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Article

Assessing sales performance gaps by gender and indigenous identity among Mexican entrepreneurs

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Abstract: The purpose of this research is to estimate the differences in sales levels between businesses owned by individuals who self-identify as Indigenous (IE) and those who do not (NIE), as well as between males (ME) and females (WE), and how this intersection may affect their sales levels. To accomplish this, an Analysis of Variance (ANOVA) is used to compare the means between the groups analyzed, and Tukey's Honestly Significant Differences (HSD) is used to determine the magnitude and direction of these differences. The results of the study show that indigenous-owned businesses have sales that are 26% lower than the general average, while women-owned businesses have sales that are 70.6% lower in the same comparison. In addition, businesses run by indigenous women have sales that are 93.5% lower on average. These findings suggest that the challenges faced by entrepreneurs reflect the structural inequalities observed in other areas of society and highlight the need for public and private policies focused on reducing these gaps.

Keywords: entrepreneurship; self-employment; indigenous people

1. Introduction

In Mexico, according to the 2020 Census of Population and Housing, an estimated 23.2 million people over the age of 3 identify themselves as indigenous, representing 19.4% of the country's total population. Quantifying this group is complex and varies depending on how it is conceptualized. At the community level, indigenous peoples can be identified based on historical, cultural, linguistic, territorial, religious, and other factors. At the individual level an indigenous person is someone who self-identifies as a member of these indigenous populations (Cobo, 1986).

Evidence suggests that poverty and belonging to an indigenous community are positively correlated. Internationally, people who belong to an indigenous group are more likely to live in poverty than non-indigenous people in the same country (Hall and Patrinos, 2006; Psacharopoulos and Patrinos, 1994). In Mexico, 71.9% of the indigenous population lives in moderate poverty and 28.5% in extreme poverty, compared to the non-indigenous population, where 39.5% live in poverty and 6.3% in extreme poverty (CONEVAL, 2022). This situation is linked to several factors, including historical marginalization, lack of access to education and health care, and limited economic opportunities.

There is growing interest in the relationship between entrepreneurship and poverty due to its potential impact on economic development, innovation and access to resources (Moradi et al.,2020). Entrepreneurship has been proposed as a possible solution to alleviate poverty (Álvarez and Barney, 2014; Yunus, 1998). In this context,

it is essential to consider factors such as access to financial resources, government support, training, and the overall business environment.

Within this framework, the concept of indigenous entrepreneurship has gained relevance. It is argued that indigenous entrepreneurship promotes self-determination, economic independence and the preservation of traditions within their communities (Henry et al, 2018). However, the goals and outcomes of businesses, organizations, or regions led or operated by indigenous individuals, compared to other types of leadership, remain underexplored.

This type of entrepreneurship is characterized by the use of traditional ecological knowledge for biodiversity conservation, participation in land management markets, and the creation of protected areas managed or co-managed by indigenous peoples (Hill et al., 2013). Unlike conventional entrepreneurship, which often focuses on individual profit, indigenous entrepreneurship places a strong emphasis on community well-being (Ratten and Dana, 2017).

There is a need to better understand the relationship between performance variables, such as sales levels, productivity, or market participation, and the fact that these businesses or enterprises are led by indigenous individuals. Exploring this relationship could help to identify whether significant differences exist, understand their causes and, if necessary, propose actions to reduce inequality gaps. This paper contributes to the literature on indigenous entrepreneurship in three ways. First, indigenous entrepreneurship is a relatively new topic in the analysis of social entrepreneurship, and the existing literature is limited and mostly from developed countries. Therefore, there is a need to expand knowledge by drawing on the experiences of developing countries (Acs et al., 2018). Second, we extend the theoretical and empirical framework on indigenous entrepreneurship and distinguishes it from conventional entrepreneurship. Third, it highlights the income gap between conventional and indigenous entrepreneurs, with the aim of highlighting the impact of entrepreneurship on economic development and reducing inequality.

Following the above, the objective of this research is to estimate the differences in sales levels between businesses owned by individuals who self-identify as indigenous and those owned by individuals who do not. It also seeks to estimate the differences between businesses owned by women and those owned by men. Furthermore, from an intersectionality perspective, the research aims to evaluate how the combination of these characteristics affects sales. To achieve this, an analysis of variance (ANOVA) will be used to compare the means between the groups analyzed, and Tukey's Honestly Significant Differences (HSD) will be used to determine the magnitude and direction of these differences, using data from the National Income and Expenditure Surveys for the years 2016 to 2022. The structure of the document is as follows: The second section analyzes the empirical and theoretical review of indigenous entrepreneurship, as well as cross-country comparisons. The third section discusses the methodology and data used in this research. The fourth section presents the findings and discussion. The fifth section includes the limitations and future research directions, while the final section presents the conclusions.

2. Theoretical and empirical review

Entrepreneurial dynamics play a fundamental role in a country's economy, especially in developing countries (Bruton et al., 2013). Through entrepreneurship, it is possible to address cross-cutting issues such as poverty (Paredo et al., 2004), and structural gaps between business sizes. In this context, it is important to distinguish between indigenous and conventional entrepreneurship. Contributions such as (Anderson et al., 2006) develop a theoretical framework that distinguishes between the two types of entrepreneurships and highlights their specificities.

From a development economics perspective, indigenous entrepreneurship explores more complex issues such as culture, social commitment, community well-being and intrinsic factors of entrepreneurs such as self-determination (Dana, 2015). For example, to explain this scenario, cultural perceptions of opportunity must be considered as a variable that triggers entrepreneurship, meaning that culture has a strong influence on firm creation (Mendoza-Ramos and Prideaux, 2018).

In Latin America, various studies have highlighted the impact of Indigenous entrepreneurship on the economic and social empowerment of Indigenous communities. In Mexico, research has shown that Indigenous entrepreneurs contribute to the economic empowerment of their communities, particularly in the tourist areas of Yucatán (Eichler, 2017). Similarly, in Bolivia, studies have found that leadership within cooperatives not only strengthens the economic autonomy of Indigenous communities, but also brings them closer to the defense of land and human rights (Zapalska and Brozik, 2017).

Indigenous entrepreneurship also plays a key role in women's empowerment. This impact can be observed from a meso-economic perspective and in the cultural cohesion of their communities (Acs et al., 2018). A relevant case is that of indigenous women entrepreneurs in the tourism sector in New Zealand, who have successfully developed sustainable businesses while preserving their cultural identity (Zapalska and Brozik, 2017). Beyond cultural preservation, numerous studies have highlighted that many Indigenous enterprises emerge with the aim of protecting and caring for the environment (Molina-Ramírez and Barba-Sánchez, 2021; Zapalska and Brozik, 2017).

From a socio-cultural perspective, case studies conducted in Mexico through in-depth interviews have shown that one of the main drivers of indigenous entrepreneurship is the socio-cultural context in which these entrepreneurs operate (Macpherson, 2021). In this regard, comparative studies in Chile and New Zealand have shown differences in the economic and social contexts of the two countries. While indigenous entrepreneurs in Chile rely heavily on their culture and family support networks, indigenous entrepreneurship in New Zealand is more influenced by a stable and prosperous political and economic environment (Rodríguez-Fernández et al., 2011).

