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ANALYSIS OF THE UKRAINIAN MARKET FOR POWER BANKS AND PORTABLE POWER STATIONS: PRICING STRUCTURE, BRAND CONCENTRATION, AND PRICE ELASTICITY

Abstract

The article presents the results of a comprehensive empirical study of the Ukrainian market for portable power sources (power banks and charging stations). By applying mathematical statistics and regression modeling, the market's pricing policies were analyzed, and segmentation was conducted based on brands and key device characteristics. Based on the findings, recommendations were developed to assist manufacturers, retailers, and users in better navigating the current market environment.

Keywords: power banks, portable power stations, e-commerce, brand concentration, market, SKU.

JEL Classification: D40, L11, L60

АНАЛІЗ УКРАЇНСЬКОГО РИНКУ ПОВЕРБАНКІВ ТА ПОРТАТИВНИХ ЗАРЯДНИХ СТАНЦІЙ: ЦІНОВА СТРУКТУРА, БРЕНДОВА КОНЦЕНТРАЦІЯ ТА ЦІНОВА ЕЛАСТИЧНІСТЬ

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Анотація

У статті представлені результати комплексного емпіричного дослідження українського ринку портативних джерел живлення (повербанків та зарядних станцій). Завдяки застосуванню методів математичної статистики та регресійного моделювання було проаналізовано цінову політику ринку та проведено його сегментацію за брендами та ключовими характеристиками пристроїв. На основі отриманих даних були підготовлені рекомендації, які допоможуть виробникам, продавцям та користувачам краще орієнтуватися в поточному ринковому середовищі.

Ключові слова: повербанки, портативні зарядні станції, е-смерсе, брендова концентрація, ринок, SKU.

JEL Classification: D40, L11, L60

Introduction

In recent years, the Ukrainian market for portable power sources has undergone an unprecedented evolution, transforming from a niche segment of secondary accessories into a strategically prioritized consumer electronics category that is critical for societal vital functions. While in the pre-crisis period, the purchase of power banks was primarily personal (for travel, tourism, or as a backup for gadgets during the workday), today these devices have become a foundational element of the household infrastructure for every Ukrainian family.

This profound transformation process is driven by the interaction of several powerful factors. On one hand, global technological trends exert their influence: rapid digitalization, mobility, and the implementation of innovative fast-charging standards (GaN technology, Power Delivery) have made portable power more efficient and compact. On the other hand, external challenges of a national scale have been the decisive element. Targeted attacks on Ukraine's energy infrastructure and the resulting capacity deficits in the power system have changed the very paradigm of device usage. They have evolved from tools of comfort into instruments for ensuring energy autonomy, communication, and the continuity of work processes.

This shift in category status has led to a significant expansion of the assortment: from low-capacity pocket storage units, the market has reoriented toward high-tech solutions capable of powering household appliances and supporting office operations for extended periods. Thus, the Ukrainian market has become a unique case where the combination of global technical progress and extreme domestic conditions has shaped a new type of conscious consumer, for whom a portable power source is a long-term investment in personal security and social stability.

Under these circumstances, the structure of consumer priorities has undergone a fundamental transformation: the superficial evaluation of nominal capacity has been replaced by a demand for comprehensive operational efficiency. The modern user demonstrates higher technical literacy, focusing attention not only on the number of available milliampere-hours but also on the speed of energy exchange. A critically important characteristic has become the charging regeneration speed of the device itself (input power), allowing the energy resource to be restored as quickly as possible during short intervals between stabilization or emergency power outages.

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Parallel to this, shifts toward durability and safety are observed: consumers increasingly prefer devices with modern battery cell types (particularly LiFePO₄), which are distinguished by increased thermal stability and a significantly higher number of recharge cycles. The reliability of internal components, intelligent Battery Management Systems (BMS), and the quality of inverters have become determining factors in choosing power sources.

Furthermore, a new demand for power output has emerged. While previously a portable power source was associated exclusively with charging gadgets, the priority has now shifted to the device's ability to support the functioning of energy-intensive household appliances – from heating systems and refrigerators to professional equipment and communication tools. Thus, the market has evolved from quantitative indicators to qualitative ones, where the primary focus is the power source's ability to ensure the uninterrupted operation of critical life-support nodes under extreme conditions.

