outcomes (Khoreva and Wechtler, 2018). Additionally, Darvishmotevali and Ali (2020) demonstrated that a sense of job security correlates with higher scores on several work-related well-being indicators, such as elevated levels of emotional engagement. This suggests that an increase in perceived job security can enhance individual resources. Therefore, our study aims to clarify the relationship between job security and job performance by improving employee well-being. Consequently, we propose the following hypotheses:

H2. Perceived job security positively affects employee job performance during social distancing protocols.

H2a. There is a direct effect of perceived job security on job performance.

H2b. There is an indirect effect of perceived job security on job performance through the mediating role of employee well-being.

2.3 Moderating role of POS on employee well-being and job performance

Eisenberger *et al.* (1986, p. 501) define POS as "employees" beliefs concerning the extent to which the organization values their contributions and cares about their well-being." Organizations provide crucial training that enables employees to handle job-related stress and adopt new skills and strategies to address organizational challenges (Ariza-Montes *et al.*, 2018). This acquisition of effective work skills simplifies tasks, leading to enhanced job satisfaction. Cheng and Yi (2018) demonstrate how attributes such as hope and resilience affect an employee's well-being, thereby influencing their job performance. Prior studies (Charoensukmongkol and Suthatorn, 2022; Shen *et al.*, 2018) contend that certain human

resource actions, including organizational leadership and culture, forecast positive relationships. Social distancing disrupts specific human resource management practices, resulting in reduced employee motivation, a situation that often leads to decreased job performance (Khoreva and Wechtler, 2018). Previous research (Guang and Charoensukmongkol, 2022) confirmed that POS is a crucial practice that can strengthen the effects of workplace factors on work outcomes and employee well-being.

Human practices significantly influence the role of POS in employee well-being and job performance. Haddon (2018) discusses the correlation between employee productivity and human resource practices, particularly in relation to employee well-being and performance. Kosinski *et al.* (2015) reveals that human resource initiatives, such as individual or group motivation, can boost job performance, which in turn leads to improved organizational productivity. Therefore, POS can be a vital tool in managing stress and fostering a positive outlook on life, which promotes a mindset conducive to achieving goals (Roemer and Harris, 2018). While POS traits may be inherent in an employee's character, organizations and human resource managers should proactively invest time and resources in prioritizing employee well-being (Naseer *et al.*, 2018). Therefore, we propose the following hypothesis:

H3. POS positively moderates the relationship between employee well-being and job performance, such that the relationship strengthens as POS increases.

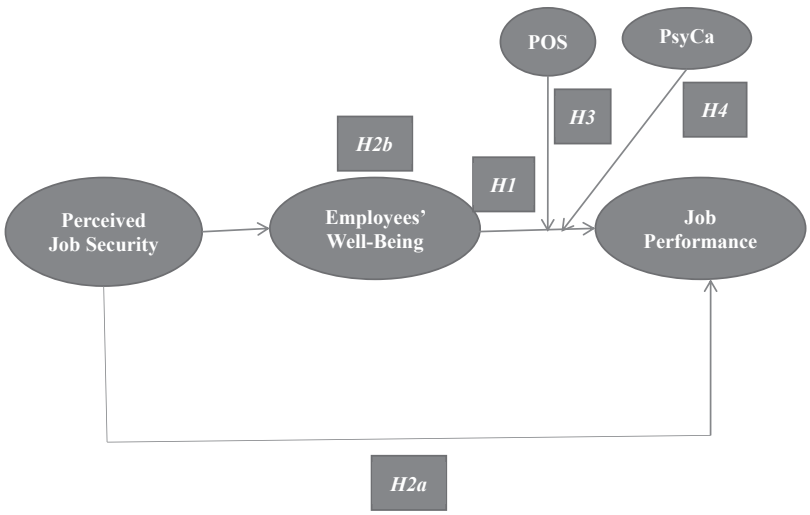
2.4 The moderating role of PsyCap on employee well-being and job performance

PsyCap is defined as an individual's positive psychological state of development, encompassing elements such as self-efficacy, hope, optimism, and resilience (Luthans *et al.*, 2015). Each of these characteristics positively influences overall health and work-related outcomes (Alarcon *et al.*, 2013). Luthans *et al.* (2015) further characterize PsyCap as a state that demonstrates a readiness for change. Self-efficacy pertains to an individual's confidence in their ability to successfully perform organizational roles. People with high self-efficacy are typically determined to reach their goals and often strive to achieve organizational objectives as if they were their own (Kotzé, 2018). Optimism, on the other hand, is the trait of expecting positive outcomes from one's efforts (Carver *et al.*, 2010). Optimistic individuals usually maintain a positive attitude, which helps them remain steadfast when addressing crises and seeking positive change in personal and organizational challenges (Krok, 2015). Lastly, resilience, a common trait among highly adaptable individuals, is crucial when encountering challenges or adversities (Friedman *et al.*, 2017). It enables employees to bounce back from difficult situations while simultaneously learning from the experience (Luthans and Youssef-Morgan, 2017).

Regarding employees' PsyCap, a positive correlation can be established between their mental state and job performance. Thus, PsyCap can serve as a dependable resource that enables workers to manage stressful situations (Fu and Charoensukmongkol, 2022). Moreover, while PsyCap can be inherent in an employee, organizations and human resource managers need to invest more time and resources in prioritizing employee well-being. The social distancing measures implemented during the current pandemic have created a challenging environment for meeting employees' developmental needs. Consequently, employee well-being has become a priority during this pandemic. Therefore, we propose the following hypothesis:

H4. PsyCap moderates the relationship between employee well-being and job performance, such that the relationship strengthens as PysCap increases.

Figure 1 presents the conceptual model of this study.



Note(s): POS: Perceived Organizational Support, PsyCap: Psychological Capital
Source(s): Authors

Figure 1.
Conceptual model

3. Methodology

3.1 Sample and data collection

The data for this study were gathered from frontline employees in public service organizations across five municipal bureaus in Riyadh, Saudi Arabia, from September to December 2021. These bureaus, which include municipal public offices and transport, civil affairs, land and housing, and healthcare, provide essential public services. After securing approval from the respective organizations' HR departments, a list of employees with at least two years of experience was compiled. The survey was then distributed to a random sample of frontline employees within each public organization.

In this study, we used a time-lagged design to mitigate the risk of common method bias (CMB) (Podsakoff *et al.*, 2012). Data were gathered in two waves, six weeks apart. In the first wave (T1), we collected data on perceived job security, employee well-being, and demographic information. With the help of the HR department, we distributed the survey to 500 employees and received 350 valid responses, a response rate of 70%. In the second wave (T2), six weeks later, we collected data on POS, PsyCap, and job performance from the initial 350 respondents. We received 279 valid responses, a response rate of 79.71%. The final sample consisted of these 279 employees, 45.9% of whom were male and 54.1% female. Additionally, 69.1% held a bachelor's degree, and 30.9% had a master's degree.

3.2 Measures

We used measurement items from previous studies for our survey. The survey was translated into Arabic, and then back-translated into English by a certified local translation service. Perceived job security was measured using a four-item scale adapted from Filimonau *et al.* (2020), with a sample item being, "When the Covid-19 crisis is over, my job will be secure" ($\alpha = 0.896$). Employee well-being was measured using an 11-item scale adapted from Tennant *et al.* (2007), with a sample item being, "I've been feeling good about myself" ($\alpha = 0.937$). Job performance was measured using an 18-item scale from Ramos-Villagrasa *et al.* (2019), with a sample item being, "I managed to plan my work so that I finished it on time" ($\alpha = 0.884$). POS

was measured using an eight-item scale adapted from Rhoades and Eisenberger (2002), with a sample item being, "My organization strongly considers my goals and values" ($\alpha = 0.720$). PsyCap was measured using a 24-item scale adapted from Luthans (2007), with a sample item being, "I feel confident analyzing a long-term problem to find a solution" ($\alpha = 0.914$).

3.3 Data analysis

Initially, we examined the characteristics of the data and the significance of the individual variables using descriptive statistics and a one-sample *t*-test, respectively. Following these analyses, we conducted a correlation analysis of the variables using Pearson's correlation. We also employed a hierarchical least squares regression to test the models outlined in the previous section. These analyses included tests for autocorrelation, multicollinearity, and the normality of residuals. All tests were performed using IBM® SPSS® Statistics software.

4. Results

4.1 Reliability, validity, and CMB

As shown in Table 1, we used a confirmatory factor analysis (CFA) to assess reliability, convergent validity, and discriminant validity. The reliability of the constructs was confirmed by Cronbach's alpha values exceeding the 0.70 threshold (Nunnally, 1970; Elkhwesky *et al.*, 2023a). Convergent validity (Table 1) was then evaluated using factor loadings and average variance extracted (AVE) measures. All items had significant factor loading ($p < 0.001$), and the AVE for perceived job security and employee well-being exceeded 0.50, establishing convergent validity (Table 1; Fornell and Larcker, 1981). Although the AVE for job performance, POS, and PsyCap was less than 0.5, the composite reliability exceeded 0.6, making the construct's convergent validity acceptable. Furthermore, the AVE was greater than the shared variance, that is, the square of the intercorrelations among constructs, indicating the constructs' discriminant validity (Hair *et al.*, 2019). We used Harman's single-factor test to examine the measurement context effect, which revealed multiple distinct factors. The first factor accounted for 31.676% of the variance, suggesting that CMB was unlikely to be a concern in our survey.

4.2 Descriptive statistics and one-sample t*-test*

Following the verification of response reliability, we integrated descriptive statistics and one-sample *t*-test results. The descriptive statistics are presented in Table 2.

The results in Table 2 reveal that perceived job security has a mean score of 3.9229 and a standard deviation of 0.91494, indicating minimal volatility and slight variation in responses. Employee well-being has a mean score of 3.46 and a standard deviation of 0.82337, also suggesting low volatility in responses. Similar low volatility is observed in the statistics for

Variable	Cronbach's alpha	CR	λ	AVE
Perceived job security	0.896	0.927	0.872–0.879	0.762
Employee well-being	0.937	0.946	0.694–0.871	0.616
Job performance	0.884	0.894	0.645–0.793	0.392
POS	0.720	0.824	0.684–0.827	0.477
PsyCap	0.914	0.922	0.549–0.778	0.373

Note(s): λ, factor loadings
Source(s): Authors

Table 1. Variable reliability

job performance, POS, and PsyCap. Furthermore, the skewness coefficient for all variables is close to zero, implying a normal distribution of the data.

Table 3 displays the results of the one-sample *t*-test, which was used to determine whether the data variation was significant. The perceived job security variable has a *t*-statistic of 71.618, indicating its statistical significance at a 0.01 level of significance. The *t*-statistics for employee well-being and job performance are 70.345 and 103.827, respectively, both of which are statistically significant at a 0.01 level of significance. The variables POS and PsyCap are also significant at the 0.01 level, because their two-tailed significant statistics are close to zero. Their respective *t*-statistics, 98.745 and 110.420, further confirm their statistical significance.

4.3 Correlation analysis

Table 4 displays the results of Pearson's correlation with significance. There is a significant positive correlation between perceived job security and employee well-being, although the

	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Perceived job security	3.9229	0.91494	−0.806	0.146	0.569	0.291
Employee well-being	3.4676	0.82337	−0.462	0.146	0.195	0.291
Job performance	3.4844	0.55955	−0.012	0.146	1.407	0.291
POS	3.3759	0.57105	−0.084	0.146	1.948	0.291
PsyCap	3.5618	0.53880	−0.141	0.146	2.313	0.291

Note(s): $N = 279$
Source(s): Authors

Table 2.
Descriptive statistics

	Test value = 0					
					95% confidence interval of the difference	
	t	*df*	Sig. (2-tailed)	Mean difference	Lower	Upper
Perceived job security	71.618	278	0.000	3.92294	3.8151	4.0308
Employee well-being	70.345	278	0.000	3.46758	3.3705	3.5646
Job performance	103.827	277	0.000	3.48441	3.4183	3.5505
POS	98.745	278	0.000	3.37590	3.3086	3.4432
PsyCap	110.420	278	0.000	3.56183	3.4983	3.6253

Source(s): Authors

Table 3.
One-sample *t*-test

	Perceived job security	Employee well-being	Job performance	POS	PsyCap
Perceived job security	1				
Employee well-being	0.392**	1			
Job performance	0.383**	0.563**	1		
POS	0.293**	0.526**	0.668**	1	
PsyCap	0.328**	0.582**	0.740**	0.678**	1

Note(s): **Correlation is significant at the 0.01 level (two-tailed)
Source(s): Authors

Table 4.
Pearson's correlation

correlation is moderate, at 39.2%. Job performance also shows a statistically significant positive correlation with perceived job security, with a correlation of 38.3%. Both variables are directly proportional to job security during the COVID-19 pandemic. Furthermore, both POS and PsyCap show a strong correlation with employee well-being and job performance.

4.4 Impact of perceived job security on employee well-being

We use a hierarchical least square (HLS) regression to examine the effect of perceived job security during the COVID-19 pandemic, considering the moderating variables of POS and PsyCap. The results of the HLS regression are displayed in Tables 5 and 6.

The SPSS software performed the HLS regression on Model I and Model II concurrently. According to the HLS analysis results in Table 5, Model I accounted for 15.3% of the population, while Model II represented 40.9% of the population. Furthermore, our models did not display any autocorrelation.

Table 6 provides the coefficient statistics. In Model I, there is a positive correlation between perceived job security and employee well-being, with a *t*-statistic of 7.085, indicating a highly significant probability at a 0.01 level of significance. Model II further illustrates the positive effect of perceived job security on employee well-being, even when considering the presence of POS and PsyCap. The *t*-statistic for perceived job security in this model is 4.214, and with a significance level of 0.01, this variable, along with POS and PsyCap, are statistically significant, explaining their impact on employee well-being. Based on these statistics, Hypothesis 2 (H2) remains valid, owing to the significant positive influence of perceived job security on employees' job performance. Additionally, both moderators significantly and positively affected employee well-being during the pandemic, so we cannot reject Hypotheses 3 (H3) or 4 (H4).

4.5 Impact of perceived job security on job performance

According to the results presented in Table 7, Model III accounted for 14.7% of the population results, whereas Model IV accounted for 61.4%. Furthermore, the regression showed no signs of autocorrelation.

According to Table 8, there is a positive correlation between perceived job security and job performance. This correlation is statistically significant, as evidenced by a *t*-statistic of 6.89 and a near-zero probability value. Model IV further illustrates the positive correlation between perceived job security and job performance, moderated by POS and PsyCap. The coefficient of perceived job security in this model has a *t*-statistic of 3.359 and a significance probability of 0.001, indicating a significant positive correlation at the 0.01 level of significance. Additionally, no multicollinearity issues were found among the independent variables.

Table 5. Hierarchal least squares regression analysis model summary (equations I and II)

						Change statistics				
Model	*R*	*R*-square	Adjusted *R*-square	Std. Error of the estimate	*R*-square change	*F*-change	df1	df2	Sig. F change	Durbin–Watson
I	0.392	0.153	0.150	0.75894	0.153	50.199	1	277	0.000	
II	0.640	0.409	0.403	0.63625	0.256	59.564	2	275	0.000	1.998

Note(s): Predictors: (constant), perceived job security
Predictors: (constant), perceived job security, POS, PsyCap
Dependent variable: employee well-being
Source(s): Authors

Model		Unstandardized coefficients		Standardized coefficients			Correlations			Collinearity statistics	
		B	Std. Error	Beta	t	Sig	Zero-order	Partial	Part	Tolerance	VIF
I	(Constant)	2.085	0.200		10.404	0.000					
	Perceived job security	0.352	0.050	0.392	7.085	0.000	0.392	0.392	0.392	1.000	1.000
II	(Constant)	−0.319	0.277		−1.152	0.250					
	Perceived job security	0.187	0.044	0.208	4.214	0.000	0.392	0.246	0.195	0.883	1.132
	POS	0.312	0.091	0.216	3.409	0.001	0.526	0.201	0.158	0.534	1.872
	PsyCap	0.562	0.098	0.368	5.728	0.000	0.582	0.327	0.265	0.521	1.918

Note(s): Dependent variable: employee well-being
Source(s): Authors

Table 6.
Hierarchical least squares regression analysis coefficient statistics (equations I and II)

4.6 Mediation analysis

This study applied the method proposed by Baron and Kenny (1986) to assess the mediating role of employee well-being in the relationship between perceived job security and job performance. Simple and multiple regression analyses were used to evaluate the four critical conditions suggested by Baron and Kenny (1986) for confirming the mediating relationship.

