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Quality and price relationship – navigating the bidirectional dynamics in turbulent times

Abstract

Research background and purpose: This study explores the factors influencing the relationship between product quality and pricing, particularly in times of crisis. By examining various dimensions of the business context, the research aims to uncover specific dependencies within the "quality-price relationship".

Design/methodology/approach: Utilizing a dual analytical approach, the study first conducts a systematic literature review (SLR) and then applies AI-powered topic modelling to distil and understand the thematic foundations of the selected literature. This methodology offers a nuanced view of how quality and price interact.

Findings: The findings reveal that this relationship is significantly affected by several factors, including geographic, industry-specific, and market-oriented elements, as well as consumer demographics and needs.

Value added and limitations: However, the study's insights are constrained by the specific analysis period and a narrow thematic focus, which limits the broader applicability of the findings. Practically, the research suggests that the interplay between quality and price varies significantly across different products, services, markets (B2B versus B2C), and crisis contexts. This implies that businesses must tailor their quality management and pricing strategies accordingly. The originality of this paper lies in its unique exploration of the quality-price dynamic, especially through the lens of recent global crises, and its use of advanced analytical techniques combining SLR and AI-driven methods. These findings offer valuable perspectives for both academics and practitioners involved in quality management and marketing decision-making.

Keywords: *quality, price, quality-price relationship, quality management, marketing-mix*

JEL Classification: H12, L2, M00

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1. Introduction

Every organization is engaged in the selling of products or services, where the concept of "suitability" in quality plays a pivotal role. Suitability extends to fulfilling both the explicit and implicit expectations of customers but also adherence to technical quality standards and the consistency ensured by quality management. According to Lemke et al. (2011), the focus extends beyond just the technical quality of products, considering the customer's experience during usage. Macdonald and colleagues highlight the subjective nature of quality writing that "customers link their solution quality perceptions to individual value-in-use (VIU) constructs as well as collective ones" (Macdonald et al., 2016). Vargo and Lusch (2004) emphasize that value is not inherent in products at the time of exchange but is realized through usage. This perception of value significantly impacts relational outcomes such as customer satisfaction and trust (Prohl & Kleinaltenkamp, 2020).

1.1. Bidirectional relation "quality-price"

Despite ubiquity of the notion that product quality is often judged by its price, Rosillo-Díaz et al. (2022) highlight the enduring relevance of the "quality-price" topic. Eighty years ago, Scitovsky (1944) observed that people frequently associate higher prices with better quality. This association has far-reaching implications on purchasing decisions and brand image (Wydyanto & Yandi, 2020).

The bidirectional interplay of quality and price is multifaceted. Anton et al. (2023) discuss the theoretical perspective where higher quality often commands higher prices, a view supported by early studies (Scitovsky, 1944; Mussa & Rosen, 1978). However, recent research suggests that lower prices can also signify quality, introducing a paradox in the traditional price-quality relationship (Kim & Berg, 2017). Empirical studies present mixed findings, with some reporting a positive correlation between higher prices and better quality, while others indicate a negative relationship (Olbrich & Christian Jansen, 2014).

The "quality-price" mix is deeply embedded in the value-in-use concept, where customer perceptions can range from positive (value creation) to negative (value destruction) (Abid et al., 2022). The complexity is further enhanced when considering the differing perspectives of B2B and B2C customers within the supply chain (Gligor & Maloni, 2022). This calls for a nuanced understanding of the co-creation processes and their impact on customer satisfaction and business outcomes.

Price and quality are positively related in people's minds (Kurz et al., 2023). The balancing act between creating high-quality products and pricing them appropriately is a daily challenge for organizations, especially in a turbulent market environment. Sometimes there are crises – smaller and larger from the micro perspective of the

organization. In peaceful times sometimes there is a need to product recall what is due to the quality (poor) of the product and it influences also on pricing after such situation (Mukherjee et al., 2023; Mukherjee & Chauhan, 2021). "High initial perceived quality may not insulate a firm against bankruptcy" (Mukherjee et al., 2023, p. 406). In macro-economically troubled times, the issue of "quality-price" relations is even more complicated. The recent crises, including the COVID-19 pandemic and the war in Ukraine, have further complicated this dynamic, disrupting supply chains (Liu et al., 2022; Katsaliaki et al., 2022) and affecting both product quality (Ismail et al., 2023; Syafarudin, 2021; Yemeke et al., 2023) and pricing strategies (Gheibi & Fay, 2021; Li et al., 2022).

1.2. Crisis Time

The volatility of business conditions and the diverse interactions among organizations around the world can cause disruptions to ongoing operations and cause crises. The word "crisis" is being used interchangeably with a number of other terms like risk, disaster, business interruption, catastrophe or emergency (Herbane, 2010). The most common perception of the crisis is therefore negative.

There is also an important distinction between crisis and organizational crisis. An organizational crisis is described as "a disruptive, unstable event that requires decisions to be made quickly to avert the threat to survival" (Andres & Heo, 2023). As such, the organizational crisis can serve as a stimulus of growth. For example, Papakonstantinidis et al. (2023) provide CRisis-OPportunity framework and write that an organizational crisis as a systemic event offers a unique, though tough, opportunity to redesign and strengthen the business.

Crisis management in particular has recently received more attention in the business and management literature due to the various experiences of the COVID-19 pandemic (Polat & Seyfi, 2023).

The fast-paced and ever-evolving market landscape makes adaptability crucial for organizational survival. Levins (1998, p. 65) asserts that merely having a competitively priced, quality product is not sufficient for long-term success. The current research gap concerns the "quality-price" relationship in the context of macroeconomic crises and their microeconomic implications. Worldwide (macroeconomic) turmoil (like Covid-19) forces consumer behavior, which affects the actions of individual companies (microeconomic) (Nekmahmud, 2022). Alventosa et al. (2023) focused on vertical product differentiation considering a quality-then-pricing duopoly game and exploring how firms' cost structure affects firms' decisions and market structure. Chenavaz et al. (2020) investigated the interplay between price, advertising, and quality in an optimal control model. Another study focuses on how conspicuous consumption affects firm's pricing, quality decisions and profit (Zhu et al., 2022). Understanding the "quality-

price" dynamics during crisis times is vital for developing effective future marketing strategies, especially in the post-2019 era marked by the emergence of Covid-19. De & Singh (2023) analyzed in the context of Covid-19 agri-supply chain resilience, in the context of reducing supplier and retailer's price loss and enhances the logistics service quality especially for the rapidly changing market condition. In a similar field, the optimal procurement policy of a multi-product retailer in the presence of possible supply disruptions were analyzed (Gheibi & Fay, 2021). In addition, due to Covid-19 and social distance has increased the use of social media and online shopping, which, combined with the ability to compare prices and quality, must be part of the analysis when creating marketing strategies (Majid et al., 2022).