This transformation has led to a clear market differentiation into two functional segments: the personal accessories segment, oriented toward short-term recharging of mobile gadgets, and a fully-fledged segment of autonomous energy supply systems capable of guaranteeing the long-term operation of critical household infrastructure. While the market for compact solutions remains primarily a territory for consumer design and branding, the high-capacity charging station category has evolved into a high-tech arena where the intelligent component of the device plays a key role.

The primary value in this segment is now concentrated not simply in the physical volume of the battery, but in the sophistication of the management systems (BMS), which are responsible for multi-level protection, cell balancing, and maximizing service life in aggressive operating modes. A critically important parameter has become the switching speed to Uninterruptible Power Supply (UPS) mode, where a delay in milliseconds determines the system's ability to maintain the stable operation of sensitive electronics, servers, or gas boilers during sudden power failures.

Moreover, the technological excellence of modern solutions is manifested in the use of pure sine wave inverters – an uncompromising requirement for modern household appliances – and the possibility of integrating stations into complex home ecosystems via mobile applications and cloud services for remote monitoring. Thus, the high-power market has definitively moved away from the "large power bank" concept, transforming into an industry of intelligent energy hubs where price is a direct reflection of the reliability, speed, and safety of the applied engineering solutions (Sotnyk et al., 2020).

Consequently, the modern category of portable energy in Ukraine has confidently moved into a stage of market maturity characterized by a radical change in consumer philosophy and the emergence of qualitative evaluation criteria. Spontaneous demand, driven by the principles of immediate availability and minimum price, has been replaced by a period of rational and technically justified choice. The modern consumer demonstrates a high level of awareness, preferring long-term operational benefits over immediate savings. This is evident in the growing demand for devices with an extended life cycle, where the use of stable battery cells and intelligent protection systems is perceived as a necessary standard rather than an optional feature.

At the same time, there is a clear trend toward multifunctionality, where the power source is viewed as a universal energy hub capable of integrating into the user's digital ecosystem via mobile apps, supporting various fast-charging protocols, and simultaneously servicing multiple types of loads. This evolution of consumer priorities encourages manufacturers and distributors to move away from dumping strategies in favor of increasing the technological value of the product, definitively establishing the category's status as a high-tech investment in personal autonomy and comfort. As a result, the market is becoming more structured, where brand reputation, the level of service support, and actual technical characteristics prevail over marketing promises, forming a stable and transparent competitive environment.

Literature review

The research on digital market structures, dynamic pricing strategies, and the technological specifics of
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product categories in e-commerce is based on a transition from classical theories to the modern economics of multi-sided platforms (Mattos et al., 2021). Instead of outdated models of market concentration, the analysis relies on the concepts of Jean Tirole and Michael Armstrong [1] regarding the regulation of digital ecosystems, as well as the works of Geoffrey Parker and Marshall Van Alstyne [2], who revealed the mechanisms of value formation through network effects. Issues of competition in the era of algorithmic markets and Big Data are highlighted in the works of Erik Brynjolfsson and Andrew McAfee [3], where primary attention is paid to the impact of artificial intelligence (AI) on business productivity. Features of price elasticity in the online environment and digital consumer behavior are studied using the methodologies of Susan Athey [4], who combined machine learning with the economic analysis of commodity markets. The transformation of marketing strategies in the Ukrainian e-commerce segment and the adaptation of business models to modern crisis conditions are reflected in the scientific works of N. Kudenko, O. Kendiukhov, and S. Romat.

Recent studies on price elasticity of demand increasingly focus on combining econometric interpretability with statistical accuracy. Rafizadeh (2024) proposes the concept of targeted interpretability, which preserves interpretability only for key parameters—most notably price elasticity—while allowing the use of flexible machine learning methods to model other components of demand. Applying Double/Debiased Machine Learning to U.S. gasoline demand, the study demonstrates substantial differences from traditional elasticity estimates, suggesting potential bias in classical approaches. This methodology is relevant for analyzing competitive consumer electronics markets, including the assessment of price sensitivity for power banks and portable power stations (Rafizadeh, 2024).