Table 9 presents the results of the simple regression analysis, demonstrating a positive correlation between perceived job security and employee well-being ($\beta = 0.33$, $t = 6.81$, $p < 0.00$), thereby satisfying the first condition of Baron and Kenny's (1986) mediation methodology. The second condition is also met, because perceived job security correlates significantly with job performance ($\beta = 0.22$, $t = 6.50$, $p < 0.00$) (H2a). The third condition is fulfilled because employee well-being is positively and directly linked to job performance ($\beta = 0.38$, $t = 11.31$, $p < 0.00$). For the fourth condition, Table 10 reveals that employee well-being partially mediates the relationship. Specifically, Table 10 shows that the correlation between perceived job security and job performance remains significant, but is reduced ($\beta = 0.10$, $t = 3.33$) when employee well-being is introduced as a mediating variable. Thus, employee well-being partially mediates the relationship between perceived job security and job performance (H2b). Figure 2 presents the structural model.

4.7 Moderation analysis

We conducted a moderation analysis using the PROCESS macros in SPSS software, as introduced by Hayes (2018). This tool employs a conditional process analysis to investigate the relationship between two variables, moderated by a third variable. It determines the existence of a moderating effect by incorporating a linear interaction term into a multiple regression model. This analysis necessitates the consideration of both the lower limit confidence interval (LLCI) and the upper limit confidence interval (ULCI). Given that the LLCI value was 0.3859 and the ULCI was 0.4367, both of which are not equal to zero, the output is based on the *p*-value ($p < 0.05$), indicating a significant effect, as outlined in the hypothesis.

Table 11 demonstrates that POS significantly moderates employee well-being, as evidenced by a *t*-statistic value of 4.38 and a *p*-value of 0.00, which is below the 0.05 threshold. This signifies the importance of POS at the 95% confidence level. Similarly, Table 12 reveals that PsyCap significantly moderates employee well-being, with a *t*-statistic value of 6.70 and a *p*-value of less than 0.05, indicating its significance at the 95% confidence level. Table 13 presents the model summary.

Figures 3 and 4 show visual representations of the conditional effects of the primary predictors.

Hypothesis 1 (H1) is accepted, indicating a positive correlation between perceived job security and job performance. Similarly, there is a statistically significant positive correlation between employee well-being and job performance, validating Hypothesis 2 (H2).

Table 7.
Hierarchical least squares regression analysis model summary (equations III and IV)

					Change statistics					
Model	*R*	*R*-square	Adjusted *R*-square	Std. Error of the estimate	*R*-square change	*F* change	df1	df2	Sig. F change	Durbin–Watson
III	0.383	0.147	0.144	0.51781	0.147	47.467	1	276	0.000	
IV	0.784	0.614	0.610	0.34945	0.467	166.008	2	274	0.000	1.906

Note(s): Predictors: (constant), perceived job security
Predictors: (constant), perceived job security, POS, PsyCap
dependent variable: job performance
Source(s): Authors

Model		Unstandardized coefficients		Standardized coefficients			Correlations			Collinearity statistics	
		B	Std. Error	Beta	*t*	Sig	Zero-order	Partial	Part	Tolerance	VIF
III	(Constant)	2.567	0.137		18.769	0.000					
	Perceived job security	0.234	0.034	0.383	6.890	0.000	0.383	0.383	0.383	1.000	1.000
IV	(Constant)	0.363	0.152		2.383	0.018					
	Perceived job security	0.082	0.024	0.134	3.359	0.001	0.383	0.199	0.126	0.883	1.133
	POS	0.285	0.050	0.291	5.662	0.000	0.668	0.324	0.212	0.534	1.871
	PsyCap	0.517	0.054	0.498	9.595	0.000	0.740	0.501	0.360	0.522	1.917

Note(s): Dependent variable: job performance
Source(s): Authors

Table 8.
Hierarchical least squares regression analysis coefficient statistics (equations III and IV)

Additionally, perceived job security is significantly related to job performance, supporting Hypothesis H2a. Employee well-being partially mediates the relationship between perceived job security and job performance, confirming Hypothesis H2b. Both moderators significantly enhance the relationship between employee well-being and job performance during the

	DV: employee well-being					DV: job performance				
IV	β	R^2	Std. Error	t	Sig	β	R^2	Std. Error	t	Sig
Perceived job security	0.339	0.144	0.050	6.819	0.000	0.221	0.133	0.034	6.500	0.000
Employee well-being	–	–	–	–	–	0.382	0.317	0.034	11.316	0.000

Table 9.
Regression analysis

Note(s): IV: independent variables, DV: dependent variables
Source(s): Authors

			Job performance			
Independent variables	F	R^2	β	Std. Error	t	Sig
Perceived job security	42.244	0.344	0.107	0.032	3.337	0.001
Employee well-being			0.337	0.036	9.396	0.000

Table 10.
Multiple regression

Source(s): Authors

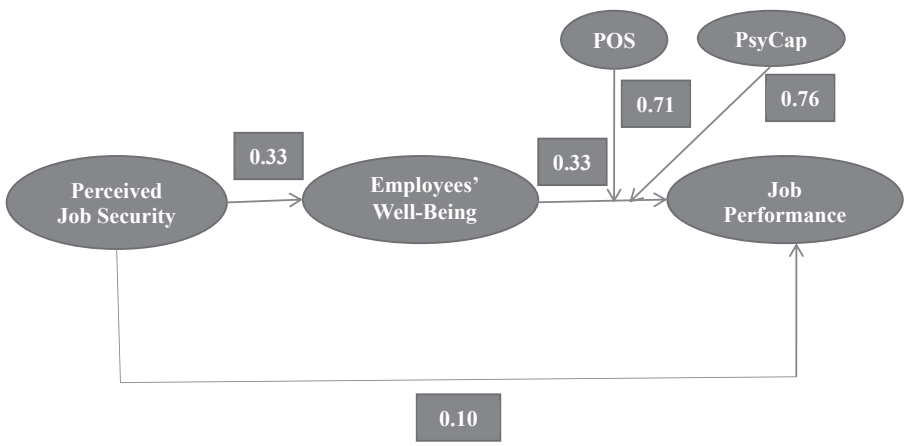


Figure 2.
Hypothesized structural model

Source(s): Authors

	β	se	t	p	LLCI	ULCI
constant	0.85	0.43	1.98	0.05	0.00	1.70
WB	0.27	0.13	2.13	0.03	0.02	0.52
POS	0.58	0.13	4.38	0.00	0.32	0.84
Int_1	−0.02	0.04	−0.6	0.55	−0.09	0.05

Table 11.
Results of POS moderation analysis (model I)

Source(s): Authors

pandemic. Consequently, we can confidently conclude that our analyses substantiate all four hypotheses, demonstrating that the relationships between the variables under consideration are statistically significant.

5. Discussion

This study explored the impact of perceived job security on employee well-being and job performance amid the social distancing measures enforced during the COVID-19 pandemic. While prior research has examined the effects of such measures on employee well-being (Tuzovic and Kabadayi, 2021) and the relationship between job security, subjective well-being, and job performance (Darvishmotevali and Ali, 2020), the influence of perceived job security and employee well-being on job performance has not been investigated. The findings of this study not only confirm the existence of such an effect, but also identified POS and PsyCap as moderating factors. The research showed that perceived job security positively influenced both job performance and employee well-being. Furthermore, this relationship was found to be stronger when moderated by POS and PsyCap.

	B	se	*t*	*p*	LLCI	ULCI
constant	0.22	0.40	0.55	0.58	−0.57	1.01
WB	0.29	0.12	2.40	0.02	0.05	0.52
PsyCap	0.79	0.12	6.70	0.00	0.56	1.02
Int_1	0.04	0.03	−1.32	0.19	−0.11	0.02

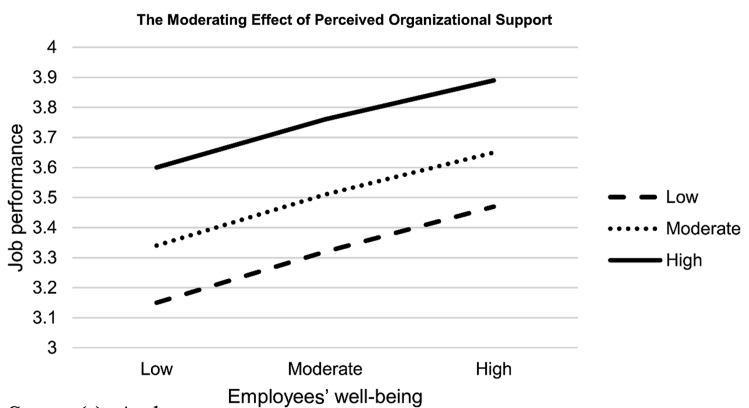
Source(s): Authors

Table 12. Results of PsyCap moderation analysis (model 2)

	R	R^2	MSE	*F*	DF1	DF2	*p*
Model 1	0.71	0.51	0.16	94.61	3.00	274.00	0.00
Model 2	0.76	0.58	0.13	124.18	3.00	274.00	0.00

Source(s): Authors

Table 13. Model summary



Source(s): Authors

Figure 3. The moderating effect of POS on the association between employee well-being and job performance

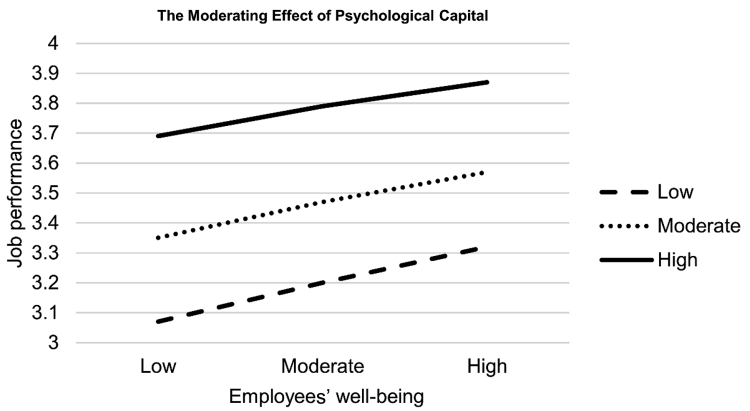


Figure. 4.
The moderating effect of PsyCap on the association between employee well-being and job performance

Source(s): Authors

Our findings align with those of previous research. For instance, Umrani *et al.* (2019) discovered that job security and organizational support positively influenced employees' job performance. They proposed that ensuring job security and providing organizational support could enhance employees' job performance, a conclusion that resonates with our findings. Usman (2017) also found that improved psychological well-being positively affected job performance among corporate employees. Earlier studies have explored the impact of employee well-being on job performance from various angles. In their research on the relationship between employee well-being and performance, Edgar *et al.* (2017) found that different aspects of well-being contributed differently to employees' task and contextual performance, with happiness and trust showing a positive correlation with both types of performance. Johari *et al.* (2019) demonstrated that positive feedback positively affected employee well-being, serving as a significant mediator in the relationship between feedback and job performance.

This study's findings revealed a significant impact of perceived job security on employees' job performance. Darvishmotevali and Ali (2020) discovered a positive correlation between job security and employees' job performance, primarily through an increase in subjective well-being. The study also tested a second hypothesis (H2), suggesting a positive effect of employee well-being on job performance, which yielded significant positive results. Given its direct influence on both individual and organizational performance, enhancing employee well-being remains a top priority for many companies and executives. Therefore, this study's findings confirm a positive correlation between both employee well-being and job security with employee job performance.

Moreover, our findings indicate the critical role of employee well-being in the relationship between perceived job security and job performance. The data suggest that employee well-being contributes to a positive reciprocal response, which is manifested in their job performance. Our results confirm that when organizations invest in creating a secure job environment, and this is positively perceived by employees, it leads to an enhancement in job performance (H2a and H2b).

Our findings indicate that POS has a moderating effect on employee well-being and job performance, with the relationship strengthening as POS increases. Cheng and Yi's (2018) study emphasized how POS elements such as hope and resilience affect employee well-being and performance. They argued that POS plays a crucial moderating role in assessing employee well-being and job performance, because it gauges the degree to which employees

believe their employer values their contributions. It also illustrates the company's concern for its employees' well-being and its potential to meet their socio-emotional needs. This study's results reveal that these socio-emotional needs influence job performance through the effect of POS on employee well-being, which subsequently has a positive effect on job performance.

This study also used PsyCap as a moderator, which demonstrated a significant and positive impact on employee well-being and job performance. The assumption was that this relationship would strengthen as PsyCap increased. Fida *et al.* (2015) found that each PsyCap attribute positively influenced overall health and work-related outcomes. PsyCap, encompassing traits such as self-efficacy, hope, optimism, and adaptability, is a set of resources that enhance work performance and success. Our findings indicate a significant positive moderating effect of PsyCap attributes on employee well-being and job performance. This affirms that PsyCap could be one of the essential tools that Folkman and Lazarus (1984) identified as necessary for employees to manage stressful workplace situations.

5.1 Theoretical implications

This study presents three significant contributions to academic knowledge in this field of research. First, it expands upon the evolving body of work on the application of SCCT in the context of job security and performance, offering insights into previously unexplored implications. This is the first empirical study to apply the SCCT model in the setting of the COVID-19 pandemic within an emerging Arab country. Second, the study addresses the lack of prior literature on the effect of job security and employee well-being on work performance. We believe our findings will assist practitioners in uncovering new insights into employee work performance. Researchers will gain a deeper understanding of the contrasting outcomes, because the results support both hypotheses H1 and H2. Furthermore, the application of both POS and PsyCap to assess their effect on job performance yielded a positive effect. Third, this research could offer a fresh perspective on additional ways to amplify the positive effect of employee well-being on job performance. Lastly, this study enriches the existing literature in the context of emerging Arab countries by introducing a new boundary condition of employee well-being, considering PsyCap and POS. In this study, PsyCap and POS were found to bolster the relationship between employee well-being and job performance.

5.2 Practical implications

The study's findings provide crucial recommendations for practitioners and policymakers. First, managers might observe an uptick in employee job performance as a result of simultaneous enhancements in employees' well-being and perceived job security. Therefore, managers should place a high priority on employees' psychological, social, and health well-being (Elkhwesky *et al.*, 2023b). Our findings suggest that increasing employee well-being should be a primary focus for organizations, given its direct effect on employee job performance (Johari *et al.*, 2019). Practitioners can boost their employees' well-being by providing mentorship, encouragement, assistance when needed, and offering team-building opportunities to make employees feel valued.

Second, this research is significant because it offers organizations a deeper understanding of the effect of well-being on work performance. It forms the foundation for a variety of organizational outcomes, such as innovation, creativity, and employee engagement in organizational tasks. Thus, managers could potentially value employees' psychological well-being to ensure improved job performance. They should develop policies and practices to enhance their employees' PsyCap through training and soft skills programs, thereby improving their mental health and job performance. We also discovered that if a company fails to implement measures for maintaining job security, employees' negative attitudes and

behaviors related to work become apparent. Consequently, managers should consider ways to enhance employees' perceived job security factors to ensure optimal professional performance. Organizational strategies aimed at improving employees' job performance may not be effective if the employees lack self-confidence and experience stress. Interventions such as employee participation in planning, information sharing, and execution can reduce job insecurity and improve desired outcomes. By developing training programs and providing opportunities for employees to reflect on their work and learn new knowledge, practitioners can mitigate the effect of work stressors, thereby boosting their confidence and performance at work.

Lastly, it could be advantageous for managers to differentiate between employees with high and low levels of POS. It is crucial for businesses to ensure employees understand their value. By implementing effective performance management systems, managers can make employees feel appreciated and reassure them of their significant contributions to the workplace. Additionally, endorsing employees through a reward system can assist organizations in maintaining high levels of job security and productivity.

