Behavioral Analysis of Consumer Economic Decision-Making Based on Price and Location: Evidence from K-Means Clustering in the Restaurant Sector

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ABSTRACT

This study examines how price and location are perceived across heterogeneous consumer segments in a traditional restaurant setting, using Pondok Gudeg Rini in Depok as a case study. Moving beyond regression-based causal models, the research employs a data-driven K-Means clustering approach to identify distinct behavioral decision patterns. A quantitative descriptive design was applied, using survey data from 100 respondents collected through structured questionnaires and analyzed with SPSS. The clustering analysis reveals three behavioral segments: (1) consumers with high price tolerance and strong decision engagement, (2) value-oriented consumers with moderate evaluations, and (3) highly price-sensitive consumers with lower decision engagement. One-way ANOVA results ($p < 0.05$) confirm statistically significant differences among the clusters. Rather than assuming homogeneous rational responses, the findings highlight the heterogeneity of economic decision profiles and demonstrate the relevance of clustering techniques for capturing behavioral segmentation in micro-level economic contexts.

Keywords: Price, Location, Economic Decision-Making, Behavioral Economics, K-Means Clustering.

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Introduction

In an increasingly competitive culinary industry, particularly within small and medium-sized service enterprises, fluctuations in consumer demand have become more pronounced in recent years as individuals face changing income conditions, shifting consumption preferences, and tighter budget constraints. These developments reflect broader patterns in individual economic decision-making, where consumption choices are increasingly shaped by perceived costs, benefits, and contextual limitations. Understanding how individuals make economic decisions under such constraints has therefore become essential for ensuring business sustainability.

From an economic perspective, purchasing decisions are not merely responses to marketing stimuli, but outcomes of individual choice processes structured by economic signals. Among the most fundamental signals, price and location play central roles in shaping decision behavior. Price functions as a reference point that influences perceived value and affordability, while location affects transaction costs, accessibility, and the overall convenience of consumption (Wen et al., 2021). Together, these factors determine how individuals evaluate trade-offs and allocate limited resources across consumption alternatives.

Pondok Gudeg Rini, a traditional Javanese restaurant located in Parung Bingung, Depok, provides a relevant empirical context for examining these decision mechanisms. Despite operating continuously since 2012 and maintaining favorable evaluations of food quality, the restaurant has experienced notable fluctuations in sales performance in recent years. A decline in customer visits and revenues from mid- to late 2024 coincided with intensified local competition and increasing consumer sensitivity toward prices and accessibility. This situation suggests shifts in individual economic preferences and constraints, reflecting how consumers reassess spending decisions under perceived economic pressures.

Previous empirical studies have documented the importance of price and location in shaping purchasing behavior, particularly in service-based industries. Several studies report significant positive effects of these variables on consumption decisions (Ananda et al., 2023; Wen et al., 2021). However, existing research is still largely dominated by regression-based approaches that focus on average effects and implicitly assume homogeneous decision behavior across individuals. As a result, little is known about how individuals with different sensitivities, preferences, and budget constraints respond heterogeneously to economic cues such as price and location, especially in offline consumption settings.

This limitation suggests that conventional linear models may be insufficient to capture the diversity of individual economic decision patterns observed in real-world environments. Therefore, this study aims to identify distinct behavioral profiles of individuals based on their perceptions of price and location by employing a data-driven clustering approach. This study contributes to the behavioral economics literature by providing a segmented and behaviorally grounded explanation of how economic signals shape heterogeneous consumption decisions under real-world constraints, thereby extending empirical understanding beyond average causal relationships.

Despite extensive evidence confirming the importance of price and location in shaping purchasing decisions, most prior studies rely on regression-based models that estimate average treatment effects. Such approaches implicitly assume behavioral homogeneity and overlook latent segmentation in economic responses.

This study advances the literature in three fundamental ways. First, it reconceptualizes price and location not merely as marketing variables, but as behavioral economic signals embedded in bounded rational decision frameworks. Second, it operationalizes heterogeneity through an unsupervised clustering approach, enabling the identification of structurally distinct economic profiles rather than mean-based causal estimates. Third, by situating clustering within behavioral economics theory (Expected Utility Theory, Prospect Theory, and Bounded Rationality), this research bridges methodological innovation with theoretical grounding, thereby contributing both empirically and conceptually to the literature on heterogeneous consumer decision-making in offline service contexts.

