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The Impact of Adaptive Pricing on the Competitiveness of Small Companies in Online Commerce

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Abstract. The relevance of the study is due to the need to adapt small enterprises to the current conditions of online commerce, where adaptive pricing is becoming an important tool for increasing competitiveness in conditions of limited resources and high competition. The article provides a scientific justification for the impact of adaptive pricing on increasing the competitiveness of small enterprises in online commerce, taking into account the technological, economic and behavioral factors that shape the effectiveness of dynamic pricing strategies in the digital environment. The purpose of the article is to provide a scientific substantiation of the impact of adaptive pricing on the level of competitiveness of small enterprises in online commerce, taking into account the technological, economic and behavioral factors that determine the effectiveness of dynamic pricing strategies in the digital environment.

The paper uses the methods of literature review, comparative analysis, empirical research, and data analysis to identify the problems associated with the implementation of adaptive pricing in small enterprises. The analysis of technical, organizational and informational barriers allowed to identify the main obstacles to the effective application of pricing, as well as to develop recommendations for overcoming them.



The study found that the use of adaptive pricing increases the competitiveness of enterprises, allowing them to respond quickly to changes in market conditions and demand. It is determined that the effective use of adaptive pricing allows small companies not only to maintain their market position, but also to increase their share by personalizing price offers and improving customer service.

The practical value of the work lies in the development of recommendations for optimizing adaptive pricing processes for small enterprises, which will significantly improve the efficiency of pricing strategies with limited resources. Prospects for further research include improving tools for automating pricing processes and market monitoring methods for small companies.

Keywords: adaptive pricing, competitiveness, small enterprises, online trading, dynamic pricing strategies, digital environment.

Вплив адаптивного ціноутворення на конкурентоспроможність малих компаній в онлайн-торгівлі

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Анотація. Актуальність дослідження зумовлена необхідністю адаптації малих підприємств до сучасних умов онлайн-торгівлі, де адаптивне ціноутворення стає важливим інструментом для підвищення конкурентоспроможності в умовах обмежених ресурсів і високої конкуренції. У статті надано наукове обґрунтування впливу адаптивного ціноутворення на підвищення конкурентоспроможності малих підприємств в онлайн-торгівлі, з урахуванням технологічних, економічних та поведінкових чинників, що формують ефективність застосування динамічних цінових стратегій у



цифровому середовищі. Метою статті є наукове обґрунтування впливу адаптивного ціноутворення на рівень конкурентоспроможності малих підприємств в онлайн-торгівлі з огляду на технологічні, економічні й поведінкові чинники, що визначають ефективність застосування динамічних цінових стратегій у цифровому середовищі.

У роботі використано методи аналізу літературних джерел, порівняльного аналізу, емпіричного дослідження, а також методи аналізу даних для виявлення проблем, пов'язаних із впровадженням адаптивного ціноутворення на малих підприємствах. Аналіз технічних, організаційних та інформаційних бар'єрів дозволив визначити основні перешкоди для ефективного застосування ціноутворення, а також розробити рекомендації щодо їх подолання. У результаті дослідження виявлено, що використання адаптивного ціноутворення підвищує конкурентоспроможність підприємств, дозволяючи оперативно реагувати на зміни ринкових умов і попиту. Визначено, що ефективне застосування адаптивного ціноутворення дозволяє малим компаніям не лише зберегти свої позиції на ринку, а й збільшити свою частку шляхом персоналізації цінових пропозицій та покращення обслуговування клієнтів.

Практична цінність роботи полягає в розробленні рекомендацій щодо оптимізації процесів адаптивного ціноутворення для малих підприємств, що дозволить значно покращити ефективність цінових стратегій за умови обмежених ресурсів. Перспективи подальших досліджень включають удосконалення інструментів автоматизації цінових процесів і методів моніторингу ринку для малих компаній.

Ключові слова: адаптивне ціноутворення, конкурентоспроможність, малі підприємства, онлайн-торгівля, динамічні цінові стратегії, цифрове середовище.

