



Case study on sustainability as an influencing factor on the purchasing behaviour of bakery consumers

- Consumption behaviour of baked goods among the urban population in Germany-

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ABSTRACT:

The concept of sustainability has become increasingly important in the purchasing decisions of consumers around the world. This is particularly true in the food industry, where customers are becoming increasingly aware of the environmental and social impact of the products they buy. In recent years, bakeries have also begun to recognise the importance of sustainability in their operations and product offerings. This research article aims to analyse the different aspects of sustainability as a purchasing decision for bakeries. To do this, a quantitative consumer survey from 2021 was analysed. By understanding these factors, bakeries can make informed decisions to align with sustainability goals while meeting the evolving needs and preferences of their customers.

KEYWORDS: Sustainability, Bakery, Survey, purchasing Behaviour, influence factor

I. INTRODUCTION

As consumer awareness of environmental issues continues to grow [1], bakeries are under increasing pressure to adopt environmentally friendly practices. In this article, a quantitative consumer survey from 2021 will be excerpted to analyse which factors are important to consumers in the context of sustainability in bakeries and how this influences consumers' purchasing decisions. Covid-19 had a major impact on smaller companies in particular [2]. These include reducing energy and water consumption, minimising food waste and using regional raw materials. Bakeries can also look into using renewable energy sources and organic raw materials to further reduce their environmental footprint. A study by Peano and colleagues found that "conservation of natural resources"[3] is an important purchasing criterion for consumers of baked goods. This shows that

integrating environmentally friendly practices not only helps to reduce environmental impact, but also has the potential to strengthen a bakery's market position.

It is crucial for bakeries to understand consumer perceptions and preferences when it comes to sustainability. Conducting surveys or gathering customer feedback can provide valuable insights into which sustainable practices and initiatives resonate with consumers. By actively engaging with their customers, bakeries can align their sustainability efforts with the expectations of their target audience and build a reputation as an environmentally conscious business.

By addressing these different aspects of sustainability, bakeries can position themselves as environmental leaders and meet the growing demand for sustainable and ethical food.

In Germany, there is an increasing trend towards very small artisan bakeries that work in a niche with a limited product range and larger companies with over 1,000 employees that provide a basic supply of baked goods [4]. In addition, the distinction between artisan bakeries and the bakery industry is dwindling [5]. Around 5% of bakeries in Germany generate almost 70% of total sales [6]. The number of bakeries has fallen from 9,965 in 2021 to 9,607 in 2022, while total sales have risen from €14.89 billion to €16.27 billion in 2022 [7].

Bakeries can proactively engage with their customers to raise awareness of sustainable practices. This can be achieved through informative signage in the bakery, social media campaigns or organising educational events on sustainability. By sharing information about their sourcing practices, packaging choices and environmental initiatives, bakeries can encourage consumers to make environmentally conscious choices and reinforce their brand's reputation as a leader in sustainable baking. By implementing these strategies, bakeries



can position themselves as champions of sustainability in their communities and appeal to environmentally conscious consumers. By adopting sustainable practices, bakeries have the opportunity to lead the way in promoting environmental responsibility, supporting the local economy and meeting the evolving demands of conscious consumers. By continuously developing their sustainable initiatives and communicating their efforts transparently, bakeries can differentiate themselves in the marketplace while contributing to a more sustainable and responsible food industry.

II. Background to this Survey

The quantitative consumer survey, which is partially analyzed in this paper, was conducted in the pedestrian zone of Bertha-von-Suttner-Platz in Bonn, Germany. The day chosen for the survey was a summer Saturday, 12 June 2021. A summer Saturday, for the reason that on such a day the probability is greatest that a representative average of the population is actually out shopping in the city. The survey was conducted using two I-Pads and the survey platform "Survey-Monkey". Every survey participant who completed the survey was allowed to draw a ticket from a raffle and thus take part in a prize draw. The prizes were small vouchers from neighboring shops up to a maximum of € 10.

In addition to the social questions, questions on sustainability were recorded in an evaluation matrix according to the Likert scale [8] so that they could be analyzed in detail [9] at a later date. In addition, key points from the conversations with the survey participants were written down. As not all of the survey participants were prepared for an in-depth discussion, these statements cannot be included in the survey results in a representative manner, but merely outline the context of the questions and answers. The background to this survey was to find out whether the general population is interested in sustainable food, especially baked goods, and whether there is a willingness to make a certain effort to achieve this. It was also important to establish whether there is a market for sustainable food, especially baked goods, at all. As a rule, companies always adapt to the market [10] and if there is no willingness to buy special products, or if the higher production costs resulting from these requirements are not recouped through the consumption of these products, this market segment will not develop and this movement will disappear from the market again [11].