Rootedness, identity, communality (a shared way of life) and worldview play a fundamental role in the success of Indigenous business ventures and have a positive impact not only on the entrepreneurs but also on their communities (Macpherson, 2021). On the other hand, ethnographic studies in Bolivia and Mexico have shown that indigenous women-led enterprises often serve as a strategy to combat exclusion and segregation in the labor market. However, these studies also show that in their quest

for financial independence and social recognition, many women entrepreneurs endure conditions of self-exploitation and precariousness within their own businesses (Stavenhagen, 1992).

2.1. Self-identification and indigenous people

International law, through instruments such as ILO Convention 169 and the United Nations Declaration on the Rights of Indigenous Peoples, provides a legal basis for defining indigenous peoples. These instruments emphasize elements such as: a) Direct descent from populations that inhabited a territory prior to colonization, and; b) the maintenance of their own social, economic, cultural and political institutions, even if these have been modified over time.

This conceptualization poses several challenges. Identifying the "original" inhabitants of a region can be a complex task that depends on the temporal framework used, since dynamics of conquest, displacement, and subjugation existed even before colonization. In addition, determining the extent to which an institution can be "modified" before it is no longer considered indigenous is a significant challenge.

Identifying an individual as indigenous requires a multi-perspective and cautious approach. According to Stavenhagen (1992), "indigeneity is the result of top-down and bottom-up government policies" characterized by a process of historical injustice, dispossession, and servitude.

Bonfil (2020) suggests a distinction between "indigenous" and "ethnic group". The former is associated with colonization and is considered conceptually broader than ethnicity, in the sense that it can encompass one or more ethnic groups, which in turn are subsets within a broader society. On the other hand, according to Bonfil, "ethnic group" refers to a "specific historical entity that shares a common past and a set of distinctive communication codes and relationships".

In general, any attempt to define the indigenous population based on a single criterion is considered inadequate, and categorizations based solely on aspects such as language or region are discarded. However, when attempting to estimate the size of this population through income surveys or censuses, it is necessary to formulate specific questions that capture the complexity of indigenous identification. In this sense, the respondent's self-identification can encompass the multiple dimensions of indigenous identity through a self-identification question (Wilson, 2001).

Self-identification is based on social identity theory, which suggests that individuals categorize themselves as belonging to different groups, such as a professional group, a fan base of a particular music band, or as people with or without children. Along with this self-categorization, individuals also evaluate the groups they feel they belong to (in-groups) and the groups they do not feel they belong to (out-groups) (Trepte and Loy, 2017). This type of categorization will be used in this study.

2.2. Entrepreneurship and self-employment

From the earliest studies of entrepreneurship, it has been noted that it is inherently associated with change, creativity, and innovation. Schumpeter (1911) referred to this concept as "creative destruction", describing the process of introducing goods or services that displace existing ones, thereby creating or segmenting new markets.

Baumol classifies entrepreneurship according to its objectives. Productive entrepreneurship contributes to social welfare, including the introduction of new products or production processes. In contrast, unproductive entrepreneurship aims to obtain transfers, often through rent-seeking or violence. Entrepreneurship becomes destructive when resources are used for rent-seeking or expropriation (Baumol, 1996). While unproductive entrepreneurship can lead to economic inefficiency and suboptimal resource allocation, destructive entrepreneurship has far more serious consequences, such as environmental damage, significant economic losses, and social degradation. Unproductive entrepreneurship often operates within legal boundaries, sometimes exploiting loopholes or inefficiencies, while destructive entrepreneurship often involves illegal activities.

An analysis of the relationship between institutional development, entrepreneurship and social value suggests that a robust institutional framework enables entrepreneurship to generate social value at the aggregate level. At the individual level, however, entrepreneurs can both create and destroy social value (Lucas and Fuller, 2017). This analysis underscores the importance of appropriate regulation and the allocation of financial resources to projects that generate social value not only at the aggregate level, but also at the firm level.

Complementary to this, the concept of evasive entrepreneurship has been developed. This is defined as "market-driven entrepreneurial activity that seeks to circumvent the existing institutional framework by using innovation to exploit contradictions within that framework" (Elert and Henrekson, 2016). In rigid labor markets, evasive entrepreneurship often takes the form of self-employment. Individuals who are unable to find formal employment or who find formal wages inadequate often provide goods and services irregularly or informally through self-employment or microenterprises.

Another classification of entrepreneurship is based on motivation (Hechavarria and Reynolds, 2009). On the one hand, there is necessity-driven entrepreneurship, which results from a lack of other options or alternatives. Although these ventures can sometimes be a catalyst for innovation, they are often associated with lower rates of growth and innovation. Opportunity-driven entrepreneurship, on the other hand, involves businesses that are started to take advantage of an innovative idea or a market opportunity.

Variation in the level of overall entrepreneurship has a significant impact on factors such as employment and economic development (Ramírez-Urquidy, 2022). The nature and direction of these effects depend on several factors, including the type of entrepreneurship, the prevailing business structures in each region, the adaptability of firms to economic fluctuations, and the average size of firms in different regions. For the purposes of this study, the terms self-employment and entrepreneurship are used interchangeably, without focusing on whether entrepreneurial activity is driven by necessity or opportunity.

2.3. About indigenous entrepreneurship

The concept of indigenous entrepreneurship has gained prominence as entrepreneurship is explored as an alternative to poverty and inequality (Moradi et al.,

2020). There is ongoing debate as to whether this type of entrepreneurship merits recognition as a distinct field of research (Hindle and Moroz, 2010). This theory suggests that indigenous entrepreneurship promotes self-determination, economic independence and the preservation of traditions in indigenous communities (Henry et al., 2018).The proposed definition is as follows: "Indigenous entrepreneurship is an activity that focuses on creating new businesses or pursuing economic opportunities-or both-with the goal of reducing indigenous disadvantage through the creation of culturally viable and community-accepted wealth" (Hindle and Moroz, 2010)

Research has advanced in analyzing entrepreneurship in relation to gender (Ramírez-Urquidy, 2022; Sorzano, et al., 2023) the migratory status of individuals (García, 2018), or rural contexts (Paz, 2022). Each of these cases identifies specific challenges and opportunities for harnessing entrepreneurship. However, research on the performance of indigenous businesses in Mexico remains limited, and the challenges faced by members of this social group add additional complexities.

In the context of this paper, these difficulties are reflected in the level of sales. It is assumed that this variable indirectly reflects aspects such as the type of market in which the business operates, the competition it faces, and the types of goods or services it offers, among other factors. Based on that, the following hypothesis can be proposed: Firms run by individuals who identify as indigenous will, on average, perform less well than those run by individuals who do not identify as indigenous.

2.4. The relationship between gender and entrepreneurs

There is an extensive literature on the relationship between the gender of entrepreneurs and the challenges faced by women entrepreneurs. Numerous studies show that women face specific obstacles compared to their male counterparts, including limited access to finance, smaller business support networks, and the persistence of gender stereotypes that affect their ability to develop and scale businesses.