Problem statement. In the current conditions of digital transformation of trade, small businesses are forced to look for new ways to ensure their competitiveness in online markets dominated by large players with powerful analytical resources and wide



opportunities to influence pricing. One of these innovative strategies is the introduction of adaptive pricing, an approach that involves dynamic price changes depending on consumer behavior, demand, seasonality, competitor data, and other variables.

The problem is that while large companies are already actively using such tools, small businesses face a number of barriers, including limited technical and financial resources, lack of awareness of data analysis algorithms, and difficulty in assessing the effectiveness of pricing strategies in real time. At the same time, it is small companies that play a key role in the development of local economies, shaping the competitive environment and meeting niche demand, which necessitates the development of scientifically sound approaches to the implementation of adaptive pricing in their activities. Studying the impact of this approach on market sustainability and the ability of small businesses to adapt to dynamic conditions is important both in theoretical and applied terms, as it contributes to the development of recommendations for improving their efficiency, digital maturity, and competitive advantages in e-commerce.

Analysis of recent research and publications. A review of scientific papers on the impact of adaptive pricing on the competitiveness of small companies in online commerce allows us to identify four content areas that are actively studied by modern scholars and practitioners. The first area is devoted to the strategic management of pricing in the digital economy. In particular, O. O. Hetman [1] reveals the strategic level approaches to managing the competitiveness of enterprises, emphasizing that adaptability in pricing is part of a broader management model that takes into account the dynamics of the external environment. In turn, I. Liganenko, O. Darushyn, and O. Nikolayev [2] analyze the pricing policy of manufacturing enterprises in the context of instability, drawing attention to the need for an individual approach to pricing depending on market changes, which is of direct importance for small online companies. In this direction, it is worth deepening the analysis of the strategic behavior of small companies in terms of adaptive pricing, in particular, to consider the role of institutional support and digital strategies in ensuring price flexibility.



The second area of research focuses on the direct analysis of dynamic pricing in e-commerce. V. Liman, Y. Ivanchuk, and R. Yaroshchuk [3] study the use of flexible pricing strategies in Ukrainian online retail, noting that dynamic pricing allows small companies to respond quickly to changes in demand. A similar emphasis can be traced in the work of V. Liman, I. Malinich, and P. Malinich [4], who consider the prospects for the introduction of artificial intelligence for automated price management in online sales. S. Vasylytsova, M. Gasyuk [5] analyze the phenomenon of dual pricing and demonstrate how modern IT systems are changing approaches to pricing in e-commerce, in particular through personalized segmentation. Dynamic pricing is positioned by I. M. Oklander as one of the leading trends in digital marketing that strengthens the market position of companies [6]. Further research should focus on analyzing the effectiveness of the implemented dynamic pricing systems and their impact on consumer behavior in relation to different categories of goods.

The third area concerns a comparative analysis of online and offline pricing approaches. Y. Verbytskyi [7] reviews approaches to retail price optimization, comparing the effectiveness of offline and online mechanisms. He emphasizes that the online environment provides much more tools for adapting to consumer preferences. Antonova [8] complements this approach with real-life examples of price changes in the online segment, which demonstrate the dependence on dynamic algorithms and customer patterns. It is advisable to expand the empirical base by quantitatively comparing adaptive pricing models in online and offline channels, taking into account the behavioral aspects of customers.

The fourth area is represented by foreign publications describing mathematical models and algorithms for adaptive pricing. Y. Xiao, S. X. Zhou [9] investigate the options for pricing strategies when a consumer chooses between a cash bonus and a product upgrade, which is especially relevant for digital products. M. C. Cohen, I. Lobel, R. Paes Leme [10] substantiate the use of product characteristics for accurate pricing. J. Bauer, D. Jannach [11] propose an approach to price optimization in the case of scarce and noisy data, which is important for small companies with limited



information. X. Wu, H. Chen, J. Wang, L. Troiano, V. Loia, and H. Fujita [12] show the effectiveness of deep learning in creating pricing strategies in an unstable environment. Y. Liu, Q. Liu, H. Zhao, Z. Pan, C. Liu [13] present a reinforcement learning simulation model for forming pricing decisions in trading scenarios. K. Chen, Y. Zha, L. C. Alwan, and . Zhang [14] study the influence of the reference price effect and strategic customer behavior, which allows to improve the accuracy of predicting the response to price changes. It is promising to further develop interdisciplinary models of dynamic pricing based on behavioral economics, as well as to adapt these algorithms to the realities of the Ukrainian online trading market.