2. Research problem and methods

Market variability is an inherent aspect of every organization's functioning. Adapting organizational actions to economic conditions is a fundamental operational element, which gains particular importance in turbulent times. On the supply side, there may be issues with raw materials, which combined with internal organizational difficulties, can affect both the range and quality of the offerings. Uncertainty on the revenue side also poses challenges in defining the price for products and services offered. Therefore, it is crucial to acquire knowledge about the factors influencing the "quality-price" relationship.

This leads to the pressing question: What factors, particularly in times of crisis, influence the quality and price of products and their interrelationship, impacting both microeconomic (organizational activities) and macroeconomic (supply-demand relationships) spheres? From the above, it follows that the research objective has been adopted: To identify specific dependencies in area of "quality-price relationship" in crisis time. To achieve that goal, we employed a two-pronged analytical approach. First we conducted a systematic literature review (SLR), and second we leveraged AI-powered topic modelling to distil and understand the thematic underpinnings of the selected literature, offering a nuanced view of the quality-price dynamic.

Defining the Research Scope:

1. Temporal Scope: Since 2020, due to the emergence of Covid-19, and as a subsequent period following the studies conducted from 1989–2019 by Rosillo-díaz et al. (2022), with special emphasis on the time of Covid-19 and the war in Ukraine in the context of turbulence and regional impact.
2. Subject Scope: The "quality-price" relationship – with an attempt to identify differences among others for: article type (research paper or theoretical description), analysis level (micro and macro), regional point of view (geographical scope), type of activity (industry and form of ownership), type of offering (products vs. services), product type (basic necessities vs. premium products), market type (B2B vs. B2C).

Our research utilized the Scopus database to pinpoint pertinent studies. While some research cast a wider net by consulting various databases (e.g., Web of Science, EBSCO), our preference for Scopus was informed by several factors. Notably, Scopus boasts a larger repository than Web of Science, encompasses a wider array of sources from non-Western regions, and shares a significant overlap (over 90%) of titles with Web of Science, with the latter covering about a third of Scopus' content. It's crucial to clarify that our approach doesn't dismiss the value of employing multiple databases for literature searches or undermine Web of Science's significance. Indeed, a study by (Singh et al., 2021) highlighted a substantial overlap in the coverage of major databases within our research's scientific domain. Based on these considerations, we found Scopus to be adequately comprehensive for conducting our literature review and achieving the study's three main goals.

3. Results and discussion – study 1 (manual article identification)

According to the process delineated by the SLR method (Kushwah et al., 2019) in research protocol was defined, and applied strict inclusion criteria. To be included in the study, the articles had to meet six criteria: (1) include words in the title: "quality AND price AND relation*", (2) published between 2020-2023, (3) studies in English, (4) in scientific journal, (5) indexed in Scopus or WoS, (6) full-text article. A systematic literature review was adopted as the method of study, due to the thematically specific scope of the review and the relatively small number of articles, facilitating manual analysis of their content (Donthu et al., 2021, Table 1, p. 287). As a result of the above criteria, 27 articles were identified in the Scopus database and 20 articles in Web of Science database (status as of January 18, 2024). After analysis, 19 articles were removed (repetitions). This seems to be a relatively small number of articles, however, which is due to searching by a set of specific words only in article titles. This approach was used deliberately to search for articles concretized in the research area under study. In the verification process, other articles were identified according to the same above criteria in other databases: Emerald, Springer, Routledge, Taylor & Francis, ProQuest. Only in the last database did one article previously unidentified appear, in the others the articles duplicated with the Scopus and Wos databases. Finally, 28 articles, listed in the appendix (Table A1.), were accepted for further analysis. Two articles were published in one journal ("Land Use Policy"), the other journal titles appear only once. By date of publication in the analyzed group, the articles are similarly distributed: 2023 (8 articles), 2022 (7), 2021 (7), 2020 (6). None of the articles explicitly specify what market they are referring to. The reference of the conclusions to the B2B or B2C category is intuitive, based on the analysis of the text of each article. For example, relation between prices and quality of dishes in local food restaurants (Severt et al., 2022) belongs to B2C

market and while analysis of relation between buyer and supplier (Nistor & Selove, 2020) is characteristic of the B2B market. In contrast, hotel services (Guizzardi et al., 2022) can apply to both B2B and B2C markets, depending on the target group: individual customers, or institutional clients (travel agencies or event organizers). Also problematic is the analysis relative to the time scope of the research, which is only sometimes described and rather old. In category of data analysis there are: 2012-2014 (Mathur, 2022) or 2009-2018 (Bilal et al., 2021). In literature review: 2006-2017 (Zhang et al., 2020). In research area: 2019 (Melesse et al., 2023), 2020 (Guizzardi et al., 2022). Content analysis of these articles does not provide information on the type and size of organizations analyzed. In the context of the "quality-price" relationship, it is also not possible to clearly identify the type of offering (products and services) and thus compare between categories (e.g., convenience versus specialty).

In terms of research objectives, it is necessary to look at the usefulness of the results published in the analyzed articles. Therefore, it is worth looking at the character of the articles (Figure 1) and the main conclusions indicated in them.
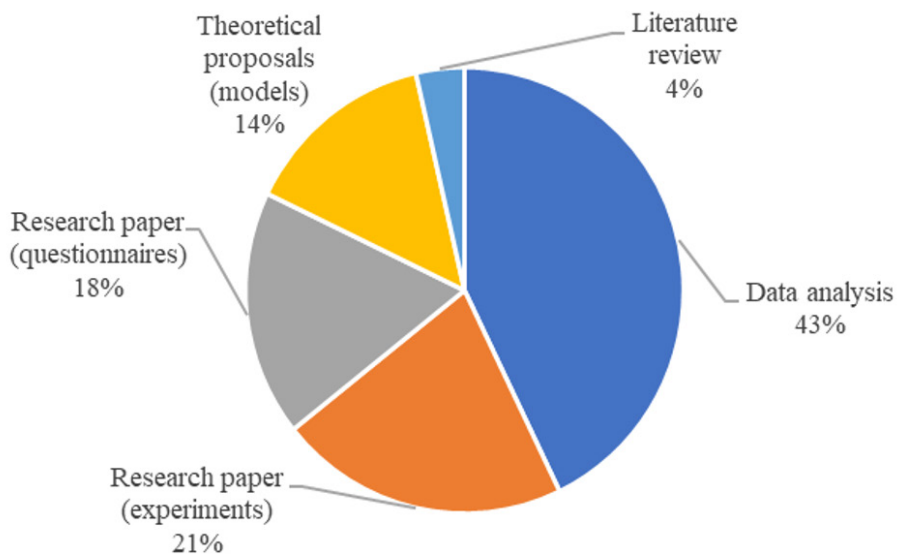

Figure 1. **The character of the analysed articles in research step 1**

Source: own elaboration

Due to the nature of the articles, most of them (12, shown in the Table 1) present data analysis. Research articles make up a total of 11 articles, divided into two groups: product testing/research (6) and survey research (5). In the following articles, the authors presented theoretical proposals (4) and one article included literature analysis.

