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Nenis in Mexico: A Multidimensional Analysis of Female Empowerment on the X Platform

Nenis en México: Análisis multidimensional del empoderamiento femenino en la plataforma X

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Abstract: This article analyzes how the phenomenon of the 'nenis' reflects social perceptions of female empowerment in Mexico. *Nenis* are entrepreneurs who market products through social networks, facing significant challenges such as limited access to financing and a lack of security in transactions. However, they demonstrate a remarkable ability to adapt and innovate. The analysis is based on a geospatial perception index created using Big Data and text mining techniques. This index was applied to 40 412 posts on the digital platform X, published between June 2021 and August 2022, to identify patterns and trends related to the topic. The cities of Mexico City, Monterrey, and Guadalajara account for the majority of the posts. The findings highlight the importance of developing policies that address regional barriers and promote the sustainable growth of female entrepreneurship.

Keywords: digital commerce, empowerment, nenis, social perception, X platform.

Resumen: Este artículo analiza cómo el fenómeno de las nenis refleja la percepción social sobre el empoderamiento femenino en México. Las nenis son emprendedoras que comercializan productos a través de redes sociales, enfrentando desafíos significativos como el acceso limitado a financiamiento y la falta de seguridad en las transacciones; sin embargo, demuestran una notable capacidad de adaptación e innovación. El análisis se basa en un índice de percepción geoespacial, creado mediante técnicas de Big Data y minería de texto. Este índice se aplicó a 40,412 publicaciones de la plataforma digital X, difundidas entre junio de 2021 y agosto de 2022, para

identificar patrones y tendencias relacionadas con el tema. Las ciudades de México, Monterrey y Guadalajara concentran la mayoría de las publicaciones. Los hallazgos subrayan la importancia de desarrollar políticas que aborden las barreras regionales y promuevan el crecimiento sostenible del emprendimiento femenino.

Palabras clave: comercio digital, empoderamiento, nenis, percepción social, plataforma X.

Introduction

In Mexico, the *nenis* phenomenon has emerged as an innovative response to the economic and social challenges resulting from the Covid-19 pandemic. Initially carrying a derogatory connotation, this term has evolved to represent female empowerment and digital self-employment, particularly through social media platforms such as Facebook, Instagram, and WhatsApp (Saldaña, 2021). By employing flexible and adaptable strategies, *nenis* have managed to generate income in a context of high economic uncertainty, demonstrating resilience and innovation capacity (Aguilera, 2021).

It is important to distinguish that although *nenis*' activities are often classified as self-employment, in some cases, they may evolve into more structured forms of entrepreneurship. Self-employment involves economic activities carried out individually and often informally, whereas entrepreneurship entails the creation and development of initiatives with a vision for growth and sustainability. This duality reflects both the opportunities and challenges these women face while operating in an unequal labor market.

According to García and González (2022), self-employment on digital platforms has been a key strategy for overcoming gender barriers; however, significant challenges persist, such as limited access to financing, labor informality, and vulnerability to unfair practices. Additionally, studies such as those by Hernández *et al*. (2021) have identified that social perceptions of *nenis* vary significantly between regions, influenced by sociocultural, technological, and economic factors.

Despite the growing interest in digital female entrepreneurship, few studies have explored the sociocultural and regional dynamics that shape social perceptions of *nenis* from a multidimensional

perspective. This gap limits the understanding of how geographical differences influence the opportunities and barriers these women face. In this regard, digital platforms not only serve as tools for generating income but also as spaces where social narratives related to gender and commerce are amplified.

Therefore, this research seeks to answer: How do social perceptions of *nenis* vary across different regions of Mexico? What sociocultural and geographical factors influence these perceptions? These questions are essential for understanding how the social perception of *nenis* is constructed and for proposing public policies that promote equitable growth in female entrepreneurship.

Through a methodological approach that combines data mining and geospatial analysis, this study examines more than 40,000 posts on the digital platform X (formerly Twitter), collected between June 2021 and August 2022. This approach enables the identification of patterns, narratives, and regional variations, contributing not only to the description of the phenomenon but also to the proposal of solutions tailored to local realities. Thus, this article provides a comprehensive perspective on the impact of *nenis* within Mexico's socioeconomic and cultural context, emphasizing the importance of inclusive strategies to strengthen both self-employment and female entrepreneurship.

Contextual Framework

To fully understand the *nenis* phenomenon, it is essential to consider the context of the Covid-19 pandemic. Due to the conditions imposed by the health crisis, many women-led businesses emerged online during this period, and many of these ventures have persisted in the post-pandemic era. This section will address female empowerment during the pandemic and the rise of the *nenis* in Mexico.

Background of the Nenis Phenomenon

The nenis phenomenon has drawn the attention of various studies as a response by women to the lack of opportunities in the formal labor market and the increasing economic precariousness during the Covid-19 pandemic. According to García and González (2022), digital female entrepreneurship through social media platforms such

as Facebook, Instagram, and WhatsApp has become a viable alternative for generating income in adverse contexts. Although this phenomenon is not exclusive to Mexico, it takes on particular characteristics due to the country's structural inequalities and gender-based cultural dynamics.

On the other hand, studies such as that of Hernández *et al*. (2021) have highlighted the contribution of self-employment to female empowerment, noting that many women turn to digital commerce not only out of economic necessity but also as a means of achieving independence from traditional gender roles. However, previous research (Cerón *et al*., 2023; Alcántara *et al*., 2022) underscores the lack of analyses linking these dynamics to geospatial contexts and the sociocultural perceptions associated with the term *nenis*. This gap leaves an important question regarding how these entrepreneurs are perceived socially and the specific challenges they face in different regions of Mexico.

Additionally, Saldaña (2021) and Aguilera (2021) emphasize that although the term *nenis* initially carried a derogatory connotation, its reinterpretation through feminist discourses has helped highlight these women's contributions to local commerce and their ability to adapt to digital environments.

Female Empowerment During the Pandemic

The World Health Organization's declaration in March 2020 warning about the Covid-19 pandemic led to the suspension of non-essential activities in the public, private, and social sectors. Beyond its impact on global health, this event had significant repercussions on various aspects of social and economic life. In Mexico, according to data from the National Institute of Statistics and Geography (INEGI), the unemployment rate rose from 4.2% in May to 5.5% in June 2020. By the last quarter of that year, the employed population had decreased by 2.4 million people compared to 2019, dropping to a total of 53.3 million (INEGI, 2021).

According to Esquivel (2020), the economic slowdown led to a supply crisis, which soon extended to demand. Regarding employment, for every 10 people who lost their jobs, 8 were women, representing 84% of job losses (Hernández, 2021). While the pandemic had widespread effects, its greatest impact was felt in the most vulnerable

economic sectors, exacerbating social and gender inequalities (Neidhöfer, 2020).

Likewise, labor informality in the country increased by three million people (Rivas & Zamora, 2021). According to Beltrán and Corti (2020), even before the pandemic, women faced significant challenges in the labor market, which were further exacerbated by the health crisis. The service sector, which employs a high percentage of women, was among the most affected, experiencing the highest job losses. Based on data from the National Survey on Occupation and Employment (ENOE), García (2021) reports that 987,339 women were expelled from the labor market, leaving 154,441 unemployed and negatively impacting 64,981 female entrepreneurs who provided employment to others. Alcántara *et al*. (2022) indicate that the female economic participation rate dropped from 45% to 35.5%, forcing many women to seek alternative means of subsistence (Saldaña *et al*., 2021).