Various theories that address the relationship between entrepreneurship and feminism have been grouped together (Greer and Greene, 2003; Minniti and Arenius, 2003). Greer and Greene suggest understanding this relationship through three feminist perspectives: Liberal, Marxist, and radical (Greer and Greene, 2003). The liberal perspective assumes that women and men are autonomous and equal individuals. Thus, observed differences in entrepreneurial activity and performance are attributed to legal or institutional barriers. Although some of these barriers to women's entrepreneurship have been reduced over time, their cumulative effects remain significant, particularly in terms of participation and performance. These institutional barriers include disparities in the type and level of education (Minniti and Arenius, 2003), prior labor market participation and entrepreneurial experience (Alene, 2020; Lerner, 1997), social and support networks (Jha and Alam, 2022)., and the quality and accessibility of formal and informal financial systems (Chaudhuri et al., 2020; Morsy, 2020).

The Marxist perspective argues that unpaid domestic work, which women do in significantly greater proportions than men, puts them at a disadvantage in terms of market participation and remuneration. Women often turn to entrepreneurship to

overcome this disadvantage (Patrick et al., 2016) Some studies suggest that women's entrepreneurship may reproduce the inequalities of an oppressive system rather than serve as a mechanism for economic liberation (Goffee and Scase, 2015). In this context, women's entrepreneurship may provide an alternative for balancing domestic work and market participation. Several studies have examined this phenomenon by estimating how factors such as marriage, having young children, or having caregiving responsibilities affect business performance. In most cases, these characteristics have a negative impact on business outcomes (Duncan, 1994).

From a radical feminist perspective, while biological differences exist between men and women, they are not the root cause of societal inequalities (Duncan, 1994). Instead, radical feminism argues that differences in behavior and attitudes are largely due to socialization and cultural conditioning that perpetuate gender roles tied to sex (Liñán et al., 2022). Biological experiences may influence certain aspects of women's lives, but radical feminism does not see these experiences as necessarily leading to certain attitudes, such as caregiving or conflict resolution. Instead, it emphasizes that the expectations of care and submission placed on women are cultural constructions designed to maintain their subordination and perpetuate male dominance (Shahriar, 2018).

This perspective views differences in entrepreneurship and business performance as the result of a system that marginalizes women in favor of men. Market institutions often favor men, as evidenced by limited access to financial systems and limited opportunities to build support networks for their businesses (Bui et al., 2018). In addition, gender roles in certain communities may marginalize women or impose social costs as a result of this system (Baughn et al., 2006). Proponents of this perspective suggest the creation of spaces specifically designed and implemented for women, such as training groups, financial products, and even special markets. On this basis, the following hypothesis is proposed: Firms run by women perform worse on average than those run by men.

2.5. Intersectionality and entrepreneurship

Intersectionality is a theoretical approach that originally proposed that the intersection of race and gender shapes the way individuals experience social phenomena such as discrimination or violence (Crenshaw, 1991). This concept has since been expanded to include other intersections such as socioeconomic status (Saatcioglu and Corus, 2014), sexual orientation (Taylor et al., 2010), gender (Shields, 2008), migration status (Bastia, 2014), and religion (Essers et al., 2010). Fundamentally, this approach suggests that these characteristics do not independently influence a person's life, but rather interact to shape their social experiences, including entrepreneurship. The context in which individuals from vulnerable groups live and develop can be a significant trigger in the decision to pursue entrepreneurship. Recent evidence demonstrates that these challenges increase the likelihood that unemployed individuals, migrants, people with physical disabilities, those with attention deficit-hyperactivity disorder, and war veterans will embark on entrepreneurial endeavors (Forson, 2013; Knight, 2016); this type of entrepreneurship is known as underdog entrepreneurship. Similarly, in line with the intersectionality perspective, the

previously listed characteristics do not depend directly on the individual, yet they influence how one relates to the entrepreneurial environment and contribute to the development of certain traits that can be advantageous when facing the challenges inherent in entrepreneurship.

Research on intersectionality in entrepreneurship is an emerging field (Dy and MacNeil, 2023). This perspective has been used to examine work-life balance and how power relations and social interactions within and across cultural, structural, and agency dimensions influence the operation of immigrant women-owned businesses (Knight, 2016). It has also highlighted the complexity of racialized women's experiences, struggles, and resistances in specific contexts and how these factors affect entrepreneurial performance (Forson, 2013). The relationship between intersectionality and entrepreneurship has been proposed as a threshold concept for studying inequalities in different types of entrepreneurships and their contexts Dy and MacNeil, 2023). From this perspective, understanding entrepreneurship through the lens of intersectionality provides a new starting point for conceptualizing and empirically studying entrepreneurial activity (Dy and MacNeil, 2023).

Ratten and Dana expands on the relevance of incorporating a gender perspective into the study of indigenous entrepreneurship with an intersectional approach. It argues that women entrepreneurs possess traits that align with the goals of community-based enterprises, which form the foundation of indigenous societies (Essers et al., 2010). From the adversity quotient perspective, ventures led by indigenous women experience a variety of adversities stemming from their gender and ethnic background. Consequently, they seek to take control of the situation through resistance and persistence, and they assume responsibility for improving their circumstances (Forson, 2013).

On this basis, the following hypothesis is proposed: Businesses run by individuals who identify as both women and Indigenous will, on average, have lower sales than their counterparts. The difference between these groups will be greater than when these characteristics are considered separately.

3. Materials and methods

Publicly available data from the National Survey of Household Income and Expenditure (ENIGH) were used for the period 2016 to 2022. This survey, conducted every two years, provides an overview of household income and expenditure in Mexico. The questionnaire identifies individuals' sources of income; for this study, only individuals who reported earning their income as independent workers were selected. The survey defines an independent worker as "a person who manages his or her own company or business without having a boss or supervisor to whom he or she reports his or her performance or results". For the purposes of this study, independent workers are considered to be entrepreneurs.

The same survey collects information on the gender of the entrepreneur and includes the following question: "According to the culture of (…), does he/she consider himself/herself to be indigenous?" If the respondent answers in the affirmative, he or she is classified as an indigenous entrepreneur (IE). Conversely, those who answer negatively are classified as non-indigenous entrepreneurs (NIE).

The survey also includes information on quarterly business sales. For descriptive statistics, sales data were converted to U.S. dollars for each period; however, for subsequent analysis, the values remain in pesos, with the corresponding dollar amounts in parentheses. First, the study examines how inequalities are distributed among the groups studied as sales increase. This is done by constructing percentiles for each group and calculating the gap for the four periods analyzed (Arceo-Gómez and Campos-Vázquez, 2014).

An analysis of variance (ANOVA) was performed to estimate whether there are statistically significant differences in sales levels between the groups being compared. Revenue data does not follow a normal distribution and is significantly skewed due to outliers reporting unusually high quarterly revenues. However, assuming normality for the residuals in ANOVA models is only necessary for small samples. Thanks to the Central Limit Theorem, even extreme violations of the normality assumption are not problematic for samples consisting of several hundred participants (Lumley et al., 2002).

