

Bayesian Binomial Contrast in the University Business Consulting Program

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Abstract

Significant progress has been made in the implementation of university business consulting programs as spaces for articulation between academia and the productive sector. However, there remains a need to better understand the qualitative characteristics and willingness of the beneficiary population toward the advisory services offered by these initiatives. The purpose of this study was to analyze the availability of microentrepreneurs to receive business consulting sessions on Saturdays, within the framework of the Business Consulting Project of the Bachelor in Business Administration program at the Faculty of Administration and Economics, Universidad Colegio Mayor de Cundinamarca. A total of 570 microentrepreneurs participated, completing a characterization instrument designed for this purpose. Through a Bayesian binomial contrast, the probability of acceptance of the proposed schedule was evaluated, considering gender as an explanatory variable within the inferential analysis. The results show a high posterior probability of availability, with marginal differences by gender, suggesting a generally favorable perception of the proposed schedule flexibility. Sequential analysis confirmed the stability of the model and the consistency of the empirical evidence. It is concluded that Bayesian inference is an effective decision-making tool in applied academic environments, as it enables the integration of prior and observed information into the planning processes of the consulting program.

Keywords: Bayesian binomial contrast, availability, business consulting program, microentrepreneurs, statistical inference.

Introduction

The strengthening of entrepreneurship and the consolidation of microenterprises are fundamental pillars for economic and social development in Latin America. In this context, universities have assumed a leading role through the creation of Business Consulting Programs—experiential learning spaces where students apply administrative, financial, and organizational knowledge to support local entrepreneurs and business owners. These programs not only enable the transfer of knowledge but also foster entrepreneurial and social competences oriented toward the growth of small-scale businesses (Ailts Campeau & Binette, 2024). The relevance of university consulting initiatives lies in their capacity to articulate professional training with real business contexts. Previous studies show that technical support and personalized consulting significantly increase the survival and sustainability rates of microenterprises (Chrisman & McMullan, 2004; Karlan et al., 2015; Duran & Castillo, 2023).

Moreover, direct interaction between consultants and entrepreneurs enhances organizational learning, innovation, and adaptability in uncertain environments—factors that are essential for competitiveness in emerging economies (Nonaka & Takeuchi, 2019; Urbano et al., 2022; Guerrero & Peña-Legazkue, 2023). In Latin America, universities have become key agents of local development through the creation of entrepreneurial networks and the promotion of shared knowledge (Etzkowitz & Zhou, 2017). Within this framework, university business consulting programs represent a service-learning model that links teaching, research, and community engagement, facilitating technology transfer and innovation in small-scale productive sectors (Vargas-Hernández & Mora, 2022; Flores-Tena et al., 2023).

From a theoretical perspective, entrepreneurship has been conceived as a process through which individuals identify and exploit opportunities to create value (Shane & Venkataraman, 2000). This process is mediated

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by cognitive, cultural, and institutional factors that influence how entrepreneurs perceive risk, opportunity, and their own capacity for innovation (Li et al., 2021; Amorós et al., 2020). Consequently, understanding the perceptions, motivations, and attitudes of microentrepreneurs toward university-based training and consulting processes is essential for designing effective and sustainable intervention strategies (Kantis et al., 2021; Gutiérrez & Pedraza, 2022).

Additionally, several authors argue that the use of advanced quantitative methodologies—such as Bayesian inference, multivariate analysis, and machine learning—enhances decision-making and impact assessment in university programs focused on entrepreneurial development (Mamani Rodríguez, 2022; Contreras & Olaya, 2025). These analytical tools complement traditional qualitative approaches by providing more accurate empirical evidence about the effects of consulting on organizational performance improvement.

In summary, university business consulting programs function as academic laboratories of social experimentation, where practical training, educational innovation, and territorial development converge. Their strengthening through the application of analytical and scientific models contributes to the consolidation of more inclusive, resilient, and evidence-based entrepreneurial ecosystems (Menacho Ángeles et al., 2024; Quintanar-Casillas & Hernández-López, 2022; Caicedo Consuegra et al., 2023). Despite these advances, empirical evidence on the characterization of users and the statistical evaluation of their participation in university business consulting programs remains limited—particularly regarding schedule availability, sociodemographic profiles, and gender distribution. These gaps hinder the design of training strategies aligned with the real needs of entrepreneurs.