Due to their position in the labor market and their role in the domestic sphere, the pandemic affected women more significantly, forcing them to face unique challenges, as highlighted by the Director General of the Public Policy Research Center at the Mexican Institute for Competitiveness (Moy, 2021). Additionally, Statista (2021) reports that, on average, women had higher participation in the informal sector, where their employment rate remained between 27% and 30% from late 2020 to late 2021, compared to men, whose rate ranged from 26% to 28%.

These figures illustrate gender inequality and the labor gap, which can be interpreted as a form of discrimination and job precarity in the third decade of the 21st century. Historically, the capitalist economic system has exhibited a patriarchal structure in which the sexual division of labor relegates women to unpaid domestic and caregiving work. As Federici (2018) points out, capitalism is sustained not only by the exploited labor force in industries but also by domestic work which, despite being unpaid, is essential for the production and reproduction of its most valuable resource: the workforce.

In Mexico, labor precarity and the gender gap have driven women to seek self-employment and entrepreneurship as strategies to overcome economic crises. In addition to managing household responsibilities, childcare, and elder care, many have had to generate income by selling products through catalogs or online bazaars on social media platforms (Rivas & Zamora, 2021), thereby meeting the

economic needs of millions of families (Moy, 2021). While these activities provide financial resources, they often lack legal labor protections and benefits, perpetuating economic dependence and vulnerability by leaving women socially and financially unprotected and limiting their opportunities in the formal labor market.

Female empowerment, understood as the process through which women gain power and control over their own lives, is reflected in their ability to rapidly adapt to new circumstances (García & González, 2022). In this regard, entrepreneurship has long been an opportunity, not only in recent times but also in past decades, since its flexible nature allows women to balance both professional and domestic responsibilities. However, female entrepreneurship continues to be undervalued or perceived as insignificant due to the informality and small scale of these businesses, despite its societal benefits, such as fostering innovation and creating opportunities (Aguilera, 2021).

Alvarado *et al*. (2021) found that women engage in entrepreneurship for various reasons: to supplement low-paying jobs, because they lack formal employment, to improve their quality of life and that of their families, or to achieve financial independence. During the pandemic and in the post-pandemic period, entrepreneurship on social media emerged as a response to the need to generate income amid declining traditional job opportunities. Social isolation and lockdown measures pushed women to seek alternative forms of self-employment, with remote work and the use of social media and digital platforms allowing them to reconcile an income-generating activity with unpaid domestic and caregiving responsibilities. Access to digital networks and connectivity enabled thousands of women to generate income (García & González, 2022). As a result of the rise in micro-entrepreneurs, a new category emerged —the *nenis*, or new online business entrepreneurs— women who achieve financial independence or support their families through digital platforms and social networks (Alvarado, 2021; García & González, 2022).

The Boom of the Nenis

Despite the novelty of recent technologies, the precarious conditions under which women enter the labor market in Mexico are not new. Many families can attest to the contributions of mothers, sisters, aunts, cousins, or grandmothers —often referred to until recently as mamás

luchonas (struggling single mothers) (Guzmán, 2021b)— who support household economies through direct income or unpaid domestic and caregiving work. Among every four working women, one chooses self-employment, making up a total of 5.2 million female entrepreneurs. Of this population, 82% participate in the informal economy; most are young, married, have at least one child, have completed secondary education, earn an average monthly income of $3,707 MXN, and do not pay taxes. Since nenis operate informally and are not registered with any institution, they are considered part of this group (Masse, 2021).

The term *neni* originated during the pandemic to describe women who sold products through social media platforms. It gained popularity in mid-2020 because these entrepreneurs, aiming to create a sense of connection, addressed their customers with affectionate terms such as bella (beautiful), nena (babe), hermosa (gorgeous), linda (cute), or preciosa (precious), fostering companionship, cordiality, and sisterhood. Additionally, they used marketing phrases like cierre de pedido (order closing), última prenda (last item), or entrega inmediata (immediate delivery) (Rocha, 2021). The Mexican Institute for Competitiveness (IMCO) defines neni as nuevas emprendedoras de negocios por internet (new online business entrepreneurs), although their activities are often not highly sophisticated and mainly involve the use of digital applications and social networks.

Initially, the term neni carried a derogatory, misogynistic, and classist connotation (Saldaña, 2021; Alcántara *et al*., 2022), as it was used mockingly to undermine the efforts and strategies of female entrepreneurs. However, its widespread use on social media platforms shed light on these businesses, highlighting the need for women to generate income on their own and the precarious conditions under which they establish and operate their businesses compared to men. Today, feminist discourse and critique have helped reframe the term, transforming it into a symbol of appreciation and visibility for women's entrepreneurship.

Nenis promote and sell their products on social media platforms such as Facebook, Instagram, and WhatsApp (Guzmán, 2021a), offering a wide range of goods and services (Aguilera, 2021), including clothing, footwear, food, cosmetics, handicrafts, and household items. Sales are typically completed through deliveries at designated meeting points or via courier services, with payments processed digitally

(Masse, 2021; Valerio *et al*., 2023). This form of commerce has enabled many women to achieve financial independence while simultaneously supporting other women.

The following typology, based on the work of Hernández *et al*. (2021), frames the analysis of businesses driven by new online entrepreneurs:

- *Small-scale entrepreneurship:* These are small-scale businesses led by one or more individuals to produce or distribute goods or services. Profits are allocated to both business needs and the entrepreneur's cost of living.
- *Necessity-driven entrepreneurship:* This type of business emerges when individuals seek a new way to generate economic income.
- *Opportunity-driven entrepreneurship:* These businesses are created to address a specific market need that has been identified.
- *Digital entrepreneurship:* Conducted through the internet, these ventures use social media, websites, and other digital platforms to promote products.

Nenis have uncovered a new dimension of entrepreneurship, demonstrating creativity, innovation, and resilience. Far from being a source of shame, being a *neni* is a source of pride, as it represents female empowerment and the effort to break gender inequality barriers —both economic and social (Aguilera, 2021).

Methodology

This study examines the social and media dynamics of perceptions about *nenis* in Mexico through a methodological approach that combines text mining and natural language processing (NLP) (Pérez & Santín, 2007). To gather information reflecting the social and economic changes that could influence public discourse on this topic, a cross-sectional analysis was conducted from June 8, 2021, to August 22, 2022. During this period, a total of 40,412 posts from individuals, businesses, non-profit organizations, and government entities were collected from the digital platform X. This diversity of sources offers a broad range of perspectives, from personal experiences to political and social discussions, covering aspects related to entrepreneurship, self-employment, and female empowerment.

For each post, data such as user information, gender, date and time, text content, state, municipality, hashtags, and author were extracted. This level of detail enabled a granular analysis of the context in which the topic is discussed. The texts were systematically processed using text mining techniques to detect relevant patterns, relationships, and trends. The data were grouped into thematic clusters, and the frequency of words, phrases, and key concepts was quantified to identify explicit and predominant narratives in the discussions, highlighting how these elements appear in discourse and influence perceptions of the studied phenomenon.