Literature Review

Grand Theory: Economic and Behavioral Decision-Making

Economic decision-making is traditionally grounded in Expected Utility Theory (EUT), which posits that individuals make choices by evaluating available alternatives and selecting the option that maximizes their expected utility based on subjective probabilities and outcomes (Von Neumann & Morgenstern, 1944). According to this theory, individuals are assumed to behave rationally by comparing costs and benefits and allocating resources in a way that optimizes personal welfare. In consumption contexts, price and location represent key

economic attributes that enter individuals' utility functions, influencing perceived benefits, opportunity costs, and overall decision outcomes.

However, extensive empirical evidence shows that individual behavior often deviates from the predictions of fully rational models. To address these deviations, Prospect Theory extends classical economic assumptions by incorporating psychological factors into decision-making (Kahneman & Tversky, 1979). Prospect Theory argues that individuals evaluate outcomes relative to reference points rather than absolute levels and exhibit loss aversion, whereby losses are perceived more strongly than equivalent gains. In consumption decisions, price frequently acts as a reference point that shapes perceived value and willingness to pay, while location influences perceived effort and transaction costs that affect perceived gains and losses.

Furthermore, Bounded Rationality provides a complementary framework by emphasizing the cognitive and informational limitations faced by individuals (Simon, 1955). Rather than optimizing perfectly, individuals rely on heuristics and satisficing strategies when making decisions under uncertainty and resource constraints. In real-world consumption environments, individuals process limited information about prices, accessibility, and available alternatives, leading to heterogeneous decision patterns across consumers.

Together, these theoretical perspectives establish that economic decision-making is not solely a matter of rational optimization but is shaped by psychological biases, contextual signals, and cognitive constraints. This integrated framework supports the use of data-driven analytical approaches to capture heterogeneity in individual decision-making, as variations in price sensitivity, location preferences, and decision intensity reflect underlying differences in how individuals construct and evaluate economic choices (Kahneman, 2003).

Individual Economic Decision-Making and Behavioral Constraints

Economic decision-making at the individual level is increasingly understood as a process shaped not only by rational cost–benefit calculations but also by cognitive limitations, contextual cues, and perceived economic constraints. Behavioral economics emphasizes that individuals often rely on heuristics, reference points, and mental accounting when making consumption decisions, leading to heterogeneous outcomes even under similar economic conditions. As a result, individual economic choices frequently deviate from the assumptions of full rationality and perfect information.

Zhang et al. (2022) provide strong empirical evidence that consumers engage in mental budgeting practices that systematically influence spending behavior. Their study demonstrates that individuals allocate resources based on internal budgeting rules rather than objective optimization, resulting in varied decision patterns across consumers. These findings suggest that economic decisions are inherently bounded and shaped by subjective perceptions of affordability, trade-offs, and financial constraints. This perspective highlights the importance of examining economic decision-making beyond aggregate outcomes and focusing on heterogeneity in individual behavioral responses.

Price as an Economic Signal in Decision Processes

Within the behavioral economics framework, price functions as a central economic signal that structures how individuals perceive value, risk, and opportunity cost. Rather than serving merely as a monetary indicator, price often operates as a reference point that shapes expectations and influences willingness to engage in consumption. Individuals interpret price not only in absolute terms but also relative to past experiences, perceived fairness, and contextual information.

Wen et al. (2021) demonstrate that price interacts with other informational cues—such as brand reputation and consumer reviews—to guide individual decision-making. Their findings indicate that economic choices emerge from the joint interpretation of multiple signals rather than from isolated price considerations. Importantly, Wen et al. (2021) emphasize that the effect of price is not uniform across individuals. Differences in preferences, experience, and perceived constraints lead to variation in how price signals are processed, reinforcing the argument that individual economic behavior is inherently heterogeneous.

Budget Constraints and Behavioral Heterogeneity

Recent empirical research further underscores the role of budget constraints in shaping individual economic behavior. Skwara and Wienert (2024) provide evidence that digital household budgets significantly influence purchase decision-making processes. Their study shows that individuals adapt their consumption behavior in response to perceived financial limits, resulting in differentiated decision patterns even within similar income groups. These findings support the behavioral economics argument that economic choices are bounded by subjective financial constraints rather than purely objective income levels.

While Skwara and Wienert (2024) focus primarily on digital consumption environments, their results have broader implications for offline economic decision-making. Budgetary considerations can amplify behavioral heterogeneity by shaping how individuals respond to the same economic signals. Under resource constraints, consumers may prioritize affordability, accessibility, or perceived utility differently, leading to diverse decision outcomes even in similar market conditions.