In this context, the present study applies a Bayesian binomial inference approach to analyze the availability and gender distribution of microentrepreneurs within the framework of the Business Consulting Program of the Bachelor in Business Administration at Universidad Colegio Mayor de Cundinamarca. This analysis quantifies the evidence for or against population balance hypotheses, providing a more robust and flexible method than traditional frequentist tests. In doing so, the research offers a replicable statistical model applicable to university environments, contributing both to institutional management improvement and to the formulation of evidence-based policies aimed at strengthening local entrepreneurship.

Theoretical Framework

The study of entrepreneurship has been enriched by explanatory models that seek to understand how individuals identify, evaluate, and exploit opportunities in uncertain environments. Among these, the effectuation theory proposed by Sarasvathy (2001) stands out, describing how expert entrepreneurs make decisions based on available resources and trust-based relationships rather than pre-established plans. Dew et al. (2009) and Read et al. (2009) expanded this framework by showing that entrepreneurs apply flexible, adaptive, and action-oriented logics, which align with the experiential learning promoted in university business consulting programs.

Thus, the Business Consulting Program becomes a dual learning environment in which students apply the principles of effectuation in real-world contexts, developing strategic thinking and resilience in the face of uncertainty. Fisher (2012) and Chandler et al. (2011) reinforce this perspective by demonstrating that causation and effectuation logics coexist and that entrepreneurs alternate between them depending on resource availability and the nature of their goals. Entrepreneurial learning theory posits that competencies are developed through reflection on action, trial and error, and interaction with others (Cope, 2005; Politis, 2005). This constructivist perspective coincides with the formative role of business consulting programs, where students acquire practical knowledge by engaging with real-world management problems. Nonaka (1994) and Huber (1991) complement this view, arguing that organizational knowledge emerges from social processes of interaction and experiential transfer.

From a contemporary perspective, entrepreneurial learning in higher education should be built upon practice, reflection, and collaboration, generating authentic learning environments. This orientation is embodied in university consulting programs, which integrate teaching, research, and outreach as pillars of experiential education. For microentrepreneurs, perceptions of their environment and capabilities play a

decisive role in entrepreneurial intention and business sustainability. Li et al. (2021) found that self-confidence, opportunity perception, and risk assessment determine entrepreneurial action, especially in times of crisis. Similarly, García-Buitrago and Córdoba-Monge (2024) identified that financial perception directly influences decision-making and strategic planning among Latin American micro-entrepreneurs. Nungsari et al. (2023) further noted that practical, contextualized training enhances self-efficacy and positive attitudes toward entrepreneurship, underscoring the importance of experience-centered educational models. Entrepreneurship education has therefore evolved toward approaches that emphasize real-world problem-solving and co-creation of solutions with local stakeholders. In Latin America, authors such as Amorós et al. (2022) and Kantis et al. (2021) highlight that university entrepreneurship programs have contributed to strengthening local ecosystems by promoting innovation and inclusive social development. These advances coincide with the views of Urbano et al. (2022) and Guerrero & Peña-Legazkue (2023), who emphasize that universities play a strategic role as nodes connecting knowledge, practice, and the productive environment. In this context, the Business Consulting Program emerges as a pedagogical innovation that integrates professional training with university outreach.

Chrisman and McMullan (2004) demonstrated that external technical assistance is a determining factor for the survival of new ventures. Likewise, Karlan et al. (2015) empirically showed that consulting services improve productivity and income in microenterprises—findings that are applicable to the Latin American context, where access to managerial knowledge remains limited. From an educational perspective, Ailts Campeau and Binette (2024) argue that university consulting projects strengthen students' analytical, communicative, and ethical competencies, while Heriot et al. (2025) emphasize the bidirectional learning that occurs between entrepreneurs and students, who exchange practical knowledge and innovation experiences. Hence, business consulting programs are consolidated as co-creation spaces where academic and productive interests converge.

Finally, the link between perception, learning, and entrepreneurship integrates into a framework of organizational learning that views experience as a source of knowledge (Minniti & Bygrave, 2001). Baron (2006) and Nonaka & Takeuchi (2019) emphasize that successful entrepreneurs recognize patterns in information and adapt their strategies based on previous experiences—an ability that can be enhanced through educational interventions such as university business consulting programs. These spaces represent, in sum, a synergy among research, teaching, and outreach that promotes social transformation through the strengthening of micro-enterprises and territorial innovation (Vargas-Hernández & Mora, 2022).