To deepen the analysis, the underlying implications and emotions associated with the *nenis* experience were examined, facilitating a more comprehensive understanding of the context and subtexts shaping public opinions on this phenomenon. By applying natural language processing algorithms in sentiment analysis techniques, hashtag recognition, relationship extraction (co-occurrence networks), and correspondence analysis, a detailed semantic analysis of the retrieved posts was achieved.

This study adopts a mixed-methods approach with a predominantly quantitative orientation, grounded in text mining and NLP techniques. This approach enables the analysis of large volumes of unstructured textual data extracted from posts on the digital platform X, providing insights into the social and media dynamics of perceptions toward *nenis* in Mexico.

The quantitative approach focuses on statistical analysis and the categorization of patterns from large-scale data, while the qualitative approach complements the interpretation by identifying and contextualizing emotions, narratives, and implicit meanings in the posts. This methodological design is ideal for studying complex and multidimensional phenomena, such as social perceptions of female entrepreneurship in different regions of Mexico.

The choice of a mixed-methods approach responds to the need to address research questions that combine descriptive aspects (What narratives about *nenis* prevail on social media?) and explanatory aspects (What sociocultural factors influence these perceptions?).

Empirical Strategy for Collecting Posts on the X Platform

Posts on X can be transformed into useful information and knowledge by applying the 4Vs model of Big Data, which consists of:

- *Volume:* The total number of posts available for analysis.
- *Value:* Determines whether a post contributes knowledge or contains relevant information.
- *Veracity:* Application of search parameters to ensure data quality and reliability.
- *Velocity:* The efficiency of servers and data processing systems.

These criteria enable the extraction of insights from vast streams of data generated on social media (Lugmayr *et al*., 2017).

To derive knowledge (C) from the X platform, a content analysis relationship equation is applied. Knowledge (C) is determined by a set of posts (x) that align with a predefined pattern (B) and are verified through a series of keywords (p), represented as follows:

$$C=\{(x1,x2,x3,\ldots,xn) \mid \exists B,\ |B|\ (p1,p2,p3,\ldots,pn)\} \qquad (1)$$

Alternatively, it can be expressed as:

$$C=\{\lim x\to n\ X,\ \exists B\ \lim p\to n\ B\} \qquad (2)$$

The knowledge obtained gains specificity through the interaction between each post and the semantic associations established by the search pattern (Semantic Web). As long as the pattern considers the geographic origin of the posts, the knowledge extracted will provide a more integrated and contextualized understanding of social interactions within the studied environment (Nguyen & Jung, 2018).

Procedure for Data Analysis

The data analysis was carried out in three main phases to ensure methodological consistency between the study objectives and the mixed-methods approach adopted:

1. Data Extraction and Preprocessing. A total of 40,412 posts from the X platform were collected using preselected keywords such as "nenis," "self-employment," "female entrepreneur," and "online sales." To ensure data quality and relevance (Ashwin *et al*., 2016), filters were applied to remove textual noise (special characters, typographical errors, and irrelevant posts) as well as duplicate posts.

The collected text was then tokenized,[1] breaking down posts into processable keywords for further analysis. Additionally, geographic information was standardized using the Unique Catalog of Geo-Statistical Codes (INEGI, 2024), ensuring consistency in the naming of states and municipalities.

2. Quantitative Analysis. In this phase, data mining techniques were used to identify general patterns in the posts:

Keyword Frequency Analysis: The prevalence of terms related to *nenis* was assessed, highlighting the most frequently mentioned concepts in public discussions.

Hashtag Clouds: These visual representations helped identify the dominant thematic trends, providing an overview of the discussions surrounding the phenomenon.

Geospatial Perception Index: A model based on Nguyen and Jung (2018) was applied to analyze regional variations in the perception of *nenis*, mapping the geographic distribution of posts and correlating them with social and economic factors.

3. Qualitative Analysis. To explore the implicit meanings behind the posts, NLP algorithms were applied to conduct:

- *Sentiment Analysis:* Identification of predominant emotions (positive, negative, or neutral) associated with *nenis*.
- *Narrative Recognition:* Detection of key narratives describing the impact of *nenis* in economic and social contexts.
- *Correspondence Analysis:* Establishment of significant associations between geographic factors and perceptions of the phenomenon, allowing for an understanding of how regional dynamics influence attitudes toward *nenis*.

The mixed-methods approach adopted in this study combines the strengths of quantitative and qualitative analysis to ensure a

1 Through tokenization, the text is broken down into units that represent the simplest elements with inherent meaning relevant to the analysis, such as words. Efficient cleaning and tokenization can be achieved using specialized libraries such as Tokenizers and Quanteda.

comprehensive examination of the *nenis* phenomenon. Quantitative techniques enable the identification of patterns and general trends, such as keyword frequency, predominant hashtags, and geospatial distribution. In contrast, qualitative techniques facilitate the interpretation of narratives, emotions, and underlying meanings. This approach not only describes the phenomenon but also contextualizes it within Mexico's sociocultural and geographic dynamics, providing a multidimensional and deeply contextualized perspective.

Procedure Phases

The following phases were carried out to quantify and analyze social perceptions of the term *nenis* based on posts from the X platform:

1. Selection of Accounts on X: Relevant accounts were identified and verified, including businesses, non-profit organizations, public institutions, and individual users. The authenticity of the accounts was validated to ensure data quality and relevance.

2. Selection and Validation of Keywords: A text cleaning and tokenization process was performed using data mining techniques in RStudio. This procedure identified 30 keywords related to the *nenis* phenomenon, such as "self-employment," "female entrepreneur," "women's empowerment," "digital business," "women entrepreneurs," and "online sales."

3. Keyword Clustering Analysis: The identified keywords were grouped into six main clusters: Female empowerment, Economic/social impact, Self-employment, Digital innovation, Community and support and Challenges and barriers. This clustering simplified the analysis and helped understand the relationships between related concepts.

4. Data Processing: To ensure consistent and reliable results, the collected posts were filtered and standardized following the study's criteria. The processing included:

- *Data Cleaning:* Irrelevant, duplicate, and erroneous posts were removed. A linguistic filter was applied to retain only posts in Spanish.
- *Data Normalization:* The *Unique Catalog of Geo-Statistical Area Codes* (INEGI, 2024) was used to standardize the names of states and municipalities.

- *Validation:* The degree of veracity (GV) of the posts was measured using a set of indicators and methodologies (Ashwin *et al*., 2016; Agarwal *et al*., 2017; Bodnar *et al*., 2015; Suthanthira & Karthika, 2018; Senapati *et al*., 2019). These included: Information Diffusion (ID): Measures the spread of messages. Geographic Extension (IEG): Assesses the territorial distribution of posts. Relevant Posts (IPR): Evaluates content relevance based on the impact of unique (non-repeated) posts relative to the total collected data.[2] The GV score is the mean of these three indicators, measured on a 0 to 1 scale, where higher values indicate stronger correlation and reliability. In this study, the GV score was 0.84.

5. Results Analysis: The collected data were processed and examined using analytical approaches such as post description, hashtag clouds, sentiment analysis, geospatial analysis, and word co-occurrence networks to clarify social perceptions of *nenis*.

Results

Regarding the local dynamics of social perceptions about *nenis*, posts related to the phenomenon were collected from the 32 federal entities, covering 32.9% of the municipalities in the country. Table 1 presents the analysis and validation of the data, highlighting the most active entities on X.

