

## Factors Affecting Bread Selection: Strategies for Promoting High-Quality Bread Consumption

Sayed Saghaian<sup>a</sup>®, Mahkameh Khavamoshi Yazdi<sup>b</sup>, Hosein Mohammadi<sup>c</sup>, and Alireza Karbasi<sup>d</sup>

<sup>a</sup>Professor, Department of Agricultural Economics,  
314 Charles Barnhart Bldg., University of Kentucky,  
Lexington, KY 40546, USA

<sup>b</sup>PhD Student, Department of Agricultural Economics,  
Azadi Sq., Mashhad, Khorasan Razavi, 8974, Ferdowsi University of Mashhad,  
Mashhad, Iran

<sup>c</sup>Professor, Department of International Economics,  
Azadi Sq., Mashhad, Khorasan Razavi, 8974, Ferdowsi University of Mashhad,  
Mashhad, Iran

<sup>d</sup>Professor, Department of Agricultural Economics,  
Azadi Sq., Mashhad, Khorasan Razavi, 8974, Ferdowsi University of Mashhad,  
Mashhad, Iran

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### Abstract

Bread forms a cornerstone of the Iranian diet, exhibiting diverse consumption patterns influenced by various household characteristics. This study aims to determine the key socioeconomic factors that shape bread-type selection within Tehran, Iran. Using data collected in 2024 from 401 households across three regions of Tehran via random cluster sampling, and applying the multinomial logit (MNL) model, we find that household income, geographic region, and family size are the most significant determinants of bread selection. This research concludes that successful strategies to promote higher-quality and more nutritious breads must integrate product improvements with targeted consumer education, respecting cultural preferences.

**Keywords:** bread choice, consumer preferences, Multinomial Logit Model, socioeconomic determinants, Tehran Urban Market

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®Corresponding author:

Email: ssaghaian@uky.edu

## Introduction

Bread holds a central and indispensable role in the Iranian diet. Reflecting this significance, per capita wheat consumption in Iran is more than double the global average (FAO, 2022), with approximately 80% of wheat dedicated to bread production. The selection and consumption of bread are deeply embedded within cultural contexts, where established beliefs and ingrained habits play a pivotal role (Gava, Bartolini, and Brunori, 2016). These factors suggest that any optimal innovation process within the bread sector must not only respect tradition but also seek to enhance it through the integration of modern technologies and quality improvements (Miolla et al., 2023). Consumer preferences and consumption levels have historically led to a wide variety of bread types (Shahnoushi et al., 2011), and as mentioned, key determinants influencing these choices include quality, daily consumption amount, bread price, and monthly household income.

Globally, bread consumption varies significantly, with roughly half the world's population consuming bulky breads, while many countries in Central America, South America, Africa, and East/Southeast Asia primarily consume flatbreads, often from traditional bakeries (Karizaki, 2017). Recognizing this global diversity, research has explored the multifaceted determinants of consumer bread choice. For instance, De Boni et al. (2019) utilized a choice experiment to assess consumer preferences for high-quality Italian industrial breads, finding that consumer knowledge regarding sustainability, nutritional attributes, price, durability, and waste management significantly influenced choices. Similarly, Gava, Bartolini, and Brunori (2016) investigated consumer determinants in Italy, highlighting the importance of ethical factors (environmental sustainability, origin concerns), sensory quality (taste, freshness, appearance), health considerations (nutritional quality of wheat and flour), and price. Their findings underscored sensory quality as a key determinant of consumer choice, further emphasizing the strong cultural component wherein beliefs and habits are critical. Studies on rye yeast bread, such as Skořepa and Pícha (2016), also identified freshness, appearance, and price as crucial factors, with price sensitivity increasing with age. These studies collectively suggest that promoting specific bread types often requires highlighting their health benefits or addressing salient consumer concerns.