6. Conclusion

This study aimed to assess the impact of perceived job security and employee well-being on job performance during the implementation of social distancing protocols. Additionally, it examined the enhanced effect of PsyCap and POS on employee well-being during this period. Our findings emphasized the positive influence of POS and PsyCap on employee well-being and their combined direct effect on job performance. We anticipate that our findings will aid managers in formulating policies that enhance employee well-being and bolster perceived job security. Furthermore, the insights gained from this study could enable managers to better understand their employees' performance and devise effective strategies for improvement.

7. Limitations and future directions

The study has several limitations, including the use of self-reported data for analysis, which may introduce social desirability bias and generalization, potentially affecting the validity and credibility of the results. The study focused on the impact of job security and employee well-being on job performance, but other relevant variables could also influence job performance. Future research could incorporate dimensions such as work stress, conscientiousness, adaptability, and integrity. Additionally, the study did not consider the multidimensional structure of well-being, including psychological, social, and health aspects, and their potential impact on employee performance. This leaves unexplored areas for researchers and practitioners to investigate. The data were collected from Saudi Arabia, limiting the generalizability of the results to other national contexts. Future studies should aim to ensure the generalizability of the results across diverse cultures and contexts.

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Received 22 September 2023
Revised 18 January 2024
20 March 2024
Accepted 24 March 2024

Banking with purpose: the impact of CSR-S on customer behavior during the COVID-19

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Abstract

Purpose – This article examines the impact of banks' corporate social responsibility communication through social media (CSR-S), electronic word of mouth (eWOM), and brand reputation on consumer behavior during the COVID-19 crisis, with a focus on purchase intention.

Design/methodology/approach – The study employed a quantitative approach to analyze data from a survey of 621 Egyptian bank customers who followed the banks' social media pages and interacted with CSR-S initiatives. A genetic algorithm selected the most relevant variables affecting purchase intention. A Bayesian regression model was used to analyze the impact of CSR-S communication, eWOM, and brand reputation on purchase intention.

Findings – CSR-S initiatives, eWOM, and brand reputation were found to influence customer purchase intention. CSR-S initiatives can boost purchase intention by encouraging brand reputation and initiative sharing with friends and other customers. However, CSR-S negatively moderates the positive impact of eWOM and brand reputation on the predisposition to contract products and services with the bank.

Originality/value – This study addresses critical research gaps in CSR literature. Firstly, it examines the impact of CSR-S actions on customer behavior, a perspective less explored in previous research. Secondly, it investigates the intricate relationships between CSR-S, eWOM, brand reputation, and purchase intention, shedding light on their interplay, particularly during the COVID-19 pandemic. Additionally, this research extends CSR-S investigations to the competitive banking industry and focuses on a developing country context, enhancing the applicability of findings for Egyptian banks. Lastly, the study employs advanced methodologies to improve the accuracy of results.

Keywords Social media, Corporate social responsibility, CSR-S initiatives, COVID-19, Banking industry, Customer behavior

Paper type Research paper

1. Introduction

The rise of social media (SM) has transformed people's lives and interactions with companies (Dalla-Pria and Rodríguez-de-Dios, 2022). SM allows individuals to interact easily with each other and brands, letting them broaden their communication and promote brands (Camilleri, 2019). As a result, SM is becoming a vital part of corporate communication, allowing businesses to interact with the public and disseminate information daily (Troise and Camilleri, 2021). Corporate social responsibility (CSR) initiatives have also benefited from the

European Journal of Management and Business Economics
Vol. 35 No. 2, 2026
pp. 266-289
Emerald Publishing Limited
e-ISSN: 2444-8494
p-ISSN: 2444-8451
DOI 10.1108/EJMBE-09-2023-0301

This work was partially supported by grant project PID2022-141694NB-I00, funded by MCIN/AEI/10.13039/501100011033/ERDF, EU.

widespread use of SM, which has transformed the way companies communicate their CSR activities to the public. Unlike offline CSR, online CSR enables people to interact and participate in the social responsibility activities of companies via SM platforms.

It is cost-effective and has a higher throughput than offline CSR communication. The competition between brands to communicate their emotional, ethical, and social position on the environment, society, and customers has made the use of SM for CSR programs a rich source of differentiation for brands, specifically during the unprecedented challenges posed by COVID-19. This pandemic triggered a crisis that swept the world (Qiu *et al.*, 2021). It forced people to stay at home, leading to a surge in SM usage. Banks and other companies quickly adapted to this change by using SM to manage their businesses and implement CSR strategies (Elia *et al.*, 2020). The pandemic posed major CSR-related challenges for companies in the banking industry. It tested their ability to meet their ethical and social obligations and develop CSR programs that targeted problems stemming from the outbreak of COVID-19 (Puriwat and Tripopsakul, 2022a, b; Al-Omoush, 2024).

It also presented an opportunity for banks to create new CSR programs and activities outside their core business (Chu *et al.*, 2020). CSR communication through SM platforms (CSR-S) has a range of effects on customer behavioral outcomes, including participation in charitable activities, CSR activities, and purchase intention. Although, recently, marketers and the banking sector have used SM as a brand communication tool (Yadav and Rahman, 2018), the psychological mechanisms through which CSR-S affects customers' attitudes and behaviors toward brands remain unclear. As a result, there is a lack of knowledge of how banks use SM to disseminate CSR initiatives to influence customer behavioral intentions, particularly during crises such as COVID-19. In this study, we analyze the effects of CSR-S initiatives adopted by banks on customer actions, eWOM, brand perception, and purchasing intention.

This research not only offers a new perspective into the dynamics of CSR communication via SM but also provides a unique lens into the banking industry in Egypt, shedding light on effective CSR-S communication that can benefit society during times of crisis. Our research methodology is advanced, enhancing the understanding of how CSR-S can drive change in the face of complex global challenges. The present study makes significant contributions to the existing body of literature. First, it examines the relationships between CSR-S, eWOM, brand reputation, and purchase intention in the banking industry throughout the COVID-19 pandemic, which makes it distinctive. More precisely, the study determines how CSR-S communication can enhance eWOM, brand reputation, and purchase intention using the initiatives proposed by banks through their SM accounts.

This research offers an original viewpoint by investigating the importance of CSR-S in the context of a worldwide emergency, such as the COVID-19 pandemic. By examining how banks can employ CSR-S initiatives, the research aims to address the challenges posed by the pandemic and promote societal well-being. Second, in contrast to the majority of prior research which has predominantly focused on organizational outcomes of CSR (Singh and Misra, 2021; Franco *et al.*, 2020), the present study examines the influence of bank-related CSR attributes that are communicated through SM on customer behavior. Concerning social issues, these CSR attributes are more likely to generate discussion on SM than those about products or services. The study also aims to improve scholars' understanding of how CSR-S in the banking industry can encourage customers to participate in charitable activities during the pandemic.

Third, the banking industry in Egypt was the focus of this study for two primary reasons. Firstly, the service sector has received minimal attention when exploring CSR. Secondly, the majority of CSR research has been conducted in developed countries. However, given the context-dependent nature of CSR, these findings cannot be extrapolated to developing countries such as Egypt. The banking sector in Egypt, like in other developing countries, is

homogeneous and competitive, with a strong emphasis on customer retention. With most banks offering similar products and services, retaining customers is difficult and customer switching is a significant risk. In this context, implementing CSR-S initiatives can be an effective marketing strategy to build a positive brand reputation and spread positive eWOM. Finally, the study employed a sophisticated combination of techniques to achieve precise results. A metaheuristic optimization algorithm, known as the genetic algorithm, enabled the selection of the most relevant variables for subsequent Bayesian regression models.

This approach is particularly effective for dealing with consumer heterogeneity. Overall, this study offers a fresh perspective, rigorous methodology, and an expanded framework, thereby significantly enhancing its contribution to the existing body of knowledge.

2. Literature review and hypothesis devolvement

Several theories are used to identify links between the variables under study. These theories are highly relevant to this research. The theory of norm reciprocity (Gouldner, 1960) suggests that individuals feel obliged to respond positively when others do something beneficial for them. When a bank performs socially responsible actions on SM, it establishes a positive norm that creates an expectation of customer reciprocity. Thus, customers are more inclined to make purchases when they perceive the bank as socially responsible. Attribution theory (Heider, 1958) provides insights into the underlying reasons behind individual and consumer behaviors (Singh *et al.*, 2021).

In the present study, attribution theory explains how customers distinguish and evaluate socially responsible brands or organizations. The theory of planned behavior – TPB – (Ajzen, 1991) indicates that a positive brand reputation can positively impact customer attitudes, create favorable subjective norms, and enhance perceived behavioral control, ultimately increasing purchase intention. Finally, social support theory (Cohen and Wills, 1985) suggests that information obtained from reliable, trustworthy fellow customers, plays a role in shaping customer purchase intention. Then, the SM information and reviews about the CSR-S initiatives of banks influence the customer purchase intention.

2.1 The relationship between CSR-S initiatives and purchase intention

Research provides empirical evidence of a connection between a company's CSR and purchase intention (Bae *et al.*, 2019; Bianchi *et al.*, 2019; Chu and Chen, 2019; Wu and Zhu, 2021; Li *et al.*, 2024). The quantity and type of CSR information shared with customers are characteristics that affect the appraisal of goods, firms, and purchase intention (Badenes-Rocha *et al.*, 2019). Corporate responsibility can influence customer purchase decisions when a brand's products or services include ethical offerings that reflect a commitment to protecting consumer interests. Arachchi and Samarasinghe (2023) observed a significant positive relationship between perceived CSR and customer purchase intention among retail customers in Sri Lanka. To clarify the relationship between CSR-S and purchase intention, this study draws on attribution theory (Heider, 1958) and the theory of norm reciprocity (Gouldner, 1960).

Following these theories, customers should be more likely to view a company positively if they see that it engages in socially responsible practices. The theory of norm reciprocity also predicts that an organization's CSR-S initiatives will result in favorable customer support (Gouldner, 1960). Puriwat and Tripopsakul (2021) concluded that a company's social responsibility initiatives on SM affect customer purchase decisions and intentions. In such cases, customers feel that the company cares about their moral and economic desires and interests. Research suggests that consumers primarily view companies' CSR-S actions favorably, with such actions increasing the likelihood that they will make a purchase

(Bialkova and Te Paske, 2020; Chu and Chen, 2019; Cheng *et al.*, 2021). Therefore, a firm's CSR-S initiatives with customers contribute to developing a socially responsible brand image, which is crucial for influencing purchase intention and choices (Mostafa and ElSahn, 2016).

Amid intense market competition, numerous companies now view CSR-S as a strategic tool. Along with their products, companies see CSR-S as a way to establish positive relationships with stakeholders, achieve long-term growth, and enhance customer behavioral intentions, including purchase intention (Troise and Camilleri, 2021). The way consumers perceive a company's CSR initiatives can have a positive impact on their attitude toward the company. This positive attitude in turn influences purchase intention (Esposito and Ricci, 2021). In sum, it is assumed that when a bank communicates its CSR-S initiatives to customers on SM, customers are likely to reciprocate with positive behavior, ultimately influencing their purchase intention. Accordingly, the following hypothesis is proposed:

H1. During the COVID-19 pandemic, banks' CSR-S initiatives have had a positive influence on customer purchase intention.

2.2 The relationship between brand reputation and purchase intention

Brand reputation has been found to exert a positive impact on stakeholder outcomes and behavioral intentions through consumer perceptions and attitudes. Such behavioral intentions include customer purchase intention (Hengboriboon *et al.*, 2022). Positioning brand reputation as an attitude in the TPB provides a comprehensive theoretical approach and a valuable diagnostic tool for managers. Under this approach, a positive brand reputation influences attitudes, creates supportive subjective norms, and enhances perceived behavioral control, leading individuals to engage with the brand and purchase intentions. Additionally, signaling theory suggests that brand reputation communicates details about the inherent intangible features of products such as quality, especially in the absence of alternative methods of assessment. Consequently, brand reputation may have an immediate impact on customer behavioral intentions (Jufri *et al.*, 2022).

Multiple studies have confirmed the impact of brand reputation on purchase intention. According to Maden *et al.* (2012), a positive brand reputation causes customers to perceive transactions as advantageous, thereby reducing costs associated with searching for information amid uncertainty and asymmetry. Customers also link a favorable reputation to superior quality, which enhances their satisfaction with purchases (Ronaldo *et al.*, 2018). Furthermore, using a well-known brand has been found to boost consumers' sense of self-worth and pride (Agmeka *et al.*, 2019). Caruana *et al.* (2006) conceived brand reputation as an attitude that directly affects the intention to perform a specific behavior.

Scholars have also discovered that customer behavioral intentions are ultimately formed by customers' cognitive and emotional appraisals of brand reputation (Balakrishnan and Foroudi, 2020; Bianchi *et al.*, 2019; Qalati *et al.*, 2021). Balakrishnan and Foroudi, (2020) suggest that using SM in a balanced manner can greatly enhance the impact of brand reputation on purchase intention. Reputable businesses are more likely to attract more customers, and a positive brand reputation has a positive impact on consumer behavioral outcomes such as purchase intention. Based on these findings, the following hypothesis can be formulated:

H2. During the COVID-19 pandemic, the brand reputation of banks has a positive influence on customer purchase intention.

2.3 The relationship between eWOM and purchase intention

This study uses social support theory (Cohen and Wills, 1985) to explore the relationship between eWOM and purchase intention. Social support theory suggests that customers often

seek social support from other customers, friends, and relatives when making purchasing decisions. Hence, credible and influential eWOM is highly valued (Wang *et al.*, 2018) and an important precursor of purchase intention (Erkan and Evans, 2016; Elhajjar, 2022; Halim and Keni, 2022; Puriwat and Tripopsakul, 2022a). Aravindan *et al.* (2023) concluded that promoting positive eWOM by emphasizing sustainable practices sparks public interest in green purchases. Likewise, Mainardes *et al.* (2023) found that eWOM quality and credibility shape consumer attitudes toward eWOM and purchase intention of cosmetics. SM provides an ideal platform for users to share information and spread viral messages.

Rahaman *et al.* (2022) indicated that eWOM information quality, credibility, utility, and ease of use are crucial in determining online consumer intentions and buying behavior on SM. Nofal *et al.* (2022) investigated the connection between eWOM on discussion forums and purchase intention. They found that the similarity between forum topics and consumer interests affects purchase intention. Similarly, Wang *et al.* (2016) evaluated the effect of eWOM interactions on purchase intention in the context of SM platforms. They found that eWOM communication has positive effects on purchase intention.

In the context of the present study, reviews and comments about CSR-S initiatives on SM platforms are seen as trustworthy and reliable sources of information by consumers, making them a key reference for purchase decisions (Bialkova and Te Paske, 2020; Kunja *et al.*, 2022; Khan *et al.*, 2024). Therefore, given the social support theory and the reliance of many customers on social connections, it is assumed that the sharing of customer comments and reviews of CSR-S initiatives among friends and relatives positively affects purchase intention. Hence, the following hypothesis can be formulated:

H3. During the COVID-19 pandemic, the eWOM of customers has a positive influence on purchase intention in the banking industry.

2.4 The relationship between CSR-S initiatives, brand reputation, eWOM, and purchase intention

Attribution theory holds that an individual's current and past behavior predicts future behavior (Weiner, 1985). Consumers try to understand the causes that incentivize the actions of firms (Kelley and Michela, 1980). These attributional inferences affect how perceptions toward the organization affect purchase intention, with these perceptions derived from company reputation or eWOM (Ellen, 2006; Reimer and Benkenstein, 2018). The literature cites two drivers of corporate behavior: altruistic motivations and selfish motivations. Altruistic motivations are built on ethical ideals (Ellen *et al.*, 2000).

In such cases, consumers consider a company's concern for a social cause as the trigger for their willingness to act (Becker-Olsen *et al.*, 2006). However, people may also believe that companies are driven by financial interests (Ellen, 2006). This conclusion is especially common in the banking sector, where banks are rarely viewed as socially responsible organizations (Forcadell and Aracil, 2017). Skepticism can explain this negative attitude toward intrinsic motivations (Mangleburg and Bristol, 1998).