To determine pricing patterns, a statistical and econometric analysis was applied based on an improved hedonic pricing model. This approach allows for the evaluation of high-tech products as a set of individual characteristics, each of which has its own value. The chosen methodology is most effective for online markets, as it enables the isolation of the impact of technical innovations on the final price and ensures the accuracy of forecasts for rapidly updating products.

Aims and Objectives

The purpose of the study is to establish the key patterns of market structure formation and pricing mechanisms in the Ukrainian market for portable power sources through an empirical analysis of current e-commerce offerings.

Methods

The study is based on a combination of empirical and econometric approaches to analyzing market structure and pricing patterns for portable power sources.

The empirical stage of the research was based on the analysis of a dataset comprising 1,393 product offerings. The database was constructed using web scraping tools, followed by a validation of attributes (brand, price, power output, fast charging protocols, etc.). For in-depth analysis, 47 leading brands represented by a statistically significant number of items were included.

Results

The Ukrainian portable power market today is a dynamic and contrasting space spanning a wide amplitude of devices: from basic compact power banks to ultra-powerful modular charging stations. This polarity in the assortment is a direct reflection of a fundamental transformation in consumer demand. While the key requirement was previously the autonomy of personal gadgets (smartphones, tablets, headphones), current energy security challenges have shifted the focus toward ensuring the complete energy independence of residential and workspaces.

A deep analysis of the database, covering 1,393 product units, has allowed for the identification of the specific architecture of the Ukrainian market. Despite the presence of 292 unique trademarks, market power is distributed unevenly: only 15 leading brands form a stable "core" of the supply, concentrating over

40% of the entire available assortment within their portfolios. Such concentration indicates high trust in proven manufacturers regarding critically important issues of power supply.

At the same time, the other part of the market is characterized by an extreme level of fragmentation. It has been established that 50% of the represented brands are niche or new players whose assortment is limited to just one product item. This points to a low entry threshold in certain market segments and the active involvement of small distributors attempting to satisfy peak demand by importing single models. This market model creates a unique environment where the stability of large players is combined with the high flexibility and chaos of small suppliers.

For a detailed understanding of internal processes, it is appropriate to apply a structural division of the market into two basic functional segments: power banks (oriented toward individual mobility and supporting low-power electronics) and portable charging stations (high-tech devices designed for the autonomous operation of household appliances, medical equipment, and communication systems during prolonged grid outages).

The distribution of these segments within the overall sample structure, reflecting the quantitative ratio of offers and the saturation level of each category, is visualized in fig. 1. This classification allows not only for an assessment of the current market state but also for forecasting further vectors of technological updates in the assortment in accordance with energy independence needs.

Distribution by type

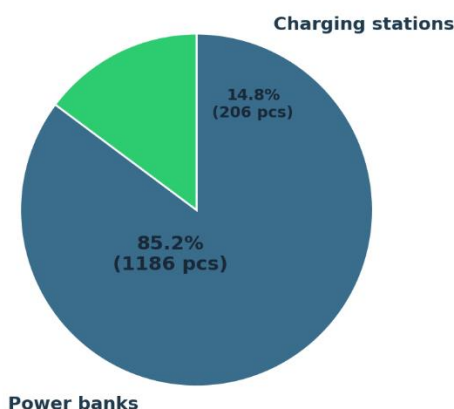


Figure 1. Distribution of Ukrainian market product items by product type

Source: author's development

The analysis of the market supply structure reveals the formation of a distinct "two-tier" model, where each level functions according to its own economic patterns. Power banks maintain absolute leadership in terms of the number of positions, accounting for 85.2% of the total assortment, which equates to 1,186 units. This dominance is driven by the segment's long-standing presence in the market, the mass availability of components, and maximum penetration among mobile gadget owners. This category has transformed into a highly competitive environment with low profit margins, where the struggle for consumers is waged primarily through price dumping, aggressive marketing, and the maximum expansion of Stock Keeping Units (SKUs). The power bank market today is effectively a commodity market, where technical differences between brands are often neutralized, and focus is placed on design and logistics speed.