The highest volume of posts about *nenis* was recorded in Mexico City (31.8%), followed by the State of Mexico (24.1%) and Nuevo Leon (7.5%). Similarly, the highest number of mentions, reported by citizens and adjusted for population, was found in Mexico City, with 140 mentions per 100,000 inhabitants, Morelos with 91, Queretaro with 76, State of Mexico with 55, Nuevo Leon with 53, and Aguascalientes with 52.

The Perception Index by Rate per 100,000 Inhabitants (GTH), divided into quartiles with the following levels: very high, high, medium, low, and very low, shows significant differences in social

[2] $ID = 1 - \left(\frac{Total\ de\ usuarios\ únicos}{Total\ de\ publicaciones}\right) = 1 - \left(\frac{984}{40,412}\right) = 0.97;$
$IEG = \frac{\left(\frac{\sum Estados\ alcanzados}{Total\ de\ estados} + \frac{\sum Municipios\ alcanzados}{Total\ de\ municipios}\right)}{2} = \frac{\left(\frac{32}{32} + \frac{499}{2,472}\right)}{2} = 0.60;$
$IPR = \frac{\sum Post\ únicos}{Total\ de\ publicaciones} = \frac{38,456}{40,412} = 0.95;\ GV = \frac{(ID+IEG+IPR)}{3} = \frac{0.97+0.60+0.95}{3} = 0.84$

perception. Thus, in five entities (Mexico City, State of Mexico, Morelos, Nuevo Leon, and Querétaro), which represent 72.7% of the total posts, perception is very high; in Aguascalientes, Colima, Guanajuato, Hidalgo, Puebla, Quintana Roo, and Tlaxcala, accounting for 13.1%, perception is high; Baja California, Baja California Sur, Campeche, Michoacan, Sinaloa, and Yucatan, representing 5.1%, fall in the medium category, while in the remaining states, accounting for 9.1% of the posts, perception levels are low or very low. This breakdown by intervals reflects variation in perception across the country.

The Perception Index by Total Number of Posts (GTP) follows the same classification as the GTH to categorize the federal entities according to the volume of messages. Thus, at the very high level, six entities concentrate 78.3% of the total posts, standing out as the most active; at the high level, six additional states account for 9.8%; at the medium level, seven states represent 6.5%; the low level includes six states with 3.2%, while the very low level comprises seven states with 2.1% of participation. This categorization provides a detailed overview of the involvement of different regions of the country in the discussion on X about the *nenis* phenomenon.

Geospatial Analysis

Figure 1 presents a map illustrating the geographic distribution of posts by federal entity according to the entrepreneurship scale. At the basic entrepreneurial level, mentions refer to *nenis* who engage in entrepreneurship out of necessity, identifying immediate opportunities and acting quickly to generate income. The intermediate level includes mentions of entrepreneurs with creativity and innovation skills, who seek professional development and invest their capital not only to meet immediate needs but also for personal and professional growth. Finally, mentions of businesswomen correspond to the advanced level; these women, in addition to having academic preparation, possess the skills to identify opportunities, create and innovate, and lead projects strengthened through external capital and feasibility studies.

The results of the geospatial analysis reveal patterns of social perception that confirm the regional inequalities identified by García and González (2022) and Saldaña (2021). In regions with higher technological connectivity, such as the north and central parts of

the country, *nenis* demonstrate a strong digital presence, leading to greater visibility and social acceptance. This contrasts with regions like the south and southeast, where limited access to technology and inadequate infrastructure negatively impact both perception and the ability of entrepreneurs to expand their businesses.

These differences highlight the need for region-specific policies, as suggested by Aguilera (2021) and Hernández *et al*. (2021), to improve technological infrastructure, ensure secure digital transactions, and promote equitable access to financial resources.

The map uses different colors to indicate the concentration of posts. Federal entities such as Mexico City, the State of Mexico, and Nuevo Leon exhibit high post density. Specifically, the first two have the highest concentration, with a large green area representing *nenis*, which aligns with high informal employment rates in both states and the role of the capital as the country's economic and cultural hub. These three entities also feature mentions of entrepreneurs (red) and businesswomen (blue), although in smaller proportions, reflecting diversity and varying levels of business development among women in digital commerce.

Morelos, Puebla, and Queretaro, located in the central and Bajio regions, show a significant number of posts. Queretaro stands out due to its high rate of posts relative to its population, suggesting a dynamic digital commerce ecosystem. Puebla and Hidalgo also exhibit notable activity, reflecting the extent to which women use social media to generate income.

In the northeastern region, Nuevo Leon has a notable concentration of *nenis*, indicative of economic development and technological penetration. Its capital, Monterrey, plays a key role in this distribution. Meanwhile, in the northwestern region, Baja California and Sonora show significant activity, which is especially relevant given their border locations and opportunities for binational trade with the United States.

In the western and Pacific regions, Guadalajara, the capital of Jalisco, and its surroundings have a high concentration of posts, highlighting the city as an important center for digital commerce. While Michoacán and Colima have lower activity, it remains significant enough to indicate the penetration of this form of commerce in economically challenged areas.

In the southern and southeastern regions, Yucatan, Quintana Roo, and Chiapas have fewer mentions, but still feature notable points of activity, reflecting an economy driven by tourism and local trade. Oaxaca and Tabasco show lower levels of activity, which may indicate limited access to social media and technology.

Figure 2 illustrates the degree of social perception of *nenis*, adjusted per 100,000 inhabitants. The analysis reveals significant variations among states, with Mexico City standing out as having a very high perception, indicating greater visibility and discussion, likely due to its population density and high activity on digital platforms.

The perception index in Queretaro, Morelos, and Puebla is high, reflecting a notable volume of mentions. In contrast, Yucatán, Campeche, and Baja California Sur exhibit very low perception levels, suggesting that the phenomenon is less relevant in these states.

The map highlights that, although *nenis* are present throughout the country, the perception and impact of this presence vary by region, which helps identify local dynamics in female entrepreneurship and the influence of digital platforms on its development.

Finally, Figure 3 presents the geospatial analysis of the perception of *nenis* based on the total volume of posts on X per federal entity. The map highlights, in green, the states with high post density, such as Mexico City, Nuevo Leon, and Queretaro, where social perception and discussion about the topic are prominent. This reflects greater visibility and possibly a higher concentration of female entrepreneurial activities. Conversely, states like Chiapas, Guerrero, and Sonora, marked in red, exhibit lower discursive activity and post density, suggesting reduced visibility or less discussion on digital platforms.

These geospatial maps indicate the regions where *nenis* establish and sustain their businesses through social networks. The strongest presence is observed in urban and metropolitan areas, likely due to more developed technological infrastructure and greater connectivity. Additionally, this trend could be correlated with the need for supplementary income, which many women achieve by balancing their domestic and professional responsibilities thanks to the flexibility of digital commerce.

The categorization of discursive activity surrounding *nenis* —ranging from very low to very high— enhances our understanding of local female entrepreneurship dynamics. The variation in post density reveals inequalities in access to technology, digital education, and economic

opportunities. These disparities highlight the socioeconomic context and the importance of key factors such as technological infrastructure and internet access.

Regions with lower activity could benefit from policies aimed at improving infrastructure and digital commerce training, as the *nenis* phenomenon reflects entrepreneurial ingenuity and resilience. Moreover, these findings emphasize the need for inclusive policies that ensure equitable access to digital opportunities. This type of analysis also suggests adapting public policies and programs to regional realities to support and foster female entrepreneurship in Mexico.