Skepticism is a feeling that causes customers to question the social commitment of a company because they feel that it is driven by the selfish goal of maximizing profits (Alcañiz *et al.*, 2010; Skarmeas and Leonidou, 2013). In normal circumstances, CSR activities may encourage consumers to develop positive perceptions of such behaviors. However, at specific times, such as during the COVID-19 crisis, the poor image of financial institutions means that consumers may be unconvinced that they have a genuine interest in CSR. This skepticism may be especially strong if the companies are more socially responsible than they had been previously. In this context, doubts arise about the reasons for CSR actions and about the willingness to display an ethical long-term commitment to society (Parguel *et al.*, 2011). Given these cognitive biases, when CSR-S increases, the positive effect of eWOM and brand

reputation on purchase intention is expected to weaken. Therefore, the following hypotheses are proposed:

H4. During the COVID-19 pandemic, the interaction of brand reputation and purchase intention is moderated by banks' CSR-S initiatives.

H5. During the COVID-19 pandemic, the interaction of eWOM and purchase intention is moderated by banks' CSR-S initiatives.

3. Methodology

3.1 Data collection and sample characteristics

The data were collected using web-based surveys in large metropolitan areas in Egypt where banking institutions actively engaged in CSR-S efforts during the COVID-19 pandemic. These cities were chosen because they had numerous branch offices of the selected banks and large populations. The questionnaire included two screening questions. The first confirmed that the participant had a bank account and followed at least one of the bank's SM accounts. The second assessed participants' level of SM activity. The questionnaire comprised three sections. The first collected preliminary data (SM usage, bank name, and screening questions). The second collected data on the main variables. The third collected demographic data. The authors selected respondents who met specific inclusion criteria.

These inclusion criteria were being an Egyptian citizen, aged older than 18 years, an SM user, having interacted with the bank's social responsibility messages, and regularly engaging with the bank's SM accounts. A total of 621 Egyptian customers participated in the study. The sample was almost equally split between men (52.5%) and women (47.5%) with many participants holding a bachelor's degree (52.5%).

The main variables were measured using pre-existing scales adopted from other studies (see Table 1). Respondents answered using a five-point Likert scale that ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). The scales used in this study were translated into Arabic to ensure linguistic accuracy and cultural relevance. Two bilingual translators independently translated the scales from the original language to Arabic, while maintaining semantic equivalence. A reconciliation meeting was held to address any discrepancies and reach a consensus on the final translated version. To assess the clarity and appropriateness of the translated scales, a pilot study was conducted with Arabic-speaking participants. Their feedback was collected and used to refine the translation, ensuring understanding and cultural suitability. The translation process aimed to address validity concerns.

The psychometric properties of the measurement model were evaluated (Hair *et al.*, 2021). The estimated CFA model in Table 1 suggests an acceptable fit ($\chi 2 = 372.58$, $p < 0.01$; SRMR = 0.036; CFI = 0.960; TLI = 0.953; RMSEA = 0.050). The internal consistency of all constructs was above the recommended thresholds, with all Cronbach's alpha and composite reliability (CR) scores exceeding 0.70. Convergent validity was ensured because the standardized factor loadings of all items were high and significant. Also, the average variance extracted (AVE) was greater than 0.50 for all factors. Following the Fornell and Larcker (1981) criteria, discriminant validity was also met, with the AVE of the constructs being greater than the square of the correlations between factors.

3.2 Data analysis

This subsection presents a pioneering method designed to meet the research aims. A genetic algorithm was used to select the most relevant variables affecting the purchase intention [1]. A Bayesian regression model was used to deal with consumer heterogeneity and analyze the

Table 1.
Measurement scale

Variables	Adapted/ adopted/self-mad	Citation	Items	Std. loading	Alpha Cronbach	CR	AVE
CSR-S	Adapted	Kang and Hustvedt (2014), Puriwat and Tripopsakul (2021)	CSR1. The bank has committed to using a portion of its profits to help communities and societies via social media during the COVID-19 pandemic	0.688*	0.848	0.848	0.527
			CSR2. During the COVID-19 pandemic, the bank gave back to the communities where it does business via social media platforms	0.718*			
			CSR3. The communities and societies have benefited from bank contributions through social media platforms during the COVID-19 pandemic	0.737*			
			CSR4. The bank integrates digital charitable contributions into its business during the COVID-19 pandemic	0.725*			
			CSR5. The bank is interested in corporate giving through social media platforms during the COVID-19 pandemic	0.759*			
BR	Adapted	Veloutsou and Moutinho (2009)	BR1. I think this bank's brand on social media is very successful among other bank brands	0.705*	0.803	0.804	0.506
			BR2. I think the bank brand is highly regarded and honesty on social media platforms	0.717*			
			BR3. I think the bank brand is trusted on social media platforms	0.684*			
			BR4. I believe the bank's brand on social media platforms will have excellent development prospects	0.740*			
eWOM	Adapted	Chu and Chen (2019), Kwok *et al.* (2019)	eWOM1. I would "Like" those bank social responsibility initiatives and messages on social media	0.679*	0.859	0.860	0.507
			eWOM2. I would "Share" those bank social responsibility initiatives and messages	0.715*			
			eWOM3. I would "Comment positively" those bank social responsibility initiatives and messages	0.705*			
			eWOM4. I will spread the positive word among my friends and acquaintances about the bank's social responsibility initiatives on social media	0.747*			
			eWOM5. I would recommend this bank products and services to my friends on social media	0.724*			
			eWOM6. If my friends or acquaintances are looking to deal with a bank through social media platforms, I will tell them about my experience of dealing with this bank	0.698*			

(*continued*)

Table 1.

Variables	Adapted/ adopted/self-mad	Citation	Items	Std. loading	Alpha Cronbach	CR	AVE
PI	Adapted	Prendergast *et al.* (2010)	PI1. After looking at the social responsibility campaigns and initiatives that the bank shared on social media platforms during the COVID-19, dealing with this bank will be my first choice compared to other banks	0.695*	0.805	0.806	0.509
			PI2. I will purchase the bank's products and services the next time I need these services in the future	0.716*			
			PI3. I recommend the bank's products and services to friends or others on social media	0.712*			
			PI4. After looking at the social responsibility campaigns and initiatives that the bank shared on social media platforms during the COVID 19, I will try its products and services	0.731*			

Note(s): *$p < 0.01$
Source(s): Table by authors

impact of the main variables on purchase intention. This sophisticated combination of techniques contributes to research on CSR-S in the banking industry.

3.2.1 Genetic algorithm. This machine learning tool selects the most useful subset of predictors to explain the customer purchase intention. First, a population of 50 chromosomes was randomly created to represent different combinations of variables used in the regression. These candidate models were coded with sequences of identical length that matched the total number of predictors. Each element in the chains is identified with each variable.

These elements took the value 1 if the regressor was present when the estimation was performed, and 0 otherwise. To evaluate the fitness of each of these potential solutions, the Akaike information criterion (AIC) is used (Scrucca, 2013). The AIC enabled the selection of the model that most adequately described a high-dimensional unknown reality. Only the fittest chromosomes reproduced, thus transmitting their genetic information to their offspring. In this competitive environment, there are two important aspects: exploration and exploitation. Exploration creates diversity in the population through crossover (which combines part of the genotype of two parent chromosomes belonging to the mating group) and mutation (which randomly alters these genes).

Following Scrucca (2013) probabilities of 80 and 10% were assigned to each of these genetic operators, respectively. Exploitation aims to reduce heterogeneity by selecting the chromosomes with the highest fitness at each stage. An elitist strategy was employed by allowing 5% of the variable combinations with the lowest AIC to survive. This stochastic search algorithm was used to perform a sequential eval 100 generation convergence criterion was met at the end of all iterations, this statistical technique returned the optimal solution $\varphi^* \equiv \arg max_{\varphi_i^{(k)}} AIC(\varphi_i^{(k)})$.

3.2.2 Bayesian regression models. Once the subset of predictors had been selected, Bayesian regressions were used to explain purchase intention. Bayesian models were chosen for two reasons: (1) the parameters included in these regressions are considered random (so their distribution can be estimated, and probabilistic judgments can be made about the hypothesized relationships) (Muth *et al.*, 2018); and (2) these models are more accurate for small samples (which is the case in most studies that use surveys to collect data) (Hahn and Doh, 2006). The main equation used to evaluate the theory and hypotheses presented in this paper is the following:

$$PI_n = \beta_0 + \beta_1 CSR\_S_n + \beta_2 BR_n + \beta_3 eWOM_n + \sum_{h=4}^{8} \beta_h z_{hn} + \omega_n \quad (1)$$

Here, z_{hn} is the set of control variables included in the model, and ω_n is the error term. Because no studies have used this methodology to make causal inferences, the parameters β of the predictors are considered *a priori* to follow a normal distribution with mean 0of and standard deviation 1of 00. A Gaussian specification was used for the error term, with variance $\sigma_\omega^2 \sim InvGamma(0.01, 0.01)$.

Using such uninformative values prevented incurring significant biases in the estimations. Finally, the impact of two moderating effects was evaluated by interacting the variable CSR_S_n with BR_n and $eWOM_n$ in Equations (2) and (3), respectively:

$$PI_n = \beta_0 + \beta_1 CSR\_S_n + \beta_2 BR_n + \beta_3 eWOM_n + \beta_4 CSR\_S_n \times BR_n + \sum_{h=5}^{9} \beta_h z_{hn} + \omega_n \quad (2)$$

$$PI_n = \beta_0 + \beta_1 CSR\_S_n + \beta_2 BR_n + \beta_3 eWOM_n + \beta_4 CSR\_S_n \times eWOM_n + \sum_{h=5}^{9} \beta_h z_{hn} + \omega_n \quad (3)$$

In these regressions, the Markov Chain Monte Carlo (MCMC) method was used. This method enabled the simulation of the posterior distribution. Specifically, the Gibbs algorithm was used because of its high efficiency in taking less time to explore these domains. To avoid pseudo-convergence problems arising from the possible multimodality of the posterior distribution, the procedure used 75,000 iterations (with different initial values) of four sequences of random vectors that satisfied the Markov property. The first 50,000 draws were not used to ensure that all chains converged stationarily to the same set of values. The autocorrelation was reduced by using 1 out of 25 iterations of the 25,000 computed per sequence. For further methodological details (Rossi *et al.*, 2005).

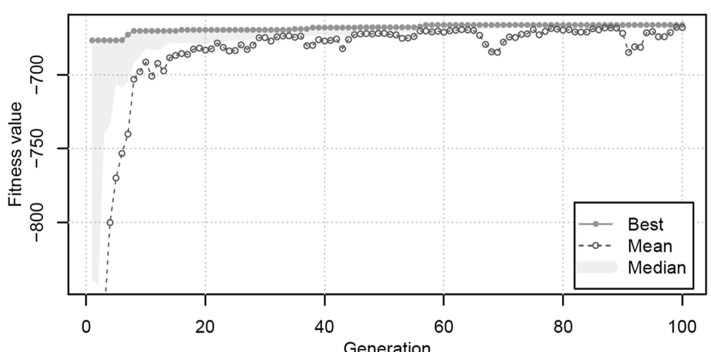
4. Findings

To identify the most effective predictors of consumer purchase intention in the estimated Bayesian regressions, a genetic algorithm was used. Figure 1 summarizes this stochastic search process by plotting the fitness values associated with each of the 100 generations considered.

Table 2 shows the descriptive statistics and correlation matrix. First, the constructs related to banks' CSR on SM, brand reputation, and eWOM were calculated using the mean of the items in the scales. The variable relating to the number of hours per day that individuals spent on SM in their relations with banks was included, as was a dummy variable that took the value 1 if the most heavily used platform by individuals was the bank app, and 0 otherwise. This item was included to determine whether they preferred Facebook, Twitter, Instagram, WhatsApp, or YouTube. Lastly, sociodemographic predictors for age, employment status (full-time employment or otherwise), and education level (included as an ordinal variable).

Table 3 displays the results of the three Bayesian models (see Methodology). To ensure the validity of the results, multiple tests were conducted. First, multicollinearity was tested by analyzing the variance inflation factor (VIF). The average value of this test was 1.55 in Model 1, 8.63 in Model 2, and 8.42 in Model 3. Multicollinearity did not appear to exist in this study because these values did not exceed the threshold of 10 established in the literature (Hair *et al.*, 2021).

Second, the Gelman-Rubin test ($\widehat{R}$) verified whether all four Markov chains reached the same stationary posterior distribution. This statistic did not exceed the threshold of 1.2 established by (Brooks and Gelman, 1998). Hence, it was assumed that there were no convergence problems. The average efficiency was greater than 99% for all models. Furthermore, the acceptance rate of the proposed magnitudes for the parameters was 100%. Consequently, no convergence problems were detected. We reach the same conclusions when analyzing the graphs linked to the main theoretical predictors of interest included in Figure 2. Regarding the goodness of fit, the deviation information criterion (DIC) was calculated, along



Source(s): Figure by authors

Figure 1.
Graphical summary of the fitness values of the chromosomes in each of the generations used in the genetic algorithm

Table 2.
Descriptive statistics of the main variables and correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Consumers' purchase intentions	1								
(2) CSR-S	*0.6097*	1							
(3) BR	*0.6582*	*0.5908*	1						
(4) eWOM	*0.7619*	*0.6482*	*0.7210*	1					
(5) Time in social media (with banks)	*0.0807*	−0.0090	0.0406	0.0644	1				
(6) Bank app	*0.1892*	*0.2478*	0.0740	*0.1594*	*−0.1126*	1			
(7) Age	*0.1269*	*0.1487*	−0.0003	0.0632	*−0.0897*	*0.3884*	1		
(8) Work status (full time)	0.0719	−0.0159	−0.0136	−0.0034	−0.0609	−0.0086	*0.1053*	1	
(9) Education	0.0235	*−0.1073*	−0.0060	−0.0650	0.0192	−0.0614	0.0472	*0.2431*	1
Observations	621	621	621	621	621	621	621	621	621
Mean	3.9682	3.9021	4.0636	4.0048	2.6377	0.1804	32.1288	0.3929	3.0032
SD	0.6772	0.7404	0.6726	0.6520	1.1691	0.3848	11.8893	0.4888	0.8443
Min	1	1	1	1	1	0	18	0	1
Max	5	5	5	5	4	1	70	1	4

Note(s): Correlations marked in italic are statistically significant at a 95% confidence level
Alpha Cronbach (α) = CSR-s (0.85), BR (0.80), eWOM (0.86), PI (0.81)
Source(s): Table by authors

Table 3.
Results of Bayesian regression models using consumers' purchase intentions as the dependent variable (standard errors in parentheses)

	Model 1				Model 2				Model 3			
	Estimat	Probability coefficients + or −	$\widehat{R}$	Efficie	Estimat	Probability coefficients + or −	$\widehat{R}$	Efficie	Estimat	Probability coefficients + or −	$\widehat{R}$	Efficie
Intercept	0.1362 (0.1403)	83.55%	1.0000	0.9937	−0.2420 (0.3266)	77.05%	1.0001	0.9945	−0.1905 (0.3212)	72.36%	1.0000	0.9896
Predictors												
CSR-S	0.1374 (0.0311)	100.00%	1.0000	0.9971	0.2472 (0.0912)	99.65%	1.0000	0.9921	0.2333 (0.0898)	99.49%	1.0000	0.9925
BR	0.1955 (0.0371)	100.00%	1.0001	1.0000	0.2971 (0.0873)	99.96%	1.0001	1.0000	0.1927 (0.0369)	100.00%	1.0000	0.9909
eWOM	0.5344 (0.0405)	100.00%	1.0000	0.9932	0.5308 (0.0401)	100.00%	1.0003	0.9870	0.6242 (0.0889)	100.00%	1.0000	0.9943
Interaction effects												
CSR-S × BR					−0.0283 (0.0221)	90.10%	1.0001	0.9941				
CSR-S × eWOM									−0.0252 (0.0222)	87.06%	1.0000	0.9936
Control variables												
Time in social media (with banks)	0.0309 (0.0143)	98.45%	1.0000	1.0000	0.0317 (0.0144)	98.56%	1.0000	1.0000	0.0319 (0.0144)	98.62%	1.0001	1.0000
Bank app	0.0815 (0.0482)	95.56%	1.0000	0.9930	0.0844 (0.0482)	96.04%	1.0000	1.0000	0.0856 (0.0482)	96.19%	1.0001	1.0000
Age	0.0028 (0.0015)	96.69%	1.0000	0.9941	0.0029 (0.0015)	96.97%	1.0001	1.0000	0.0028 (0.0015)	96.76%	1.0001	0.9927
Work status (full time)	0.0872 (0.0352)	99.40%	1.0001	0.9888	0.0886 (0.0351)	99.46%	1.0001	0.9941	0.0894 (0.0351)	99.46%	1.0000	0.9930
Education	0.0467 (0.0205)	98.91%	1.0001	0.9931	0.0476 (0.0205)	98.98%	1.0000	1.0000	0.0472 (0.0205)	98.91%	1.0000	0.9937
σ_w^2	0.1693 (0.0097)	100.00%	1.0000	1.0000	0.1692 (0.0097)	100.00%	1.0000	0.9964	0.1693 (0.0097)	100.00%	1.0001	1.0000

(*continued*)

Table 3.