In addition, Tukey's honestly significant differences (HSD) (Appendix A) test was used. This post hoc method is used in ANOVA to make multiple pairwise comparisons of group mean. It is particularly useful after finding a significant ANOVA result to determine which specific groups differ from each other.

4. Results and discussions

4.1. Descriptive results

Descriptive data are presented in **Table 1**. It is noteworthy that the percentage of Indigenous Entrepreneurs (IE) ranged from 35% to 38% during the period analyzed, a significantly higher figure compared to the 19.4% of the general population in Mexico who self-identify as Indigenous. The income data presented are quarterly and expressed in nominal terms, which shows a wide dispersion.

Sales growth followed a similar trend across groups: An increase between 2016 and 2018, a decline from 2018 to 2020, and a resumption of growth in the final period from 2020 to 2022. The percentage of women entrepreneurs (WE) ranged from 56.4% to 57.2%, while the percentage of IE ranged from 35% to 38.2%.

Table 1. Descriptive statistics.

Subject	Year	Mean	Growth (%)	Standard Deviation	*n*	%
All observations	2016	10206		41391	17969	
	2018	11387	11.6%	20602	18984	
	2020	10751	−5.6%	18956	24666	
	2022	16530	53.8%	29359	23847	
Men	2016	14407		54634	7688	43.8%
	2018	16189	12.4%	24868	8217	43.4%
	2020	15240	−5.9%	23633	10572	42.9%
	2022	22850	49.9%	35693	10386	43.6%

Table 1. (*Continued*).

Subject	Year	Mean	Growth (%)	Standard Deviation	*n*	%
Women	2016	7065		27192	10281	57.2%
	2018	7723	9.3%	15665	10767	56.7%
	2020	7384	−4.4%	13545	14094	57.1%
	2022	11654	57.8%	22126	13461	56.4%
No indigenous	2016	10281		11119	10281	63.3%
	2018	10767	13.6%	12626	10767	61.8%
	2020	14094	−7.1%	11720	14094	62.2%
	2022	13461	54.4%	18115	13461	65%
Indigenous	2016	8628		37864	6587	36.7%
	2018	9386	8.8%	18503	7260	38.2%
	2020	9141	−2.6%	16201	9324	37.8%
	2022	13588	48.6%	25305	8349	35%

Note: * The exchange rate for each year is: 20.52 (2016), 20.11 (2018), 19.96 (2020), 19.59 (2022).

Some respondents reported zero income, a phenomenon often observed in self-reported income surveys. To address this methodological challenge, the first step is to determine whether these zero-income responses are randomly distributed across the groups analyzed. In this survey, zero-income responses disproportionately affected women, accounting for 65% to 70% of such cases depending on the period, and IE, accounting for 31% to 37% of such cases (Appendix B, **Table B1**).

Given that the distribution of zero income data is not random, there are three options for dealing with this issue: Impute, remove, or retain the data. Imputation involves estimating these incomes based on other available survey data. However, this option was not considered feasible because the goal of this study is to identify relationships, and previous studies have shown significant biases associated with this method (Bollinger and Hirsch, 2006).

The second option, removing zero sales observations, was also deemed inappropriate because it would result in the loss of valuable information by excluding poorly performing firms. Since the survey reports sales rather than wages, zero sales responses may simply reflect poor performance rather than lack of participation. Therefore, the chosen approach was to conservatively retain zero income observations given their relatively small share of the total observations: 2.8% in 2016, 2.6% in 2018, 3% in 2020, and 2.4% in 2022.

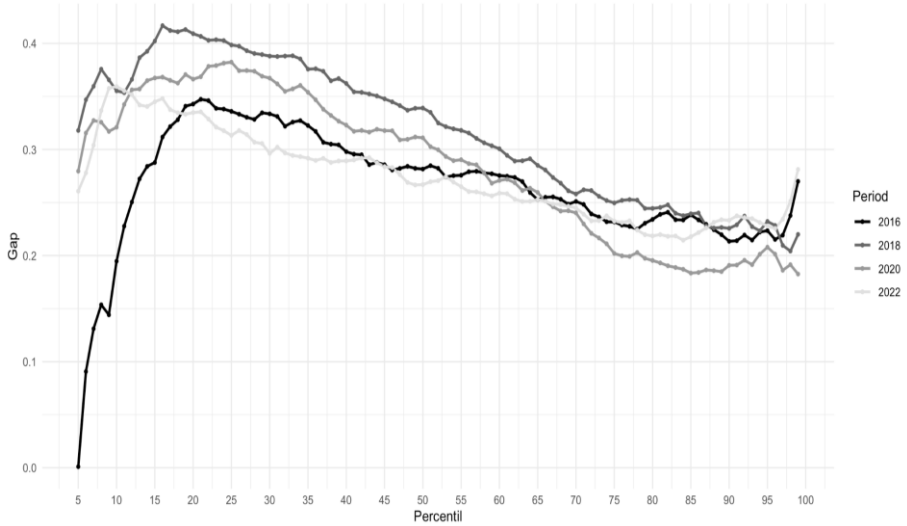

Figure 1. Quarterly sales gap between indigenous and non-indigenous, by percentile and period.

First, a graphical analysis of the gap between the groups of interest was performed. This was done by sorting the sales data from highest to lowest and calculating the ratio. Values above zero indicate a bias in favor of ME NIE, while values below zero indicate a higher income for WE or IE in the given percentile. The closer the ratio is to zero, the smaller the gap, regardless of direction.

The graph starts at the 5th percentile because sales values equal to or very close to zero prevented an accurate calculation of the ratio. The four graphs show a similar trend: As income increases, the gap decreases. However, in some periods—particularly when comparing IE and NIE—the gap widens at the higher percentiles (**Figure 1)**.

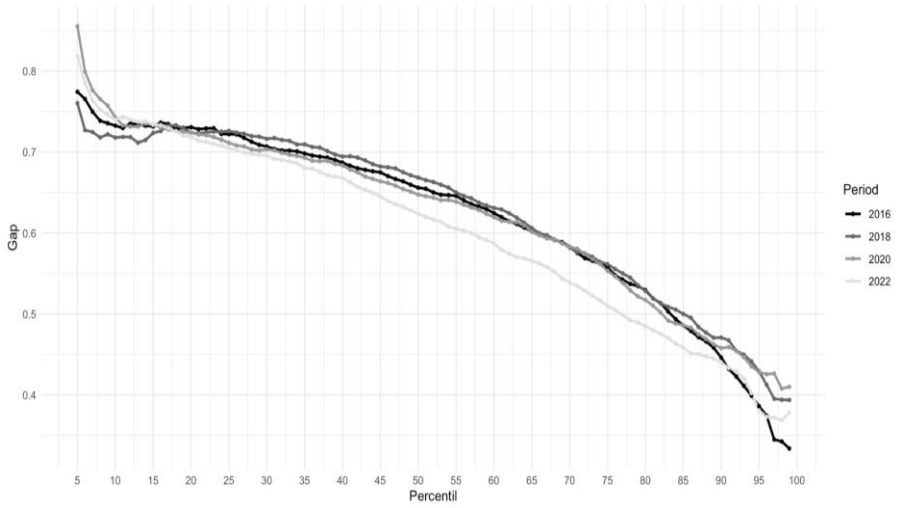

Figure 2. Quarterly sales gap between women and men, by percentile and period.