Thus, this review demonstrates that adaptive pricing in online commerce is a multifaceted scientific and practical phenomenon that covers both managerial aspects and algorithmic solutions.

Identification of previously unsolved parts of the overall problem. Despite the widespread use of adaptive pricing in online commerce, a number of important aspects remain unresolved. The study identified several unaddressed issues, including the insufficient study of the adaptation of small businesses to the digital environment and the effectiveness of adaptive pricing in the face of changing demand. Questions also remain about the long-term impact of these strategies on the competitiveness of small companies due to limited empirical material and methodological limitations. The proposed study will contribute to solving these problems by developing new approaches, using modern analytical tools and studying real cases, which will increase the effectiveness of adaptive pricing for small enterprises.

Formulating the goals of the article (defining the objectives). The purpose of the article is to provide a scientific substantiation of the impact of adaptive pricing on the level of competitiveness of small enterprises in online commerce, taking into account the technological, economic and behavioral factors that determine the effectiveness of dynamic pricing strategies in the digital environment.

The study addresses the following objectives:



1) to determine the peculiarities of the functioning of small enterprises in online commerce and the factors that affect their pricing policy in the digital environment, taking into account technical, economic and behavioral factors;

2) to explore the theoretical foundations and models of adaptive pricing in e-commerce, to assess their impact on the competitiveness of small businesses, taking into account the dynamics of demand and consumer behavior.

3) to identify the main problems faced by small businesses in implementing adaptive pricing and to develop practical recommendations for effective strategies for small companies, taking into account limited resources and modern analytical tools.

Summary of the main research material. In the context of the digital transformation of trade, small enterprises are experiencing significant changes in their business mechanisms, in particular in the formation of pricing policy. Their activities in the online environment are characterized by a high level of competition, flexibility of operational processes, speed of decision-making, and dependence on digital communication and analytical tools. The peculiarities of the functioning of such companies are determined not only by the amount of resources and the scale of their activities, but also by their ability to adapt to changing market conditions, interact effectively with customers and respond to changes in demand. The pricing policy of small businesses in online commerce is influenced by numerous factors, including consumer behavior, the competitive environment, the cost of digital logistics, marketplace integration, and personalization of customer experience. In view of this, it is becoming increasingly important to study the determinants that determine the specifics of pricing for small business structures in the field of e-commerce (Table 1).

Table 1

Factors influencing the formation of pricing policy of small enterprises in online commerce

Factor influencing the pricing policy of small enterprises	Characteristics of the impact	Features of manifestation in online trading
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Limited financial resources	Reduces the ability to maneuver in price competition	Requires precise positioning and a niche strategy
The speed of changes in the market	Requires prompt adaptation of the pricing strategy	Using digital tools to track prices
Consumer behavioral patterns	Create demand for flexible and personalized pricing	The relevance of collecting data on customer preferences
The level of competition	Requires constant monitoring of competitors' prices	The spread of automated pricing algorithms
Integration of e-commerce platforms	Dictates the terms of access to customers and the cost of sales	The need to take into account platform fees and tariffs

Source: compiled by the authors based on [2; 4, p. 326; 9, p. 857; 12, p. 144].