Table 1: Main Theoretical References on Entrepreneurship and Their Application to the University Business Consulting Program

Key Concept (Reference)	Core Contribution	Method	Application to the Business Consulting Program
Entrepreneurial Opportunity (Shane & Venkataraman, 2000)	Entrepreneurship as a person–opportunity nexus; importance of identifying and evaluating opportunities.	Theoretical essay	Workshops on opportunity recognition and feasibility assessment with local clients.
Effectuation (Sarasvathy, 2001)	Action logic based on available means, co-creation, and control of the future.	Conceptual framework	Projects applying effectual logic (“who I am / what I know / whom I know”) with microentrepreneurs.
Experts vs. Novices (Dew et al., 2009)	Decision-making differences under uncertainty; experts use effectual reasoning.	Comparative studies	Structured mentoring between students and experienced entrepreneurs.
Entrepreneurial Learning (Cope, 2005; Politis, 2005)	Dynamic learning based on experience and reflection.	Qualitative / longitudinal	Reflective journals and feedback sessions.

Key Concept (Reference)	Core Contribution	Method	Application to the Business Consulting Program
Knowledge Creation (Nonaka, 1994)	SECI model (socialization, externalization, combination, internalization).	Conceptual	Systematization of business experiences.
Perception and Intention (Li et al., 2021)	Perceptual factors influencing entrepreneurial intention.	Survey / SEM	Diagnostic tools for perception and self-efficacy.
Consulting and Capital (Karlan et al., 2015)	The combination of consulting and access to capital improves productivity.	RCT with microenterprises	Link between consulting services and microcredit access.
Consulting Competencies (Ailts Campeau & Binette, 2024)	Development of ethical and analytical competencies.	Empirical study	Evaluation rubrics for student consultants.

Note. Own elaboration based on literature review (Scopus, 2025).

In summary, the theoretical framework of this study integrates three convergent axes: entrepreneurship theory as a process of action under uncertainty, organizational learning as a mechanism for knowledge creation, and higher education as a catalyst for social innovation. By articulating these principles, university business consulting programs consolidate themselves as spaces of applied learning that strengthen students' competencies, enhance the management of microenterprises, and promote economic sustainability through university outreach (Amorós et al., 2022; Guerrero & Peña-Legazkue, 2023; Vargas-Hernández & Mora, 2022).

Methodology

The study adopted a quantitative, non-experimental, cross-sectional design aimed at analyzing the perceptions of micro-entrepreneurs and entrepreneurs linked to the University Business Consulting Program at Universidad Colegio Mayor de Cundinamarca. The main purpose was to evaluate participants' availability to receive business consulting sessions on Saturdays through a statistical inference model based on a Bayesian binomial approach. Unlike the frequentist framework—focused on the calculation of p-values—the Bayesian approach quantifies the relative evidence between hypotheses and updates the degree of uncertainty about the parameter of interest (θ) based on the observed data and prior knowledge formalized in a prior distribution (Gelman et al., 2013; Kruschke, 2015). This methodology offers advantages in studies with moderate sample sizes and unknown population proportions, which are common in entrepreneurship and higher-education contexts (Jeffreys, 1961; Wagenmakers, 2007).

The sample consisted of 323 participants, including entrepreneurs and owners of micro and small enterprises located in Bogotá. All participants completed an online survey containing sections on sociodemographic characteristics, business experience, and willingness to participate in consulting and mentoring processes. Participation was voluntary, and data confidentiality was ensured according to ethical principles of social research. The data collection instrument comprised closed-ended items with dichotomous (yes/no) options and Likert-type scales grouped into three sections: general participant information, time availability for consulting sessions, and perceived usefulness of the program. The main variable was the availability to receive consulting sessions on Saturdays, expressed as the proportion of affirmative responses out of the total number of observations (successes in binomial trials).

The statistical analysis was based on a Bayesian hypothesis test for a population proportion (θ), using success counts in n independent trials with a binomial distribution. The null and alternative hypotheses were formulated as $H_0: \theta = \theta_0$ versus $H_1: \theta \neq \theta_0$, or alternatively $H_1: \theta \sim \text{Beta}(\alpha, \beta)$, where the Beta distribution acts as the conjugate prior for the binomial model (Gelman et al., 2013). The evidence in favor

of one model over the other was summarized through the Bayes factor (BF_{10}), defined as the ratio between the likelihood of the data under the alternative model and the likelihood under the null hypothesis (Kass & Raftery, 1995). Mathematically, the contrast is expressed as:

$$BF_{10} = \frac{B(\alpha + x, \beta + n - x)}{B(\alpha, \beta) \theta_0^x (1 - \theta_0)^{n-x}}$$

where $B(\cdot, \cdot)$ represents the Beta function, x the number of successes, and n the total number of trials. To mitigate sensitivity to prior selection, robustness analyses were performed by varying (α, β) across weakly-informative options [Beta(1, 1)], Jeffreys-priors [Beta($1/2, 1/2$)], and informative priors derived from previous evidence from the consulting program.