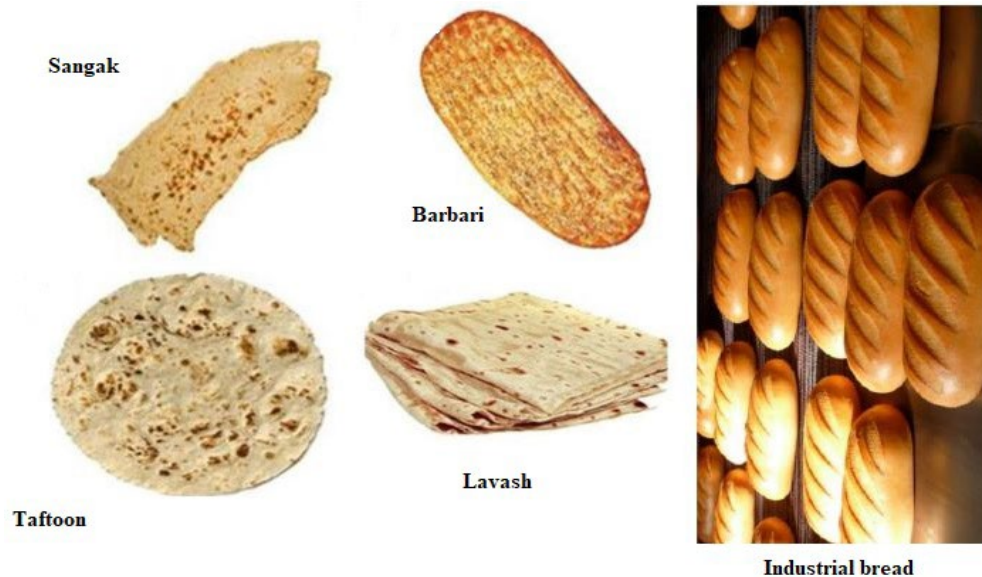
In the specific context of Iran, the consumption landscape is characterized by a dual system of subsidized traditional breads and emerging commercial varieties. While nearly 50% of the global population consumes bulky breads, Iran's market has historically been dominated by traditional flatbreads, such as *Sangak* and *Barbari*. Understanding the drivers behind consumer choices within this complex market is crucial for informing policy and industry strategies aimed at promoting healthier and more sustainable bread options. Therefore, this study aims to identify and investigate the factors influencing the consumption of different bread types in Tehran, enabling a nuanced understanding of consumer behavior and providing a basis for targeted interventions.

## Materials and Methods

To investigate the factors affecting bread type choice from the consumers' perspective, the city of Tehran was selected as the statistical population. A representative sample of 401 households was randomly selected via a cluster sampling method (Kerry and Bland, 1998) across three distinct

areas of Tehran (Regions 3, 7, and 11). Data collection was executed using a structured questionnaire administered to the selected participants during the final quarter of 2024 (October–December).

The Multinomial Logit Model (MNL) was utilized for data analysis, implemented using Stata MP17 software. The dependent variable in this study encompasses six categories of bread commonly consumed in Tehran: Sangak, Barbari, Lavash, Taftoon, Bulky bread, and Industrial bread. (see Figure 1).



**Figure 1. Types of Bread Examined in This Study**

The underlying MNL model for investigating the effect of household characteristics on the choice of bread type is specified as equation (1). The Multinomial Logit Model estimates the log-odds ratio of choosing bread type  $j$  versus the reference category (Sangak) based on the household characteristics (Long and Freese 2014; Saghaian, Mohammadi, and Jafari, 2023).

$$\ln\left(\frac{P_j}{P_{Sangak}}\right) = Y_j \quad (1)$$

$$= \beta_1 Age_i + \beta_2 gender_i + \beta_3 D_7 + \beta_4 D_{11} + \beta_5 educ_i + \beta_6 incom_i + \beta_7 family_i + \varepsilon_t$$

where  $Y_j$  represents the choice of bread type  $j$ , and  $\beta$  coefficients denote the estimated parameters for the independent variables (Age, Gender, Region, Education, Income, Family Size) for household  $i$ . For categorical variables like Gender and Region, dummy coding was applied with appropriate reference categories, ensuring that each dimension of choice is accurately captured.

## Results and Discussion

Table 1 illustrates the frequency distribution, highlighting a significant disparity among the bread choices.

**Table 1. Frequency Distribution of Bread Types**

| Types of Bread | Frequency | Percentage (%) |
|----------------|-----------|----------------|
| Sangak (base)  | 213       | 53%            |
| Lavash         | 64        | 16 %           |
| Barbari        | 62        | 15%            |
| Taftoon        | 32        | 8%             |
| Industrial     | 18        | 4%             |
| Bulky          | 12        | 3%             |
| Total          | 401       | 100%           |

Note: Source: Research Findings

As shown, Sangak bread dominates the market share at 53%. Conversely, Bulky (3%) and Industrial (4%) breads represent the lowest consumption levels.

Table 2 provides a summary of the independent variables.