Limited financial resources necessitate the most efficient allocation of costs and the choice of a pricing strategy that allows competing not by reducing margins, but through clear positioning and value creation [2]. The pace of change in the market is accelerated by the rapid development of digital technologies, the behavioral unpredictability of consumers, and economic instability, which has been exacerbated by a full-scale war that has affected logistics, costs, and the ability to pay. Customer behavioral patterns based on online activity, reviews, frequency of purchases, and receptivity to discounts are creating new requirements for to personalize price offers. The level of competition in the online space is much higher than in traditional trade, which stimulates the need to constantly monitor the pricing strategies of other market participants and respond quickly to their changes. In addition, the integration of e-commerce platforms affects the cost of selling goods, the terms of promotion and algorithms for generating product visibility for consumers, which directly affects pricing. Taken together, these factors create a complex, dynamic system within which small businesses are forced to make decisions about setting prices not only based on costs, but also on a continuous analysis of changes in the external environment, technological capabilities, target audience behavior, and the overall socio-economic situation [10, p. 4936].



In today's economy, adaptive pricing includes not only high-tech algorithms but also simple reactive approaches to changing prices depending on demand, season, events, or time. In a number of industries, these strategies are implemented without the use of specialized platforms, allowing small companies to compete effectively in the face of market instability (Table 2).

Table 2**Practical aspects of implementing adaptive pricing in different areas**

Application area	Price adaptation mechanism	Typical model	Expected effect
E-commerce	Price changes based on competitors' data and season	Algorithmic pricing	Optimize conversion, reduce churn
Hotel business	Prices change according to seasons, holidays, and events	Event, peak	Increase in occupancy and revenue
Entertainment industry	Tickets become more expensive closer to the event	Pricing by urgency	Stimulating early demand
Air transportation	Prices depend on the time of booking	Dynamic, referential	Maximize profit per seat
Taxi services	Reaction to time of day, traffic, weather	Reactive pricing	Balance of supply and demand

Source: compiled by the authors based on [6, p. 41; 10, p. 4925].

The above examples demonstrate that adaptive pricing is often based on simple market principles, even without the use of sophisticated software. Such solutions are especially important for small companies seeking to respond quickly to demand dynamics, events, seasonal changes, or changes in the competitive environment. For example, flexible price changes for tickets to cultural events or weather-dependent



regulation of taxi fares are examples of the full implementation of an adaptive pricing policy without the mandatory use of artificial intelligence or large amounts of data [6, p. 41].

At the same time, it is the digital environment in e-commerce that provides the greatest opportunities for large-scale automation of pricing decisions. The development of technology allows for the integration of adaptive models into the daily operations of small businesses, even with minimal resources (Table 3).

Table 3

Methods, tools and models of adaptive pricing used in e-commerce

Category	Example of a tool or method	Characteristics of the application
Algorithmic pricing	Prisync, DynamicPricing.AI	Platforms that allow you to automatically change prices based on rules and data about competitors, demand, and time of day
Machine learning methods	Linear regression, Random Forest, XGBoost	Algorithms that analyze large amounts of historical data on sales and user behavior, predicting the most optimal price
Segmented pricing	Shopify Pricing Tiers, HubSpot Smart Pricing	Use of customer segmentation (new, regular, corporate) to create differentiated price offers
Market monitoring	Price2Spy, Skuuudle	Tools for comparing competitors' prices in real time with the ability to automatically adjust your own prices
Behavioral pricing	Google Optimize, Dynamic Yield	Platforms that adapt the price to a specific user depending on clicks, product views, time on the site, and device

Source: compiled by the authors based on [3, p. 234; 4, p. 327; 5, p. 73; 7, p. 105].