Hashtag Analysis

Hashtags serve as indicators of the most discussed topics or key concerns in conversations on digital platforms like X. The word cloud in Figure 4 illustrates the regional differences between northern and central-southern Mexico identified in the analysis.

In the northern region (upper box), the most prevalent hashtags include #Nenis, #MujeresDeNegocio, #EmpoderamientoFemenino, #RegiasDeNegocios, and #MujeresFregonas. These not only reflect the widespread presence of *nenis* in the region but also highlight perceptions of their strength, resilience, and adaptability. Given that commerce and entrepreneurship thrive in this region, its economic dynamism and proximity to international markets, particularly the United States, may contribute to greater visibility and activity of *nenis*.

The central-southern region (lower box), with 29,148 posts, accounts for 72.1% of all analyzed hashtags. Prominent among them are #Neni, #MujeresEmprendedoras, #ArtesanasUnidas, #ComunidadEmprendedora, #HechoAMano, #MujeresTrabajadoras, and #Microemprendimiento. This diverse set of terms reflects rich cultural traditions and a strong artisanal heritage. For instance, hashtags like #HechoAMano and #ArtesanasUnidas emphasize the value placed on handmade, local, and artisanal products. Similarly, #ComunidadEmprendedora and #MujeresTrabajadoras underscore solidarity and collaborative work, which are key characteristics of social dynamics in the south. Thus, in this region, many *nenis* combine digital entrepreneurship with traditional techniques and

products, adopting a more community-driven and culturally rooted approach.

Sentiment Analysis

Sentiment analysis is an opinion-mining technique used to decipher how digital communities perceive and express emotions regarding specific topics. This analysis reveals two key facets of social perception toward *nenis*: 1) Negative emotions, which indicate challenges and obstacles and 2) Positive emotions, which highlight resilience and empowerment. Figure 5 presents a word cloud displaying the most commonly used terms in the northern and central-southern regions of Mexico.

In the left section of the figure (northern region), words such as "stress," "anxiety," "intimidation," "insolvency," and "discouragement" carry a negative connotation, reflecting the economic and labor hardships faced by *nenis*. Meanwhile, "leadership," "autonomy," "diversification," and "progress" are positive terms that underscore their ability to adapt and find new ways to generate income.

In the right section (central-southern region), words like "vulnerability," "precarious," "frustration," "exploitation," and "extortion" illustrate adverse conditions and risks encountered by entrepreneurs, referring to the most difficult aspects of entrepreneurship in a context where security and economic stability are ongoing concerns. In contrast, "growth," "ecotourism," "artisans," "authenticity," "well-being," "history," "tradition," and "culture" are positive terms associated with promising and fulfilling aspects of entrepreneurship, indicating a strong connection with local culture, tradition, and the environment. Finally, "empowerment," "self-improvement," "prosperity," and "collaboration" emphasize the ability of *nenis* to transform challenges into opportunities, driven by a strong sense of authenticity and community.

Analysis of Emotional Expressions

Regarding the analysis of emotional expressions about *nenis*, Figure 6 groups the most frequently used keywords in posts into different color-coded sections, labeled according to the eight basic emotions proposed by Plutchik (1980), as listed below:

1. *Trust (green):* Terms such as "female solidarity," "financial security," "cooperation on social networks," and "business growth" indicate trust in the community and confidence in the entrepreneurs' ability to achieve their goals. Similarly, expressions like "solid business" and "legal support" suggest a supportive and stable environment.
2. *Anticipation (blue):* Phrases like "new opportunities," "future projects," "constant innovation," and "business expansion" emphasize the proactive nature of *nenis* and their continuous pursuit of growth and improvement. Additionally, terms such as "preventing assaults" and "business strategy" reflect preparedness to face challenges and seize opportunities.
3. *Joy (brown):* Words such as "happy customers," "positive environment," "shared success," and "positive reputation" denote satisfaction and happiness stemming from business achievements and customer appreciation, as well as personal and professional fulfillment.
4. *Surprise (red):* Expressions like "new discoveries," "unexpected innovations," "positive reactions," and "unforeseen deals" highlight the ability of *nenis* to positively surprise their customers and the market with new ideas and products, which is associated with innovation and positive change.
5. *Fear (gray):* Phrases such as "complicated sales," "insecurity," "fear of extortion," and "financial loss" reveal the concerns and anxieties faced by *nenis* in their environment, emphasizing the fear of insecurity and economic challenges.
6. *Disgust (purple):* Terms like "corruption," "inequality," "abuse of power," and "frustration" reflect anger and aversion toward injustices and adverse conditions that *nenis* must confront, representing a common reaction to negative experiences in their work environment.
7. *Anger (light red):* Expressions such as "outrage over theft," "sales tension," "delivery delays," "commercial fraud," and "intimidation" indicate strong feelings of exasperation over unfair and challenging situations, reflecting the intensity of negative emotions toward these problems.
8. *Sadness (pink):* Phrases like "businesses closed," "economic loss," "sense of loss," and "depression" illustrate the devastating effects of economic and personal hardships experienced by

nenis, showcasing the deep emotional impact of these negative experiences.

Co-Occurrence Network Analysis

The interrelationship of the most frequently used terms in digital conversations about *nenis* is visualized through co-occurrence networks, particularly focusing on dominant perceptions and concerns regarding the phenomenon. The co-occurrence of terms in posts on X reveals distinctive patterns between the northern and central-southern regions of Mexico, especially regarding key topics and local concerns, as illustrated in Figure 7.

In the northern region's co-occurrence network (upper box), terms such as "female entrepreneurship," "female leadership," "business transformation," "economic autonomy," and "Regias de Negocios" emphasize a strong orientation toward economic independence and the professionalization of commercial activities. The central nodes, including "women nenis," "businesses," and "entrepreneurship," are closely connected to "business innovation," "commercial strategies," and "innovative projects," reflecting a positive perception of *nenis* as innovative leaders with strong adaptability skills.

Additionally, "institutional support" emerges as a key term, highlighting the role of training and institutional backing in entrepreneurial success. The presence of "business transformation" and "competitiveness" suggests an emphasis on professionalization and business expansion, showcasing the capabilities of *nenis* to compete in the digital market and seize growth opportunities. However, the term "sales fraud" stands out as a significant concern, illustrating the risks and challenges these entrepreneurs face in their commercial environment.

In the central-southern region's co-occurrence network (lower box), key terms include "entrepreneurial community," "united artisans," "female empowerment," "handmade," "united nenis," "female micro-entrepreneurship," and "community projects." These terms indicate a strong sense of community collaboration and a deep connection to the local environment. The central nodes —"entrepreneurs," "empowerment," "community," and "united"— are linked to "handmade products" and "artisans," suggesting a focus on sustainability and cooperation.

Moreover, the terms "extortion" and "access to financing" express concerns and significant challenges for *nenis* in this region. Overall, this dense network of interconnected terms reflects a strong emphasis on innovation and creativity, illustrating how *nenis* seek to differentiate their products through innovative and community-driven strategies.