Table 1. **"Data analysis" articles – characterization**

DOI	Main findings	Market
10.1017/jwe.2023.14	Authors found clear evidence to suggest that prices and product ratings (professional critics) are significantly related in the market of worldwide-produced wines.	B2C, International
10.1007/s11356-023-30123-5	Air pollution affects housing prices in a diminishing manner, but it varies regionally and depends on the population of the geographic area (population).	B2C, China
10.1162/rest_a_01015	Costs from switching suppliers can affect prices by discouraging buyer movements from high- to low-cost sellers. Importers switch less if their supplier offers higher quality or provides lower prices.	B2B, China
10.1007/s12076-021-00298-x	The relationship between quality of urban life and housing prices in Alexandria city (Egypt) indicated that the main hotspots were noticed in the center, inner and old parts of the city.	B2C, Egypt
10.1016/j.jss.2022.04.035	There was no correlation between hospital price of shoppable services and their quality. Authors indicated that poor compliance and wide price variability may limit patients' understanding of procedure costs.	B2C, US
10.1016/j.landusepol.2021.105922	The regression analysis shows that homeowners are unwilling to pay a premium for an increase in school quality from low to medium quality. However, they are willing to pay a) a large premium when all schools are top-quality schools and b) a premium for access to nationally renowned schools, which is in addition to the premium for top-quality schools.	B2C, US
10.1093/qopen/qoac017	Farmland prices and soil quality in Germany was analysed in that paper. The results suggest that farmers can rely on soil quality as an indicator for a certain price variation in the agricultural land market.	B2B, Germany
10.25115/eea.v39i12.6396	There is no clear and unambiguous relationship between corporate social responsibility and vulnerability to stock market crashes and how this relationship is moderated by the norm of corporate governance.	B2B, Pakistan

10.1108/ IJQRM-08-2020-0255	The study found that the price of civil engineering work measured by the bid rate had a positive and significant relationship with the quality of the work measured by the construction performance rating. Although, improving the quality of construction results is costly, competitive firms are also steadily improving their quality as it is a factor of competition.	B2B, Asian region
1528-2635-25-6-807	Results indicated that increase in audit quality led to raise stock price crash risk. Also, there is a positive effect of ownership structure (institutional and block holder) on stock price crash risk.	B2B, Egypt
URL: http://www.reaser.e	That paper aims to investigate the effect of earnings quality on the market value of the share price, and then the role of liquidity as a mediating effect in the relationship between earnings quality and the market value of the share price. In conclusion, a high earnings quality and more liquidity in Jordanian industrial public shareholding companies increase their market value of the shares' prices.	B2B, Jordan
10.1186/s12913-020-05833-y	Researchers examined the relationship between the residents' Quality of Life (QOL) and the nursing home price. Results indicated that a 10 euro increase in the daily nursing home price is associated with a significant decrease in dimensions of QOL: access to services, comfort and environment, food and meals, respect, and safety and security. Hence, our results indicate that the association between price and QOL is very small.	B2C, Belgium

Source: own elaboration

Table 1 provides a comprehensive characterization of articles focused on data analysis within the context of quality and price relationships across various sectors and regions. These articles utilize diverse datasets and methodologies to explore this relationship, ranging from the analysis of wine ratings and prices based on professional tastings, to the impact of air quality on housing prices in Chinese cities. Studies also investigate the influence of supplier quality and pricing on buyer loyalty in the U.S., the correlation between urban life quality and housing prices in Egypt, and the relationship between hospital service prices and quality in the U.S., highlighting the lack of correlation and the issues arising from poor compliance with price transparency. Other analyses include the unwillingness of homeowners in California to pay for moderate increases in school quality, the use of soil quality as a price indicator in the German agricultural land market, and the effects of corporate social responsibility on stock market vulnerability in Pakistan. Further studies delve into the quality-price dynamics in public procurement in Asia, the association between audit quality and stock price risk in Egypt, the impact of earnings quality on share prices in Jordanian industrial companies, and the link

between nursing home prices and resident quality of life in Flemish nursing homes. Collectively, these articles underscore the nuanced and multifaceted nature of the quality-price relationship across different markets and geographical locations, providing valuable insights for researchers, policymakers, and practitioners alike. While some of these topics might implicitly relate to either B2B or B2C markets - such as public procurement potentially leaning towards B2B and consumer goods like wine being more B2C - the summary does not directly address a comparison or analysis specifically between B2B and B2C markets. The studies seem to focus more on the general relationship between quality and price in various sectors without explicitly categorizing the market types involved.

Table 2. **"Research paper – product examination" articles – characterization**

DOI	Sample	Description – main observations	Market
10.3390/jmmp7040152	14 material extrusion printers with different prices.	A relationship with surface roughness, tensile strength, or other dimensional accuracy characteristics could not be found. In the performed investigations, more-expensive printers were not necessarily associated with an improvement in these quality characteristics.	B2B, Germany
10.3389/fanim.2023.1194974	A total of 1700 feed samples with their respective price information were collected from 202 marketplaces in Ethiopia.	The results of this study indicated that quality attributes have no, or a limited role in setting market prices for most feed types in the Ethiopian feed market. The fact that both good and poor-quality feeds are sold under the same label and market value affects both traders and livestock producers.	B2B, Ethiopia
10.4269/ajtmh.22-0692	204 samples of four cardiovascular and one antidiabetic medicines from health facilities and retail outlets in East Java (Indonesia).	All samples, including those provided free in public facilities, met quality specifications. Most manufacturers make both branded and unbranded medicines. Retail prices varied widely. Prices also varied between outlets for identical products because retail pharmacies set prices to maximize profit.	B2C, Indonesia
10.1016/j.jbusres.2022.03.058	Twenty-one daily queries were made for each of the 3-5 stars hotels in Venice, between midnight and 5:00 am, for limiting price changes during the scraping period.	The influence of quality on price in small hotels is lower than in large hotels; however, its variability is higher in small hotels. Large hotels charge a premium price during peak season dates, while small firms apply discounts, likely aiming to reach full occupation.	B2C, Italy