The narrowing of the gaps as income rises can be attributed to several factors (**Figure 2)**. The first is a statistical effect: At the lower percentiles, small absolute differences translate into relatively large gaps. Another explanation is that high sales income is often achieved in non-traditional sectors of the economy, where consumers

evaluate goods or services based on their quality or price, leaving less room for consideration of other factors.

Finally, the narrowing of the gap can be explained by initial barriers to finance. For entrepreneurs with low sales, self-financing or high-interest loans are often the only options available. However, as sales increase, entrepreneurs gain access to standardized financial products across groups.

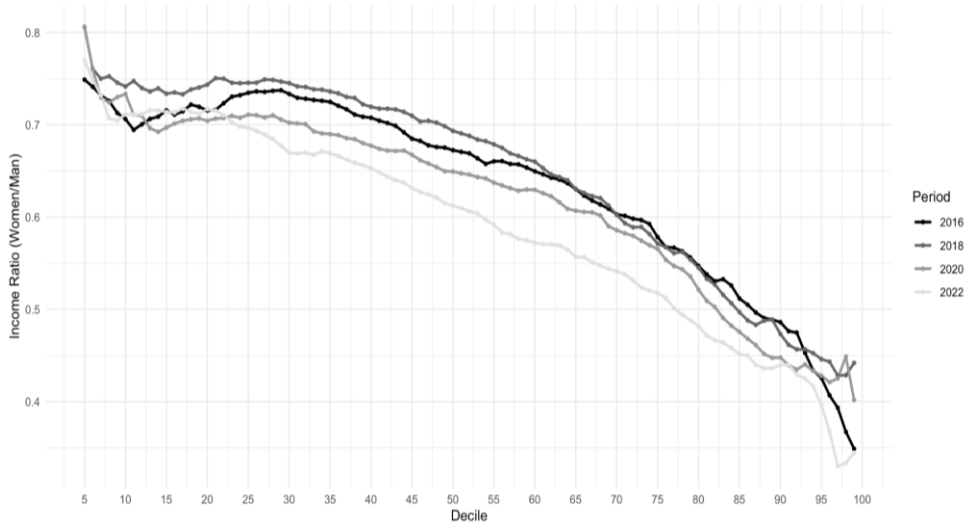

Figure 3. Quarterly sales gap between indigenous women and men by percentile and period.

The gap is never less than zero. However, the smallest difference for the lower deciles among the analyzed groups is observed between IE and NIE, showing a slower decrease as income increases and a reappearance in the higher percentiles.

In the other comparisons, contrasting income between WE and ME the gap is significantly larger. It is unclear whether this gap consistently decreases over time at all income levels. The most compelling graphical evidence is for the ratio between native women and men. In this case, the period 2022 shows a significant reduction compared to the other periods (**Figure 3)**.

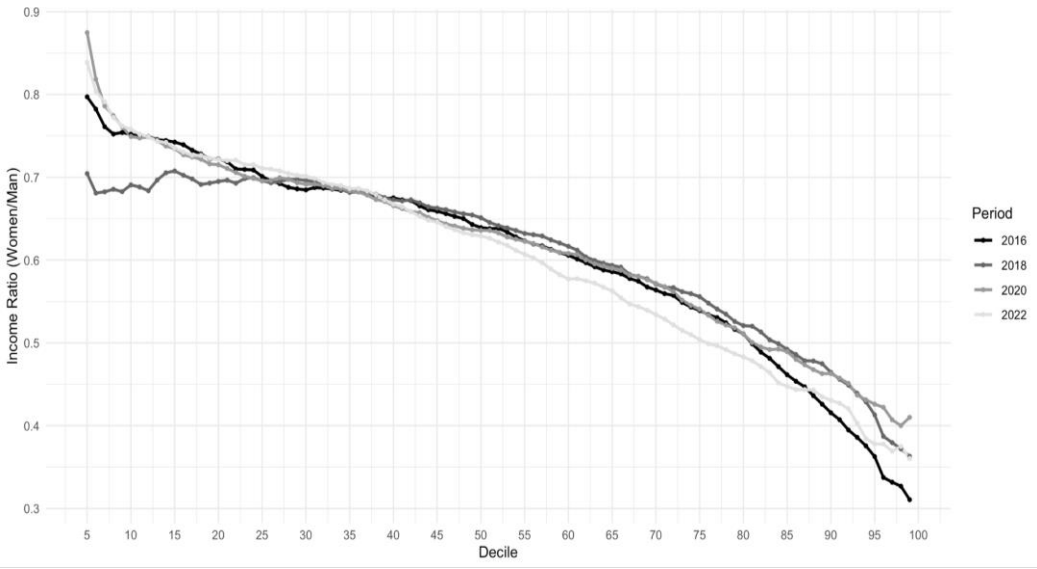

Figure 4. Quarterly sales gap between no-indigenous women and men by percentile and period.

For the period analyzed, the reduction in the gap appears to be more closely related to income growth than to the passage of time. The middle percentiles show the smallest gap in 2022 when comparing ME and WE, suggesting partial success of inclusion efforts and policies. For the comparison between non-Indigenous women and men, it is observed that in the highest deciles, the gap in high-income levels has increased in recent years, with the gap being significantly larger in 2022 compared to 2016 (**Figure 4)**.

However, progress remains to be made at both the lower and higher income levels, referred to as the "sticky floor" and "glass ceiling" respectively. These phenomena highlight the conditions that prevent certain groups from advancing: The "sticky floor" describes barriers that prevent the initial growth of their businesses at the same pace as others, while the "glass ceiling" refers to invisible barriers that prevent businesses from crossing a certain threshold of success.

The results of this study suggest that structural inequalities significantly influence entrepreneurial performance among indigenous and women entrepreneurs in Mexico **(Figures 3** and **4).** In this regard, public policies play a fundamental role in either mitigating or exacerbating these disparities (Moradi et al., 2020).

Various initiatives in Mexico have been designed to support entrepreneurship, including government backed microcredit programs, business incubators, and financing schemes targeted at vulnerable groups. Programs such as *Crédito a la Palabra para Mujeres Emprendedoras* and the *Programa Nacional de Financiamiento al Microempresario (PRONAFIM)* have aimed to improved access to capital for women and marginalized communities (CONEVAL, 2022). However, the effectiveness of these programs in reaching indigenous entrepreneurs remains an area that requires further research.

Despite these efforts, several challenges persist, including limited financial literacy, restricted access to formal credit, and market segmentation that confines indigenous and women entrepreneurs to sectors with lower profitability (Jha and Alam, 2022; Morsy, 2020). Additionally, the intersectional disadvantages identified in this study highlight the need for policies that go beyond financial support, addressing broader structural constraints such as access to education, digital tools, and formal market integration (Essers et al., 2010).