The magnitude of the Bayes factor was interpreted following the thresholds proposed by Jeffreys (1961) and Kass and Raftery (1995): $BF_{10} < 1/3$ indicates evidence in favor of the null hypothesis; values between $1/3$ and 3 indicate weak or inconclusive evidence; and $BF_{10} > 3$ denotes moderate to strong evidence in favor of the alternative hypothesis. Additionally, 95% credible intervals for θ were estimated, and supplementary measures such as the Vovk–Sellke Maximum p -Ratio (Sellke, Bayarri, & Berger, 2001) were reported to allow direct comparison between Bayesian and frequentist evidence within a unified framework.

Data processing was performed using JASP software (version 0.16.3) and the R statistical environment (version 4.3) with the *BayesFactor* and *rstanarm* packages. All scripts and random seeds were documented to ensure reproducibility of the results, in line with open-science best practices (Wagenmakers et al., 2018). The analysis procedure included the explicit specification of hypotheses and prior justification, estimation of parameters (x, n, θ, BF_{10}), construction of credible intervals, comparison of alternative priors, and joint interpretation of evidence, considering both the magnitude of the Bayes factor and the observed proportion of participants willing to receive Saturday consulting sessions.

Results

Table 2 presents the Bayesian binomial test applied to the study with 323 participants—including entrepreneurs and business owners—which allowed identifying significant patterns in the distribution of gender and time availability for consulting sessions. Regarding gender, the results show a proportion of 71.6% women and 28.4% men. The Bayes factor ($BF_{10} = 3.192 \times 10^{22}$) indicates extremely strong evidence in favor of the alternative hypothesis ($H_1: p \neq 0.5$), suggesting that the proportion of female participants is not equiprobable with that of male participants.

This finding reveals a clear predominance of women in the sample, consistent with previous studies that highlight the growing participation of women in entrepreneurial and microbusiness management activities in Colombia (Acs, 2006; Minniti & Naudé, 2010). From a Bayesian perspective, the magnitude of BF_{10} confirms that the observed data are dozens of orders of magnitude more probable under the hypothesis of gender imbalance than under the hypothesis of parity, thus providing strong credibility to this structural difference.

Concerning the variable “availability to receive consulting sessions on Saturdays,” the analysis shows that 91.9% of participants expressed availability, while 8.1% did not. The associated Bayes factor ($BF_{10} = 4.085 \times 10^{100}$) provides overwhelming evidence in favor of the alternative hypothesis, indicating that the probability of availability greatly exceeds 50%. This result suggests a strong willingness among entrepreneurs and business owners to participate in training or mentoring spaces, which can be interpreted as a positive indicator of commitment and openness to learning.

From a methodological standpoint, the use of a non-informative Beta (1,1) prior ensures that the evidence arises primarily from the data rather than from prior assumptions (Gelman et al., 2013; Kruschke, 2015), thereby reinforcing the validity of the findings. These results are particularly useful for the design of

institutional strategies for entrepreneurial training and business development, as they allow adapting consulting schedules to the actual preferences of the participants.