10.15549/jeecar.v7i3.528	University students (in Slovakia) tasted four types of tomatoes with disclosed prices, and then tasted the same tomatoes without knowing their prices.	The price of tomatoes in the Slovak market has been growing. Consumer behavior is not always rational and is often influenced by external stimuli, like product prices.	B2C, Slovakia
10.24323/akademik-gida.758815	16 different spaghetti samples obtained from nationwide chain markets in Mersin (Turkey) were evaluated and compared with their prices.	The highest elasticity values also had the highest price. Similarly, the lowest elasticity value was obtained for one of the samples with the lowest price.	B2C, Turkey

Source: own elaboration

Table 2 presents a series of studies that critically examine the relationship between product quality and price across diverse markets and products, revealing a complex and often non-linear correlation. In the realm of material extrusion printers, an investigation into 14 different models showed that higher prices do not necessarily guarantee superior quality in terms of surface roughness or tensile strength, suggesting a disconnect between price and quality improvements. A comprehensive study of 1700 feed samples in Ethiopia uncovered considerable quality variability with little impact on market prices, indicating a market where quality does not dictate price. Similarly, an analysis of cardiovascular and antidiabetic medicines in East Java highlighted consistent quality across varying price points, suggesting that retail pricing strategies rather than quality differences influence prices. In the hospitality sector, a study on Venice hotels found that smaller establishments exhibit higher price variability with less correlation to quality compared to larger hotels, which tend to command premium prices during peak seasons irrespective of quality. Consumer behavior studies in Slovakia involving tomato tasting sessions revealed that price knowledge significantly influences consumer perceptions, often overriding rational quality assessments. Lastly, a comparison of spaghetti quality and pricing in Turkey demonstrated a tentative correlation where higher elasticity values, a potential quality indicator, commanded higher prices, albeit with exceptions. These studies collectively challenge the conventional wisdom that price is a reliable indicator of quality, highlighting the multifaceted factors that influence pricing decisions in various markets.

Table 3. **"Research paper – questionnaire" articles – characterization**

DOI	Sample	Description – main observations	Market
10.1108/IJQSS-01-2023-0006	589 e-mail questionnaires in India	Customer attachment to the store significantly impacts their willingness to pay more.	B2C, India
10.1108/TQM-06-2021-0158	326 respondents who have used restaurant services in Bangladesh	Perceived service quality and price fairness both have a direct and significant effect on consumer satisfaction.	B2C, Bangladesh
10.1080/15256480.2020.1842836	557 surveys collected through an online survey panel via customers of local food restaurants in US	There is a significant relationship between CSR and perceived quality, price fairness, and satisfaction. The relationship between CSR and perceived quality has the largest influence of the relationships.	B2C, US
10.17010/ijom/2021/v51/i5-7/161645	Survey between women consumers in India	The results revealed that Economic Price Searching Behavior (EPSB) was one of the shopping orientation facets significantly associated with age, income, and brand loyalty.	B2C, India
10.1080/10548408.2021.1887054	survey questionnaire - 394 clients of aviation	The results revealed that value dimensions and relationship quality factors were significantly associated, and such relationships significantly affect loyalty intentions.	B2C, International

Source: own elaboration

Table 3 synthesizes findings from research papers that utilized questionnaires to explore consumer perceptions and behaviors related to quality and price in various sectors. A study involving 589 email respondents in India found that customer attachment significantly influences their willingness to pay more, underscoring the emotional connection's role in perceived value. Similarly, research with 326 participants in Bangladesh revealed that both perceived service quality and price fairness directly and significantly impact consumer satisfaction within the restaurant industry, highlighting the critical balance between service delivery and pricing strategies. In the United States, a survey of 557 customers of local food restaurants demonstrated a strong link between corporate social responsibility (CSR) and perceived quality, price fairness, and satisfaction, with CSR's impact on perceived quality and its role in enhancing conative loyalty through local food usage being particularly notable. An Indian survey focusing on women consumers identified distinct shopping orientations related to economic price searching, quality

seeking, and value deriving behaviors, all significantly influenced by demographic factors like age, income, and brand loyalty. Lastly, a study of 394 aviation clients investigated the complex interplay between quality, emotion, price, social values, and the physical in-flight environment on brand loyalty intentions, revealing that relationship quality and in-flight conditions significantly mediate and amplify loyalty intentions. Collectively, these studies emphasize the multifaceted nature of consumer decision-making, where quality, price, emotional connections, and environmental factors intertwine to shape satisfaction and loyalty.

Table 4. **"Theoretical proposal" articles – characterization**

DOI	Description – main observations	Market
10.1016/j.jedc.2022.104586	The results contribute to the understanding of the price-quality relationship by clarifying the role of the initial market conditions. Consumer reference price and product quality at market entry may impact the sign of the price-quality relationship.	B2C, B2B
10.1007/s12530-019-09315-3	The research indicated a flexible pricing mechanism that supports price–quality relation in the cloud markets where resource type instances with various QoS levels are supplied.	Rather B2B
10.1016/j.meatsci.2021.108607	The aim of this study was to provide a systematic tool that integrates the elements on a food label referring to tradition and naturalness. Fermented meat labels were found to be strongly embedded in 'authenticity', and less in naturalness, an element more attractive for private labels than for branded products.	Rather B2C

Source: own elaboration

Table 4 showcases articles presenting theoretical proposals related to the price-quality relationship across various sectors, offering novel insights and frameworks for understanding these dynamics. One study delves into the price-quality relationship by examining the influence of initial market conditions, suggesting that consumer reference prices and product quality at market entry can significantly affect this relationship. Another research piece proposes a flexible pricing mechanism tailored for cloud markets, aiming to align prices with the Quality of Service (QoS) levels of different resource type instances, thereby supporting a more accurate price-quality correlation in this domain. Lastly, a study focused on the meat industry offers a systematic tool for analysing food labels, particularly fermented meat products, emphasizing 'authenticity' and 'naturalness'. This tool highlights the disparity in how these qualities are perceived and valued between private and branded products, suggesting implications for pricing strategies based on perceived quality cues. Together, these articles contribute to a deeper understanding of the factors influencing the price-quality relationship and propose

innovative approaches to pricing that consider market entry conditions, service quality levels, and product authenticity.

Table 5. **"Literature review" articles – characterization**

DOI	Sample	Description – main observations	Market
10.1016/j. landusepol.2020. 104843	A total of 256 related articles were collected - about houses in China	This study discusses the problem of the Chinese school district housing premium based on three aspects of education, namely location, stage, and characteristics. The study finds that education resources in the compulsory education stage have a positive impact (5.5 %) on housing prices.	B2C, China

Source: own elaboration

The study 1 embarked on an exploration of the quality-price (Q-P) relationship during times of crisis, only to find that the selected articles, although published within the targeted years of crisis, predominantly discussed research conducted in earlier periods. The diversity of topics within these articles ranged from the quality and pricing of tomatoes, through the impact of school quality on housing prices, to mathematical models for pricing along the supply chain, underscoring the broad and vital nature of the Q-P relationship. This relationship is highly individualized, varying significantly across different organizations, product types, markets (whether B2B or B2C), and both macro and microeconomic situations. The macro-level analyses tend to average data, providing a general background for decision-making but highlighting the need for individual considerations in specific decisions. Interestingly, the study reveals factors influencing existing Q-P relationships, such as in Ethiopia, where the price of grains remains the same regardless of quality, pointing to challenges in quality assessment and variable verification that may be addressed in more developed regions. Despite the title's emphasis on 'crisis,' the direct impact of global events like wars appeared to be regionally nuanced, suggesting a complex interplay between crisis conditions and the Q-P dynamic that defies simplistic generalizations.