Based on these findings, future entrepreneurship policies should incorporate an intersectional perspective that recognizes the compounded barriers faced by indigenous women entrepreneurs. The implementation of inclusive financial mechanisms, specialized business training, and programs that facilitate market linkages for indigenous owned businesses could contribute to reducing the observed disparities and promoting more equitable economic growth.

Several policies have been implemented in Mexico to support indigenous women entrepreneurs. For instance, the National Institute of Indigenous Peoples has developed micro-loan programs aimed at indigenous women-led businesses, seeking to reduce financial barriers and promote economic autonomy. Additionally, programs such as Social Development Fund (FONDESO) offer micro-financing opportunities with flexible repayment schemes, prioritizing women from marginalized communities (FONDESO, 2023).

Beyond financial access, culturally tailored training programs have also been introduced. The Network of Indigenous Women in Entrepreneurship provides business training that incorporates indigenous languages and traditional knowledge, ensuring that educational content aligns with local economic and social realities (Vázquez-Maguirre, 2019). Similarly, international initiatives such as the Inter-American Development Bank's Women's Entrepreneurship Program have supported indigenous women by offering mentoring and skills development focused on sustainability and market access (IADB, 2022).

Despite these efforts, challenges remain expanding the reach and impact of such programs. Limited awareness, bureaucratic barriers, and the need for greater market integration continue to hinder indigenous women's full participation in entrepreneurial ecosystems. Addressing these gaps requires a more coordinated effort between government agencies, financial institutions, and indigenous organizations to develop policies that enhance access to resources while preserving cultural identity.

4.2. ANOVA and Tukey results

The "sticky floor" effect at lower percentiles amplifies small absolute differences in income, while the "glass ceiling" at higher percentiles is likely driven by more systemic barriers. In high-income segments, specialized markets and sectors often prioritize performance and quality over demographic factors, which can contribute to narrower disparities. As businesses expand, entrepreneurs gain access to more favorable financing conditions, partially mitigating initial income gaps, though not eliminating them entirely.

The partial narrowing of these gaps in 2022 suggests that inclusion programs, microfinance initiatives, and other targeted policies have been somewhat effective. However, persistent barriers remain at both ends of the income spectrum, requiring further intervention. While progress is evident, particularly at middle-income levels, significant disparities persist at the lower and upper extremes of the distribution. Addressing both the "sticky floor" and "glass ceiling" effects remain crucial to ensuring equitable access to resources and opportunities, fostering sustainable business growth across all demographic groups. The results in **Table 2** confirm that there is indeed a statistically significant difference in the average sales of IE compared to NIE, as well as between WE and ME. The latter comparison shows a larger gap in all periods analyzed. The variation of these differences over time is not consistent, with the largest gap observed in 2022 for both comparisons. Referring to the differences reported in **Table 2**, the average sales difference for IE vs. NIE is −23.9% in 2016, −28.45% in 2018, −24% in 2020, and −27.39% in 2022, based on the average sales reported in **Table 1**. This corresponds to an average revenue difference of −26% for IE during the analysis period.

For the WE vs. ME comparison, the differences are more pronounced, with differences of −69% in 2016, −73.6% in 2018, −72.1% in 2020, and −67% in 2022, resulting in an average sales difference of −70% during the analyzed period. These results provide evidence in support of the first two hypotheses: The data show that both gender and indigenous identity are associated with average sales that are significantly lower than the overall average for entrepreneurs.

Table 2. Tukey's honestly significant differences.

Indigenous-No Indigenous (American's dollars).				
Year	Diff.	Lower Limit	Upper Limit	*P-Adj*
2016	−121.39	−182.34	−60.43	0.0000952
2018	−161.11	−190.39	−131.83	0
2020	−129.6	−153.51	−105.77	0
2022	−231.05	−270.1	−192	0
Women-Man (Americans dollars)				
Year	Diff.	Lower Limit	Upper Limit	*P-Adj*
2016	−352.83	−412.20	−293.47	0
2018	−417.06	−445.78	−388.34	0
2020	−388.75	−412.13	−365.36	0
2022	−565.36	−602.93	−527.79	0

Note: If the *P-Adj* value is below 0.05, the group means are statistically different with a 95% confidence level.

Finally, the results in **Table 3** show the differences when the previously discussed characteristics are combined. In all comparisons, the expected disadvantages are reflected in the sales performance of the firms.

When analyzing the comparison between indigenous: Women and non-indigenous: Men, a statistically significant difference is observed in all periods analyzed. In terms of the average revenue reported for each period, the differences are −89.7% in 2016, −99.8% in 2018, −92.9% in 2020, and −91.4% in 2022, resulting in an average revenue gap of −93.5% over the period analyzed.

Table 3. Tukey's honestly significant differences (HSD): Combination of sex and indigenous self-identification.

	2016		**2018**		**2020**		**2022**	
	Diff.	***P-Adj***	**Diff.**	***P-Adj***	**Diff.**	***P-Adj***	**Diff.**	***P-Adj***
Indigenous: Man-No indigenous: Man	−148.6	0.01	−185.86	0	−165.77	0	−281.90	0
Indigenous: Women-Indigenous: Man	−306.9	0	−379.16	0	−334.34	0	−489.4	0
No indigenous: Women-Indigenous: Man	−230.98	0.	−254.74	0	−256.12	0	−324.34	0
Indigenous: Women-No indigenous: Man	**−455.59**	**0**	**−565.03**	**0**	**−500.11**	**0**	**−771.36**	**0**
No indigenous: Women-No indigenous: Man	−379.64	0	−440.6	0	−421.89	0	−606.24	0
No indigenous: Women-Indigenous: Women	75.95	0.243	124.42	0	78.21	0	165.12	0

Note: If the *P-Adj* value is below 0.05, the group means are statistically different with a 95% confidence level.

This finding partially supports the third hypothesis proposed: The intersectionality of being an indigenous woman does have a more negative effect on sales levels, but the effect is less severe than the combined effect of these characteristics considered separately.

The normality test is rejected for all four periods, indicating that the residuals deviate significantly from a normal distribution. However, these tests are highly sensitive—especially with large datasets—so even minor deviations from normality can lead to rejecting the null hypothesis. In the context of income surveys, where data often exhibit heavy tails and outliers, slight departures from normality are not unusual

and may not critically affect the robustness of the results. The large sample sizes typically found in income surveys help ensure that estimates remain reliable, even when the normality assumption is not strictly met. Additional considerations, such as identifying and handling outliers, should still be considered (Chaudhuri et al., 2020).

The Welch method was used in cases where the assumption of homogeneity of variances is not met. The results generally yield higher *F*-values and very small *p*-values. This suggests that differences between groups are even more pronounced when correcting for potential violations of the equal variance's assumption. Both methods—the traditional ANOVA and Welch ANOVA—show consistent results regarding the significance of the main effects (ethnicity, sex, education) on income across the studied periods (Appendix B, **Table B2**). The nonparametric estimations were conducted using the Kruskal-Walli's test, he results are reported in Appendix B, **Table B3**, they are consistent with the findings presented in both the ANOVA and Welch tests.