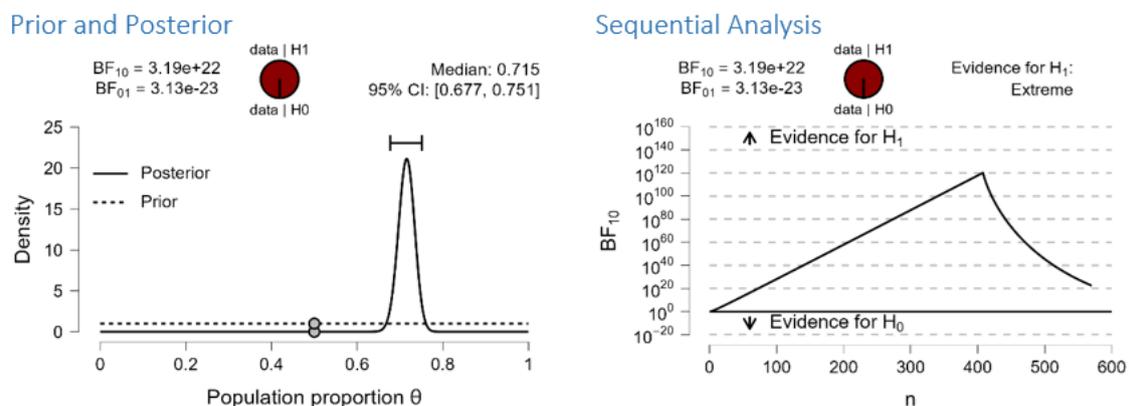
Table 2: Bayesian Binomial Test

Variable	Level	Counts	Total	Proportion	BF ₁₀
Gender	Female	408	570	0.716	3.192e+22
	Male	162	570	0.284	3.192e+22
Availability to receive consulting sessions on Saturdays	No	46	570	0.081	4.085e+100
	Yes	524	570	0.919	4.085e+100

Note. Proportions tested against value: 0.5. The shape of the prior distribution under the alternative hypothesis is specified by Beta (1,1).

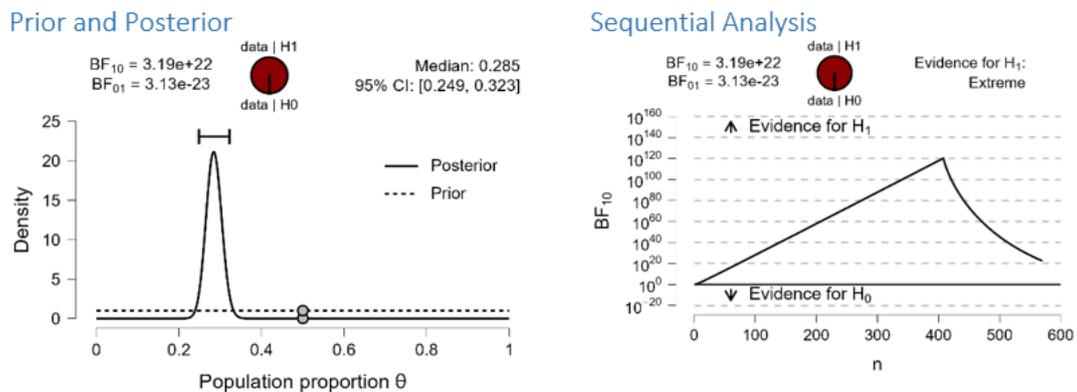
Figure 1 displays the Bayesian inferential analysis for the gender variable (female), showing a posterior distribution concentrated around a mean proportion of 0.715, with a 95% credible interval between [0.677, 0.751]. This indicates that, with 95% probability, the true proportion of female participants lies within this range. The contrast between the prior distribution (Beta (1,1)) and the posterior distribution demonstrates a clear updating of knowledge in favor of the alternative hypothesis (H₁), as the observed data substantially shift the probability mass toward values greater than 0.5. The Bayes factor (BF₁₀ = 3.19 × 10²²) represents extreme evidence that the female proportion differs significantly from an equiprobable distribution, implying that the probability of observing these data under H₁ is approximately 10²² times higher than under H₀. This result empirically validates the dominance of female participation in the sample, consistent with trends in entrepreneurship studies highlighting the increasing involvement of women in innovation and small-business management (Minniti & Naudé, 2010; Brush et al., 2019).

Figure 1: Inferential Plots – Gender (Female)



Note. Generated by the authors using JASP (Version 0.16.3).