Price and Location in Offline Service-Based Consumption

In offline service-based contexts, such as restaurants, economic decision-making is influenced not only by price but also by location-related factors that affect transaction costs, accessibility, and convenience. Location functions as an economic attribute that shapes the perceived cost of consumption by influencing travel time, effort, and opportunity cost. Together with price, location forms a set of economic cues that structure how individuals evaluate trade-offs and allocate limited resources.

Ananda et al. (2023) empirically demonstrate that price and location significantly affect purchasing decisions among restaurant consumers. Their findings confirm that these variables are salient determinants of individual consumption behavior in offline settings. However, their study relies on regression-based analysis that captures average effects across consumers, thereby offering limited insight into behavioral heterogeneity. While the study establishes the relevance of price and location, it does not explore how individuals with different sensitivities and constraints may interpret these cues differently.

This limitation reflects a broader pattern in the literature, where service-based economic decisions are often analyzed under assumptions of behavioral homogeneity. As a result, existing empirical evidence provides limited understanding of how economic signals generate distinct decision profiles among individuals facing different financial and contextual constraints.

Methodological Implications and Research Gap

Across the reviewed studies, a consistent theme emerges: individual economic decision-making is heterogeneous and shaped by multiple interacting cues. Nevertheless, much of the existing literature relies on linear or causal modeling approaches that emphasize average relationships and overlook variation in behavioral responses. Experimental and digital-context

studies highlight behavioral constraints and heterogeneity, but these insights are often disconnected from real-world, offline service environments such as traditional restaurants.

Consequently, there remains limited empirical understanding of how price and location jointly structure heterogeneous decision patterns in offline consumption under real-world economic constraints. Addressing this gap requires analytical approaches capable of identifying distinct behavioral profiles rather than assuming uniform responses across individuals. Data-driven clustering methods offer a promising avenue to capture such heterogeneity by grouping individuals based on shared perceptions and decision outcomes, thereby enabling a more nuanced analysis of individual economic behavior.

Based on the existing literature, this study positions itself within the behavioral economics tradition by examining how economic signals in the form of price and location shape heterogeneous individual decision-making patterns in offline service consumption. By employing a clustering-based approach, the study extends prior research beyond average effects and contributes to a segmented understanding of economic behavior under real-world constraints.

Conceptual Implications for Behavioral Economics

The findings empirically support the behavioral economics proposition that consumers operate under differentiated utility constructions. Rather than representing deviations from rationality, heterogeneity appears as a structural property of economic decision systems. Cluster 1 approximates utility-maximizing individuals with relaxed budget constraints. Cluster 2 reflects satisficing behavior under moderate constraints. Cluster 3 represents loss-averse and budget-bound decision-making dominated by affordability thresholds. This segmentation illustrates how bounded rationality manifests in observable consumption patterns, reinforcing the argument that representative-agent models inadequately capture real-world economic behavior.

Research Method

This study employed a quantitative descriptive research design, integrating a data-driven clustering approach using the K-Means algorithm. The quantitative framework enabled the measurement and statistical interpretation of individual economic perceptions related to price, location, and purchasing decisions (Fadhilah et al., 2023; Hardiansyah et al., 2019). The application of K-Means clustering facilitated the identification of heterogeneous behavioral profiles based on respondents' questionnaire responses, thereby capturing variation in individual economic decision-making rather than average causal effects (Ahmed et al., 2020; Dal Santo et al., 2024; E. E. Lee et al., 2021). Unlike traditional regression analysis, which prioritizes causal inference, the clustering approach focuses on uncovering latent behavioral structures and grouping individuals based on similar economic perceptions and decision outcomes.

Population and Sample

The target population of this study refers to all customers who have made purchases at Pondok Gudeg Rini. However, due to the absence of a complete customer database and the limited accessibility of the entire consumer population, this study adopts the concept of an *accessible population*, namely customers who visited the restaurant during the data collection period.

A non-probability purposive sampling technique was employed by selecting 100 respondents who had made at least one purchase at the restaurant and were willing to participate in the survey (Stratton, 2023; Turban et al., 2023). This sample size was determined based on data availability and practical considerations rather than probabilistic inference, and therefore represents an accessible subset of the broader consumer population rather than a statistical census.