**Table 2. Descriptive Statistics for Independent Variables**

| Variable                       | Type                       | Range                    | Mean  | Std. Dev. |
|--------------------------------|----------------------------|--------------------------|-------|-----------|
| Age (household head)           | Quantitative               | 25 to 81 years           | 42.5  | 10.2      |
| Income (million rials)         | Quantitative               | 200 to 830 million rials | 450.0 | 110.5     |
| Education (years of schooling) | Quantitative               | 5 to 22 years            | 13.2  | 3.5       |
| Family size (persons)          | Quantitative               | 1 to 7 persons           | 3.8   | 1.2       |
| Gender (1 = male, 0 = female)  | Qualitative (dummy) 0 or 1 |                          | 0.72  | -         |
| Region 7 (D7)                  | Qualitative (dummy) 0 or 1 |                          | 0.30  | -         |
| Region 11 (D11)                | Qualitative (dummy) 0 or 1 |                          | 0.25  | -         |

Note: Reference Categories: Gender (Female), Region (Region 3). Source: Research Findings

### *Multinomial Logit Model Estimation Results*

The model estimates the log-odds of choosing bread type *j* relative to the base category, Sangak. Table 3 shows the impact of independent variables across all alternative choices. It should be noted that Average Marginal Effects (AMEs) represent the expected change in the probability of choosing a particular bread type for a 1-unit change in the independent variable, averaged across all observations in the sample (Mohammadi and Saghaian, 2022).

**Table 3. Results of the Multinomial Logit Model Estimation**

| Variable                  | Category vs.<br>Sangak | $\beta$  | S.d.      | Z     | p-value | AME     |
|---------------------------|------------------------|----------|-----------|-------|---------|---------|
| Income (million<br>rials) | Barbari                | 0.00018* | 0.000077  | 2.40  | 0.016   | +0.0035 |
|                           | Lavash                 | 0.000068 | 0.000097  | 0.71  | 0.480   | +0.0008 |
|                           | Taftoon                | 0.000012 | 0.0000110 | 1.09  | 0.275   | +0.0015 |
|                           | Industrial             | 0.000009 | 0.0000130 | 0.69  | 0.490   | +0.0011 |
|                           | Bulky                  | 0.000015 | 0.0000140 | 1.07  | 0.284   | +0.0018 |
| Region 7 (D7)             | Barbari                | 0.2556*  | 0.0539    | 4.74  | 4.75    | +0.0512 |
|                           | Lavash                 | 0.1252*  | 0.0598    | 2.09  | 0.036   | +0.0240 |
|                           | Taftoon                | 0.1880*  | 0.070     | 2.69  | 0.007   | +0.0370 |
|                           | Industrial             | 0.1084   | 0.1093    | 0.99  | 0.321   | +0.0130 |
|                           | Bulky                  | 0.150**  | 0.090     | 1.67  | 0.095   | +0.0180 |
| Region 11 (D11)           | Barbari                | 0.051    | 0.0350    | 1.46  | 0.144   | +0.0095 |
|                           | Lavash                 | -0.082*  | 0.040     | -2.05 | 0.040   | -0.0155 |
|                           | Taftoon                | -0.045   | 0.0480    | -0.94 | 0.347   | -0.0055 |
|                           | Industrial             | -0.020   | 0.0550    | -0.36 | 0.718   | -0.0025 |
|                           | Bulky                  | -0.10**  | 0.0600    | -1.67 | 0.095   | -0.0120 |
| Family size               | Barbari                | -0.233** | 0.1265    | -1.85 | 0.065   | -0.0350 |
|                           | Lavash                 | -0.10    | 0.1400    | -0.71 | 0.477   | -0.0120 |
|                           | Taftoon                | -0.15    | 0.1600    | -0.94 | 0.347   | -0.0180 |
|                           | Industrial             | -0.52*   | 0.254     | -2.05 | 0.041   | -0.0850 |
|                           | Bulky                  | -0.705*  | 0.254     | -2.75 | 0.021   | -0.1150 |
| Age (years)               | Barbari                | -0.010   | 0.0103    | -0.98 | 0.329   | -0.0015 |
|                           | Lavash                 | -0.0438* | 0.0128    | -3.43 | 0.001   | -0.0075 |
|                           | Taftoon                | -0.0144  | 0.0161    | -0.90 | 0.370   | -0.0018 |
|                           | Industrial             | -0.068   | 0.0180    | -3.78 | 0.000   | -0.0110 |
|                           | Bulky                  | -0.055   | 0.020     | -2.75 | 0.006   | -0.0090 |
| Gender (male = 1)         | Barbari                | 0.349    | 0.2930    | 1.19  | 0.233   | +0.0400 |
|                           | Lavash                 | -0.067   | 0.3535    | -0.19 | 0.849   | -0.0070 |
|                           | Taftoon                | -0.0031  | 0.5176    | -0.01 | 0.995   | ≈-0.000 |
|                           | Industrial             | -1.295   | 0.8400    | -1.54 | 0.123   | -0.1000 |
|                           | Bulky                  | -17.42*  | 0.8399    | -20.9 | 0.012   | ≈-0.000 |
| Education (years)         | Barbari                | -0.1870  | 0.1586    | -1.18 | 0.238   | -0.020  |
|                           | Lavash                 | 0.3202** | 0.1729    | 1.85  | 0.064   | +0.0480 |