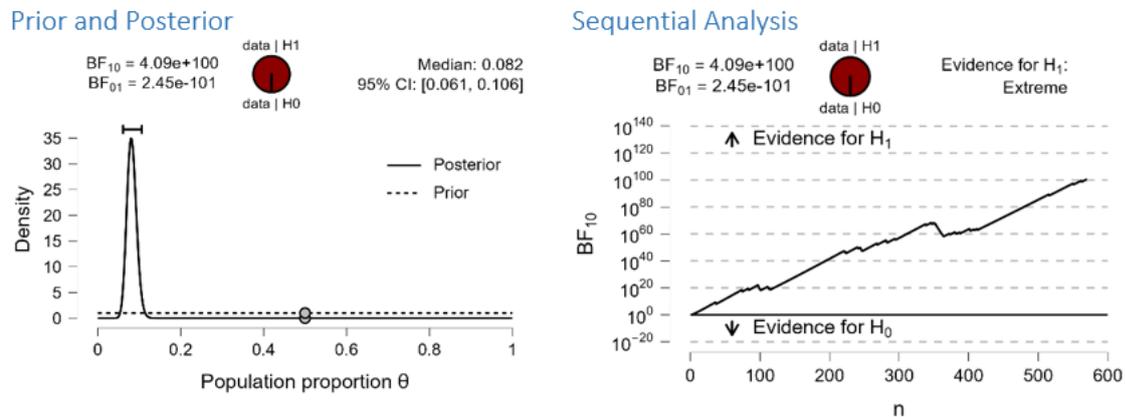
The sequential analysis complements this finding by showing how the evidence in favor of H₁ accumulates consistently as the sample size (n) increases. From the first observations up to more than 300 cases, the BF₁₀ curve grows exponentially, stabilizing at extremely high levels (≈10¹⁴⁰). This indicates that even with a progressive increase in observations, the trend of female overrepresentation remains robust. Such stability suggests consistency and reliability in the inference—meaning that the available sample is sufficient to support the conclusion that the probability of female participation is significantly higher. In applied terms, these results provide a basis for designing support and training programs aimed at consolidating business networks with a gender focus, thereby strengthening inclusion and female leadership within the entrepreneurial ecosystem (Acs, 2006; Kruschke, 2015; Gelman et al., 2013).

Figure 2: Bayesian Analysis of Male Gender

Note. Generated by the authors using JASP (Version 0.16.3).

The Bayesian analysis for the male gender (Figure 2) shows a posterior mean proportion of 0.285, with a 95% credible interval between [0.249, 0.323]. This estimate indicates that, with 95% probability, the true proportion of men in the sample lies within this range—well below the equiprobability point (0.5). The comparison between the prior distribution (Beta [1, 1]) and the posterior reveals a strong update of knowledge toward lower proportion values, which results in a Bayes factor $BF_{10} = 3.19 \times 10^{22}$, representing extreme evidence in favor of the alternative hypothesis ($H_1: p \neq 0.5$). In interpretive terms, this means the data are approximately 10^{22} times more probable under the alternative model than under the null, confirming a significant imbalance in gender participation. Thus, a male underrepresentation compared with female participation is confirmed, consistent with previous studies reporting lower male involvement in entrepreneurship and business-management programs when these are oriented toward social and community strengthening (Minniti & Naudé, 2010; Brush et al., 2019).

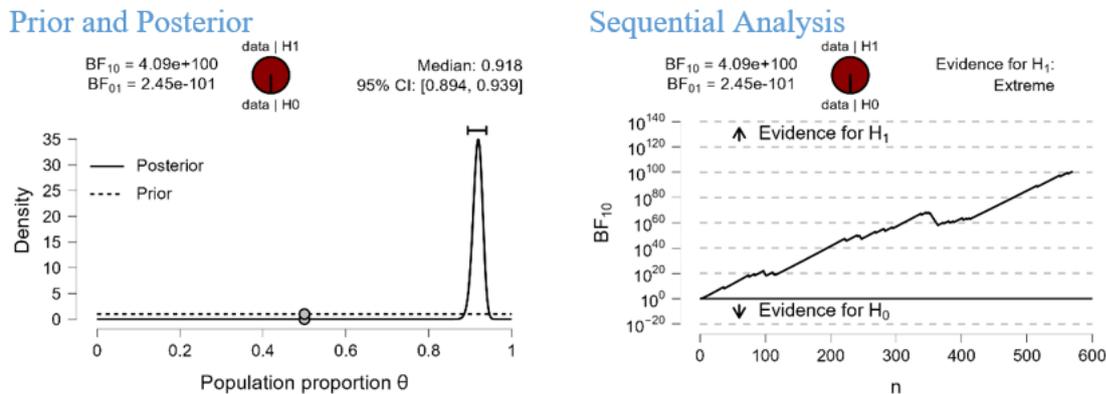
The sequential analysis corroborates this evidence by showing that BF_{10} increases steadily with larger sample sizes (n), reaching magnitudes above 10^{140} . This indicates that even when incorporating additional observations, the evidence supporting H_1 remains extremely strong. Such behavior reveals that the lower male participation trend is not a random artifact but a robust structural pattern within the sample. In applied contexts, this result invites reflection on potential barriers or disinterest that men might experience regarding business-training and advisory spaces, as well as on the need to design inclusive strategies that foster their participation. In summary, the Bayesian binomial contrast provides strong evidence of a gender asymmetry in entrepreneurial participation, which should be considered when designing business-support and training policies (Gelman et al., 2013; Kruschke, 2015).