Correspondence Analysis

Finally, through a Correspondence Analysis (CA), association patterns between posts on X across four geographical regions were identified.[3] To facilitate the interpretation of the CA, Figure 8 displays only the statistically significant results. For example, in the southeastern region, most mentions highlight the challenges of scaling entrepreneurship, which are attributed to distrust in online transactions, limited access to technology and internet services, lack of support or business development programs, and inefficient delivery services for goods and products. Additionally, this region expresses a greater demand for government commitment in terms of foreign investment and the involvement of multinational corporations. Conversely, in the northern region, posts emphasize the advantages of proximity to the United States, rapid adoption of technology, access to financing, business incubation programs, and coworking spaces. However, concerns about unfair competition from large corporations are also frequently mentioned.

Discussion of Results

The social and media dynamics of the *nenis* phenomenon in Mexico were analyzed using six data mining techniques: descriptive analysis, geospatial analysis, hashtag-based thematic analysis, sentiment analysis, co-occurrence networks, and correspondence analysis. This methodology contributed to quantifying social perception of the phenomenon by categorizing key terms, themes, and discussion

3 These regions are: 1) Central (Mexico City, Mexico State, Guerrero, Hidalgo, Morelos, Puebla, and Tlaxcala; 2) West (Aguascalientes, Colima, Guanajuato, Jalisco, Michoacan, Nayarit, Queretaro, and Zacatecas); 3 North (Baja California, Baja California Sur, Coahuila, Durango, Chihuahua, Sinaloa, Sonora, Nuevo Leon, San Luis Potosi, and Tamaulipas); and 4) Southeast (Campeche, Chiapas, Oaxaca, Quintana Roo, Tabasco, Veracruz, and Yucatan).

topics among users of the digital platform X, as well as identifying complex patterns and relationships within these perceptions.

Previous studies have explored the *nenis* phenomenon using X data, examining various dimensions with different analytical approaches (Delfín *et al*., 2022; Valdez, 2023; Alcántara *et al*., 2022). However, few studies have proposed measuring georeferenced social perception at the state level, based on post diffusion and regional discussion trends. Although these studies quantify the phenomenon using diverse techniques, none incorporate thematic analysis or correspondence analysis.

The findings of this study align with previous research by Alcántara *et al*. (2022), García and González (2022), Hernández *et al*. (2021), Utrera (2023), and Cerón *et al*. (2023) regarding female empowerment, self-employment, and digital entrepreneurship during periods of crisis. Specifically, they confirm the role of women in the digital market and informal commerce as a means of economic survival in highly vulnerable environments.

Nevertheless, due to the lack of studies combining complementary methods or yielding comparable results, the alternative approach proposed in this research is highly relevant. It provides a detailed understanding of regional variations in social perceptions and experiences of *nenis*, highlights the importance of self-employment and female empowerment, and reveals the geographical barriers and inequalities faced by these entrepreneurs across different regions of Mexico.

Conclusion

This study examined the social perception of *nenis* using a text mining and natural language processing approach to analyze data extracted from the digital platform X. Through Big Data and Text Mining techniques, a geospatial perception index was constructed, offering a novel method to detect regional variations in mentions of the phenomenon, diversity in public perception, and the challenges and opportunities these entrepreneurs face.

This approach allowed for the identification of patterns and trends in the social perception of *nenis* from a comprehensive and multidimensional perspective, highlighting the importance of digital

platforms as tools for empowerment and economic development for women in Mexico.

Accordingly, the northern and central-southern regions of the country —particularly in major cities— exhibited the highest levels of discussion on the topic. In general, *nenis* in these regions face challenges related to access to resources, institutional support, and transaction security. Comparatively, the north stands out for its proximity to international markets and rapid adaptation to technology, whereas the south is characterized by strong community support but also faces technological infrastructure and transportation challenges.

In the northern region, this is reflected in the strong connection between terms related to technology, competitiveness, and female leadership, suggesting a tendency toward technological adaptation and benefits from proximity to the United States, which facilitates product imports and access to foreign markets. However, challenges such as sales fraud necessitate the implementation of more robust verification and security systems to protect these entrepreneurs.

In the southern region, terms such as "entrepreneurial community," "united artisans," "handmade," and "community projects" indicate a strong reliance on artisanal products and community support. However, these entrepreneurs also face significant obstacles, including limited access to financing and extortion in sales, which are exacerbated by poor technological infrastructure and inefficient transportation systems. Nonetheless, a strong sense of community and cooperation helps them collectively confront these challenges.

These findings suggest that strengthening female entrepreneurship requires reforms tailored to each region's needs, with a focus on improving technological infrastructure, providing access to financing and training, and enhancing security in digital transactions. Additionally, fostering a supportive community environment and facilitating networks among entrepreneurs is crucial for resource sharing and knowledge exchange.

In summary, the results underscore the importance of understanding regional variations in the perception and experiences of *nenis* to design more effective policies and support programs. This knowledge should be leveraged to acknowledge the significance of digital platforms and social networks as tools for economic development and female empowerment.

Limitations and Recommendations

This study presents several limitations that must be considered when interpreting the results regarding the social perception of *nenis* in Mexico. First, the analysis is based on data from the digital platform X, a widely used social network but one that does not necessarily reflect the diversity of opinions and experiences of the entire Mexican population. Additionally, although text mining techniques and Big Data models are powerful tools for processing large volumes of information, these methods depend on the quality and authenticity of the analyzed data. The ambiguity and sarcasm present in digital publications may also complicate semantic and sentiment analysis, introducing potential errors in interpretation.

Furthermore, the classification and analysis of publications based on hashtags and keywords may introduce biases if the selection is not sufficiently representative. The variability in language use may lead to misinterpretations of the actual intentions or sentiments of users. Another crucial aspect is that, while this study covers all federal entities, the concentration of data in urban areas limits the generalizability of findings to rural contexts, where social dynamics may differ significantly. Finally, by using a cross-sectional data design, this study faces limitations in establishing causal relationships and analyzing long-term trends related to the social perception of *nenis*.

To overcome these limitations and improve the accuracy of future studies, it is recommended to diversify data sources, incorporating other digital platforms and social networks to capture a broader range of opinions. Additionally, complementing quantitative analyses with qualitative methods, such as interviews or regional surveys, would help validate the results and provide a more comprehensive perspective. Conducting longitudinal analyses with data collected over different periods would also allow for the identification of trends and long-term dynamics.

Moreover, refining text mining algorithms could enhance the detection and interpretation of ambiguous language and sarcasm, reducing potential errors in the analysis. Finally, implementing a more specific geographic segmentation that considers differences between urban and rural areas would lead to more representative and generalizable findings at a national level. These recommendations

aim not only to address the identified limitations but also to advance knowledge on the social perception of the *nenis* phenomenon and its socioeconomic impact in Mexico.