At the same time, the share of charging stations – representing 14.8% of the sample or 206 units – demonstrates a rapid evolution from a niche product for tourism or professional use to a strategically important category of essential goods. Despite having a smaller numerical presence, this segment is characterized by ultra-high capital intensity. According to expert estimates, charging stations are capable of generating up to 40% of total market revenue due to a high average transaction value that is dozens of

times higher than the cost of a typical power bank. The need for households to have full autonomous power supply has transformed consumer expectations: the priority is no longer just energy storage, but rather power output, charging speed, and the ability to integrate into home networks.

Unlike the fragmented and chaotic power bank market, the charging station segment appears significantly more consolidated and premium. Here, competition shifts from the "price-volume" plane to the plane of technological excellence, battery cell reliability, and the functionality of remote management software. The dominance of global technology leaders, such as EcoFlow or Bluetti, sets high quality standards, forcing smaller players to seek narrow niches or compete in the budget sub-segment of low-power stations.

The identified market polarity dictates the need for players to implement differentiated development strategies. For the power bank segment, the most viable model is an operational one focused on mass turnover, cost optimization, and presence in all possible sales channels. Meanwhile, for the charging station segment, service advantages, the availability of official warranties, professional consulting, and the development of long-term brand loyalty become critically important. This structural duality indicates a mature market capable of simultaneously meeting everyday mobility needs and critical demands for energy resilience.

The analysis of brand concentration is a key dimension for evaluating the structure of any commodity market, as it allows for the determination of monopolization levels and the intensity of competition. In the context of the Ukrainian portable power source market, this analysis takes on special significance given its unique architecture: a combination of high fragmentation, with 292 unique brands represented, and a clearly defined leadership "core." The ranking of the 15 leading brands by number of product positions, shown in fig. 2, demonstrates not only the numerical superiority of certain manufacturers but also their strategic role in shaping the market landscape.

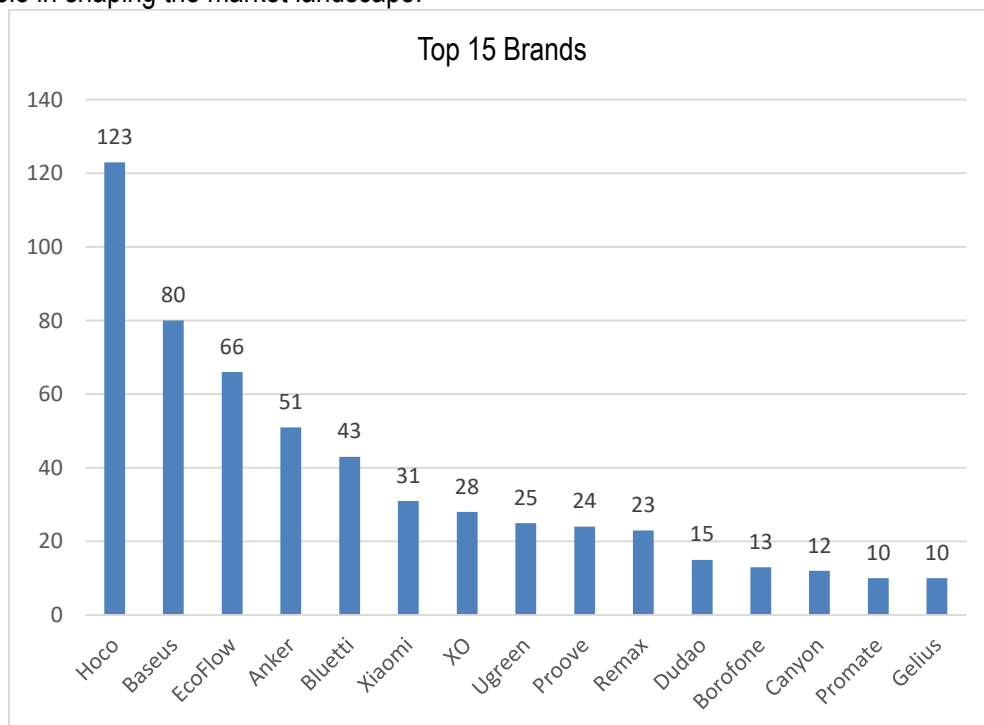


Figure 2. Ranking of the top 15 brands in the Ukrainian portable power source market by number of product items