4. Results and discussion – study 2 (AI article clustering)

To process a large collection of scholarly content (1474 articles), we applied BERT (Bidirectional Encoder Representations from Transformers), a model introduced by Devlin et al. (2019). This model marked a significant advancement due to its bidirectional understanding of context in text, setting new standards in various NLP tasks. BERT's effectiveness stems from its transformer architecture, which allows

comprehensive contextual analysis by examining words both before and after a given word in a sentence.

Though not a traditional topic model, BERT can be used for topic modeling by capturing nuanced semantic relationships in text. Theoretically, it outperforms traditional models in understanding context and nuances in language, though it's more complex and resource-intensive (Devlin et al. 2019). Traditional topic modeling (like Latent Dirichlet Allocation, Correlated Topic Model, or Structural Topic Model) might group discussions on "efficient fuel consumption" and "prolonged delivery periods" under a broad "efficiency" theme, not distinguishing between the positive aspect of a car's feature and the negative aspect of shipping times. Using BERT on this data, the model could discern the context, placing "efficient fuel consumption" under "Vehicle Performance" and "prolonged delivery periods" under "Shipping Delays." Imagine a dataset with terms like "loyalty programs," "online campaigns," and "buying habits." Where traditional models might lump these under "Marketing," BERT could offer finer distinctions like "Loyalty and Rewards Programs" and "Digital Advertising Trends." However, BERT's nuanced analysis demands significant computational resources, especially for larger datasets.

We employ a pre-trained transformer-based language model 'all-MiniLM-L6-v2' in our analysis. Available through Hugging Face's Sentence Transformers library, this model has been developed as a variant of the MiniLM model. It has been pre-trained for versatility in various natural language processing (NLP) tasks, such as text classification. It has undergone an extensive training on a large corpus of text data, utilizing a masked language modeling technique. This specific approach in training is what endows the model with its ability to understand the context of words and sentences effectively. In terms of processing capabilities, the 'all-MiniLM-L6-v2' aligns with the original MiniLM design, handling input sequences up to a maximum of 512 tokens. We benefited from some of the features available in existing libraries (BERTopic), like automatic topic reduction, and topic representation. We added the coherence score calculation based on the genism library (Rehourek & Sojka, 2011).

The basis for the application of AI analysis was a group of 1474 articles published in journals indexed in Scopus database. To be included in the study, the articles had to meet five criteria: (1) include words "quality AND price AND relation*" (like in the first analytical step) but not only in title but also in abstract or keywords: (2) published between 2020.01.01-2024.01.29, (3) studies in English, (4) in scientific journal, (5) indexed in Scopus. The analysis was based on downloaded abstracts of all articles.

Table 6. **Topics – general results and clustering**

Topic	Number of papers	Frequency (%)	Topic name	Topic representation
0	313	21.25	Agricultural Practices and Food Security	[,food', ,water', ,agricultural', ,household', ,cooperative', ,producer', ,plant', ,safety', ,land', ,ecological']
1	206	13.99	Consumer Brand Dynamics and Marketing	[,brand', ,loyalty', ,customer satisfaction', ,purchase intention', ,fashion', ,shopping', ,trust', ,mobile', ,product quality', ,store']
2	161	10.93	Financial Market Analysis and Corporate Governance	[,stock price', ,investor', ,list', ,corporate', ,disclosure', ,governance', ,accounting', ,equity', ,board', ,ownership']
3	160	10.86	Logistics and Supply Chain Optimization	[,supplier', ,supply chain', ,material', ,manufacturer', ,green', ,manufacturing', ,construction', ,export', ,subsidy', ,module']
4	119	8.08	Medical Services and Healthcare Management	[,care', ,hospital', ,medical', ,treatment', ,home', ,visit', ,spending', ,95', ,intervention', ,disease']
5	61	4.14	Real Estate Dynamics and Housing Policies	[,housing', ,housing price', ,house', ,green', ,house price', ,estate', ,real estate', ,residential', ,rent', ,household']
6	58	3.94	Renewable Energy Policies and Carbon Emission	[,carbon', ,emission', ,renewable energy', ,renewable', ,economic growth', ,carbon emission', ,co2', ,co2 emission', ,energy consumption', ,gas']
7	47	3.19	Food Quality and Restaurant Customer Experience	[,restaurant', ,food', ,customer satisfaction', ,delivery', ,revisit', ,loyalty', ,tourist', ,fairness', ,certify', ,brand']
8	41	2.78	Tourism and Destination Management	[,hotel', ,tourist', ,tourism', ,destination', ,room', ,travel', ,wom', ,visit', ,involvement', ,book']
9	31	2.10	Oil Price Influence on Economic Stability	[,oil price', ,inflation', ,rent', ,volatility', ,run', ,exchange rate', ,stability', ,long run', ,economic growth', ,crude']
10	23	1.56	Air Quality Impact on Corporate and Urban Development	[,air quality', ,pollution', ,air pollution', ,housing', ,concentration', ,compensation', ,house', ,housing price', ,house price', ,stickiness']

11	21	1.43	Wine Industry Marketing and Consumer Choice	[‚producer', ‚origin', ‚sensory', ‚pv', ‚quality perception', ‚price base', ‚novelty', ‚logistic regression', ‚authenticity', ‚logistic']
12	18	1.22	Transportation Infrastructure and Urban Mobility	[‚transport', ‚road', ‚train', ‚station', ‚destination', ‚fuel', ‚tourist', ‚park', ‚fuel price', ‚resource allocation']
13	18	1.22	Student Engagement and Educational Development	[‚loyalty', ‚brand', ‚low cost', ‚satisfaction loyalty', ‚travel', ‚customer satisfaction', ‚airport', ‚word mouth', ‚mouth', ‚service quality price']
14	15	1.02	IoT and Edge Computing	[‚student', ‚mix', ‚voice', ‚motivation', ‚high education', ‚faculty', ‚developmental', ‚reform', ‚administration', ‚adult']
15	14	0.95	Forecasting in Energy Systems and Thermal Optimization	[‚edge', ‚device', ‚solve', ‚game', ‚instance', ‚mobile', ‚auction', ‚pricing mechanism', ‚delay', ‚ieee']
16	13	0.88	Charter Schools and Real Estate Valuation	[‚forecast', ‚thermal', ‚optimization', ‚renewable', ‚energy efficiency', ‚electricity', ‚comfort', ‚flexible', ‚load', ‚flexibility']
17	13	0.88	Forecasting and Predictive Analytics in Energy Markets	[‚school', ‚housing', ‚premium', ‚rental', ‚housing price', ‚residential', ‚house', ‚house price', ‚homeowner', ‚district']
18	11	0.75	Time Series Forecasting and Predictive Modelling	[‚forecast', ‚forecasting', ‚training', ‚predictability', ‚time series', ‚bias', ‚neural network', ‚neural', ‚metric', ‚probability']