	Model 1				Model 2				Model 3			
	Estimat	Probability coefficients + or −	$\widehat{R}$	Efficie	Estimat	Probability coefficients + or −	$\widehat{R}$	Efficie	Estimat	Probability coefficients + or −	$\widehat{R}$	Efficie
Observations	621				621				621			
Avg. accept. rate	100.00%				100.00%				100.00%			
Avg. efficiency	99.53%				99.62%				99.46%			
Avg. DIC	668.4618				668.7275				669.0391			
Avg. log (ML)	408.3498				416.0728				416.2789			
Log (BF)					−7.7230				−7.9291			

Source(s): Table by authors

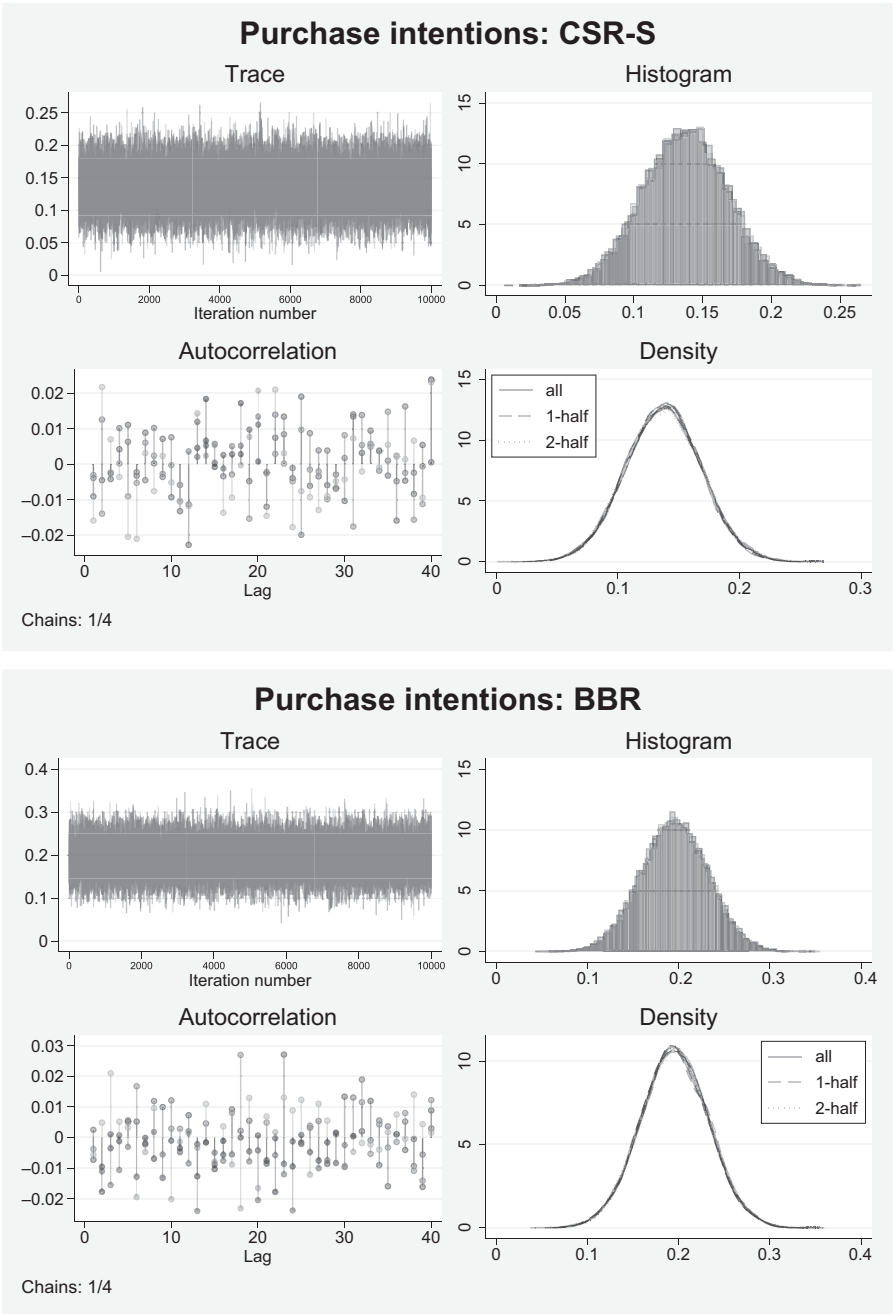
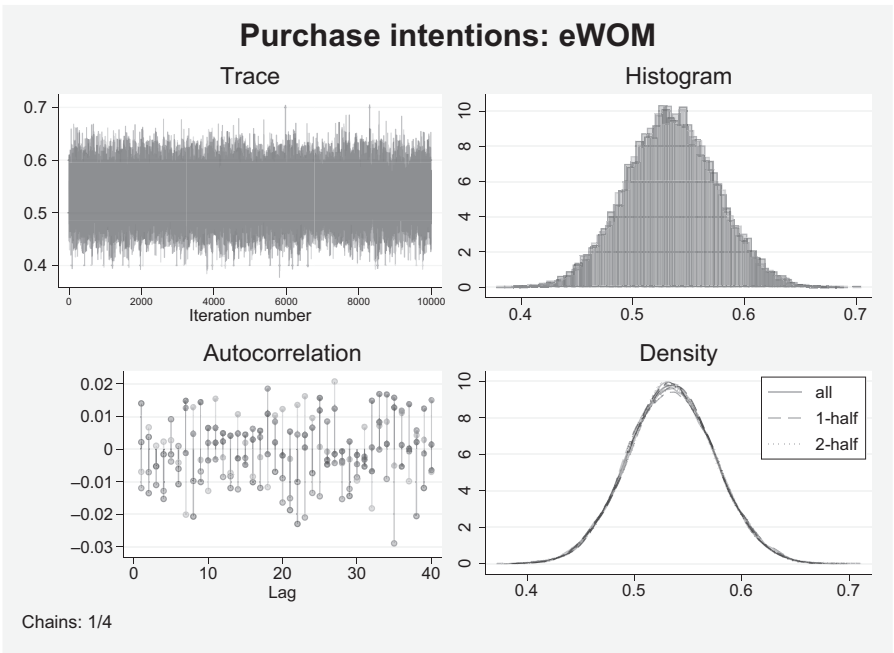


Figure 2.
Graphical summaries and convergence diagnostics for simulated posterior distribution: trace plots, auto correlation plots, and distributional plots

(*continued*)



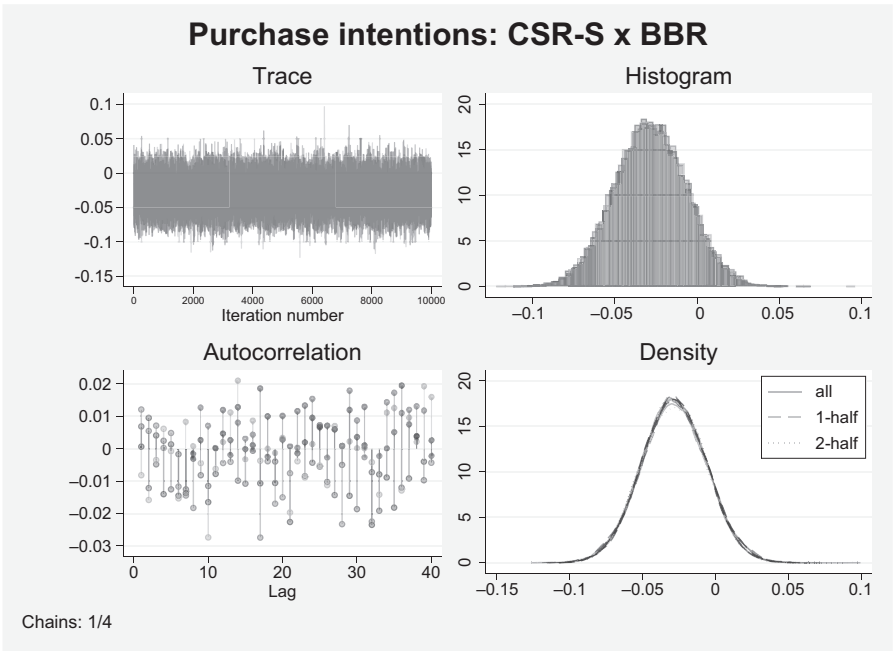


Figure 2.

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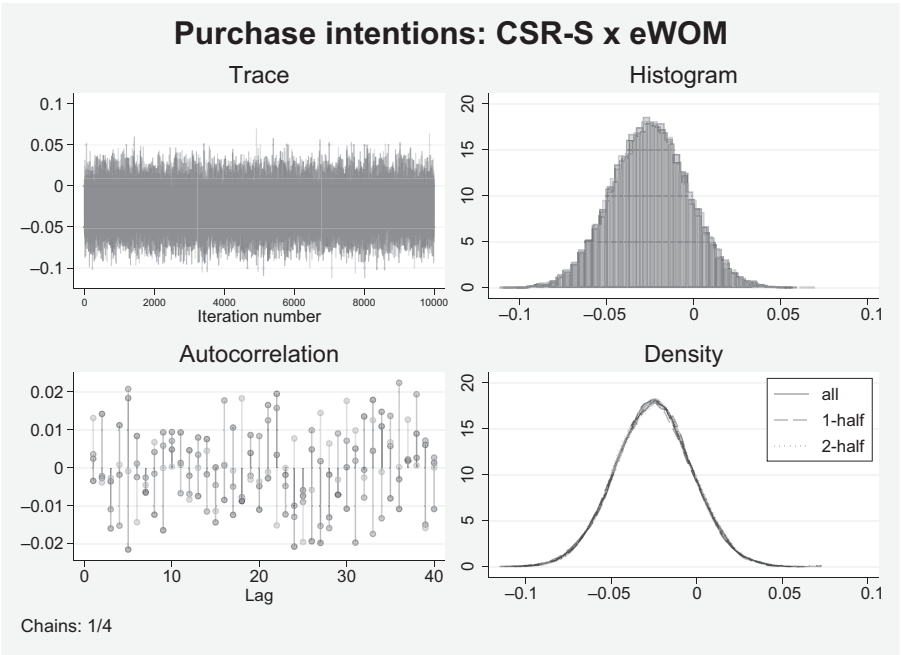

Figure 2.

with the log marginal likelihood (using the Laplace-Metropolis approximation) of the three specifications. Model 1 was preferable to the other two models because of its lower value for the first of the indicators (668.4618) and higher value for the second (−408.3498). Finally, Model 1 had the highest posterior probability (99.92%) based on the observed data. Thus, the results are interpreted concerning the first regression. The discussion only refers to the other two regressions about the interaction effects.

Third, measures were taken to address the possible existence of omitted covariate endogeneity. The impact threshold of confounding variables (ITCV) and the robustness of inference to replacement (RIR) tests were employed. For methodological details (Busenbark *et al.*, 2022). According to the ITCV, the square root of the product of the correlations between the omitted covariate and the dependent variable and the omitted covariate and the predictors of theoretical interest should be greater than 0.325 to give a spurious finding ($\alpha = 0.05$). The controls used in this study had no correlations with these variables above these thresholds (see Table 2). Therefore, it was highly unlikely that the existence of confounding factors would invalidate the results. The same conclusions were reached using the RIR. In the worst-case scenario, at least 55.582% of the estimated effect would have to be biased to alter the findings.

Results in Table 3 are used to test the hypothesized relationships. First, 100% of the posterior distribution of the variable CSR-S in Model 1 has positive values. Therefore, a greater perception that the bank used SM for CSR activities during the COVID-19 pandemic increases consumer purchase intention. This result supports Hypothesis 1.

Regarding Hypothesis 2, brand reputation has a positive impact on the customer's purchase intention. If the bank's brand has a higher reputation on SM and excellent development prospects, it is 100% likely to increase consumer purchase intention. As for

Hypothesis 3, there is a 100% chance that eWOM has a positive influence on the customer purchase intention. These results validate Hypotheses 2 and 3.

Finally, the analysis examined the interaction between banks' CSR-S and brand reputation/eWOM and their effects on consumer purchase intention in Models 3 and 4. The results show that 90.10 and 87.06% of the values associated with the posterior distributions of these two parameters are negative. These results support Hypotheses 4 and 5 because it is highly likely that CSR-S negatively moderates the positive impact of brand reputation and eWOM on purchase intention.

5. Discussion

The outbreak of COVID-19 has accelerated digital transformation. Banks have played a crucial role in promoting digital social responsibility during this period. Consumers have reported that a brand's response to the pandemic heavily influenced their likelihood of purchasing products or services from that brand (Soto-Acosta, 2020). Although CSR-S, brand reputation, and eWOM are crucial parts of banks' strategy, researchers still have a limited understanding of their effects on purchase intention during crisis periods. To address this gap, this study evaluates a proposed model of relationships between CSR-S, brand reputation, eWOM, and purchase intention.

The conclusions of the study could benefit Egyptian banks that use SM to promote CSR-S during challenging times such as the COVID-19 pandemic. Based on data from 621 participants, the analysis showed a significant positive link between CSR-S initiatives and purchase intention. These findings are consistent with those of prior research (Bae *et al.*, 2019; Bianchi *et al.*, 2019; Chu and Chen, 2019; Wu and Zhu, 2021). CSR-S initiatives that promote social causes or engage with customers online can have a positive impact on customer attitudes, generating and enhancing purchase intention.

The analysis also revealed a positive relationship between brand reputation and purchase intention, which supports the findings of prior research (Balakrishnan and Foroudi, 2020; Bianchi *et al.*, 2019; Qalati *et al.*, 2021). When a bank has a higher reputation than other banks, customers feel proud to use that bank and consider it trustworthy. These feelings ultimately increase purchase intention. The findings suggest that banks should strengthen their reputation as socially responsible to improve the purchase intention of customers. The study also provided other noteworthy findings. For instance, eWOM has a significant positive impact on purchase intention. This finding is also consistent with those of previous studies (Elhajjar, 2022; Halim and Keni, 2022; Puriwat and Tripopsakul, 2022a, b).

The results also support Hypotheses 4 and 5. They confirm that CSR-S negatively moderates the positive impact of brand reputation and eWOM on customer purchase intention. This finding is important because it shows that a significant increase in the CSR-S initiatives of banks can also have a negative impact on consumer perceptions of those banks, especially when these actions take place in a period of strong social pressure such as the COVID-19 pandemic. In such contexts, consumers may become skeptical. They may believe that these supposedly disinterested actions hide a different motive, namely, to improve the image of companies and boost their profits (Reimer and Benkenstein, 2018; Riera and Iborra, 2023). This situation can cause the impact of brand reputation and eWOM on purchase intention to weaken.

In short, CSR-S can offer a powerful tool to forge favorable ties with customers. However, a large increase in such initiatives in times of crisis may be interpreted as a lack of integrity and transparency. Such activity by a bank could elicit suspicion among customers about whether the bank will be socially responsible in the long run. Therefore, banks must adopt developed strategies for CSR-S, addressing immediate requirements while maintaining constant and genuine involvement with social concerns. Banks may build confidence with consumers and navigate crises effectively by smoothly incorporating CSR-S into their strategy framework and guaranteeing alignment with fundamental values.

