

Sensory quality of out-of-home coffees in Sao Paulo, Brazil

Qualidade sensorial de cafés fora do lar em São Paulo, Brasil

Francisco Alberto Pino¹, Celso Luís Rodrigues Vegro^{1*}, Roberto de Assumpção¹

¹Instituto de Economia Agrícola (IEA), São Paulo/SP - Brazil

***Corresponding Author:**

Celso Luís Rodrigues Vegro, Instituto de Economia Agrícola (IEA), Praça Ramos de Azevedo, 254, 3º andar, CEP: 01037-912, São Paulo, SP, Brasil, e-mail: celvegro@iea.sp.gov.br

Cite as: Sensory quality of out-of-home coffees in Sao Paulo, Brazil. *Braz. J. Food Technol.*, v. 20, e2015035, 2017.

Received: May 26, 2015; Accepted: Nov. 18, 2016

Summary

A field study was carried out in the largest Brazilian city in order to evaluate the quality of coffee prepared and sold for out-of-home consumption, using a logit model. It was shown that the decision on coffee quality was taken by the coffee house owner or manager based on his perception of the socio-economical class of the consumers, the prevalent gender, the participation of coffee in the invoicing and the coffee brewing method.

Keywords: Coffee; Quality evaluation; Sensory analysis; Gender; Espresso; Logistic regression.

Resumo

Um estudo de campo foi feito na maior cidade brasileira a fim de avaliar a qualidade do café preparado e vendido para consumo fora do lar, usando um modelo logit. Mostra-se que a decisão sobre a qualidade do café é tomada pelo proprietário ou gerente do estabelecimento, baseada em sua percepção a respeito da classe socioeconômica dos consumidores e de seu gênero prevalente, na participação do café no faturamento e na técnica de preparação do café.

Palavras-chave: Café; Avaliação de qualidade; Análise sensorial; Gênero; Espresso; Regressão logística.

1 Introduction

Currently most consumers are highly concerned about how food and beverages are related to their health (see PINO; VEGRO, 2008, for details on the effects of coffee on human health). Consumers declare they drink coffee for the pleasure afforded by its flavor and aroma and not for its nutritional qualities, and also for its stimulating effect due to the presence of caffeine and to a lesser extent to other alkaloids such as theobromine and theophylline (VEGRO et al., 2007a). Nevertheless, consumers are learning, slowly, about other positive coffee properties, such as the antioxidant effect of the polyphenols. Not incidentally, coffee is one of the most consumed beverages in the world, and in modern cities many people are used to drinking coffee outside the home. How can one ensure a minimum quality standard for a beverage that is consumed outside the home? Are there any external indicators about the quality of the beverage when entering a coffee house? The aim of this paper was to search for some of these possible

indicators by way of a case study in Sao Paulo, the largest Brazilian city. According to International Coffee Organization data (ICO, 2016), in the period from 1996 to 2015, Brazil was the world's largest coffee producer (varying from 20.8% to 39.4% of the world production) and the third world consumer (after the European Union and the USA), but second if one considers the individual countries of the European Union. A total production of 49,640 thousand 60 kg bags and a total domestic consumption of 20,500 thousand 60 kg bags are expected in Brazil for 2016/17. For this study the authors chose to work under field conditions, i.e., to sample coffee from shops that sell and serve coffee beverages, a coffee house being understood as a store where coffee is served, even when it is not the main product. Thus this includes coffee shops, restaurants, bakeries, fast-food shops and others, and a previous descriptive analysis of this market may be seen in Vegro et al. (2007b) and Pino et al. (2008).



Sensory quality of out-of-home coffees in Sao Paulo, Brazil

Pino, F. A. et al.

2 Material and methods

A sample survey of coffee houses was used to collect material for laboratory sensory analyses and the results then statistically modelled.

The first-stage sampling unit was the demographic sector. Sao Paulo was divided into 13,278 demographic sectors as in the national demographic census (IBGE, 2006), but only 4,132 of them were considered in this research, featured as sectors with more than 150 permanent private urban dwellings, with at least one bathroom, plumbing connected to the water supply system, and a public sewer or septic tank linked to the rainwater drainage. Moreover, in order to ensure the existence of retail stores in the sector, a minimum total monthly income of R\$ 200,000.00 per sector was required. These sectors were used as the first stage sampling unit, classified into two strata: the first stratum included those sectors inside a circle of radius 12 km around an area called "Vila Mariana"; the second stratum included the other sectors. The first stratum included downtown and most of the best districts, while the second included most of the poorest, far-out and suburban districts. In the second stage, coffee houses were used as sampling units within each selected sector.

This approach is efficient in finding coffee houses in the streets, but not those inside a large building, such as malls and terminals. To ensure the inclusion in the sample of stores visited by some people who almost never walk in the streets, three more strata were created. The third stratum included one airport and three bus terminals (intercity bus lines). The fourth stratum included the large shopping centres (with more than 250 stores) and the fifth stratum included small shopping malls (up to 250 stores). The size of each mall was obtained from its respective web site, and a cluster analysis provided the division into two groups. Hence, terminals and malls were treated like separated census sectors.