5. Limitations and future research

This study provides valuable insights into the disparities in sales levels among indigenous and non-indigenous entrepreneurs, as well as gender—based differences in entrepreneurial performance. However, certain limitations must be acknowledged.

First, the study relies on self -reported survey data from the National Income and Expenditure Survey, which may introduce response bias. While this dataset is widely used for economic analysis, self-reported sales figures might not fully capture informal earning or underreported income, particularly in indigenous communities where informal economic activities are prevalent. Future research could benefit from complementary qualitive approaches, such as in-depth interviews or case studies, to provide a more nuanced understanding of entrepreneurial experiences.

Second, while the study identifies significant disparities in sales levels, it does not account for all possible determinants of business performance. Factors such as access to financial services, digital literacy, business networks, and sectoral differences could further explain variations in entrepreneurial success. Future studies could incorporate additional control variables or adopt mixed- methods approaches to capture these elements more comprehensively.

Third, the findings are specific to Mexico and may not be directly generalizable to other national contexts. Although indigenous entrepreneurships are relevant topic globally, institutional and economic conditions vary across countries. Comparative studies in other Latin American or indigenous-majority regions could help validate findings and identify regional specific challenges.

Lastly, while this study examines disparities through an intersectional lens, future research could explore longitudinal data to assess whether these gaps persist, widen, or diminish over time. Understanding the long-term impact of entrepreneurships policies and socioeconomic interventions on indigenous and women entrepreneurs would provide further valuable insights for policymakers and researchers alike.

By acknowledging these limitations and suggesting potential research directions, this study contributes to a broader understanding of indigenous and gendered

entrepreneurship while highlighting areas for further academic and policy driven exploration.

6. Conclusions

Entrepreneurship is proposed as a mechanism for social mobility and reducing inequalities. However, for this assumption to be true, it is crucial to consider the structural disadvantages faced by certain groups, which further complicate an already challenging endeavor.

Women face additional challenges, such as the unequal distribution of household responsibilities, which limits the time available to run their businesses. This can result in lower sales. Similarly, businesses owned by indigenous people tend to have lower average sales, which hinders their social mobility. This may be related to limited access to finance, operating in traditional sectors or small markets. From an intersectionality perspective, it is evident that Indigenous women entrepreneurs have lower sales compared to non-indigenous women entrepreneurs and Indigenous male entrepreneurs. This highlights the importance of specific public and private interventions that take structural and intersectional inequalities into account when designing interventions or public policies.

The findings underscore the importance of examining other dimensions of inequality, such as access to education, social networks, and training programs. Future research should also examine how cultural, regional, and industry-specific factors influence the performance of marginalized entrepreneurs.

Given the impact of structural inequalities on the performance of indigenous and women entrepreneurs, it is essential to design targeted interventions that effectively address these gaps. In terms of financial access, expanding microloan programs with flexible conditions and differentiated interest rates for vulnerable populations, such as the National Microenterprise Financing Program (PRONAFIM), could improve capital accessibility for these groups. Additionally, the creation of loan guarantee schemes to support indigenous entrepreneurs in formal banking institutions would help mitigate the risks associated with a lack of credit history.

Regarding training and education, the implementation of culturally tailored business education programs is crucial. Initiatives such as the Indigenous Women's Entrepreneurship Network, which incorporate training in indigenous languages and adapt business education to community-based enterprises, have proven effective in enhancing the sustainability of indigenous ventures. Furthermore, strengthening the digital inclusion of indigenous entrepreneurs through programs that provide access to technology, e-commerce training, and digital marketing strategies would enhance their competitiveness in broader markets.

Access to formal markets remains a key barrier. Policies that promote the integration of indigenous and women-led enterprises into larger value chains such as certification programs for origin denominated products or the facilitation of their entry into fair trade platforms and government procurement opportunities could significantly improve their market reach. Finally, there is a need to establish systematic monitoring and evaluation mechanisms to assess the impact of existing policies on reducing inequalities within the entrepreneurial ecosystem.

The combination of these strategies would not only help reduce the income gaps identified in this study but also foster a more equitable and sustainable entrepreneurial environment.

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Data availability statement: All of the information used in this document is publicly available at the following link: https://www.inegi.org.mx/programas/enigh/nc/2022/. On the same page, the questionnaires and their coding are also accessible.

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References

Acs, Z. J., Autio, E., Szerb, L. (2018). In: The Global Entrepreneurship Index. Springer.

Alene, E. T. (2020). Determinants that influence the performance of women entrepreneurs in micro and small enterprises in Ethiopia. Journal of Innovation and Entrepreneurship, 9(1), 1–20.

Álvarez, S. A., Barney, J. B. (2014). Entrepreneurship opportunities and poverty alleviation. Entrepreneurship Theory and Practice, 38(1), 159–184. https://doi.org/10.1111/etap.12078

Anderson, R. B., Dana, L. P., Dana, T. E. (2006). Indigenous land rights, entrepreneurship, and economic development in Canada: "Opting-in" to the global economy. Journal of world business, 41(1), 45–55.

Arceo-Gómez, E. O., Campos-Vázquez, R. M. (2014). Evolución de la brecha salarial de género en México. El Trimestre Económico, 81(323), 619–653.

Bastia, T. (2014). Intersectionality, migration and development. Progress in Development Studies, 14(3), 237–248. https://doi.org/10.1177/1464993414521330

Batalla, G. B. (2020). El concepto de indio en América: Una categoría de la situación colonial. Plural, 3, 1–15.

Baughn, C. C., Chua, B.-L., Neupert, K. E. (2006). The normative context for women's participation in entrepreneurship: A multicountry study. Entrepreneurship Theory and Practice, 30(5), 687–708. https://doi.org/10.1111/j.1540-6520.2006.00142.x

Baumol, W. J. (1996). Entrepreneurship: Productive, unproductive, and destructive. Journal of Business Venturing, 11(1), 3–22. https://doi.org/10.1016/0883-9026(94)00014-X

Bollinger, C. R., Hirsch, B. T. (2006). Match bias from earnings imputation in the Current Population Survey: The case of imperfect matching. Journal of Labor Economics, 24(3), 483–519.

Bruton, G. D., Ketchen, D. J., Ireland, R. D. (2013). Entrepreneurship as a solution to poverty. Journal of Business Venturing, 28(6), 683–689.

Bui, H. T., Kuan, A., Chu, T. T. (2018). Female entrepreneurship in patriarchal society: Motivation and challenges. Journal of Small Business & Entrepreneurship, 30(4), 325–343.

Chaudhuri, K., Sasidharan, S., Raj, R. S. N. (2020). Gender, small firm ownership, and credit access: Some insights from India. Small Business Economics, 54(4), 1165–1181.

Cobo, J. R. M. (1986). Estudio del problema de la discriminación contra las personas indígenas. Naciones Unidas.

CONEVAL. (2022). Medición de la pobreza 2022. Available online: https://www.coneval.org.mx/Medicion/MP/Documents/MMP_2022/Pobreza_multidimensional_2022.pdf (accessed on 20 October 2024).