**Table 3 (cont.)**

| Variable | Category vs. Sangak | $\beta$ | S.D.    | Z    | p-value | AME     |
|----------|---------------------|---------|---------|------|---------|---------|
|          | Taftoon             | 0.0467  | 0.28322 | 0.16 | 0.869   | +0.0050 |
|          | Industrial          | 0.2799  | 0.3051  | 0.92 | 0.359   | +0.030  |
|          | Bulky               | 0.4573  | 0.3051  | 0.92 | 0.359   | +0.0550 |

Source: Research Findings. \* Significant at the 5% level, and \*\* significant at the 10% level.

### *Interpretation of Results*

**Geographic Influence (Region 7):** The strongest and most consistent predictor across several bread categories is the consumer's location in region 7. This region significantly elevates the probability of choosing Barbari (by  $\approx 5.12$  percentage points), Taftoon (by  $\approx 3.70$  pp), and Lavash (by  $\approx 2.40$  pp) relative to the base choice, Sangak. This highlights a strong regional preference for these types of bread.

### **Socio-Demographic Factors**

**Age:** An increase in consumer age acts as a significant deterrent for Industrial ( $-1.1$ pp probability change per year), Lavash ( $-0.75$ pp), and Bulky ( $-0.90$  pp) bread choices. This finding suggests a generational shift or evolving preferences away from these types as individuals age.

**Family Size:** Larger households are significantly less likely to opt for Bulky ( $-11.50$ pp) and Industrial ( $-8.50$ pp) breads, indicating that they might be less suitable for larger family consumption patterns or economic constraints within larger families.

**Income:** The effect of Income is highly specific, significantly boosting the probability of choosing Barbari by approximately  $0.35$ pp per million Rials increase. Its impact on other bread types is not statistically significant, suggesting that Barbari is uniquely perceived as a superior good among the analyzed breads.

**Education:** Higher Education levels are marginally, yet significantly, associated with an increased probability of choosing Lavash (by  $\approx 4.80$ pp). This finding could reflect an appreciation for artisanal or specific types of bread associated with higher education.

The coefficient estimated for Gender (Male = 1) on the choice of Bulky bread category ( $\beta \approx -17.4$ ) exhibits an unexpectedly large magnitude, whereas its corresponding Average Marginal Effect (AME) is effectively zero. This outcome is indicative of quasi-separation within the dataset, suggesting the model faces difficulty in reliably estimating the effect due to the scarcity of observations pertaining to this specific combination. Consequently, this finding will be reported with extreme methodological caution, explicitly acknowledging that it does not constitute reliable evidence of a gender-based preference for Bulky bread. Effects for Gender on all other bread categories were found to be statistically non-significant.

Regional Contrasts: While Region 7 shows strong positive associations, Region 11 exhibits a significant deterrent effect on the choice of Lavash ( $-1.55pp$ ), suggesting distinct market or preference structures in different regions.

### *Model Specification Tests*

#### A. Independence of Irrelevant Alternatives (IIA) Test—Hausman Test

The Hausman test results confirm the validity of the IIA assumption, as all  $p$ -values are greater than 0.05, thus endorsing the Multinomial Logit framework.

**Table 4. Hausman Test Results for IIA Assumption**

| Types of Bread | $\chi^2$ Statistic | df | $p$ -value | Conclusion                    |
|----------------|--------------------|----|------------|-------------------------------|
| Barbari        | 12.310             | 10 | 0.267      | Fail to reject H0 (IIA holds) |
| Lavash         | 7.995              | 10 | 0.628      | Fail to reject H0 (IIA holds) |
| Taftoon        | 15.650             | 10 | 0.107      | Fail to reject H0 (IIA holds) |
| Industrial     | 11.450             | 10 | 0.327      | Fail to reject H0 (IIA holds) |
| Bulky          | 10.118             | 10 | 0.422      | Fail to reject H0 (IIA holds) |

Source: Research Findings

#### B. Likelihood Ratio (LR) Test for Category Aggregation

The LR test confirms that the separation of the six categories is statistically justified, as merging the two rarest types (Bulky and Industrial) significantly reduces the model's fit.