III. Results and analysis of the representative consumer survey

This Saturday, a total of 48 valid consumer surveys were successfully completed. These surveys made it possible to gain insights into consumer behaviour. The composition of participants by gender and age group was almost balanced. Around 4.2% of participants identified themselves as part of the diverse gender and were on average around 9 years younger than the other respondents.

In order to analyse the consumption behaviour in more detail, the boxplots of the baked goods consumption data were run both as violin elements and as jitter elements. Interestingly, the analysis showed that male respondents consume baked goods on average and median about 5 times per week. In contrast, the female participants had a similar average frequency of baked goods consumption, but the fluctuations in their consumption habits were much more pronounced compared to the male participants. This differentiated view enables a nuanced analysis of consumer behaviour between the genders and provides valuable insights for future research and market strategies in the food industry.

Table 1: Analysis of survey participants by gender, year of birth and weekly consumption of baked goods

| Deskriptive Statistik | GEBJAHR | | | Backwakon/w | | |
|-----------------------|----------|-----------|----------|-------------|-----------|----------|
| | DIVERS | MAENNLICH | WEIBLICH | DIVERS | MAENNLICH | WEIBLICH |
| Gültig | 2 | 22 | 24 | 2 | 22 | 24 |
| Fehlend | 0 | 0 | 0 | 0 | 0 | 0 |
| Modus | 1985.000 | 1960.000 | 1964.000 | 0.000 | 0.000 | 2.000 |
| Median | 1988.500 | 1977.500 | 1978.000 | 3.000 | 5.000 | 3.000 |
| Mittelwert | 1988.500 | 1976.682 | 1977.583 | 3.000 | 5.000 | 4.958 |
| Standardabweichung | 4.950 | 15.154 | 18.937 | 4.243 | 4.536 | 5.304 |
| Variationskoeffizient | 0.002 | 0.008 | 0.010 | 1.414 | 0.907 | 1.070 |
| MAD | 3.500 | 11.500 | 16.000 | 3.000 | 4.000 | 2.000 |
| Varianz | 24.500 | 229.656 | 358.601 | 18.000 | 20.571 | 28.129 |
| Minimum | 1985.000 | 1949.000 | 1936.000 | 0.000 | 0.000 | 0.000 |
| Maximum | 1992.000 | 2004.000 | 2006.000 | 6.000 | 14.000 | 21.000 |

* Es gibt mehr als einen Modus, nur der erste ist berichtet

The addition of violin elements to boxplots enables additional visualization and interpretation of the data distribution. While boxplots show the central tendencies such as median, quartiles and outliers well, violin plots provide a better visualization of the data distribution and density of values [12]. They show the frequency distribution of the data across the entire range of values, which is particularly useful for recognizing differences in the concentration of data points and identifying potential clusters or patterns.

Combining boxplots with violin elements [13] gives a more comprehensive insight into the



data and allows you to better understand the spread and shape of the distribution alongside the central tendencies. The addition of jitter elements can also help to clarify the overlap between data points and give a more accurate idea of the distribution, especially when the data is highly concentrated. Overall, this combination allows for a more precise analysis and interpretation of the data [14].

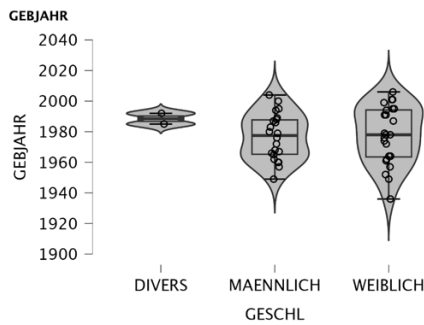


Figure 1: Boxplot of survey participants by gender and year of birth

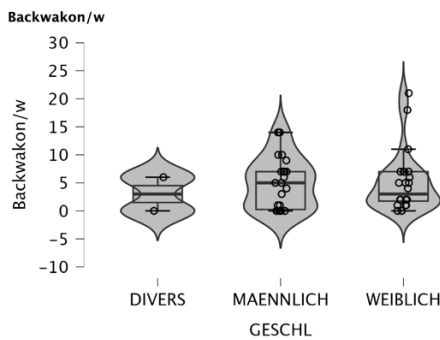


Figure 2: Boxplot of survey participants by gender and number of weekly baked goods consumption

However, the effectiveness of these visualizations is context-dependent and their design should be carefully considered [15].

The age of the respondents has no influence on the frequency of baked goods consumption.