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Annex

Table 1
Geographical Coverage

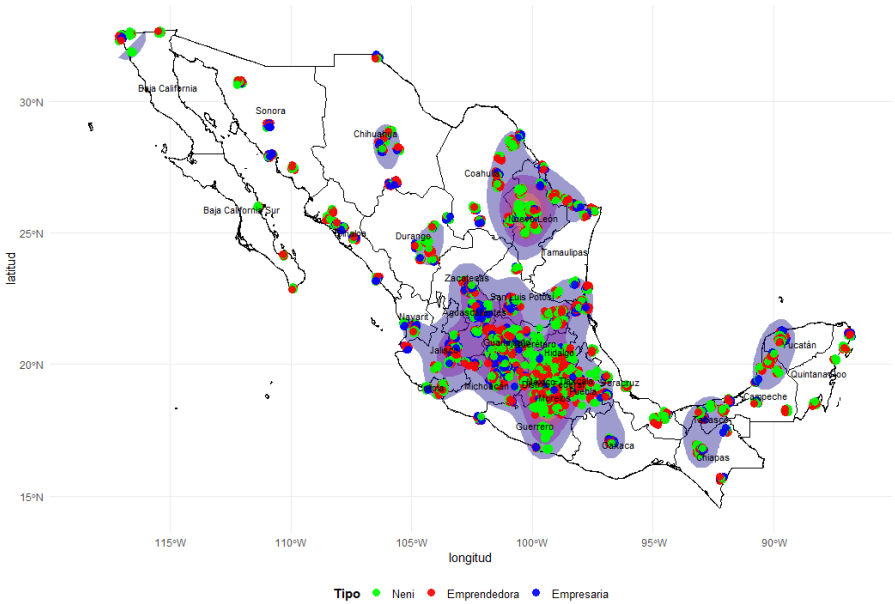
Entity	Total Municipalities	Detected Municipalities	Coverage	Total Posts	TCH	GTH	GTP
Aguascalientes	11	7	63.6%	752	51.9	High	High
Baja California	7	5	71.4%	531	14.1	Medium	Medium
Baja California Sur	5	3	60.0%	109	13.6	Medium	Very low
Campeche	13	2	15.3%	93	10.1	Medium	Very low
Chiapas	125	7	5.6%	266	2.7	Very low	Medium
Chihuahua	67	9	13.4%	258	4.7	Very low	Medium
Ciudad de Mexico	16	16	87.5%	12,856	139.6	Very high	Very high
Coahuila de Zaragoza	38	13	34.2%	204	6.2	Low	Low
Colima	10	4	40.0%	173	23.6	High	Low
Durango	39	8	20.5%	542	1.6	Very low	High
Guanajuato	46	12	26.1%	567	30.1	High	High
Guerrero	81	14	17.2%	103	2.8	Very low	Very low
Hidalgo	84	28	33.3%	793	24.5	High	High
Jalisco	125	15	12.0%	696	8.3	Low	High
Estado de Mexico	125	93	74.4%	9,741	54.6	Very high	Very high

Entity	Total Municipalities	Detected Municipalities	Coverage	Total Posts	TCH	GTH	GTP
Michoacan	113	12	10.6%	637	12.8	Medium	High
Morelos	36	26	72.2%	1,804	91.4	Very high	Very high
Nayarit	20	4	20.0%	121	8.9	Low	Low
Nuevo Leon	51	23	45.1%	3,040	52.5	Very high	Very high
Oaxaca	570	5	0.87%	148	3.5	Very low	Very low
Puebla	217	94	43.3%	2,252	34.2	High	Very high
Queretaro	18	14	77.7%	1,928	76.4	Very high	Very high
Quintana Roo	11	5	45.4%	465	24.3	High	Medium
San Luis Potosi	58	14	24.1%	190	6.5	Low	Low
Sinaloa	18	6	33.3%	348	11.2	Medium	Medium
Sonora	72	6	8.33%	119	3.9	Very low	Very low
Tabasco	17	4	23.5%	158	6.5	Low	Very low
Tamaulipas	43	14	32.5%	294	8.2	Low	Low
Tlaxcala	60	12	20.0%	310	22.3	High	Low
Veracruz	212	12	5.66%	450	5.5	Low	Medium
Yucatan	106	5	4.71%	328	13.7	Medium	Medium
Zacatecas	58	7	12.1%	136	8.2	Low	Very low
Total	2 472	499	32.93%	40 412			

TCH: Rate per one hundred thousand inhabitants.
GTH: Degree per rate per one hundred thousand inhabitants.
GTP: Degree per total posts.
Source: Own elaboration based on data collected from X.

Figure 1

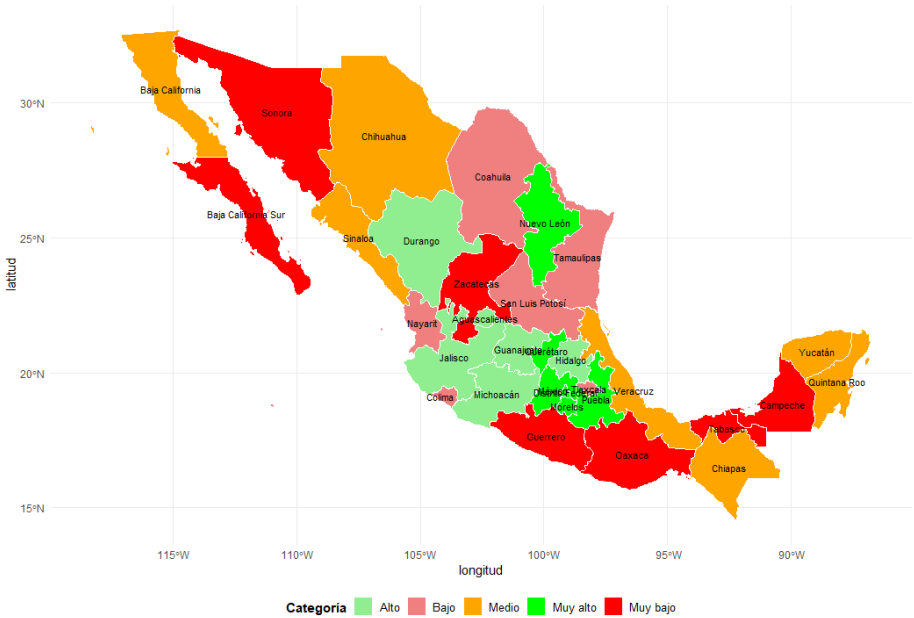
Geospatial Distribution of *Nenis* in Mexico



Source: Prepared by the authors based on data collected in X.

Figure 2

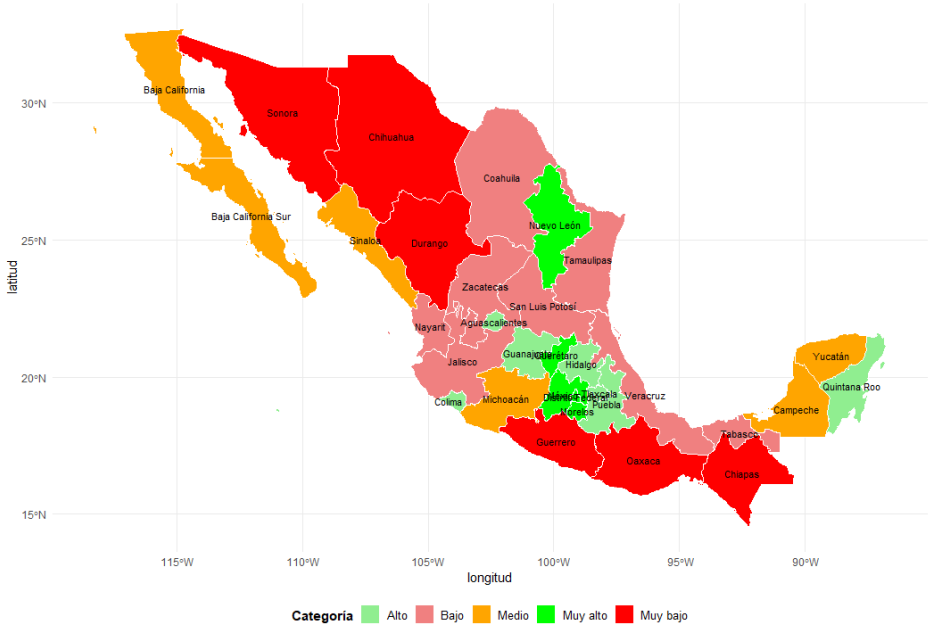
Degree of Social Perception of the *Nenis* Phenomenon (per 100,000 inhabitants)



Source: Prepared by the authors based on data collected in X.