Research Variables and Measurement

The study examined three principal variables: price, location, and purchasing decision. Price is defined as individuals' economic evaluation of affordability, fairness, and perceived value of the restaurant's menu offerings (Chubaka Mushagalusa et al., 2022; Samoggia et al., 2021; Silva, 2020). Location refers to consumers' perceptions of accessibility, convenience, and transaction-related costs associated with reaching the restaurant, including traffic conditions and parking availability (Bivina et al., 2019; Merten & Kuhnimhof, 2023; Yen et al., 2020).

Purchasing decision is defined as an individual's economic choice to allocate resources toward consumption, reflecting subjective preferences, perceived utility, and willingness to engage in repeated transactions under perceived economic constraints (Ali, 2019; H. J. Lee, 2020; Petcharat & Leelasantitham, 2021; Rayi & Aras, 2021). All variables were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Data Collection

Data were collected through a structured questionnaire administered both in person and via Google Forms. The instrument consisted of sections addressing demographic characteristics, perceptions of price and location, and indicators of purchasing behavior. Additional data were obtained through direct observation and secondary sources, including internal sales records from January to December 2024, which indicated a decline in customer visits and revenue toward the end of the year. These supplementary data provided contextual insights for interpreting consumer decision patterns under changing economic conditions.

Validity and Reliability Testing

Prior to implementing the K-Means clustering procedure, the validity and reliability of the research instrument were evaluated using the Pearson Product–Moment correlation and Cronbach's Alpha coefficient (Chen, 2020; Kuderer et al., 2022; Nurabadi et al., 2022; Rachmani et al., 2020). All measurement items exceeded the established thresholds ($r > 0.30$; $\alpha > 0.60$), indicating acceptable levels of construct validity and internal consistency.

Data Analysis Technique

Data analysis was conducted using SPSS version 25. The K-Means algorithm was applied after determining the optimal number of clusters ($k = 3$) using the elbow method, which showed a substantial reduction in within-cluster variance after the third cluster (Chen, 2020; Kuderer et al., 2022; Nurabadi et al., 2022; Rachmani et al., 2020). From a behavioral economics perspective, three clusters represent a meaningful categorization of individual decision patterns, reflecting high, moderate, and low levels of price sensitivity and decision intensity.

The algorithm initialized random centroids, calculated Euclidean distances between each observation and cluster centers, and iteratively reassigned cases until convergence was achieved at the sixth iteration, indicating a stable clustering solution.

Methodological Limitations

This study employs a non-probability purposive sampling technique, which limits the generalizability of the findings beyond the observed sample. The relatively small sample size and single-case context may introduce self-selection bias, as respondents who participated in the survey may differ systematically from non-participants. In addition, the use of self-reported questionnaire data may be subject to response bias. Therefore, the results should be interpreted as context-specific behavioral insights rather than population-level generalizations.

Results and Discussion

The K-Means clustering analysis identified three distinct behavioral profiles based on individuals' economic perceptions of price, location, and purchasing decisions. Convergence was achieved at the sixth iteration, indicating that the cluster centroids had stabilized and that the solution demonstrated strong internal consistency. The final cluster distribution consisted of 37 individuals in Cluster 1, 37 individuals in Cluster 2, and 22 individuals in Cluster 3. These clusters represent heterogeneous patterns of individual economic decision-making within the consumer population of Pondok Gudeg Rini, consistent with the behavioral economics view that consumption choices are not uniform across individuals (Kahneman, 2003).

Substantial differences were observed across the cluster centers. Cluster 1 recorded the highest mean values for price (32), location (47), and purchasing decision (60), indicating that individuals in this group perceive prices as fair, evaluate location attributes positively, and exhibit strong decision intensity. From an economic perspective, this cluster reflects individuals with high perceived utility and low price sensitivity, suggesting that consumption decisions are driven primarily by perceived benefits and experiential value rather than cost considerations. This pattern aligns with evidence that individuals with higher perceived utility rely less on price as a binding constraint in decision-making (Wen et al., 2021).

Cluster 2 displayed moderate mean scores—price (30), location (40), and purchasing decision (52)—representing individuals who evaluate economic cues through balanced trade-offs between perceived utility and cost. This group reflects economically rational but constraint-aware individuals who engage in consumption decisions when perceived value aligns with their willingness to pay. Their behavior is consistent with bounded rationality,

where individuals rely on satisficing strategies rather than strict optimization when processing economic information (Kahneman, 2003).

In contrast, Cluster 3 exhibited the lowest mean values, particularly for price (24), location (35), and purchasing decision (44). This cluster represents individuals with high price sensitivity and strong budget constraints. From a behavioral economics standpoint, this group reflects individuals whose consumption decisions are dominated by affordability thresholds and perceived losses, consistent with mental budgeting and loss aversion mechanisms (Zhang et al., 2022; Skwara & Wienert, 2024).