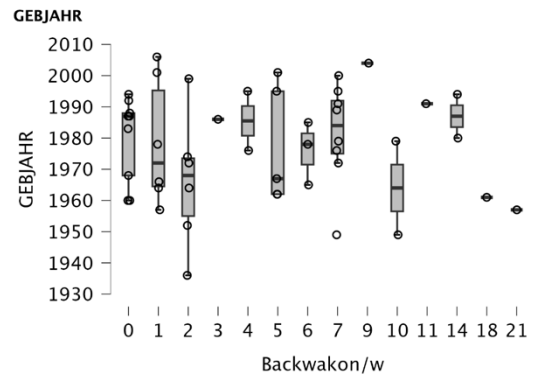


Figure 3: Boxplot to visualise the weekly consumption of baked goods by year of birth

Table 2: Frequency of weekly consumption of baked goods by year of birth

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | 18 | 21 |
|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Gesamt | 0 | 6 | 6 | 1 | 2 | 5 | 6 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 1 |
| Feldzahl | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Median | 197.000 | 197.000 | 198.000 | 198.000 | 198.500 | 197.000 | 197.000 | 198.000 | 198.000 | 198.000 | 198.000 | 198.000 | 198.000 | 198.000 | 197.000 |
| Moduswert | 197.000 | 197.000 | 198.000 | 198.000 | 198.000 | 197.000 | 197.000 | 198.000 | 198.000 | 198.000 | 198.000 | 198.000 | 198.000 | 198.000 | 197.000 |
| Standardabweichung | 1.400 | 20.000 | 21.000 | NA | 0.000 | 9.000 | 18.000 | 8.000 | 21.000 | NA | 8.000 | NA | 8.000 | NA | NA |
| Minimum | 196.000 | 197.000 | 198.000 | 198.000 | 197.000 | 196.000 | 196.000 | 198.000 | 198.000 | 198.000 | 198.000 | 198.000 | 198.000 | 198.000 | 197.000 |
| Maximum | 198.000 | 200.000 | 200.000 | 200.000 | 200.000 | 200.000 | 200.000 | 200.000 | 200.000 | 200.000 | 200.000 | 200.000 | 200.000 | 200.000 | 200.000 |

As the T-test[16] has proven to be a suitable methodological approach for the scientific evaluation of consumer surveys, it is used in this specific study to analyze the potential relationship between the gender of the respondent and the frequency of sustainably produced food as well as the willingness to pay a higher price for sustainably produced baked goods.

Table 3: T-test on the frequency of consumption of sustainably produced food in relation to gender

| T-Test für unabhängige Stichproben | | | |
|---|--------|----|-------|
| | t | df | p |
| Konsum nachhaltiger Lebensmittel (1=immer, 6=nie) | -0.048 | 46 | 0.962 |

Hinweis: Students T-Test.

Table 4: Group Descriptives on the frequency of consumption of sustainably produced food in relation to gender

| Group Descriptives | | | | | | |
|---|-----------|----|------------|-------|----------------|-----------------------|
| | Gruppe | N | Mittelwert | SD | Standardfehler | Variationskoeffizient |
| Konsum nachhaltiger Lebensmittel (1=immer, 6=nie) | MAENNLICH | 23 | 3.261 | 1.356 | 0.283 | 0.416 |
| | WEIBLICH | 25 | 3.280 | 1.400 | 0.280 | 0.427 |

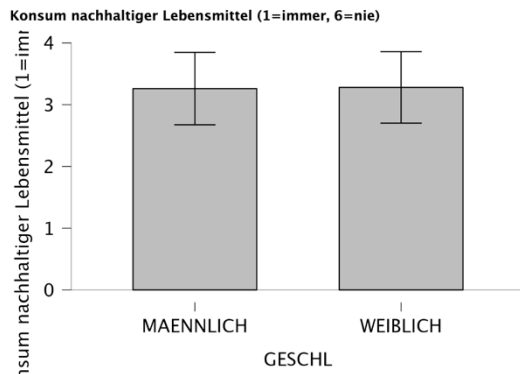


Figure 4: Boxplot on the frequency of consumption of sustainably produced food in relation to gender

Analyzing the average use of sustainable food, measured on a scale from 1 (only sustainable purchases) to 6 (never sustainable purchases), yielded interesting results. Female participants were found to have a mean score of 3.280 (standard deviation = 1.400), indicating that they tend to consume sustainable food more frequently. In comparison, the mean score for male participants was 3.261 (standard deviation = 1.356), suggesting a slightly lower prevalence of sustainable food consumption among men.

Statistical analysis using a t-test revealed a difference that is not considered significant ($t(46) = -0.048, p < 0.05$). This suggests that the observed variation in average sustainable food consumption patterns between genders is not statistically significant. These results suggest that although women tend to have a slightly higher consumption of sustainable food, these differences are not sufficient to be categorized as significant. Further research could help to understand the underlying factors for these small differences between the genders and gain more insight into sustainable food consumption behaviour.