In today's environment, these tools provide small businesses with access to advanced analytical capabilities without the need for significant investments in their



own IT infrastructure. For example, the use of the Prisync service [15] and Dynamic Prisync AI [16] allows an entrepreneur to set rules for updating prices depending on the prices of competitors on marketplaces, which is especially relevant in conditions of high volatility of consumer demand. Machine learning algorithms, such as XGBoost [17], allow modeling customer reactions to price changes, taking into account seasonality, product categories, and previous purchases. At the same time, segmented pricing modules in Shopify [18] or HubSpot [19] allow you to create unique offers for different groups of customers, which increases loyalty and average check. Tools like Price2Spy [20] and Skuuudle [21] are actively used for competitive analysis, especially in niche segments where small price changes can have a significant impact on sales. Behavioral platforms such as Dynamic Yield [22] provide the highest level of personalization, allowing you to adapt not only the price but also the entire visual block of the offer according to the user's actions on the site [12, p. 151]. Therefore, in practice, adaptive pricing is transforming into a comprehensive system of solutions that synchronizes marketing, analytical and pricing strategies, providing small companies with new opportunities for survival and growth in a volatile market, exacerbated by war, inflation and unstable purchasing power.

The use of adaptive pricing helps to transform the key performance indicators of small companies in online commerce. It allows for a flexible response to consumer behavior and market changes, while optimizing profitability and increasing customer engagement. Below is an analytical description of the main indicators that are subject to changes under the influence of adaptive pricing (Table 4).

Table 4

Indicators of the impact of adaptive pricing on the competitiveness of small enterprises

Impact indicator	The nature of the change under adaptive pricing	Practical implications for competitiveness
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Elasticity of demand	Growing due to personalization of price offers	Allows better forecasting of sales in response to price changes
Sales conversion	Improved through price relevance for target groups	Increase in the share of customers among website visitors
Average check	Increases due to package offers and price scenarios	Strengthening the effect of cross-selling and increasing margins
Reaction time to market changes	Reduced by automated algorithms	Increased ability to maintain market positions in the face of demand fluctuations
Customer loyalty	Strengthened by price fairness and personalized approach	Building a stable base of repeat customers

Source: compiled by the authors on the basis of [14, p. 549-551].

Real-life examples demonstrate that small Ukrainian companies are actively using adaptive pricing as a mechanism to increase their competitiveness in online commerce. For example, Gifty, a company specializing in the production of gift products, implemented an example of a three-day seasonal campaign with a 15% discount on a number of finished goods, such as planners, calendars, candles, and mugs. The price promotion was limited in time and tied to holiday demand, which indicates the adaptation of pricing policy to peak consumer behavior [23]. In turn, the Dodo Socks brand used adaptive social media promotions as part of its New Year's marketing aimed at increasing conversion. The offers were formed taking into account digital channels and provided for a flexible combination of cost and assortment for different types of audience [24]. These examples confirm the effectiveness of using elements of dynamic and segmented pricing even with limited resources, which is especially important for small businesses in a highly competitive digital environment.

For example, small Ukrainian businesses, including those using adaptive pricing, faced a sharp drop in the average check in the first months of the war due to economic instability and a decline in the purchasing power of the population. However, due to

price adjustments and the introduction of promotions, including seasonal ones, the average check gradually increased in 2023. This process confirms the effectiveness of adaptive pricing, which allows small companies not only to survive but also to restore their competitiveness even in a crisis (Fig. 1).