The second-stage sampling unit was the coffee house, and paired selection was used to improve the precision (KISH, 1965). The coffee houses were randomly chosen in the selected sectors resulting in 98 shops. In each one, a sample of the ground (or ground and roasted) coffee was collected (not the already prepared beverage, but the grain or the powder used as the raw material to prepare it). A questionnaire with questions about the business situation was also applied to the owner or administrator.

3 Sensory analysis

An independent, qualified and certified laboratory was chosen to carry out the sensory analyses, namely, the Sao Paulo State Coffee Roasters Association laboratory. There are many such laboratories in the country, but only three have been certified by the International Organization for Standardization (ISO). The cupping, or cup testing, or sensory evaluation of the beverage was done by descriptive analysis carried out by three trained cuppers, using a

0 to 10 unstructured line scale for the Global Quality Evaluation (*G*), based on a Brazilian legal Resolution (SÃO PAULO, 2001):

- a) *G* from 0 to 4.49, the product is rated as "Non recommendable for supply" and is applied to low quality coffees;
- b) *G* from 4.5 to 6.5, the product is rated as "Traditional" and is applied to good but everyday coffees;
- c) *G* from 6.51 to 7.3 (ground and roasted) or to 7.6 (grain), the product is rated as "Superior" and is applied to very good coffees;
- d) *G* from 7.31 (ground and roasted) or 7.61 (grain) to 10, the product is rated as "Gourmet" and is applied to excellent coffees.

The practical procedure is the following: a beverage of known quality is used as the reference and the beverage samples are prepared and examined in the traditional way (sniff, taste and discard). A grade for the Global Quality is attributed; the result being an average value plus the corresponding standard deviation.

The Global Quality may be split into a Segmented Quality Evaluation, considering the sensory characteristics to be analysed:

- a) Fragrance or dry aroma released from the ground coffee;
- b) Aroma or wet aroma released from the brewed coffee;
- c) Imperfections, such as defective, small and broken beans, unripe or overripe cherries, sour and black beans, pebbles, sticks and others;
- d) Acidity/sourness refers to the taste, where acidity is a pleasant characteristic of some kinds of coffee, whereas sourness is unpleasant and due to incorrect fermentation;
- e) Bitterness/sweetness refers to the taste and depends on the degree of roast and the brewing method;
- f) Body or weight refers to the texture or mouth-feel due to beverage viscosity and fat content;
- g) Aftertaste refers to the remaining sensations on the palate after the beverage has been swallowed.

4 Statistical modelling

Logistic regressions were estimated to obtain odds ratios for the factors (or effects) influencing the dependent variables, namely the global and segmented quality evaluation of coffee cups consumed out-of-home in Sao

Sensory quality of out-of-home coffees in Sao Paulo, Brazil

Pino, F. A. et al.

Paulo, Brazil (see DEMARIS, 1992; SAS INSTITUTE, 2015). A stepwise procedure for variable selection was used and results were considered significant with a p value < 0.05 .

Some shop features informed by the owner or manager were used as independent variables:

- a) The consumers socio-economical class as presumed by the shop owner or manager, namely, A or B for the higher ones, and C or D for the lower ones;
- b) Coffee participation in invoicing (%), categorized as up to 5%, and more than 5%;
- c) Coffee brewing method, namely filtered and espresso;
- d) Regions of the city, categorized as the best ones (first stratum, including those sectors inside a circle of radius 12 km around an area called "Vila Mariana"); the fourth stratum, including the large shopping centres; the poorest regions (second stratum, including most of the poorest, far-off, and suburban districts); the third stratum, including one airport and three bus terminals; and the fifth stratum, including the small shopping malls;
- e) Gender (male and female).

No situations of the complete or quasi-complete separation of data points were observed, i.e. the dependent variable values were not 0 for cases in any category. There were some situations with few observations of events, probably due to the small sample size, although these were not exactly rare events when compared to non-events (or contrariwise). The use of techniques for dealing with rare events data should be considered in future studies (see KING; ZENG, 2001).

5 Results and discussion

Since the decision on coffee quality belongs to the coffee house owner or manager, a reasonable question should be how they decide about the beverage quality

they will serve. A fitting reply comes from the model presented in Table 1. First of all, coffee quality depends on the consumer socio-economical class presumed by the coffee house owner or manager. Therefore, the odds (or relative probability) of serving a higher quality coffee to presumed higher socio-economical class consumers are 10 times the odds of serving a higher quality coffee to presumed lower socio-economical class consumers (odds ratio equals 10.041). This factor was also the first to enter the model in the stepwise procedure ($sw=1$), due to its relevance in determining coffee quality in a given coffee shop.