6. Conclusions

The COVID-19 crisis has placed consumers in a vulnerable position. The challenging context has not only increased the potential weakness of customers but has also undermined trust in the banking sector, thereby placing banks in exposed situations regarding their reputation and public image (Moliner *et al.*, 2020). In this specific situation, this study provides evidence of the influence of CSR-S initiatives, eWOM, and brand reputation on customer purchase intention. Specifically, CSR-S actions positively affect purchase intention. However, CSR-S moderates the positive impact of eWOM and brand reputation on purchase intention.

Consequently, this emphasizes the need for a well-rounded approach to CSR-S in the banking sector, which promotes social responsibility while maintaining the genuineness and credibility of a bank's brand. As a result, our study offers significant insights into navigating the intricate relationship between CSR-S, eWOM, brand reputation, and purchase intention. Thus, it gives strategic counsel for banks aiming to establish and uphold consumer trust during difficult periods.

6.1 Theoretical implications

Firstly, it adds to prior research on CSR-S by examining customer perceptions of CSR-S initiatives rather than other organizational factors that are unique to banks. Previous studies have predominantly explored CSR-S in other non-consumer contexts, such as organizations' financial performance (Singh and Misra, 2021; Hakimi *et al.*, 2023), quality management (Franco *et al.*, 2020), or the level of employer attractiveness (Seara *et al.*, 2023). This approach, therefore, illuminates the gaps in previous research, focusing on CSR-S through the lens of consumers and their perceptions of ethical practices. Secondly, drawing on the theory of norm reciprocity, attribution theory, theory of planned behavior, and social support theory, this study shows that customer engagement with CSR-S initiatives, brand reputation, and eWOM positively influence purchase intention.

However, according to the attribution theory, it also reveals that customers may perceive that banks' CSR-S efforts during a period of crisis such as the COVID-19 pandemic are not consistent with their previous actions. Consequently, the positive effect of brand reputation and eWOM on purchase intention weakens. In this situation, customers may conclude that they are carried out by banks to try to clean their image. Thirdly, this study provides new information about how customers' skepticism impacts their evaluation and reaction to banks' CSR-S initiatives, especially in times of crisis. This could be an interesting avenue for future research, as banks can design more successful and trustworthy CSR-S actions by understanding the role of skepticism. Finally, this study provides theoretical arguments to suggest that CSR-S initiatives should be timed carefully to shape customer perceptions. Implementing CSR-S during a crisis versus a non-crisis period could impact how customers perceive and respond to them, offering an avenue for future research.

6.2 Managerial implications

Regarding the managerial implications of our findings, it seems evident that banks should actively leverage SM platforms to disseminate specific information about their CSR activities. The positive correlation between the spread of this information via SM and consumers' intentions to acquire banking products emphasizes the importance of transparent communication. Secondly, this study highlights that fostering and cultivating a positive brand reputation and emphasizing CSR should be a strategic priority for banks. The findings suggest a direct link between a positive brand reputation and an increase in consumer intentions to engage in banking products or services.

Banks should consistently communicate their commitment to CSR through their SM to strengthen this association. Thirdly, the work highlights that banks should actively manage

eWOM channels, emphasizing their sustainable practices. Positive eWOM, specifically highlighting socially responsible initiatives, positively influences consumers' intentions to choose banking products or services. Banks should encourage and monitor discussions and content that highlights their commitment to sustainability, promoting a positive online narrative on their SM and online communication platforms. Fourthly, when organizational crises occur (e.g. the COVID-19 pandemic or an economic recession), banks should exercise caution when intensifying CSR activities beyond their usual practices.

While engagement in CSR is crucial, excessive increases may be perceived by consumers as a strategic move driven solely by financial interests. Banks should find a balance to ensure that CSR efforts align with authentic social responsibility rather than being perceived as opportunistic. Lastly, recognizing the prevalent perception that banks are not inherently seen as socially responsible organizations, the industry should proactively work to change this perception. Consistent and genuine CSR initiatives, even during non-crisis periods, can gradually reshape the image of banks as socially responsible organizations. This long-term strategy can contribute to reducing skepticism when banks intensify CSR-related activities during crises.

In this regard, to communicate CSR initiatives on SM effectively and to maintain an ongoing dialogue with consumers, banks should follow a structured approach. This includes creating an authentic and compelling narrative, using visual content, regularly updating about ongoing projects to increase the audience interest (e.g. through co-creation of CSR initiatives (Ahmad *et al.*, 2021), collaboration programs, or feedback mechanisms), encouraging user engagement, sharing achievements and lessons learned, and integrating CSR into the overall content strategy. Strategic use of hashtags and CSR-S reports are also essential.

6.3 Limitations

Although the present study contributes substantially to CSR-S theory and practice, it has certain limitations. The limitations of this study may serve as a guide for future research. First, this study was conducted in one region (Egypt) and one industry (banking). Therefore, it is difficult to generalize the findings across many geographies and sectors. Customer perceptions of CSR-S may vary depending on diverse cultural traits, so future studies should broaden their scope by collecting and comparing cross-country data. Additionally, this model could be applied to other less sophisticated service industries than banking. Second, this study was quantitative.

The analytical results of the questionnaire may have limited the findings. Future studies could benefit from using qualitative approaches such as interviews to identify new factors. Third, the current model was solely based on measuring the effect of CSR-S on positive behavioral intentions such as positive eWOM and purchase intention. It ignored negative aspects. Therefore, future studies should measure CSR-S effects on negative behavioral intentions such as negative eWOM and switching. These intentions are important indicators of customer dissatisfaction. Finally, the present study solely covered a limited number of constructs. Future empirical research could explore and verify additional constructs, such as customer loyalty, brand equity, and brand image.

Note

1. Multiple regression is not resistant to model misspecification (Bohrnstedt and Carter, 1971). Suitable selection ensures the parsimony of the estimation by eliminating irrelevant variables that do not provide substantive information. It also avoids overfitting the model by penalizing complexity. A genetic algorithm helps overcome this problem by selecting the regressors that give the regression the greatest predictive power (Calcagno and de Mazancourt, 2010).

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Further reading

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Received 4 January 2023
Revised 9 July 2023
16 April 2024
Accepted 6 May 2024

The market reaction of energy companies to the announcement of the Russian–Ukrainian invasion

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Abstract

Purpose – This study aims to empirically analyze the market response of energy companies to the Russian-Ukrainian invasion. Additionally, it examines the comparison of market reactions between companies in NATO member countries and non-member countries.

Design/methodology/approach – This study utilizes a sample of 1,511 energy sector companies. To achieve the research objectives, two methods are employed. First, an event study is used to analyze the market reaction using Cumulative Abnormal Return (CAR) to the announcement of Russia's invasion of Ukraine on February 24, 2022 (event day) within an event window of (−30, +30). Second, a cross-sectional analysis is conducted to compare the responses of companies in NATO member countries with those in non-member countries.

Findings – The findings of this study reveal that energy companies worldwide reacted positively both before and after the announcement of the invasion, with significant reactions observed in companies from the Americas, Europe, and Asia & Pacific regions. However, the Middle East and Africa markets did not show significant reactions. Furthermore, the study indicates that most developed and emerging markets responded positively, likely due to the increase in energy commodity prices during the war. Moreover, the market reaction of companies in NATO member countries was stronger compared to other markets.

Originality/value – This study contributes to the existing literature by being the first to examine the impact of the Russian invasion of Ukraine on the energy sector, while categorizing markets as developed, emerging, and frontier. It also specifically explores the market reaction of energy companies in NATO member countries, providing unique insights into the differential responses within the energy sector.

Keywords Russian–Ukraine invasion, Market reaction, Event study, Energy companies

Paper type Research paper

1. Introduction

War has a detrimental impact on the economic sector, affecting countries involved in conflicts and those situated on the border of the global economy (Antonakakis *et al.*, 2017; Christofis *et al.*, 2013; Leigh *et al.*, 2003). Aside from the physical destruction of infrastructure, wars also

European Journal of Management and Business Economics
Vol. 35 No. 2, 2026
pp. 290-306
Emerald Publishing Limited
e-ISSN: 2444-8494
p-ISSN: 2444-8451
DOI 10.1108/EJMBE-01-2023-0006

The author expresses gratitude to the Faculty of Economics and Business, Mulawarman University, Samarinda, Indonesia, and the Research and Development Agency of East Kutai, Sangatta, Indonesia. Special thanks to the anonymous reviewers for their valuable insights and thorough review of this paper.

have repercussions on global financial markets (Choudhry, 2010; Frey and Kucher, 2000; Hudson and Urquhart, 2014; Schneider and Troeger, 2006). These effects are particularly evident in the Middle East and Europe (Hassouneh *et al.*, 2018; Leigh *et al.*, 2003; Schneider and Troeger, 2006). The OECD (2022a) explains that the impact of war can result in increased commodity prices and decreased equity values, leading to economic decline in conflict-affected countries. However, there remains a significant gap in understanding the nuanced effects of conflict on specific industries within affected regions and their interconnectedness with global markets.

Recently, on February 24th, 2022, Russia announced its invasion of Ukraine. Both Russia and Ukraine hold significant roles as major exporters of foodstuffs, minerals, and energy. This conflict between the two countries has sent shockwaves through the global economy and financial markets (OECD, 2022b). The Russian–Ukrainian invasion has introduced uncertainties that can potentially impact global markets, and numerous studies have analyzed the market reaction to this event. Tosun and Eshraghi (2022) and Basnet *et al.* (2022) have found that the invasion has triggered a negative market reaction, leading investors to withdraw from the conflicted region due to the uncertain geopolitical risks. However, it is important to note that these studies primarily focus on the European market. In our paper, we specifically examine the market reaction of energy sector companies to the Russian–Ukrainian invasion. Guenette *et al.* (2022) elaborate on the impact of the Russia–Ukraine war on the global economy, highlighting a sharp increase in oil prices, as evidenced by a 60% rise in coal prices and a 40% increase in European natural gas prices. Additionally, Deng *et al.* (2022) discovered that rising prices in the energy sector can trigger inflation, leading to concerns among investors about significant inflationary pressures and geopolitical risks. Yoon and Ratti (2011) note that high energy price uncertainty results in a decrease in investment responsiveness to sales. In contrast, Gregoriou and Kontonikas (2010) demonstrate a positive relationship between commodity prices and stock prices. Despite these known repercussions, there is a lack of comprehensive studies that delve into the intricacies of how different industries respond to conflict scenarios and how these responses reverberate throughout the global financial system.

Furthermore, there is a growing body of literature discussing market reactions to the war between Russia and Ukraine (Boubaker *et al.*, 2022; Boungou and Yatie, 2022; Yousaf *et al.*, 2022; Abbassi *et al.*, 2023). Boubaker *et al.* (2022) and Boungou and Yatie (2022) found that almost all markets reacted negatively to the Russian invasion of Ukraine, primarily due to investors' concerns about increasing global geopolitical risks. However, the Asian market showed little to no significant reaction, likely because it is geographically distant from the conflict zone. Additionally, Abbassi *et al.* (2023) and Yousaf *et al.* (2022) discovered that the war between Russia and Ukraine negatively impacted both developed and emerging markets. While existing literature highlights the significant impact of conflicts, there is limited research on emerging and frontier markets and their vulnerability to geopolitical tensions. Understanding how emerging markets navigate the challenges posed by war-induced uncertainties is crucial for developing effective risk management strategies on a global scale.

This study aims to examine the market reaction of energy sector companies to the Russian–Ukrainian invasion. To accomplish this objective, we employ an event study methodology to investigate the impact of the invasion on abnormal returns in several regions, including the Americas, Europe, the Middle East & Africa, and Asia & Pacific. Exploring why certain markets exhibit resilience while others experience volatility can shed light on the underlying mechanisms of market integration and investor behavior during times of geopolitical upheaval. The results indicate that energy companies worldwide exhibited a positive market reaction both before and after the announcement of the invasion. Specifically, companies in Europe, the Americas, and Asia & Pacific demonstrated positive reactions. Moreover, we also find that the market reacted positively to the war between Russia and

Ukraine in developed and emerging markets. However, the frontier market did not exhibit a significant reaction. In-depth, we observe that most countries in the frontier market tended to react negatively to the Russian–Ukrainian invasion, whereas most countries in developed and emerging markets displayed a positive reaction.

Furthermore, we also examine market reactions to energy sector companies in NATO member countries compared to non-members, along with the influence of certain company characteristics on these reactions. Our findings reveal that the market reaction in NATO member countries was stronger compared to other countries, starting from the announcement of the invasion and continuing afterward. Additionally, we find that company size has a significant positive effect on market reaction, while board size has a significant negative effect. These results suggest that larger company size and smaller board size contribute to a stronger market reaction.

Our paper's main contribution is to provide empirical evidence of the market reaction of sector energy companies to the Russian–Ukrainian invasion. First, we complement the discussion on the impact of war on financial markets (Antonakakis *et al.*, 2017; Gupta *et al.*, 2001; Kollias *et al.*, 2013; Leigh *et al.*, 2013; Christofis *et al.*, 2013; Hassouneh *et al.*, 2018; Hoque and Zaidi, 2020; Boubaker *et al.*, 2022; Boungou and Yatie, 2022; Basnet *et al.*, 2022; Tosun and Eshraghi, 2022; Abbassi *et al.*, 2023; Yousaf *et al.*, 2022; Nerlinger and Utz, 2022; Shaik *et al.*, 2023).

Second, we build upon the existing literature, including studies such as Shaik *et al.* (2023) and Nerlinger and Utz (2022), to enhance our understanding of the impact of war on the market reaction of sector energy companies. Moreover, we go beyond previous research by examining the specific effects of the Russian invasion of Ukraine on the energy sector, categorizing markets as developed, emerging, and frontier. One noteworthy aspect of our study is that we delve into the frontier market, which has been largely overlooked in previous investigations. By analyzing the market reactions of various countries within this category, we gain a more comprehensive understanding of their responses to the Russian–Ukrainian invasion. Our findings highlight a contrasting pattern between developed and developing markets, which demonstrated positive reactions, and the frontier market, which exhibited a different, more negative reaction.

Thirdly, our paper specifically explores the market reaction of energy sector companies in each country worldwide by categorizing markets as developed, emerging, and frontier. Previous studies did not explore every country (Nerlinger and Utz, 2022). Yudaruddin and Lesmana (2023), Yudaruddin *et al.* (2023), and Yudaruddin and Lesmana (2024) conducted closely related research that examined each country, yet the market reaction of energy sector companies in each country remains unexplored.

Fourth, our paper sheds light on the behavior of companies in NATO member countries compared to non-members. We observe that companies in NATO member countries displayed a lower market reaction prior to the invasion announcement, but a stronger reaction afterward, relative to other markets. This distinction offers valuable insights into how geopolitical events can impact the behavior of energy sector companies within different geopolitical contexts. Moreover, we identify the significant influence of company characteristics on investors' decisions to purchase shares. Specifically, we find that company size has a positive effect on market reaction, while board size has a negative effect. These insights highlight the importance of considering company-specific factors when analyzing market reactions during geopolitical crises.

Finally, our paper addresses the limitations of prior studies and contributes to a more comprehensive understanding of the market dynamics surrounding the Russian–Ukrainian invasion. By examining different market categories, considering the behavior of companies in NATO member countries, and exploring the impact of company characteristics, our study provides valuable insights for policymakers, portfolio managers, and investors seeking to navigate and minimize risks during periods of war, particularly sector energy companies.

2. Literature review

Some economic literature discussed the impact of war on the economic sector (Antonakakis *et al.*, 2017; Gupta *et al.*, 2001; Kollias *et al.*, 2013; Leigh *et al.*, 2013). Christofis *et al.* (2013) found that terrorism had a negative influence, especially in the tourism sector. Antonakakis *et al.* (2017) showed that market reactions had a negative impact when geopolitical risks increased, particularly in the energy sector. Increased military and security expenditures incurred costs, triggering corruption that negatively impacted the economy (Gupta *et al.*, 2001). Leigh *et al.* (2013) explained the impact of war on the airline, IT, gold, and energy sectors, especially the long-term decline in oil prices. The OECD (2022b) explained that war could lead to an increase in commodity prices and a decrease in equity, resulting in economic decline in conflict countries. The Institute for Economics and Peace (2012) stated that war had a negative effect on the macroeconomy. For example, a large budget deficit burdened taxpayers, limited consumption and investment, and led to inflationary pressures due to above-trend growth. Thies and Baum (2020) explained that war was a major obstacle for low-income countries due to a decrease in the workforce resulting from high war deaths and low productivity. The European Parliament (2022) explained that the Russia–Ukraine war had a negative impact on the banking sector.