Source: author's development

The undisputed leader in terms of supply volume is the brand Hoco, which accounts for 8.83% of the market (123 positions), a figure 1.5 times higher than its closest competitor, Baseus (5.74%). Hoco's dominance is built on a strategy of aggressive pricing and maximum coverage across all capacity

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categories. The upper echelon of the market demonstrates clear segmentation: while Hoco and Baseus focus on mass demand, EcoFlow (66 positions) and Bluetti (43 positions) lead the high-tech charging station segment, offering a broad range from basic to industrial models. Anker maintains a steady niche by focusing on premium power banks with support for modern fast-charging protocols.

The middle and lower tiers of the top 15 are formed by brands with diversified strategies, including Xiaomi, XO, and Ugreen, which balance quality and cost, as well as budget brands such as Dudaο or Borofone. Collectively, the fifteen largest players control 40% of the assortment, indicating moderate market concentration. The four-firm concentration ratio, CR-4 = 22.97% (Hoco + Baseus + EcoFlow + Anker = 320 SKUs out of 1,393), points to the competitive nature of the industry: despite the absence of a monopoly, a narrow group of leading brands exerts a decisive influence on price and technology trends, while numerous other participants occupy local niches with minor individual shares.

This market dynamic and the strategic positioning of key players are reflected in the quantitative metrics of brand representation. Table 1 provides summarized data on the brands that form the quantitative profile of the market. The table illustrates the brand hierarchy: from established leaders that define market conditions and technological trends to niche and local brands whose presence ensures variety and price competition in the portable power category.

Table 1 - Ranking of brands in the Ukrainian portable power source market by number of product items

№	Brand	Number of SKUs	Share of Sample, %	Cumulative Share, %
1	Hoco	123	8,83	8,83
2	Baseus	80	5,74	14,57
3	EcoFlow	66	4,74	19,31
4	Anker	51	3,66	22,97
5	Bluetti	43	3,09	26,06
6	Xiaomi	31	2,23	28,28
7	XO	28	2,01	30,29
8	Ugreen	25	1,79	32,09
9	Proove	24	1,72	33,81
10	Remax	23	1,65	35,46
11	Dudaο	15	1,08	36,54
12	Borofone	13	0,93	37,47
13	Canyon	12	0,86	38,33
14	Promate	10	0,72	39,05
15	Gelius	10	0,72	39,77
-	The remaining 277 brands	839	60,23	100,00
Total	292	1393	100	-

Source: author's development

Analysis of the presented statistical data indicates the formation of a specific structure in the Ukrainian portable power source market, combining high overall fragmentation with the pronounced dominance of a narrow group of leaders. The presence of 292 unique brands in the sample points to market openness and intense competition; however, the fact that the top 15 players accumulate nearly 40% of all product offerings confirms the consolidation of core consumer attention around a limited circle of proven brands.

The unconditional leadership of the Hoco brand, with a share of 8.83%, along with the performance of Baseus and Anker, forms a powerful mass-market cluster oriented toward everyday mobile device charging needs. Simultaneously, the significant presence of brands such as EcoFlow and Bluetti in the top five of the ranking illustrates the market's transformation: from simple accessories to complex energy independence systems, which has become critically important in the Ukrainian reality.

Despite the market core (top 15) controlling a significant share of the assortment, over 60% of offerings come from the "other" 277 manufacturers. This creates conditions for flexible price competition and prevents monopolization, allowing consumers to choose between premium solutions from leaders and budget alternatives from lesser-known marks. Such a share distribution architecture suggests a mature market where the established brand hierarchy is capable of responding promptly to shifts in demand, ensuring both quantitative variability and technological diversity of products.