A one-way ANOVA confirmed statistically significant differences across clusters for all variables ($p < 0.05$), indicating that price and location operate as effective economic signals differentiating individual decision patterns. The distances between cluster centroids further reinforced behavioral separation, with the greatest distance observed between Cluster 1 and Cluster 3 (22.26), suggesting substantial divergence between high-utility and high-constraint decision profiles.

These findings indicate that price functions as a reference point shaping perceived utility and willingness to allocate resources, while location operates as a transaction-cost attribute influencing perceived effort and convenience. This supports prior evidence that individuals interpret price and contextual cues jointly rather than independently when forming economic decisions (Wen et al., 2021).

Importantly, the results demonstrate that individuals do not respond uniformly to these economic cues. Instead, heterogeneous behavioral responses emerge depending on subjective preferences, perceived constraints, and reference-dependent evaluations. This pattern is consistent with behavioral economics theory, which argues that economic choices are shaped by bounded rationality and psychological reference points rather than pure rational optimization (Kahneman, 2003; Zhang et al., 2022).

Unlike regression-based approaches that estimate average effects, the clustering results reveal structurally different economic decision-making profiles. This supports the behavioral economics argument that individual choices are heterogeneous and context-dependent, particularly under budget constraints and limited information (Skwara & Wienert, 2024).

From a strategic management perspective, segmentation-based pricing and accessibility strategies outperform uniform approaches. The results suggest that SMEs should transition

from generalized pricing models toward behavioral-informed micro-segmentation strategies to enhance economic sustainability and consumer welfare alignment.

Conclusion

This study began from the observation that small and medium-sized service enterprises operate within increasingly volatile demand conditions, where consumers face changing income levels, shifting preferences, and tighter budget constraints. In such an environment, understanding how individuals evaluate economic trade-offs becomes essential for business sustainability. By examining Pondok Gudeg Rini as an empirical case, this research sought to explain how price and location function as central economic signals shaping purchasing decisions under real-world constraints.

The findings confirm that price and location significantly structure individual economic decision-making. However, their influence does not operate uniformly across consumers. Instead, the clustering analysis reveals three distinct behavioral profiles reflecting differentiated levels of price sensitivity, perceived utility, and decision intensity. These results indicate that fluctuations in consumer demand may not merely reflect changes in external competition or market conditions, but also the presence of heterogeneous decision architectures shaped by bounded rationality, reference dependence, and perceived transaction costs.

Consistent with the study's objective, the clustering-based approach demonstrates that conventional regression models, while useful for estimating average effects, are insufficient for capturing the structural diversity of consumer responses. By operationalizing heterogeneity through unsupervised segmentation, this research shows that economic decision-making in offline service contexts is inherently pluralistic rather than homogeneous.

From a managerial standpoint, the results suggest that sustainability in competitive culinary markets requires behavioral segmentation rather than uniform pricing or accessibility strategies. Recognizing that some consumers are utility-driven, others value-balanced, and others highly price-constrained enables more adaptive strategic decisions in pricing, location optimization, and resource allocation. Such differentiation may help small and medium-sized enterprises respond more effectively to demand volatility and shifting consumer constraints.

At the theoretical level, this study advances behavioral economics by reconceptualizing price and location as psychologically embedded economic cues within bounded rational decision systems. By integrating Expected Utility Theory, Prospect Theory, and Bounded Rationality with clustering-based empirical analysis, the research bridges methodological innovation with theoretical grounding, thereby extending understanding beyond representative-agent assumptions.

Nevertheless, the findings should be interpreted within contextual limitations. The single-case design and non-probability sampling approach restrict external generalization. Future studies should apply multi-site comparisons, probability-based sampling, and additional cluster validation techniques to further examine the robustness of heterogeneous decision patterns across service sectors.

Overall, this study demonstrates that consumer demand fluctuations in competitive service industries are closely linked to structurally heterogeneous economic decision mechanisms. Price and location, therefore, should be understood not merely as operational marketing variables, but as behavioral economic signals that organize differentiated consumption choices under real-world constraints.

Theoretical Contribution

This research contributes to behavioral economics by empirically demonstrating that heterogeneity in economic decision-making is not residual variation, but a structural characteristic of consumer behavior under constraint. Through clustering-based operationalization, the study provides a methodological pathway for integrating psychological economic theory with empirical segmentation analysis in offline service markets.

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