Source: own elaboration

Based on the applied methodology, we excluded 131 papers (8.89% of the total collection) from the further analysis due to their low internal coherence and dissimilarity to other identified topics. We further submitted to resulting topical distributions to hierarchical clustering procedure (HDBScan) to review possible agglomerates. The resulting 6 clusters (with threshold of 0.8) are presented in Table 7.

Table 7. **Clusters' description**

Topics	Cluster	Number of papers	Title	Subject matter
5, 10, 17	1	97	Macro-factors of quality of life (air, house, school)	Quality of life is largely influenced by the quality of air where one lives. In turn, proximity to highly ranked schools is an important factor affecting the quality and price of housing. These issues are considered in this group of articles from a macroeconomic perspective – largely for the purposes of urban policy-making.
0, 3, 4, 11, 14	2	628	Micro-factors of quality of life (air, house, school)	The above-mentioned issues planned at the macro level then affect decisions at the micro level – both before economic agents and current and potential residents in the area. In addition, describing further factors affecting the quality of life (e.g., availability of medical care) and indicating these factors as affecting the price level for housing in the area.
1, 7, 8, 13	3	312	Customer satisfaction and brand loyalty	The relationship between the quality of the product and the price is most important precisely in the microeconomic perspective – in a particular company. Articles in this group indicate an individual issues in the context of marketing-mix strategy, considering competitive business environment which increase customer expectation.
12, 15	4	32	Transport infrastructure and energy systems	It can be pointed out that "transport infrastructure and energy systems" is part of the macro-environment of organizations and people in a given geographic area. This influences companies' location decisions and people's housing decisions.
16	5	24	Sustainability and predictability of economic conditions	The articles in this group deal with macroeconomic issues and global conditions for conducting activities including investment in stock markets and by various types of funds.
2, 6, 9	6	250	Assets – natural and financial	Earth humanity's most important resource. This cluster describes issues such as climate change, carbon neutrality, renewable energy, environmental degradation, availability and price of natural resources, among others.

Source: own elaboration

The juxtaposition of manual article identification and AI-driven article clustering in our study reveals a multifaceted landscape of the quality-price relationship, particularly during times of crisis. The manual review illuminated the diverse ways in which quality and price intersect across various industries and market types, from B2B to B2C, and from tangible products to intangible services. The AI clustering further unraveled the

complexity of this relationship, showcasing a broad spectrum of topics and thematic areas influenced by quality and price dynamics.

5. Summary of the discussion

One of the most striking findings from both approaches is the considerable variability in the factors that mediate the quality-price relationship. This variability is not only evident across different sectors but also within them, suggesting that the interplay between quality and price is highly context dependent. For instance, the manual review highlighted how the perception of quality in consumer goods like wine can significantly impact pricing strategies, whereas the AI clustering revealed how agricultural practices and food security considerations might influence the quality-price discourse in a completely different way.

Clusters of topics can be used to form an analytical structure to facilitate the navigation of the complex relationship between quality and price (Figure 2).
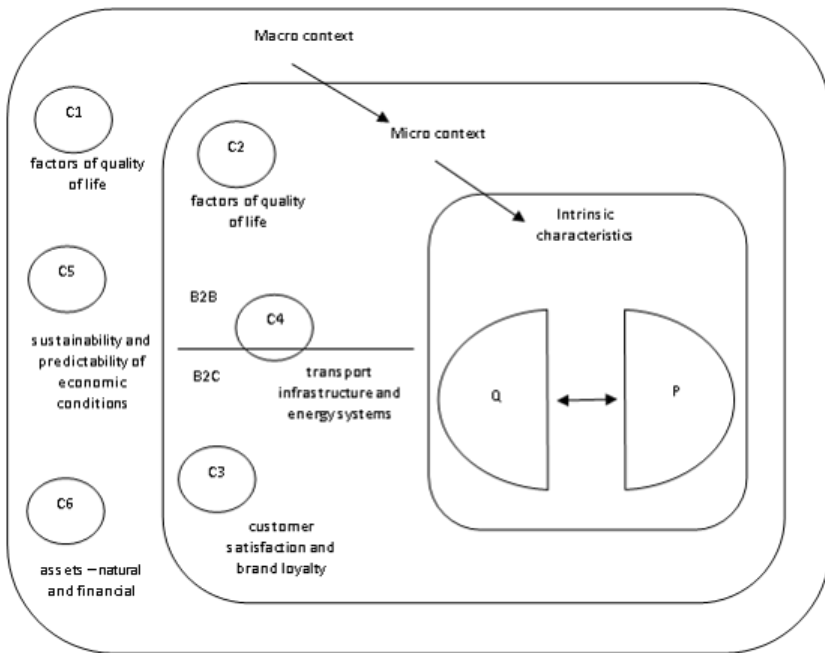

Figure 2. **Factors affecting the interrelationship of product quality (Q) and pricing (P) – cluster approach**

Source: own elaboration

The diversity of keywords and themes identified in the analyzed articles underscores the complexity of defining and measuring quality and its subsequent impact on pricing. This diversity points to the necessity for organizations to adopt a nuanced understanding of what quality means to their specific customer segments and how it translates into value. The concept of 'value in use' becomes particularly relevant here, as it emphasizes the subjective nature of quality perception and its direct influence on pricing strategies. In times of crisis, this subjective perception is likely to be even more pronounced, as consumers and businesses alike reassess their priorities and the value they derive from products and services. The findings from both studies also highlight the adaptive strategies businesses must employ to navigate the turbulent waters of crisis management. The ability to maintain or even enhance quality without disproportionately inflating prices becomes a critical competitive advantage. This balance is essential not only for sustaining customer satisfaction and loyalty but also for ensuring business resilience in the face of supply chain disruptions, changing market demands, and economic uncertainties brought about by crises.