Some financial literature explored the market reaction during wars in various countries, with most studies indicating a negative market response (Choudhry, 2010; Frey and Kucher, 2000; Hudson and Urquhart, 2014; Schneider and Troeger, 2006). Frey and Kucher (2000) analyzed government bond values in five countries and observed a decrease in bond values before the outbreak of World War II. Choudhry (2010) examined the effect of WWII on the Dow Jones index. During times of war, the market reaction was characterized by changes in stock prices and increased return volatility, which generally had a detrimental impact on the stock market. Hudson and Urquhart (2014) supported this finding by demonstrating that the capital market reacted more strongly to negative events than to positive ones during WWII. Schneider and Troeger (2006) similarly found negative market reactions during the Gulf War, conflicts between Israel and the Palestinians, and civil wars in ex-Yugoslavia. Leigh *et al.* (2013) discovered that the Iraq war had an extreme market reaction that affected Turkey, Israel, and European countries. Hassouneh *et al.* (2018) reported that violent conflicts negatively impacted Palestine's capital market. Additionally, Hoque and Zaidi (2020) stated that geopolitical risk affected stock returns in developing countries.

Other literature examined the impact of the Russian–Ukrainian invasion on global financial markets. According to the OECD (2022a), Russia and Ukraine played crucial roles in exporting major foodstuffs, minerals, and energy. The conflict between the two countries caused a shock to the global economy and financial markets. The lifting of sanctions on Russia by Europe affected all sectors of the economy, while Europe imposed limitations on capital inflows (Liadze *et al.*, 2022). The invasion resulted in significant increases in commodity prices and sharp declines in equity prices in global financial markets, particularly in Russian and emerging markets in Europe and Asia. Additionally, corporate and sovereign credit market conditions deteriorated outside of Russia, especially in emerging markets and Europe (OECD, 2022a). Similarly, Sector *et al.* (2022) explained that the Russian–Ukrainian invasion had a negative impact on the Russian economy, leading to high unemployment, inflation, and reduced imports. Basnet *et al.* (2022) examined the invasion's impact on Russian companies, revealing a negative market reaction. Tosun and Eshraghi (2022) analyzed the market reaction to the announcement of the Russian–Ukrainian invasion, finding that trading volumes increased but investors started exerting selling pressure, resulting in decreased company returns. Boungou and Yatié (2020) demonstrated that the invasion significantly impacted global financial markets, particularly in border countries and countries imposing sanctions. Furthermore, Boubaker *et al.* (2022) examined the invasion's impact on market reactions and found that it affected global financial markets but had no

impact on Asian markets. In contrast, Abbassi *et al.* (2023) analyzed the market reaction in G7 countries to the announcement of the Russian invasion, finding that it was considered a negative signal, leading to a negative market reaction, especially in Japan, which was the most affected Asian country. Yousaf *et al.* (2022) also found a negative impact of the Russian–Ukrainian invasion on the G20 market. Meanwhile, Kamal *et al.* (2023) found that the Australian stock market initially reacted negatively to the event date, but the negative impact diminished over time. They also noted that small and medium-sized businesses were affected during the pre-event and event periods. Similarly, Kumari *et al.* (2023) discovered positive post-event cumulative abnormal returns in Portugal, Denmark, and Poland, while some developed countries had minimal involvement in the war events.

Several studies have examined the impact of the Russian–Ukrainian invasion on energy sector companies and how they have responded in the market. Shaik *et al.* (2023) conducted a comprehensive analysis of the influence of geopolitical risk on crude oil, gold, and stock returns, comparing the effects during major disruptive events such as the Global Financial Crisis, COVID-19, and the Russia–Ukraine war. Their research utilized the Geopolitical Risk index, a precise measure that tracks the escalation of geopolitical tensions over time. In a similar vein, Nerlinger and Utz (2022) focused specifically on analyzing the consequences of the conflict on energy firms' stock prices, revealing a notable positive performance of energy companies, particularly in North America, in the immediate aftermath of Russia's invasion. Guenette *et al.* (2022) highlighted the impact on the global economy, including a significant surge in oil prices, with coal prices increasing by 60% and European natural gas prices soaring by 40%. Similarly, Vasileiou (2022) attributed the sharp rise in commodity prices, including energy commodities, to the war between Russia and Ukraine. Deng *et al.* (2022) found that the surge in energy prices within the sector could potentially trigger inflation, which led investors to be cautious and avoid companies involved in the conflict due to heightened geopolitical risks. Conversely, investors also displayed positive responses to the energy transition, depending on energy supplies from Russia. Tosun and Eshraghi (2022) observed that investors tended to divest from companies engaged in the Russia–Ukraine conflict. Furthermore, Hutter and Weber (2022) argued that the energy crisis had significant short-term repercussions on industrial production, exacerbating the global financial markets following the post-COVID-19 period. Finally, Yoon and Ratti (2011) found that elevated uncertainty in energy prices caused a decrease in the investment responsiveness to sales.

Furthermore, some literature examined the influence of company characteristics on market reactions. Yermack (1996) stated that companies with small boards increased market prices because they paid less compensation and improved CEO performance, which investors saw as a positive signal. Similarly, Amalia *et al.* (2022) found that board size had a positive effect on environmental and energy disclosure, adding value to companies in the capital market. In contrast, Orozco *et al.* (2018) stated that companies with large boards improved company performance and reputation, resulting in increased market value. Similarly, Erkens *et al.* (2012) found that companies with an excessive number of boards experienced a decrease in income during periods of global economic uncertainty. Moreover, Hashmi *et al.* (2020) stated that large companies gained the trust of investors compared to small ones.

3. Data and methodology

The data for this study have been taken from the Wall Street Journal database and investing website. This study focuses on 1,511 companies in the energy sector. We utilized the approach to event study proposed by Fama *et al.* (1969). Recent studies on market reactions to the announcement of the Russian invasion of Ukraine also use the event study method (Abbassi *et al.*, 2023; Boubaker *et al.*, 2022; Yousaf *et al.*, 2022; Boungou and Yatie, 2022; Kamal *et al.*, 2023). In calculating the market reaction, three measurements, namely the

normal rate of return, average abnormal rate of return, and cumulative abnormal rate of return were used (Boubaker *et al.*, 2022; Yousaf *et al.*, 2022; Lesmana and Yudaruddin, 2023, 2024) as follows:

Calculation of normal rate of return:

$$R_{i,t} = \alpha_i + \beta_i R_{i,M_{i,t}} \tag{1}$$

Calculation of the average abnormal rate of return:

$$AR_{i,t} = R_{i,t} - \left(\alpha_i + \beta_i R_{i,M_{i,t}}\right) \tag{2}$$

Calculation of cumulative abnormal rate of return:

$$CAR_{i(t_1,t_2)} = \sum_{t_2}^{t=t_1} AR_{i,t} \tag{3}$$

where, $R_{i,t}$ is the actual daily returns of stock i on the trading day [$R_{i,t} = \ln(\text{Price}_{i,t} - \text{Price}_{i\text{-}t})/\text{Price}_{i,\text{-}t}$] and $R_{Mi,t}$ is the market return on day t. We collect the daily closing prices of the leading stock indices of these countries as our proxy for the market index. α_i and β_i are the regression coefficients. The expected normal return of individual stock i can be calculated when α_i and β_i remain stable during the estimation period. Furthermore, $AR_{i,t}$ is the average abnormal return rate of stock i on the trading day t, obtained by subtracting the expected from the actual return, and $CAR_{i(t_1,t_2)}$ is the cumulative abnormal return rate of stock i in the event window period (t_1, t_2).

To perform the event study, we need to define the event, event date and event window. Russia announced the first invasion of Ukraine on February 24th, 2022, and the news caused panic, especially among the two countries playing the role of the energy and food sectors in the world. The event window consists of 60 days from $t-30$ to $t+30$. Windows can lead to biased results when event is too short, and 100 trading days was used to improve forecast accuracy. The study adopts 11 event windows to classify abnormal returns from the effect of the Russia–Ukraine war: pre-event days [−30, −15, −10, −5, −1], event day [0] and post-event days [+1. +5, +10, +15, +30]. Utilizing a 30, 15 and 10-day event window before and after the announcement offers several advantages in analyzing market reactions. Firstly, it allows for the consideration of potential delays and transmission effects that may gradually unfold in financial markets. This extended time frame provides a more comprehensive understanding of how the market responds to the event, capturing both immediate and sustained changes. Secondly, by encompassing a longer period, it helps mitigate the influence of random fluctuations and daily noise, ensuring more reliable and accurate findings. Researchers can distinguish genuine market reactions from short-term volatility. This approach enhances the robustness of the analysis and strengthens the validity of the conclusions drawn. Overall, the 30-day event window provides a more nuanced perspective on market dynamics, enabling a deeper exploration of investor behavior and market trends during and after the announcement. An event window of 30 days before and after the announcement of the Russian–Ukrainian invasion is shown in Figure 1.

Firstly, the market reaction to the Russian–Ukrainian invasion announcement was analyzed. This was measured using Cumulative Abnormal Return (CAR). Secondly, the method developed by Boubaker *et al.* (2022) was employed to investigate the market reaction to the Russian–Ukrainian invasion. Thirdly, the procedure outlined by Xiong *et al.* (2020) was applied to examine the effects of NATO membership and control variables on the market's reaction to the Russian invasion of Ukraine. Following Boubaker *et al.* (2022), Boungou and Yatie (2022), Yousaf *et al.* (2022), and Abbassi *et al.* (2023), several control variables were

considered: (1) SIZE, which is the logarithm of the firm's market capitalization; (2) BSIZE, which represents the Board Size; (3) INF, denoting the inflation rate, i.e. the average consumer price annual percent change; and (4) GDP, referring to the GDP per capita in current prices. These variables are displayed in Table 1. To achieve this objective, the following estimation is provided:

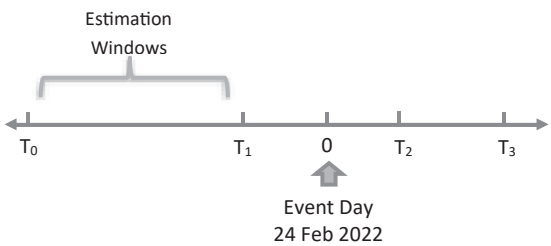
$$CAR_{iw} = \alpha_{iw} + \beta_1 NATO_{iw} + \beta_2 SIZE_{iw} + \beta_3 BSIZE_{iw} + \beta_4 INF_{iw} + \beta_5 GDP_{iw} + \epsilon_{i,t} \quad (4)$$

where $CAR_{i,t}$ is the cumulative abnormal return of the country i for the event window w. The definitions of the variables are in Table 1. Furthermore, in general, our methodology follows the method of Boubaker *et al.* (2022).

4. Empirical result and discussion

4.1 Analysis of the impact of the Russian–Ukrainian invasion on the energy companies

Our study aims to examine the market reaction of energy sector companies to the announcement of the Russian–Ukrainian invasion. Following Boubaker *et al.* (2022),



Source(s): Elaborated by the authors

Figure 1. Event Window selection, T_0–T_1 as estimation window, T_1–T_2 as event window, T_2–T_3 as post event window

Variable	Abbreviation	Description	Data sources
Cumulative abnormal returns	CAR	The cumulative abnormal return over the event window. The abnormal return is computed as the difference between the actual raw returns and the predicted returns based on the market model	the wall street journal database and www.investing.com
NATO members	NATO	A dummy variable that takes one for NATO member countries and 0 otherwise	https://www.nato.int/cps/en/natohq/nato_countries.htm
Size of Company	SIZE	Logarithm of market capitalization	Full Year 2021 Financial Statement
Board Size	BSIZE	Number of Director	Full Year 2021 Financial Statement
Inflation	INF	Inflation rate, average consumer prices, Annual percent change (2021)	https://www.imf.org/external/datamapper/PCPIPCH@WEO/OEMDC/ADVEC/WEOWORLD
Gross domestic product	GDP	GDP per capita, current prices; Purchasing power parity; international dollars per capita (2021)	https://www.imf.org/external/datamapper/PPPPC@WEO/OEMDC/ADVEC/WEOWORLD

Table 1. Variable definitions

Yousaf *et al.* (2022), and Abbassi *et al.* (2023), we employ the event study method. We analyze a period of 30 days before and after the announcement of the Russian–Ukrainian invasion. Table 2 displays the reaction of energy sector companies to the invasion. Specifically, we focus on Russia, a country with a significant contribution to energy exports. The European sanctions imposed on Russia during the invasion led to retaliatory measures by Russia, such as limiting their energy exports. This restriction triggered a sharp increase in energy prices. Consequently, oil prices rose, resulting in higher returns for energy sector companies and a positive reaction in the global market. These findings align with previous studies conducted by Gregoriou and Kontonikas (2010), which revealed a positive long-term relationship between commodity and stock prices in OECD countries. Furthermore, our results indicates that the impact of the Russian–Ukrainian conflict was significant in both developed and emerging markets, while frontier markets did not experience a substantial impact.

More specifically, the countries were divided into several regions: Americas, Europe, Middle East & Africa, and Asia & Pacific, as shown in Table 2. Firstly, energy companies in Europe exhibited a positive reaction one day before and after the announcement of the Russian–Ukrainian invasion. Secondly, energy companies in Asia displayed a positive reaction in the 30 and 10 days preceding the announcement. Additionally, the market continued to react positively on the event day and subsequent days after the announcement. Thirdly, energy companies in America demonstrated the most significant positive reactions to the Russian–Ukrainian invasion. Lastly, energy companies in the Middle East and Africa region exhibited a positive reaction as well, albeit to a lesser extent. This can be attributed to the fact that the region has less dependency on Russia's energy supply compared to Europe. These findings support Abbassi *et al.* (2023), who stated that countries with trade dependence on Russia and Ukraine are most affected. Moreover, Boubaker *et al.* (2022) mentioned that countries located far from Russia and Ukraine showed no reaction to the war.

We also expanded on the previous findings by examining the reactions in each country categorized as developed markets, developing markets, and frontier markets [1,2]. We discovered that several developed markets, including Canada, France, Germany, Israel, Japan, Netherlands, Sweden, the United Kingdom, and the United States, exhibited a positive reaction to the war between Russia and Ukraine, either before or after the announcement. Furthermore, some markets initially reacted negatively before the announcement but displayed a positive reaction after the announcement. Notably, the energy company market in Russia tended to react negatively to the announcements of the Russian–Ukrainian invasion. These results highlight that energy companies in conflict zones face uncertainty due to geopolitical risks. Investors also tend to withdraw by selling their shares in countries engaged in conflicts. Our findings align with Deng *et al.* (2022), who observed that price increases in the energy sector can trigger inflation spikes due to higher input costs. Consequently, investors fear such inflationary pressures and are driven away from companies involved in conflicts. Similarly, Tosun and Eshraghi (2022) reported that investors tend to divest from companies entangled in the Russia–Ukraine conflict. Additionally, the significant surge in energy commodity prices led investors to perceive it as a positive signal during the war.