A central aspect of the quantitative analysis of commodity markets is determining how sensitive the price is to variations in the product's technical parameters. For the portable energy market, the fundamental factor of consumer value is capacity (mAh for power banks and Wh for charging stations). Despite the obvious correlation between energy volume and cost, the architecture of this connection is of fundamental importance – whether it is proportional-linear or possesses a more complex character. To verify this dependence, a log-linear regression analysis was applied, allowing the obtained coefficients to be interpreted as indicators of price elasticity (Table 2).

Table 2 - Parameters of log-linear price elasticity models

Parameter	Power Banks	Charging Stations	Interpretation
Number of observations	1 187	206	Subsample size
Elasticity coefficient (β_1)	0,214	0,728	Percentage price increase per 1% of capacity
Model constant (β_0)	5,126	5,246	Logarithm of the base price
Coefficient of determination R^2	0,120	0,906	Share of explained variation
p-value	< 0,001	< 0,001	High statistical significance
Nature of dependency	Sublinear	Close to linear	Type of price reaction
Economic interpretation	Economies of scale	Pricing transparency	Market characteristic

Source: author's development

For power banks, log-linear regression yielded the following results: $\log(\text{Price}) = 0.214 \times \log(\text{mAh}) + 5.126$, $R^2 = 0.120$, $p\text{-value} < 0.001$. The interpretation of these parameters is as follows: the resulting elasticity coefficient of 0.214 indicates that a 1% increase in device capacity correlates with an average price increase of only 0.21%. Such a sublinear dependence demonstrates the low sensitivity of price to

quantitative increases in energy resources. In practical terms, this means that doubling the capacity (e.g., moving from 10,000 mAh to 20,000 mAh) results in a market price increase of only 16%, and tripling it leads to an increase of only 25%. This confirms the hypothesis that in this segment, the price reaction lags significantly behind the growth rate of technical parameters, and the lion's share of value is formed by other, non-technical factors.

The identified sublinear dependence of price on capacity in the power bank segment is a characteristic feature of a mature and highly competitive market with well-established technological processes. This market state indicates a pronounced economies of scale effect, where the unit cost of each capacity unit (mAh) naturally decreases as the overall battery volume increases.

This trend is primarily driven by the high share of fixed costs for basic components – such as the casing, printed circuit control board, interface connectors, and packaging – the costs of which remain practically unchanged regardless of energy volume. Furthermore, the manufacturing technology for larger battery cells implies a lower cost per unit of capacity compared to smaller elements. An additional restraining factor is intense market competition, which forces manufacturers to minimize margins and limits their ability to set proportionally higher prices for high-capacity models.

Despite the identified connection, the low coefficient of determination ($R^2 = 0.120$) indicates that capacity variation accounts for only 12% of power bank pricing. This means that the overwhelming majority of market value (88%) is formed under the influence of a complex set of other factors, among which brand premium and the level of marketing support play key roles. Additional technological parameters also make a significant contribution to price, including support for fast-charging protocols (Power Delivery, Quick Charge), the presence of wireless power transfer modules, the type and quality of battery cells used, as well as ergonomic properties such as design, dimensions, and the quality of packaging materials. Such a distribution of influence factors points to a complex price architecture in this segment, where capacity serves only as a baseline parameter, and fully uncovering market positioning mechanisms requires the application of more complex hedonic regression models with an expanded set of parameters, opening prospects for further scientific research.

A fundamentally different picture is observed for charging stations. Log-linear regression for this subsample yielded the following result: $\log(\text{Price}) = 0.728 \times \log(\text{Wh}) + 5.246$, $R^2 = 0.906$. That is, the price elasticity with respect to capacity for charging stations is 0.73, which is significantly higher than the corresponding figure for power banks (0.21). The interpretation of this difference is as follows: doubling the capacity of a charging station (e.g., from 1,000 to 2,000 Wh) leads to a price increase of 65–66%, rather than 16% as seen with power banks. This significantly stronger dependence of price on capacity in the charging station segment is explained by several factors: a more complex technological product base (inverter, BMS system, heavy-duty connectors), the use of more expensive battery elements like LiFePO₄ (compared to Li-Po in power banks), a higher share of battery cost in the overall product manufacturing cost, and a smaller scale effect due to lower production volumes.