In synthesizing the insights from the manual and AI-assisted reviews with the overarching theme of 'value in use' in times of crisis, it becomes evident that the quality-price relationship is not static. It evolves in response to external pressures and internal strategies, reflecting the dynamic nature of markets and the continuous process of value co-creation between businesses and their customers. The diverse range of keywords and themes identified in the literature underscores the need for a tailored approach to understanding and managing this relationship, one that acknowledges the unique challenges and opportunities presented by different industries, market conditions, and crisis situations.

6. Conclusions

In conclusion, the interplay between quality and price remains a central concern for businesses, especially during periods of crisis. The insights garnered from this comprehensive review shed light on the importance of context, customer perception, and adaptive strategies in navigating the quality-price dynamic. As organizations continue to grapple with the challenges posed by global crises, the lessons learned from this body of research will be invaluable in guiding more resilient, customer-centric, and value-driven approaches to quality and pricing.

This comprehensive examination of the quality-price relationship during periods of crisis reveals a complex and nuanced landscape that defies simplistic characterizations. While the initial intent was to analyze this dynamic in the context of recent global upheavals, the study uncovered that the pertinent literature often delved into research conducted prior to these crises, spanning a diverse array of topics from consumer goods to real estate and beyond. This diversity underscores the

individualized nature of the quality-price nexus, which varies significantly across different markets, industries, and geographical regions. The findings highlight the importance of context in understanding and applying the quality-price relationship, emphasizing that macro-level analyses provide only a broad overview, whereas the true essence of this dynamic is best understood – and indeed, operationalized – on a micro scale. Moreover, the study points to the critical role of crisis conditions in shaping these relationships, although the direct impacts are often regionally specific and influenced by a multitude of factors. Through this exploration, the paper contributes to a deeper understanding of the intricate interplay between quality and price, offering valuable insights for both scholars and practitioners navigating the challenges of maintaining quality and setting prices in an ever-evolving market landscape marked by uncertainty and change.

In conclusion, the interplay between quality and price remains a central concern for businesses. The current study contributes to both scientific theory and business practice by deepening the understanding of the quality-price relationship, particularly in times of crisis. From a theoretical perspective, it advances knowledge by systematically integrating insights from prior literature with AI-driven topic modeling, offering a structured view of how quality and price interact across different industries and economic conditions (Devlin et al., 2019; Donthu et al., 2021). The study bridges gaps in existing research by highlighting how macroeconomic crises influence microeconomic decision-making, reinforcing the importance of context in value perception and pricing strategies (Nekmahmud, 2022; Liu et al., 2022).

From a practical perspective, these findings offer valuable insights for decision-makers in quality management, pricing strategy, and crisis adaptation. Specifically, practitioners can apply the results in the following areas:

- Pricing strategies: businesses can use the insights on the bidirectional quality-price relationship to refine their pricing models, ensuring they align with customer perceptions of value, particularly in volatile market conditions.
- Product and service positioning: companies can leverage findings on value perception to develop differentiation strategies that emphasize quality over price, or vice versa, depending on their target segments.
- Crisis management: understanding how external shocks (e.g., supply chain disruptions, inflation) affect pricing and quality expectations enables firms to develop more resilient business models that can sustain competitive advantage during economic downturns.
- Marketing and consumer communication: By recognizing that consumers' price-quality associations vary across sectors, firms can tailor their marketing messages to reinforce perceived value, particularly in digital and social media marketing.
- Supply chain and procurement decisions: managers can utilize insights on quality-price dynamics to optimize supplier selection and procurement policies, ensuring

a balance between cost efficiency and product quality during periods of economic uncertainty.

Companies can use these insights to develop pricing models that align with consumer expectations, refine value propositions, and implement more resilient quality management strategies (Mukherjee et al., 2023; Gligor & Maloni, 2022). Entrepreneurs, particularly those in emerging markets or industries affected by global crises, can apply these findings to balance cost efficiency with quality differentiation, ensuring sustainable competitive advantage.

The insights from this study emphasize the importance of context, customer perception, and adaptive strategies in navigating the quality-price dynamic. While our findings provide valuable perspectives on how macroeconomic crises influence this relationship, several limitations must be acknowledged.

First, the study primarily relies on existing literature and AI-assisted topic modeling, which, despite its analytical depth, does not replace empirical validation. The identified clusters and thematic groupings provide a structured understanding but may not fully capture the granularity of firm- or industry-specific dynamics. Second, our reliance on Scopus-indexed sources, while justified by its broad coverage, may have introduced a bias by excluding potentially relevant research from other databases. Additionally, the study focuses on crises like the COVID-19 pandemic and the war in Ukraine, but future disruptions – whether economic, geopolitical, or technological – may exhibit different patterns in the quality-price relationship.

Future research could aim to address these limitations through empirical studies that investigate firm-level strategies in real-time crisis conditions. Case studies and longitudinal research could provide deeper insights into how organizations adapt their pricing and quality strategies in response to sudden shocks. Moreover, expanding the scope to include consumer sentiment analysis or behavioral experiments would help in understanding how perceptions of price and quality evolve dynamically during crises. Finally, integrating alternative data sources, such as social media discourse and customer reviews, could enhance the understanding of value perception and market responses in turbulent times.

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Appendix

Table A1. **Identification of articles in first step (Journals in Scopus/WoS published between 2020-2023)**

No.	Database	Year	DOI	Journal title	Keywords in article
1.	Scopus / Wos	2023	10.1108/IJQSS-01-2023-0006	International Journal of Quality and Service Sciences	Integrated store, Attachment with store, Customer engagement, Willingness to pay more, Loyal webrooming, Cross-buying, Perceived relationship investment, Alternative retailer attractiveness
2.	WoS / Scopus	2023	10.1016/j.jedc.2022.104586	Journal of Economic Dynamics & Control	OR in marketing, Dynamic pricing, Reference price, Product quality, Price-quality relationship
3.	Scopus / Wos	2023	10.3390/jmmp7040152	Journal of Manufacturing and Materials Processing	material extrusion, quality, low-cost, printer price, part quality
4.	WoS / Scopus	2023	10.3389/fanim.2023.1194974	Frontiers in Animal Science	animal nutrition Ethiopia, livestock, feed, nutritive analysis, price left
5.	Scopus	2023	10.1017/jwe.2023.14	Journal of Wine Economics	experience goods; prices; ratings; two-stage least square; wine industry
6.	Scopus / Wos	2023	10.1108/TQM-06-2021-0158	TQM journal	Perceived service quality, Perceived price fairness, Consumer satisfaction, Consumer loyalty, Restaurant service, PLS-SEM
7.	WoS / Scopus	2023	10.1007/s11356-023-30123-5	Environmental Science and Pollution Research	Air quality, Housing prices, Interpretable machine learning, Nonlinear relationship, Importance analysis, China
8.	WoS / Scopus	2023	10.4269/ajtmh.22-0692	American Journal of Tropical Medicine and Hygiene	-
9.	WoS / Scopus	2022	10.1162/rest_a_01015	Review of Economics and Statistics	-