**Table 5. Likelihood Ratio Test for Combining Bulky and Industrial Breads**

| Model                       | Log-Likelihood (LL) | Number of Parameters (df) | LR Statistic ( $\chi^2$ ) | $p$ -value | Conclusion |
|-----------------------------|---------------------|---------------------------|---------------------------|------------|------------|
| Unrestricted (6 categories) | -475.950            | 24                        | -                         | -          | -          |
| Restricted (5 categories)   | -478.250            | 22                        | 5.40                      | 0.020      | Reject H0  |

### C. Goodness-of-Fit Criteria

Table 6 provides an overview of the key criteria used to assess the model's overall goodness-of-fit.

**Table 6. Multinomial Logit Model Fit Criteria**

| Criterion                         | Value                               |
|-----------------------------------|-------------------------------------|
| Log-likelihood (intercept only)   | -535.18                             |
| Log-likelihood (full model)       | -475.95                             |
| LR test statistic (vs. intercept) | 118.47<br>(with $p \approx 0.000$ ) |
| McFadden's $R^2$                  | 0.11                                |
| Cragg-Uhler $R^2$                 | 0.27                                |
| AIC                               | 2.58                                |
| BIC                               | -1199.93                            |

Source: Research Findings

The highly significant LR statistic ( $\chi^2 = 118.47$  with  $p \approx 0.000$ ) indicates that the full model (including independent variables) provides a significantly better fit to the data than the null model (containing only the intercept). This result confirms that the chosen set of variables has significant explanatory power over the choice of bread. McFadden's  $R^2$  measure is 0.11, and in discrete choice models, this value is generally considered acceptable. Cragg-Uhler  $R^2$  value of 0.27 suggests a stronger fit than McFadden's, indicating that the model performs reasonably well in distinguishing between choices, and, finally, AIC/BIC values suggest a balance between model fit and the number of parameters used.

## Conclusions and Recommendations

The analysis of bread choice in Tehran, anchored by the Multinomial Logit model (see Table 3), confirms that consumer decisions are significantly driven by a convergence of socioeconomic status and geographic location. The market is overwhelmingly dominated by Sangak (53%), establishing it as the baseline preference.

### Key Empirical Findings

**Income and Geographic Sorting:** Higher household income significantly correlates with increased demand for Barbari—suggesting its perception as a “superior good” in this context—while simultaneously exhibiting a strong deterrent effect on the choice of Industrial and Bulky breads. Furthermore, regional disparity is pronounced: residence in Region 7 acts as a powerful positive incentive for choosing Barbari, Taftoon, and Lavash over Sangak, suggesting embedded local market conditions or established preferences that override purely national socioeconomic factors.



**Demographic Constraints:** Family size emerges as a practical constraint, significantly pushing larger households away from Bulky and Industrial bread options. Similarly, advancing age is strongly associated with a lower propensity to choose Lavash and Industrial varieties, pointing toward evolving generational dietary patterns.

### *Recommendations for Policy and Industry*

To promote a dietary shift toward nutritionally superior bread alternatives, interventions must skillfully navigate deeply entrenched cultural habits while addressing product limitations:

**Prioritize Palatability and Quality for Alternatives:** For low-share categories like Bulky and Industrial bread, the primary barrier is likely not just awareness, but perceived quality. Manufacturers must invest in product development that rigorously matches or exceeds the sensory attributes (taste, texture) of traditional breads. If the AMEs show a significant drop-off in demand (e.g., larger families avoiding Industrial bread), the product design needs to better align with larger household utility.

**Targeted Geographic and Segmented Campaigns:** Consumer education campaigns should be geographically focused. Given the strong positive effect of Region 7 on traditional alternatives, strategies should investigate the success factors in this region and attempt to replicate them elsewhere. Campaigns should specifically highlight the tangible benefits of alternatives, such as extended freshness (counteracting the known short shelf-life of fresh Sangak) or fortified nutritional content.

**Support for Traditional Sectors on Standards:** Rather than advocating for the outright replacement of Sangak or Lavash, focus resources on optimizing their production. This involves supporting traditional bakeries in standardizing ingredient use (e.g., reducing excess salt or leavening agents) to maintain cultural acceptance while mitigating potential health concerns.

**Innovation through Fortification:** The most promising path for cultural acceptance alongside health benefits lies in product innovation. Introducing fortified versions of highly preferred breads (like Barbari or Lavash), where the nutritional boost is integrated without altering the core, culturally accepted sensory experience, is recommended to bridge the gap between preference and public health goals.

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