Figure 3

Degree of Social Perception of the *Nenis* Phenomenon



Source: Prepared by the authors based on data collected in X.

Figure 4

Most Used Words About the *Nenis* Phenomenon

Source: Prepared by the authors based on data collected in X.

Figure 5

Analysis of Sentiments on the *Nenis* Social Phenomenon

Source: Prepared by the authors based on data collected in X.

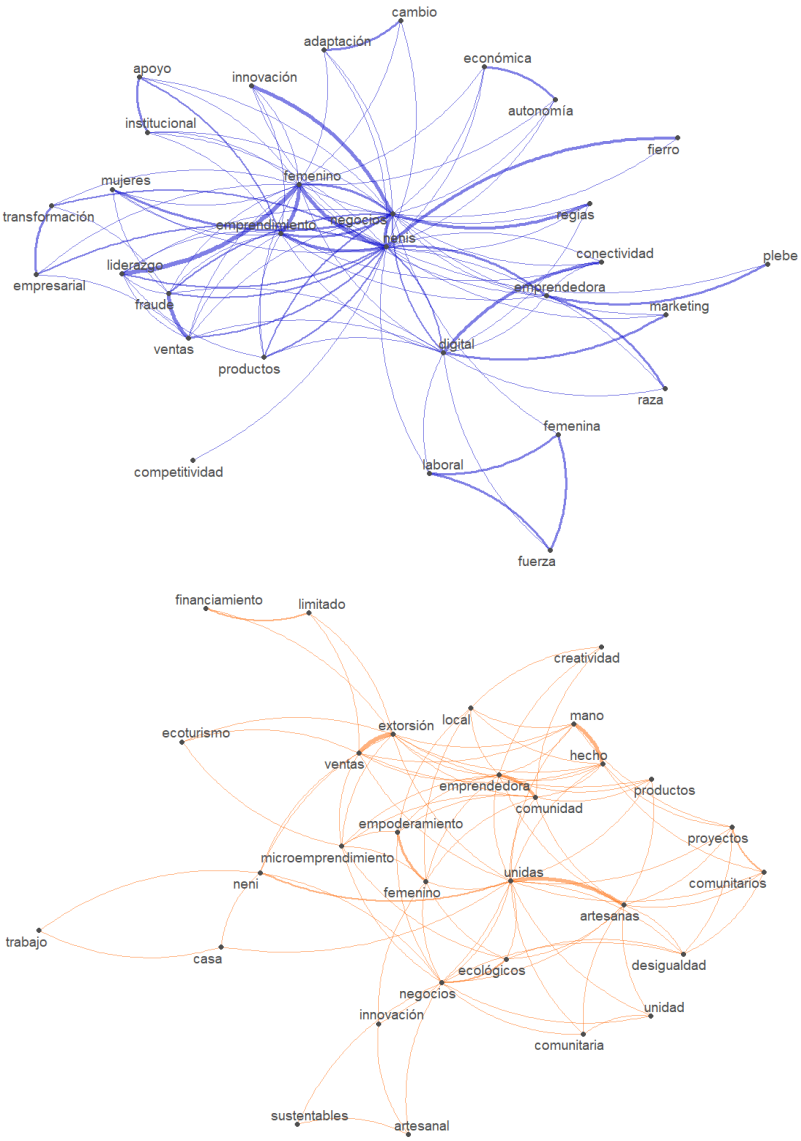
Figure 6

Analysis of Emotions on the *Nenis* Phenomenon

Source: Prepared by the authors based on data collected in X.

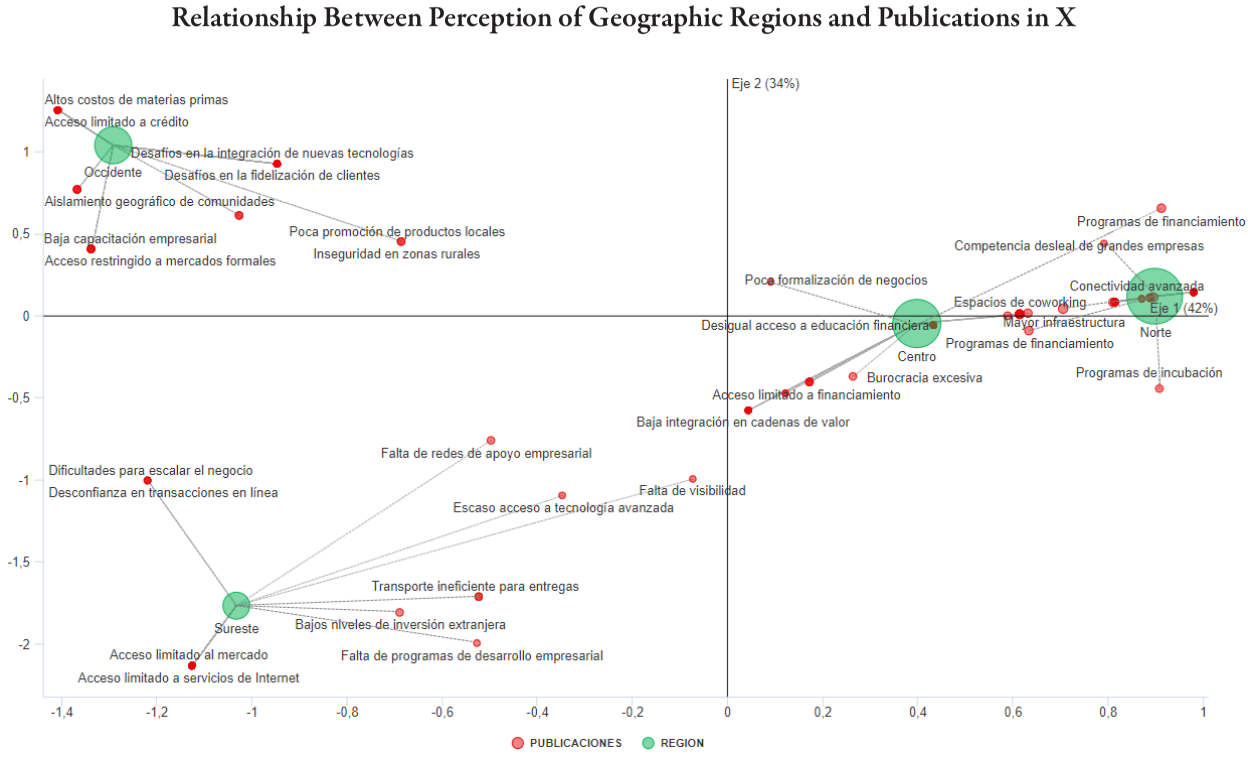
Figure 7

Network of Word Clusters from Northern and Central-Southern Mexico



Source: Prepared by the authors based on data collected in X.

Figure 8



Source: Prepared by the authors based on data collected in X.

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