10.	Scopus / Wos	2022	10.1007/s12076-021-00298-x	Letters in Spatial and Resource Sciences	Hedonic pricing technique, Urban areas, Quality of urban life, Geographically weighted regression
11.	WoS / Scopus	2022	10.1016/j.jbusres.2022.03.058	Journal of Business Research	Dynamic pricing Advance booking Construal level theory Online ratings Firm size
12.	WoS / Scopus	2022	10.1016/j.jss.2022.04.035	Journal of Surgical Research	Compliance, US news and world report, Price transparency, Quality, Shoppable procedures
13.	Scopus / Wos	2022	10.1080/15256480.2020.1842836	International Journal of Hospitality and Tourism Administration	Local foods; corporate social responsibility; restaurants; conative loyalty; satisfaction; price fairness; perceived quality
14.	WoS / Scopus	2022	10.1016/j.landusepol.2021.105922	Land Use Policy	Land use policy School quality Spatial hedonic regression Housing Urban economics
15.	Scopus	2022	10.1093/qopen/qoac017	Q Open	Soil quality index, Agricultural land market, Farmland prices, FMOLS, DOLS.
16.	Scopus	2021	10.1007/s12530-019-09315-3	Evolving Systems	Cloud resource allocation • Quality of service (QoS) • Negotiation • Price–quality relation • Fuzzy system
17.	WoS / Scopus	2021	10.1016/j.meatsci.2021.108607	Meat Science	Tradition Naturalness Fermented meat Food label Content analysis
18.	Scopus	2021	10.25115/eea.v39i12.6396	Estudios de Economia Aplicada	Stock Price Crash-risk; Corporate Governance Structure; Agency theory; Signaling theory Corporate Social Responsibility.
19.	Scopus	2021	10.17010/ijom/2021/v51/i5-7/161645	Indian Journal of Marketing	Demographics, Brand Loyalty, Shopping Orientation, Women Consumers
20.	WoS / Scopus	2021	10.1108/IJQRM-08-2020-0255	International Journal of Quality & Reliability Management	Japan, Performance, Public procurement, Construction industry, Price and quality

21.	Scopus / Wos	2021	10.1080/10548408. 2021.1887054	Journal of Travel and Tourism Marketing	Airline service; quality value; emotion value; price value; social value; relationship quality; in-flight physical environments; brand loyalty
22.	Scopus	2021	1528-2635-25-6-807	Academy of Accounting and Financial Studies Journal	Audit Quality, Ownership Structure and Stock Price Crash Risk.
23.	Scopus / Wos	2020	10.15549/jeecar. v7i3.528	Journal of Eastern European and Central Asian Research	customer experience, price expectations, customer behavior, price effect, descriptive statistics
24.	Scopus	2020	URL: http://www. reaser.eu	Review of Applied Socio-economic Research	Information opacity, Earnings quality, Investor protection, Emerging market shares, Industrial Companies.
25.	WoS / Scopus	2020	10.1016/j.landusepol. 2020.104843	Land Use Policy	School district housing High quality Basic education resources Housing prices Premium rate
26.	WoS	2020	10.1287/ mksc.2020.1237	Marketing Science	game theory • relational contracts • cross-subsidized pricing
27.	Scopus	2020	10.24323/akademik-gida.758815	Akademik Gida	Spaghetti, Quality parameters, Consumer perception
28.	Scopus / Wos	2020	10.1186/s12913-020-05833-y	BMC Health Services Research	Quality of life, Price, Nursing homes, InterRAI, Ownership type

Table A2. I**dentification no. 2: Articles from Scopus representing particular thematic groups**

No.	Year	DOI	Journal title	Keywords in article
0.	2023	10.1016/j.ijdrr.2022.103490	International Journal of Disaster Risk Reduction	Apartment complex, Community organization, Contingency food provisioning, Food quality
1.	2023	10.59865/abacj.2023.53	ABAC Journal	Brand equity, Customer mind model, Dried forest fruit, Marketing mix
2.	2024	10.1080/20430795.2021.2006128	Journal of Sustainable Finance & Investment	Strong board, Audit committee effectiveness, External audit quality, Crash risk, Vietnam
3.	2021	10.1287/msom.2021.0974	Manufacturing and Service Operations Management	behavioral operations, supply chain management, quality management, experiments
4.	2023	10.1016/j.echo.2023.01.002	Journal of the American Society of Echocardiography	Price transparency, Echocardiography, Value-based care
5.	2022	10.18408/ahuri5124401	Ahuri	Filtering, affordable housing, housing market dynamics, price elasticity of supply, rental depreciation metric
6.	2022	10.1007/s11356-021-17601-4	Environmental Science and Pollution Research	Oil price, Carbon emissions, Renewable energy consumption, Nonrenewable energy, European countries
7.	2020	10.1016/j.ijhm.2019.102381	International Journal of Hospitality Management	Nonlinear effects, Food experiential quality, Customer dining satisfaction, Negative bias
8.	2021	10.1108/IJCHM-06-2020-0582	International Journal of Contemporary Hospitality Management	Online review, Airbnb popularity, Cooperation–competition relationship, Flipped impact
9.	2023	10.1108/JIABR-09-2022-0234	Journal of Islamic Accounting and Business Research	Bank diversification, Bank stability, Islamic banks, Oil price, Political instability

10.	2021	https://caod.oriprobe.com/articles/61831549/Compensation_in_the_smog__Air_quality_and_corporat.htm	Journal of Industrial Engineering and Management	pay stickiness; haze; PM2.5
11.	2021	10.1108/BFJ-03-2020-0252	British Food Journal	Perceived quality, Word-of-mouth, Price, Expertise, Strength-of-tie
12.	2023	10.15240/tul/001/2023-4-011	Marketing and Trade	Tourism, public transport, economy, destinations
13.	2022	-	Transformations in Business & Economics	passenger satisfaction, passenger loyalty, price sensitivity, service quality, quality-seeking behaviors, quality seekers.
14.	2023	10.1111/bjet.13313	British Journal of Educational Technology	-
15.	2020	10.1109/ACCESS.2020.3018166	IEEE Access	Internet of Things, pricing, load balancing, cloud service broker, edge cloud service provider.
16.	2022	10.1016/j.buildenv.2022.109238	Building and Environment	Thermal comfort quality Energy and economic costs Control of climatization Life cycle energy analysis Life cycle cost analysis
17.	2022	10.1080/02673037.2020.1845304	Housing Studies	Housing tenure; education; inequality; segregation; middle classes
18.	2023	10.17586/2226-1494-2023-23-1-105-111	Scientific and Technical Journal of Information Technologies, Mechanics and Optics	intrinsic predictability, forecasting error, misprediction