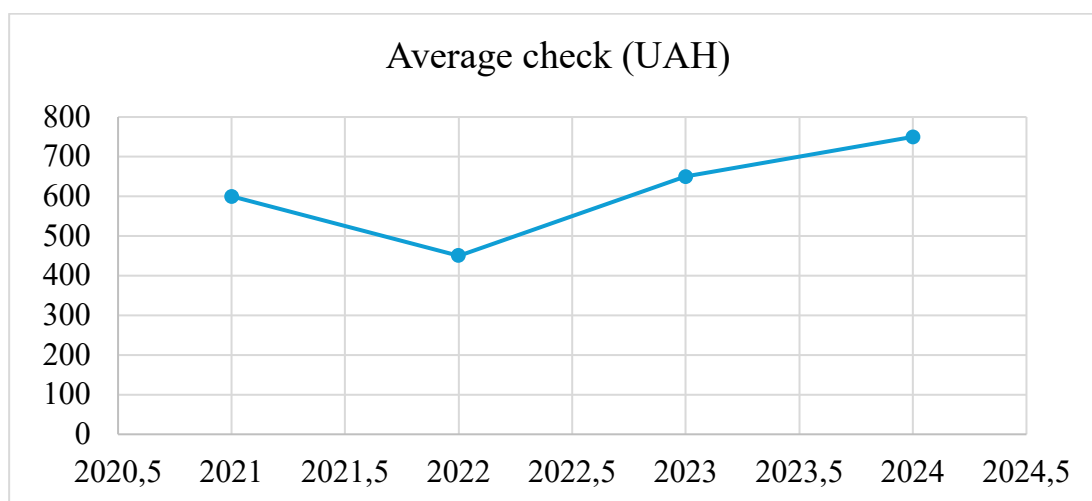


Fig. 1. Changes in the average check in Ukraine (2021-2025)

Source: compiled by the authors based on [25].

In particular, after a sharp drop in the average check in 2022, it began to grow in 2023, which may indicate that the population is adapting to the new economic conditions and growing confidence in online commerce. This also indicates the correctness of adaptive pricing strategies, when businesses were able to respond to changes in supply and demand by adjusting their prices depending on market conditions.

Small businesses face a number of challenges when implementing adaptive pricing. Technical barriers include a lack of access to specialized software solutions and infrastructure for automated pricing, which makes it difficult to quickly adapt prices to changes in demand and market conditions. Without such tools, businesses are forced to rely on manual calculations, which increases costs and reduces efficiency.

Organizational barriers include a lack of coordination between different departments, such as marketing, finance, and logistics, which leads to delays in decision-making and incorrect pricing strategies. The lack of qualified personnel



capable of working with data and making informed decisions further complicates the implementation of adaptive pricing [9, p. 859].

Information barriers include a lack of access to up-to-date market data and analytics, which limits the ability of small companies to respond adequately to changes in demand and competitors' prices [8, p. 106]. Poor quality of collected data and lack of monitoring systems also lead to erroneous pricing decisions.

In addition, small businesses lack the financial resources to invest in adaptive technologies and systems, which allows competitors who have already implemented such solutions to have significant market advantages [6, p. 40]. Enterprises often face the problems of changing standards and pricing requirements, which adds additional difficulties in adapting to market conditions.

Implementing effective adaptive pricing strategies for small companies with limited resources requires the use of affordable analytical tools and process optimization. The use of automated tools, such as Google Sheets [26] or simple CRM systems, allows you to automate pricing, reducing the dependence on manual calculations. It is also advisable to use free analytical platforms, such as Google Analytics [27] or SimilarWeb [28], to monitor competitors' prices and dynamically adjust your own pricing strategies. Creating price segments for different consumer groups and applying dynamic pricing allows you to respond flexibly to changes in demand. The use of A/B testing to evaluate the effectiveness of pricing strategies allows choosing the most effective options without significant investment [11, p. 57]. Engaging external consultants to perform accurate analytical tasks makes it possible to obtain professional recommendations with limited internal resources. Regular monitoring of financial indicators and adjustment of pricing policy in accordance with the results obtained allows small companies to maintain high competitiveness even in difficult economic conditions.

Conclusions. The study found that adaptive pricing is a key tool for increasing the competitiveness of small businesses in online commerce. However, businesses face a number of challenges, including technical barriers, such as the lack of automated



systems for prompt price adjustments, organizational difficulties due to low levels of coordination between departments, and information constraints, such as lack of access to up-to-date market data for accurate demand forecasting.

It is recommended to implement affordable automation technologies, such as simple analytical platforms or CRM systems for small businesses, which will reduce the time spent on manual price adjustments. In addition, small businesses should strengthen internal coordination between departments, such as marketing and logistics, to ensure consistency in pricing policies. It is also important to develop data analysis skills among employees to optimize pricing strategies. To overcome information barriers, investment should be made in affordable market and competitor monitoring tools to help make informed pricing decisions. Prospects for further research include the development and adaptation of more accessible analytical tools, improved automation of pricing processes, and the integration of the latest technologies for small businesses.

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