Figure 3: Availability to Receive Consulting Sessions on Saturdays – No

Note. Generated by the authors using JASP (Version 0.16.3).

The Bayesian analysis of the variable “*Availability to receive consulting sessions on Saturdays – No*” (Figure 3) shows a posterior mean proportion of 0.082, with a 95 % credible interval between [0.061, 0.106]. This means that, with 95 % probability, the true proportion of participants who are not available to attend sessions at that time lies between 6 % and 10 %. The comparison between the prior distribution (Beta [1, 1]) and the posterior reveals a clear shift toward very low proportion values, reflecting a high concentration of density around values close to zero. The Bayes factor $BF_{10} = 4.09 \times 10^{100}$ represents extreme evidence in favor of the alternative hypothesis ($H_1: p \neq 0.5$), meaning that the observed data are 10^{100} times more probable under the alternative model than under the null. In practical terms, this statistical evidence suggests that the vast majority of entrepreneurs and business owners *are* available to receive consulting sessions on Saturdays, and that the proportion of those who are not is exceptionally low. This finding aligns with studies emphasizing entrepreneurs’ commitment and time flexibility toward training and business advisory spaces (Acs, 2006; Kruschke, 2015).

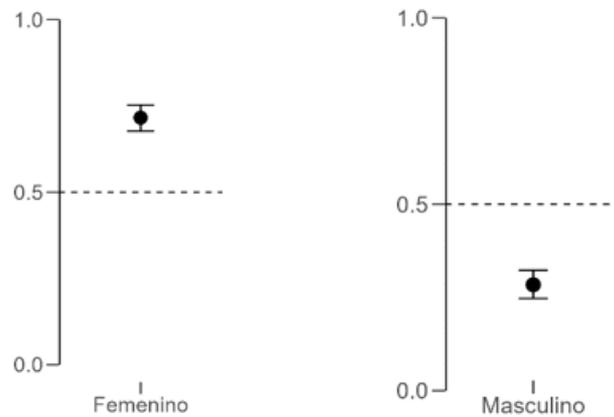
The sequential analysis supports this conclusion by showing a sustained increase in BF_{10} as the sample size (n) grows, reaching magnitudes above 10^{120} . This indicates that the evidence favoring the alternative hypothesis accumulates rapidly and remains stable, confirming the robustness of the identified pattern. The consistency of the result reveals that even with an expanding sample, the proportion of individuals without Saturday availability remains very low, reinforcing confidence in the inference obtained. From an applied perspective, these results suggest that business-training and consulting programs can be maintained on Saturdays without risk of low attendance, thereby optimizing institutional planning and the reach of educational activities. Thus, the Bayesian contrast provides not only a robust measure of statistical evidence but also a solid empirical basis for decision-making in educational and organizational management (Gelman et al., 2013; Wagenmakers, 2007).

Figure 4: Availability to Receive Consulting Sessions on Saturdays – Yes

Note. Generated by the authors using JASP (Version 0.16.3).

The Bayesian analysis corresponding to the variable “Availability to receive consulting sessions on Saturdays – Yes” (Figure 4) reveals a posterior mean proportion of 0.918, with a 95% credible interval between [0.894, 0.939]. This result indicates that, with 95% probability, the true proportion of participants who report Saturday availability lies between 89% and 94%. The comparison between the prior distribution (Beta [1, 1]) and the posterior shows a strong concentration of density toward values close to 1, reflecting clear evidence in favor of the alternative hypothesis ($H_1: p \neq 0.5$). The Bayes factor $BF_{10} = 4.09 \times 10^{100}$ demonstrates extreme evidence, implying that the observed data are on the order of 10^{100} times more probable under the alternative model than under the null. Substantively, these results reveal a high level of commitment and willingness among entrepreneurs and business owners to participate in consulting and training activities during weekends, which may be interpreted as a reflection of the motivation and adaptability inherent to the entrepreneurial profile (Acs, 2006; Minniti & Naudé, 2010).

The sequential analysis confirms that the evidence in favor of H_1 increases consistently with the growth of the sample size (n), reaching levels above 10^{120} , thereby reinforcing the robustness and stability of the identified pattern. The upward curve of the BF_{10} indicates that, even with the inclusion of additional observations, the probability that most participants remain available on Saturdays stays constant and highly significant. This statistical consistency suggests that offering consulting sessions on this schedule is feasible and effectively aligned with the preferences of the studied population. From an applied standpoint, this result can serve as valuable input for institutional planning of business-training and advisory programs, allowing optimization of attendance and educational impact. Taken together, the Bayesian binomial contrast provides strong empirical evidence supporting the pertinence of maintaining flexible training strategies aligned with the availability and commitment of the entrepreneurial audience (Gelman et al., 2013; Kruschke, 2015; Wagenmakers, 2007).