Furthermore, we have also documented the reaction of developing markets to Russia's invasion of Ukraine. The findings of this study indicate that several markets, such as China, Greece, Mexico, the Philippines, South Africa, South Korea, Taiwan, and Turkey, exhibited a significant positive reaction both before and after the announcement of the invasion. The Chinese market, in particular, shares similarities with the US market. These findings demonstrate that the movement of Chinese stocks can increase when the US market is used as a model (Ma, 2020; Zhang, 2022). Moreover, most markets displayed a positive reaction in the 30-day period, with the reaction intensifying over time. This outcome suggests that prior to the invasion announcement, the market had already reacted to Russia's military preparations

Table 2.
Cumulative abnormal returns for different sets of markets during the event window

Event window		Global (1,511 companies)	Developed markets (1,068 companies)	Emerging markets (311 companies)	Frontier markets (132 companies)	Americas (463 companies)	Europe (471 companies)	Middle East & Africa (75 companies)	Asia & Pacific (558 companies)
Pre-Event days	(−30, 0)	0.00130***	0.00536***	0.00280*	0.00562	0.00890***	0.00029	−0.00522	0.00468*
		(3.7317)	(3.3551)	(1.8227)	(0.8675)	(4.5532)	(0.1333)	(−0.3159)	(1.9609)
	(−15, 0)	0.00665	0.01002*	0.00262	−0.01109	0.03095***	−0.00271	0.00398	−0.00489
		(1.4440)	(1.7916)	(0.2645)	(−0.8103)	(3.2014)	(−0.3304)	(0.2075)	(−0.7071)
	(−10, 0)	0.01381**	0.01621**	0.01757	−0.01447	0.01478	0.00782	−0.01346	0.01859**
		(2.2826)	(2.1657)	(1.3401)	(−1.1020)	(1.2063)	(0.6852)	(−0.5832)	(2.0045)
	(−5, 0)	0.01975***	0.02698***	0.01022	−0.01628	0.04079***	0.01830	0.01769	0.00781
		(2.8957)	(3.1024)	(0.7924)	(−1.1170)	(2.8715)	(1.5068)	(0.6500)	(0.7462)
	(−1, 0)	0.03577***	0.04659***	0.01881	−0.01190	0.08765***	0.02433*	0.01930	0.00362
		(4.6561)	(4.9346)	(1.1153)	(−0.6942)	(5.3590)	(1.7261)	(0.6331)	(0.3323)
Event days	(0, 0)	0.04792***	0.06002***	0.03479**	−0.01905	0.09944***	0.03423**	0.01930	0.01914*
		(6.1357)	(6.1398)	(2.2772)	(−0.9492)	(6.1990)	(2.3034)	(0.6331)	(1.7128)
Post-Event days	(0, +1)	0.03976***	0.05042***	0.02692*	−0.01615	0.08062***	0.02499*	0.02880	0.01827
		(5.1987)	(5.3183)	(1.6793)	(−0.8880)	(5.1618)	(1.8218)	(0.9613)	(1.5616)
	(0, +5)	0.00913***	0.10309***	0.07507***	0.03465*	0.13118***	0.08499***	0.04715*	0.06915***
		(11.0816)	(10.1172)	(4.2770)	(1.8084)	(7.7491)	(5.8047)	(1.6939)	(5.3952)
	(0, +10)	0.12303***	0.15292***	0.04962***	0.05414	0.20621***	0.13499***	0.02270	0.05845***
		(12.1907)	(11.7110)	(3.0079)	(2.4300)	(9.1497)	(7.2714)	(0.8864)	(4.4358)
	(0, +15)	0.07367***	0.09293***	0.03192	0.01620	0.12681***	0.09176***	0.00569	0.02510*
		(6.9638)	(6.9408)	1.5329	(0.7591)	(5.4295)	(4.9038)	(0.2043)	(1.6664)
	(0, +30)	0.10048***	0.13139***	0.04956*	−0.02963	0.15154***	0.13731***	0.01734	0.04140**
		(8.5606)	(9.1269)	(1.9567)	(−1.1130)	(6.1376)	(6.4971)	(0.4921)	(2.3639)

Note(s): CAR stands for cumulative abnormal return. The ordinate represents the event window. ***, **, and * are significant at 1%, 5%, and 10% confidence levels, respectively

Source(s): Elaborated by the authors

in the border areas, resulting in a gradual increase in oil prices due to declining energy supplies. The reaction grew stronger as tensions between the US and Russia escalated, with reciprocal sanctions being imposed. Eventually, Russia began to limit its energy supply to hostile countries, leading to a surge in oil and energy prices, which in turn drove up stock prices in the energy sector. These results align with the study by Gregoriou and Kontonikas (2010), which found a positive relationship between commodity prices and stock prices. On the other hand, several developing markets, such as India, Indonesia, and Thailand, reacted negatively to the invasion. This negative reaction indicates that the war between Russia and Ukraine created geopolitical risks that prompted investors to withdraw from the capital market. These findings are consistent with the studies by Boubaker *et al.* (2022), Boungou and Yatie (2022), Basnet *et al.* (2022), Tosun and Eshraghi (2022), Abbassi *et al.* (2023), Yousaf *et al.* (2022), and Hoque and Zaidi (2020), which highlight the negative impact of geopolitical risks on the capital market.

Additionally, we also examined the market reaction to the Russian–Ukrainian invasion in frontier markets. The reaction in frontier markets differs from that of emerging and advanced markets to the invasion. Most frontier markets exhibited a negative reaction both before and after the announcement, including Bangladesh, Czech Republic, Morocco, Namibia, Romania, and Russia. However, there were two frontier markets, namely Argentina and Vietnam, that displayed a positive reaction to the invasion. These results indicate that investors in frontier markets tend to be more concerned about the increased geopolitical risks arising from the war between Russia and Ukraine. The increase in energy commodity prices was not perceived as a positive signal by investors during the war. This finding is supported by Hoque and Zaidi (2020), which suggests that geopolitical risks have a negative impact on stock returns in developing countries.

4.2 Cross sectional analysis

Table 3 presents a summary of various variables based on a sample size of 1,511 companies. Variables such as NATO, SIZE, BSIZE, INF, and GDP show relatively lower skewness and

Variables	Mean	p25	Median	p75	Std dev	Skewness	Kurtosis
CAR (−30, 0)	0.0035	−0.0117	0.0050	0.0178	0.0282	0.3460	3.1927
CAR (−15, 0)	0.0016	−0.0661	0.0010	0.0677	0.1221	0.0362	2.9598
CAR (−10, 0)	0.0045	−0.0726	0.0066	0.0768	0.1392	0.1805	3.1364
CAR (−5, 0)	0.0136	−0.0791	0.0086	0.0966	0.1670	0.2602	3.0856
CAR (−1, 0)	0.0279	−0.0805	0.0168	0.1367	0.1909	0.1559	2.9263
CAR (0, 0)	0.0389	−0.0729	0.0332	0.1520	0.2035	0.0260	2.8460
CAR (0, +1)	0.0300	−0.0779	0.0215	0.1350	0.1939	0.1338	2.8730
CAR (0, +5)	0.0824	−0.0527	0.0690	0.2104	0.2219	0.1934	2.7969
CAR (0, +10)	0.1060	−0.0554	0.0857	0.2519	0.2539	0.2842	2.6550
CAR (0, +15)	0.0555	−0.0984	0.0373	0.2007	0.2520	0.2673	2.7778
CAR (0, +30)	0.0840	−0.1093	0.0641	0.2520	0.3075	0.2854	2.7557
NATO	0.5103	0.0000	1.0000	1.0000	0.5001	−0.0410	1.0016
SIZE	21.823	19.241	21.500	24.171	3.2148	0.2997	2.2148
BSIZE	8.2012	5.0000	7.0000	10.000	3.5028	3.5028	3.1888
INF	3.2186	2.3000	3.2000	4.7000	1.4596	0.8054	2.6651
GDP	47.935	32.350	52.980	66.060	19.449	0.5118	2.8560

Note(s): CAR = Cumulative abnormal returns. NATO = A dummy variable that takes one for NATO member countries and 0 otherwise. SIZE = Logarithm of market capitalization. BSIZE = Number of Director. INF = Inflation rate. GDP = GDP per capita
Source(s): Elaborated by the authors

Table 3. Summary statistics of variables (N = 1,511)

kurtosis values, indicating a distribution that approximates normality. Meanwhile, Table 4 provides information on the presence of multicollinearity among the variables listed. Overall, there is no issue of multicollinearity between independent variables.

Moving forward, Table 5 presents a comprehensive analysis of the cumulative abnormal returns (CAR) using cross-sectional regression. The study aims to investigate the impact of NATO membership on market reactions surrounding the Russian–Ukrainian invasion. Geopolitical events have been known to have significant implications for financial markets, including the energy sector. Therefore, this analysis delves into the specific market reactions of energy companies in NATO member countries compared to non-member countries.

The findings reveal interesting patterns in market reactions. Ten days before the announcement of the invasion, energy companies in NATO member countries displayed a weaker market reaction compared to non-members. However, from one day before the announcement to thirty days after, the market reaction among NATO member energy companies was significantly stronger. This indicates that NATO membership plays a significant role in shaping market reactions of energy companies during geopolitical events.

Moreover, the analysis incorporates control variables to provide a more nuanced understanding of the factors influencing market reactions. The size of the company, represented by the SIZE variable, exhibits a positive influence on CAR during certain periods, suggesting that larger energy companies tend to have more favorable market reactions. These results align with the study conducted by Hashmi *et al.* (2020), which found that companies with larger sizes tend to gain more trust from investors. Conversely, the BSIZE variable, representing the size of the board of directors, has a negative impact on CAR in several periods, implying that energy companies with larger boards of directors tend to have less favorable market reactions. This finding is supported by Yermack (1996), who found that companies with smaller boards and lower compensation payments tend to be viewed as a positive signal by investors.

These findings have important implications for policymakers and energy companies within NATO member countries. The stronger market reactions observed among NATO member energy companies highlight the economic consequences of geopolitical conflicts and the need for policymakers to adopt measures to mitigate negative impacts on the energy sector. Additionally, the influence of company characteristics, such as size and board size, on market reactions underscores the significance of effective corporate governance practices within the energy industry during times of geopolitical uncertainty. Policymakers should encourage energy companies to adopt transparent and robust governance structures to enhance market confidence and stability.

This analysis contributes to the existing body of knowledge on the economic and financial implications of war and geopolitical tensions, specifically within the energy sector of NATO member countries. It sheds light on how NATO membership influences market responses of

Variables	NATO	SIZE	BSIZE	INF	GDP	Variance inflation factor (VIF)
NATO	1.0000					1.37
SIZE	−0.2685***	1.0000				1.47
BSIZE	−0.1275***	0.4509***	1.0000			1.26
INF	0.1017***	0.0106	0.0332	1.0000		1.03
GDP	0.4969***	−0.4286***	−0.2327***	−0.0749***	1.0000	1.55

Table 4.
Pearson's correlation and Variance Inflation Factor

Note(s): NATO = A dummy variable that takes one for NATO member countries and 0 otherwise. SIZE = Logarithm of market capitalization. BSIZE = Number of Director. INF = Inflation rate. GDP = GDP per capita. ***, **, and * are significant at 1%, 5%, and 10% confidence levels, respectively
Source(s): Elaborated by the authors

Table 5. Cross-sectional regression analysis of cumulative abnormal returns

	Pre-event days					Event days	Post-event days				
Variables	(−30, 0)	(−15, 0)	(−10, 0)	(−5, 0)	(−1, 0)	(0, 0)	(0, +1)	(0, +5)	(0, +10)	(0, +15)	(0, +30)
NATO	0.00190	0.00306	−0.02991*	0.00680	0.03064	0.03862**	0.01978	0.02555	0.09467***	0.05943**	0.08055***
	(0.57)	(0.28)	(−1.95)	(0.39)	(1.64)	(2.06)	(1.03)	(1.25)	(4.31)	(2.36)	(2.89)
SIZE	−0.00011	0.00349**	0.00152	0.00407	0.00453	0.00526*	0.00378	0.00523*	0.00105	−0.00122	−0.00283
	(−0.26)	(2.11)	(0.65)	(1.50)	(1.49)	(1.72)	(1.27)	(1.68)	(0.29)	(−0.30)	(−0.61)
BSIZE	0.00017	−0.00291**	−0.00274*	−0.00330**	−0.00337*	−0.00245	−0.00420**	−0.00244	−0.00458**	−0.00617***	−0.00557**
	(0.51)	(−2.51)	(−1.94)	(−2.05)	(−1.92)	(−1.35)	(−2.40)	(−1.31)	(−2.12)	(−2.79)	(−2.09)
INF	0.00029	0.00411**	0.00250	0.00287*	0.00401*	0.00167	0.00205	0.00172	0.00460**	0.00488**	0.00321
	(0.72)	(2.44)	(1.39)	(1.70)	(1.89)	(0.90)	(1.13)	(0.87)	(2.10)	(2.01)	(1.16)
GDP	0.00002	0.00030	0.00061	0.00065	0.00081*	0.00085*	0.00078*	0.00122**	0.00135***	0.00080	0.00115
	(0.54)	(1.23)	(1.59)	(1.49)	(1.74)	(1.96)	(1.67)	(2.42)	(2.71)	(1.26)	(1.59)
Constant	0.00261	−0.07630*	−0.02010	−0.08703	−0.10451	−0.11418	−0.06351	−0.08160	0.00793	0.06538	0.10013
	(0.23)	(−1.74)	(−0.31)	(−1.18)	(−1.26)	(−1.41)	(−0.79)	(−0.97)	(0.08)	(0.59)	(0.80)
Obs.	1,511	1,511	1,511	1,511	1,511	1,511	1,511	1,511	1,511	1,511	1,511
R Square	0.0012	0.0092	0.0056	0.0058	0.0108	0.0109	0.0083	0.0105	0.0339	0.0183	0.0240

Note(s): CAR = cumulative abnormal return. NATO = a dummy variable that takes one for NATO member countries and 0 otherwise. SIZE = Logarithm of market capitalization. BSIZE = Number of Director. INF = Inflation rate. GDP = GDP per capita. The ordinate represents the event window. ***, **, and * are significant at 1%, 5%, and 10% confidence levels, respectively. The model uses the ordinary least squares (OLS) estimation technique with robust standard errors

Source(s): Elaborated by the authors

energy companies during geopolitical events and underscores the importance of considering company-specific factors in understanding market reactions. These insights provide policymakers, investors, and researchers with a deeper understanding of the dynamics at play in the energy sector of global financial markets during times of geopolitical conflicts.

5. Conclusion

This study examines the market reaction of energy sector companies to the Russian–Ukrainian invasion. To achieve this goal, an event study method was used to explore the impact of the Russian–Ukrainian invasion on abnormal returns in several countries, including Europe, America, the Middle East & Africa, and Asia & the Pacific. The energy companies worldwide market reacted positively before and after the announcement of the invasion, with companies in the Americas, Europe, and Asia & the Pacific showing significant reactions. However, the Middle East and Africa market did not react significantly. Additionally, we find that most developed and emerging markets reacted positively due to the increase in energy commodity prices during the war. Conversely, the frontier market experienced negative impacts as a result of the invasion. Furthermore, the reaction of NATO members was stronger compared to other markets, and firm characteristics can have implications for market reactions during invasions. Overall, this study demonstrates that the conflict between the two countries has triggered an increase in global commodity prices, particularly in the energy sector. Investors perceive the sharp rise in energy prices as a positive signal for energy companies in the future, excluding companies located in war zones. However, numerous studies have found war to be a negative signal for investors. This study also highlights the increase in commodity prices during wars as a positive signal for investors.

The implications of these findings highlight the need for more precise risk mitigation strategies, particularly for companies in frontier markets vulnerable to geopolitical uncertainties. The contribution of this research lies in the in-depth analysis of market reactions in the energy sector and financial markets' response to geopolitical conflicts, particularly focusing on the Russian–Ukrainian invasion. By offering a nuanced analysis of market reactions across different regions, market categories, and company characteristics, our research provides valuable guidance for policymakers, investors, and portfolio managers in navigating and mitigating risks during periods of geopolitical uncertainty. Therefore, policymakers should focus on addressing the vulnerabilities of frontier markets to geopolitical tensions, recognizing their unique challenges and potential for negative impacts during conflicts. Future research could delve deeper into understanding the specific factors contributing to the negative market reactions observed in frontier markets, such as structural weaknesses, reliance on imports, or limited access to global financial networks. Moreover, given the stronger market reaction observed in NATO member countries, policymakers should explore the implications of geopolitical alliances and security frameworks on market behaviors during crises. Future studies could investigate how these alliances influence investor perceptions, risk assessments, and capital flows, contributing to a more comprehensive understanding of geopolitical risk management in financial markets.

Notes

1. Market classification through the web: https://www.msci.com/oursolutions/indexes/marketclassification
2. We do not present the results of the cumulative abnormal returns for before-event, the event day, and post-event windows in developed markets, emerging markets, and frontier markets in each country in this paper because we are limited to the maximum number of words for each figure and table, but the results are available on request to the authors.

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