Particularly striking is the coefficient of determination $R^2 = 0.906$ for the charging station model: capacity explains 90.6% of price variation, which is an exceptionally high figure for hedonic models. This indicates that the charging station market is much more "technologically transparent" compared to the power bank market: price here is formed primarily by technical parameters, while the influence of brand premium and other non-technical factors is significantly lower. A practical consequence of this fact is that for a charging station buyer, the price efficiency of a choice is almost entirely determined by the "UAH/Wh" ratio, whereas for a power bank buyer, this ratio is merely a guideline significantly adjusted by brand and functionality.

The established patterns of price elasticity have significant practical importance, defining development vectors for all market entities. For manufacturers, these data indicate the feasibility of applying differentiated pricing approaches: while in the power bank segment, a strategy based on capacity as the main value driver is unproductive due to low consumer readiness for proportional surcharges, priorities should shift toward branding, ergonomics, and unique functional advantages. Conversely, in the charging station category, energy capacity remains the fundamental selection criterion, requiring brands to carefully monitor and maintain a competitive cost per unit of energy.

For retailers and marketplaces, the results serve as a basis for improving the assortment matrix, where in the mass power bank segment, presenting a wide model range with variable capacities within a single price range is justified. At the same time, working with the charging station category requires a completely different logic – forming a clear hierarchy of models where each position has a ratio between price and power that is clear to the client, ensuring transparency of choice and a rational justification of cost.

Discussion

The results obtained within this analysis not only allow for the systematization of the current state of the portable power source market but also create a foundation for the further development of research methodology for dynamic consumer markets. Despite the high representativeness of the formed sample, the proposed model has certain limitations due to both the specifics of the data sources and the complexity of the object of study.

Traditionally, the analysis of e-commerce segments is based on data from individual trading platforms. The presented data allowed for the identification of key structural patterns; however, full validation of the results requires expanding the observation base. In this context, a promising direction is the transition to the analysis of meta-samples that combine data from several large retailers, which would neutralize the specific assortment biases of individual platforms.

It is important to consider that this study is static, meaning it captures the state of the market at a specific point in time. In conditions of high instability caused by external changes in the Ukrainian energy system, the stability of the identified trends needs to be verified through continuous monitoring. Implementing regular observation of market dynamics over a long period will allow for the identification of seasonal patterns and mechanisms for adapting pricing policies to sharp changes in demand.

Thus, the research results make it possible to move from a descriptive account of the market to an understanding of its internal logic, yet leave open the question of the direct link between the supply structure and actual consumer demand. Prospects for further development are linked to the integration of data on sales volumes and user engagement, which will allow the proposed model to be transformed into a comprehensive tool for forecasting market dynamics under conditions of turbulence.

Conclusions

The comprehensive study of the Ukrainian portable power source market indicates the formation of a complex, fragmented, yet clearly structured ecosystem adapting to extreme demand conditions. The analysis of a sample including 1,393 product offers from 292 unique manufacturers demonstrates a state of moderate market concentration. Specifically, it was established that over 40% of the assortment is controlled by a group of fifteen key players, indicating the presence of stable brand leaders while maintaining a high level of competition among small and medium-sized distributors.

Despite the numerical dominance of the power bank segment, which currently accounts for over 85% of market offers, a qualitative shift in the supply structure is observed. The portable charging station category is demonstrating rapid dynamic growth, transforming from a niche product for a narrow circle of specialists into a strategically important element of energy independence for Ukrainian households. This trend reflects a transition from "mobile gadget recharging" to building "autonomous power systems for critical household appliances and communication tools."

The identified market segmentation confirms a direct correlation between the technological capacity of devices and their market value. The analysis proved that consumers demonstrate high demand elasticity regarding quality, showing a readiness to pay for innovation, the energy efficiency of battery cells (specifically the transition to LiFePO₄), and the reliability of electronic power management components.

The research results create a solid foundation for developing predictive monitoring models for price dynamics and a deeper study of consumer behavior transformation under conditions of unstable energy infrastructure. The data obtained have practical significance both for retailers in optimizing assortment portfolios and for state institutions in the context of assessing consumer market resilience.

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ADDITIONAL INFORMATION

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