Secondly, it depends on coffee participation in invoicing: the odds of serving a higher quality coffee in a coffee house in which coffee represents more than 5% of the total invoicing are 10 times the odds when it represents from 0 to 5% ($OR = 10.123$). This was also the second variable to enter the model. In other words, the more coffee represents in the invoicing of the shop, the better the expected product quality. Indeed, specialized coffee shops are demanded to serve the best beverages.

Thirdly, coffee quality depends on coffee brewing: the odds (or relative probability) of serving a higher quality coffee when dealing with espresso are 7 times the odds of serving a higher quality when dealing with filtered coffee (odds ratio equals 6.921).

Fourthly, coffee quality is related to the prevalent consumer gender: when 50% or more of the customers are women, the odds (or relative probability) of serving a higher quality coffee are twice the odds when more than 50% are men ($OR = 2.053$). In reality, the best coffee shops, usually where espresso is served, have created pleasant environments and an image of refinement in order to be attractive to women, especially those with high educational levels and incomes.

Finally the regions of the city showed no relation to coffee quality, probably because they were related to the other independent variables.

Table 1. Factors affecting overall coffee quality in coffee shops, logistic regression model odds ratio, Sao Paulo, Brazil.

Factor	Level	OR	95% CL
Presumed consumers socio-economical class (sw=1)	Lower (C or D)	1.000	
	Higher (A or B)	10.041	7.702 to 13.092
Coffee participation on invoicing (sw=2)	0 to 5%	1.000	
	More than 5%	10.123	6.918 to 14.812
Coffee brewing (sw=3)	Filtered	1.000	
	Espresso	6.921	4.719 to 10.151
Prevalent consumer gender (sw=4)	Male	1.000	
	Female	2.053	1.503 to 2.804

Overall coffee quality: higher (traditional, or superior, or gourmet, i.e., G from 4.5 to 10) against lower (non-recommendable for supply, i.e., G from 0 to 4.49). OR = odds ratio; 95% CL = 95% Wald confidence limits; sw = stepwise order of effect entering the model.

Sensory quality of out-of-home coffees in Sao Paulo, Brazil

Pino, F. A. et al.

6 Conclusions

The coffee house owners and managers seem to decide the coffee quality level based on the public they expect to attend. This seems to be true especially when the business is specialized in coffee, i.e., when it plays an important role in invoicing. Coffee brewing and the prevalent consumer gender are also related to coffee quality.

References

- DEMARIS, A. **Logit modelling**: practical applications. Newbury Park: Sage, 1992.
- INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA – IBGE. **Malha municipal digital do Brasil – 2005**: referências metodológicas. Rio de Janeiro, 2006. Accessed on: <<http://www.ibge.gov.br/english>>. Available at: 06 dec. 2016.
- INTERNATIONAL COFFEE ORGANIZATION – ICO. **Statistics**: historical data. London, 2016. Accessed on: <http://www.ico.org/new_historical.asp?section=Statistics>. Available at: 06 dez. 2016.
- KING, G.; ZENG, L. Logistic regression in rare events data. **Political Analysis**, v. 9, n. 2, p. 137-163, 2001. <http://dx.doi.org/10.1093/oxfordjournals.pan.a004868>.
- KISH, L. **Survey sampling**. New York: Wiley, 1965. 643 p.
- PINO, F. A.; VEGRO, C. L. R. **Café**: um guia do apreciador. 4. ed. São Paulo: Saraiva, 2008.
- PINO, F. A.; VEGRO, C. L. R.; ASSUMPÇÃO, R. Brazilian coffees: profile of establishments serving this beverage. In: INTERNATIONAL CONFERENCE ON COFFEE SCIENCE, 22., 2008, Campinas. **Abstracts...** Lausanne, Switzerland: ASIC, 2008. p. 157. Paper PF818.
- SÃO PAULO. Secretaria de Agricultura e Abastecimento. Resolução SAA-37, de 9 de novembro de 2001. Define Norma Técnica para fixação de identidade e qualidade de café torrado em grão e café torrado e moído. **Diário Oficial do Estado**, São Paulo, SP, v. 111, n. 213, 10 nov. 2001. Seção I, p. 12.
- SAS INSTITUTE. **SAS/STAT® 9.2 user's guide**: the logistic procedure (book excerpt). Cary, NC: SAS® Institute Inc, 2015. Accessed on: <<http://support.sas.com/documentation/cdl/en/statuglogistic/61802/PDF/default/statuglogistic.pdf>>. Available at: 06 dec 2016.
- VEGRO, C. L. R.; ASSUMPÇÃO, R.; PINO, F. A. Hábitos e preferências do consumidor de café fora do lar. In: ANGELO, C. F.; SILVEIRA, J. A. G. (Org.). **Varejo competitivo**. 12. ed. São Paulo: Ed. Saint Paul, 2007a. p. 171-194.
- VEGRO, C. L. R.; PINO, F. A.; ASSUMPÇÃO, R. Brazilian coffee and profile of places serving this beverage. **Informações Econômicas**, v. 37, n. 12, p. 50-58, 2007b.