Analyzing the average willingness to pay a premium for sustainably produced food revealed interesting findings. Women showed a mean value of 3.520 (standard deviation = 1.806), which indicates that their willingness to pay more for sustainably produced food tends to be lower compared to men. In contrast, the mean score for male participants was 3.043 (standard deviation = 1.745), suggesting a higher willingness to pay a premium for sustainably produced food among men.

Statistical analysis using a t-test revealed a significant difference between the genders ($t(46) = -0.928, p < 0.001$), indicating that the observed variation in willingness to pay a premium for sustainably produced food is statistically significant between women and men. These results suggest that, on average, women are less willing to accept a higher price for sustainably produced food compared to men. Further research could help to understand the reasons for these differences and develop possible strategies to promote more sustainable consumer behaviour in both genders.

A comprehensive analysis shows that there is no significant discrepancy in the consumption of sustainable food between the sexes. It emerges that the desire for a sustainable diet is similarly pronounced in both genders. However, a more differentiated dynamic emerges with regard to the willingness to pay a financial premium for sustainably produced food. In this context, it can be seen that the willingness to accept a higher price for sustainably produced food shows a marginal tendency towards stronger approval among male consumers compared to female consumers.

Table 5: T-test to analyse the gender-specific willingness to pay more for sustainably produced food

| T-Test für unabhängige Stichproben | | | |
|--|--------|----|-------|
| | t | df | p |
| Bereitschaft für nachhaltige Lebensmittel mehr zu zahlen (1=ja, 6=nie) | -0.928 | 46 | 0.358 |

Hinweis: Students T-Test.

Table 6: Test for equality of variances (according to Levenes) to analyse the gender-specific willingness to pay more for sustainably produced food

| Prüfung auf Gleichheit der Varianzen (Levenes) | | | | |
|--|-------|-----------------|-----------------|-------|
| | F | df ₁ | df ₂ | p |
| Bereitschaft für nachhaltige Lebensmittel mehr zu zahlen (1=ja, 6=nie) | 0.233 | 1 | 46 | 0.632 |

Table 7: Group Descriptives to analyse the gender-specific willingness to pay more for sustainably produced food

| Group Descriptives | | | | | | |
|--|-----------|----|------------|-------|----------------|-----------------------|
| | Gruppe | N | Mittelwert | SD | Standardfehler | Variationskoeffizient |
| Bereitschaft für nachhaltige Lebensmittel mehr zu zahlen (1=ja, 6=nie) | MAENNlich | 23 | 3.043 | 1.745 | 0.364 | 0.573 |
| | WEIBlich | 25 | 3.520 | 1.806 | 0.361 | 0.513 |

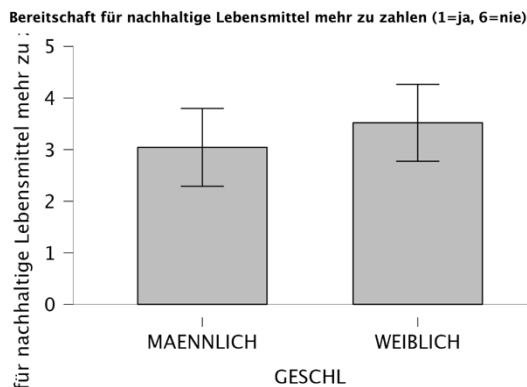


Figure 5: Boxplot to analyse the gender-specific willingness to pay more for sustainably produced food

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IV. CONCLUSION

This study presents the results of a separate consumer survey aimed at analysing consumer behaviour and attitudes towards sustainably produced food, particularly in the context of baked goods. The survey found that there were no significant differences in the average consumption of sustainable food between the genders. However, it was found that men tend to be more willing to pay a higher price for sustainably produced food compared to women. These differences were statistically significant. The results provide important insights into consumer behaviour in relation to sustainable food and emphasise the importance of the gender dimension in the development of measures to promote sustainable consumption.

In light of these findings, bakers in Germany face the challenge of meeting consumer needs and expectations for sustainable baked goods. To better appeal to consumers, bakers may need to focus more on communicating their sustainable production practices. Transparency about the origin of ingredients, organic farming methods and social responsibility could increase consumer trust and willingness to pay a higher price for sustainable baked goods. In addition, measures to reduce the environmental footprint during production, such as the use of renewable energy sources and the avoidance of food waste, could help to increase consumer interest. The integration of sustainability certifications or labels could also help to increase awareness and recognition of sustainable baked goods and provide consumers with guidance when shopping. Overall, the results of this study provide important impetus for bakers to adapt their products and practices and promote a sustainable food culture in Germany.

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