Figure 5: Descriptive Plots – Female and Male Gender

Note. Generated by the authors using JASP (Version 0.16.3).

The *Descriptive Plots by Gender* (Figure 5) display a clear asymmetry in the composition of the sample, revealing a higher proportion of female participants compared with males. In the female group, the estimated proportion exceeds 0.7, with a credible interval that does not include the reference value of 0.5. This indicates that female participation is significantly higher than parity expectations. This result confirms the findings of the previous Bayesian analyses, showing a marked predominance of women among the 323 surveyed entrepreneurs and business owners. This trend aligns with recent research on entrepreneurship in Latin America, which highlights the increasing participation of women in productive activities—particularly within the commerce and service sectors (Minniti & Naudé, 2010; Brush et al., 2019). From a sociological perspective, this greater female presence can be associated with the pursuit of economic autonomy, the consolidation of support networks, and the active role of women in sustaining microbusinesses.

In contrast, the male group shows a substantially lower proportion, with an estimated point near 0.3—also distant from the parity reference line (0.5). This pattern reinforces the evidence of a structural gender imbalance within the sample, where men represent a minority compared with women. The narrow credible interval suggests a precise and stable estimation, allowing a high degree of confidence that the observed difference is not due to random variation. In practical terms, these results underscore the need to explore the causes of lower male participation in training or business-advisory processes, which may be related to time constraints, perceived utility, or workload factors. Conversely, the strong female participation represents an opportunity to strengthen institutional policies that support entrepreneurship with a gender perspective, recognizing the contribution of women to innovation, income generation, and social transformation (Acs, 2006; Kruschke, 2015; Gelman et al., 2013).

Conclusions

The Bayesian binomial contrast confirms a clear gender asymmetry in the sample: the female proportion centers around 0.715 (95% CrI [0.677, 0.751]) and the male proportion around 0.285 (95% CrI [0.249, 0.323]), with extreme Bayes factors ($BF_{10} \approx 3.19 \times 10^{22}$) that decisively reject the null hypothesis of parity ($p = 0.5$). The empirical evidence supports previous literature documenting the increasing participation of women in entrepreneurship and microbusiness management processes, particularly in emerging economies and support programs (Brush, Greene, & Welter, 2019; Minniti & Naudé, 2010). These differences reflect structural patterns within the entrepreneurial ecosystem rather than mere sampling biases. Regarding advisory logistics, the proportion of participants available on Saturdays is very high (median = 0.918; 95% CrI [0.894, 0.939]) compared with a low proportion of unavailability (median = 0.082; 95% CrI [0.061, 0.106]), showing extreme evidence in favor of the alternative hypothesis ($BF_{10} \approx 4.09 \times 10^{100}$). This finding suggests a high level of commitment and openness toward training spaces, consistent with theories linking entrepreneurship to human capital accumulation and active learning (Acs, 2006). From an institutional

management perspective, the results validate Saturday scheduling as an effective strategy to maximize attendance and impact.

Methodologically, the use of weakly informative priors (Beta [1,1]) and the sequential analysis of the BF_{10} demonstrate that the evidence in favor of the alternative hypotheses accumulates steadily as the sample size increases, reinforcing the robustness of the model. This behavior is consistent with the principles of Bayesian inference—belief updating through binomial likelihood and Beta–Binomial conjugation—and with established guidelines for interpreting the Bayes factor (Jeffreys, 1961; Kass & Raftery, 1995; Gelman et al., 2013). In practical terms, the analysis moves beyond exclusive reliance on p -values and provides a quantitative measure of the strength of evidence (Wagenmakers, 2007).

Finally, the conjunction of female overrepresentation and high Saturday availability suggests two programmatic priorities: (i) strengthening support strategies and networks with a gender focus, and (ii) consolidating flexible training schemes aligned with the actual availability of the target audience. These orientations are consistent with evidence linking capacity building and networking with improved business outcomes, particularly among women entrepreneurs (Brush et al., 2019; Minniti & Naudé, 2010). Overall, the Bayesian results—clear, consistent, and robust—offer a solid empirical foundation for institutional policy decision-making and the management of entrepreneurship support programs.

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