Crenshaw, K. (1991). Demarginalizing the intersection of race and sex: A black feminist critique of antidiscrimination doctrine, feminist theory, and antiracist politics. University of Chicago Legal Forum, 1989(1), 139–167.

Dana, L.-P. (2015). Indigenous entrepreneurship: An emerging field of research. International Journal of Business and Globalisation, 14(2), 158–169. https://doi.org/10.1504/IJBG.2015.067433

Duncan, S. (1994). Theorising differences in patriarchy. Environment and Planning A, 26(8), 1177–1194. https://doi.org/10.1068/a261177

Dy, A. M., MacNeil, H. (2023). Doing inequality, doing intersectionality: Intersectionality as threshold concept for studying inequalities in entrepreneurial activity. International Journal of Entrepreneurial Behavior & Research.

Eichler, J. (2017). New responses to mining extractivism in the Bolivian lowlands: The role and potential of indigenous cooperatives in self-managing mining resources. The International Journal of Human Rights, 22(2), 262–285.

Elert, N., Henrekson, M. (2016). Evasive entrepreneurship. Small Business Economics, 47(1), 95–113. https://doi.org/10.1007/s11187-016-9725-x

Essers, C., Benschop, Y., Doorewaard, H. (2010). Female ethnicity: Understanding Muslim immigrant businesswomen in the Netherlands. Gender, Work & Organization, 17(3), 320–339. https://doi.org/10.1111/j.1468-0432.2008.00425.x

FONDESO. Fondo para el Desarrollo Social de la Ciudad de México. Available online: https://fondeso.cdmx.gob.mx (accessed on 20 October 2024).

Forson, C. (2013). Contextualising migrant black business women's work-life balance experiences. International Journal of Entrepreneurial Behaviour & Research, 19(5), 460–477.

García, C. (2018). Emprendimiento caficultor en migrantes de la región huasteca del centro de México. Equidad y Desarrollo, 1(30), 119–147.

Goffee, R., Scase, R. (2015). In: Women in charge: The experiences of female entrepreneurs. Routledge.

Greer, M. J., Greene, P. G. (2003). Feminist theory and the study of entrepreneurship. In: Butler, J. E. (editor). New perspectives on women entrepreneurs. Information Age Publishing. pp. 1–24.

Hall, G., Patrinos, H. A. (2006). In: Indigenous people, poverty and human development in Latin America (1st ed.). Palgrave Macmillan.

Hechavarria, D. M., Reynolds, P. D. (2009). Cultural norms & business start-ups: The impact of national values on opportunity and necessity entrepreneurs. International Entrepreneurship and Management Journal, 5(4), 417–437. https://doi.org/10.1007/s11365-009-0115-6

Henry, E. Y., Dana, L. P., Murphy, P. J. (2018). Telling their own stories: Māori entrepreneurship in the mainstream screen industry. Entrepreneurship & Regional Development, 30(1–2), 118–145.

Hill, R., Pert, P. L., Davies, J., et al. (2013). Indigenous land management in Australia: Extent, scope, diversity, barriers and success factors. Cairns: CSIRO Ecosystem Sciences.

Hindle, K., Moroz, P. (2010). Indigenous entrepreneurship as a research field: Developing a definitional framework from the emerging canon. International Entrepreneurship and Management Journal, 6(4), 357–385. https://doi.org/10.1007/s11365-009-0111-x

IDB (Inter-American Development Bank). Indigenous peoples. Available online: https://www.iadb.org/en/who-we-are/topics/gender-and-diversity/indigenous-peoples (accessed on 20 October 2024).

INPI. Instituto Nacional de los Pueblos Indígenas. Available online: https://www.gob.mx/inpi (accessed on 20 October 2024).

Jha, P., Alam, M. M. (2022). Antecedents of women entrepreneurs' performance: An empirical perspective. Management Decision, 60(1), 86–122.

Knight, M. (2016). Race-ing, classing and gendering racialized women's participation in entrepreneurship. Gender, Work & Organization, 23(3), 310–327.

Lerner, M., Brush, C., Hisrich, R. (1997). Israeli women entrepreneurs: An examination of factors affecting performance. Journal of Business Venturing, 12(4), 315–339. https://doi.org/10.1016/S0883-9026(96)00061-4

Liñán, F., Jaén, I., Martín, D. (2022). Does entrepreneurship fit her? Women entrepreneurs, gender-role orientation, and entrepreneurial culture. Small Business Economics, 58(2), 1051–1071.

Lucas, D. S., Fuller, C. S. (2017). Entrepreneurship: Productive, unproductive, and destructive—Relative to what? Journal of Business Venturing Insights, 7, 45–49.

Lumley, T., Diehr, P., Emerson, S., Chen, L. (2002). The importance of the normality assumption in large public health data sets. Annual Review of Public Health, 23(1), 151–169.

Macpherson, W. G., Tretiakov, A., Mika, J. P., Felzensztein, C. (2021). Indigenous entrepreneurship: Insights from Chile and New Zealand. Journal of Business Research, 127, 77–84.

Mendoza-Ramos, A., Prideaux, B. (2018). Assessing ecotourism in an Indigenous community: Using, testing and proving the wheel of empowerment framework as a measurement tool. Journal of Sustainable Tourism, 26(2), 277–291.

Menzies, J., Chavan, M., Jack, R., et al. (2024). Australian indigenous female entrepreneurs: The role of adversity quotient. Journal of Business Research, 175, 114558.

Miller, D., Le Breton-Miller, I. (2017). Underdog entrepreneurs: A model of challenge–based entrepreneurship. Entrepreneurship Theory and Practice, 41(1), 7–17.

Minniti, M., Arenius, P. (2003). In: Women in entrepreneurship—The entrepreneurial advantage of nations: First annual global entrepreneurship symposium. United Nations. pp. 1–28

Molina-Ramírez, E., Barba-Sánchez, V. (2021). Embeddedness as a differentiating element of indigenous entrepreneurship: Insights from Mexico. Sustainability, 13(4), 2117.

Moradi, M., Imanipour, N., Arasti, Z., Mohammadkazemi, R. (2020). Poverty and entrepreneurship: A systematic review of poverty-related issues discussed in entrepreneurship literature. World Review of Entrepreneurship, Management and Sustainable Development, 16(2), 125–152.

Morsy, H. (2020). Access to finance–Mind the gender gap. The Quarterly Review of Economics and Finance, 78, 12–21.

Patrick, C., Stephens, H., Weinstein, A. (2016). Where are all the self-employed women? Push and pull factors influencing female labor market decisions. Small Business Economics, 46(3), 365–390. https://doi.org/10.1007/s11187-015-9697-2

Paz, I. M. J. (2022). Emprendimiento rural como estrategia de desarrollo territorial: Una revisión documental. Económicas CUC, 43(1), 257–280.

Peredo, A. M., Anderson, R. B., Galbraith, C. S., et al. (2004). Toward a theory of indigenous entrepreneurship. International Journal of Entrepreneurship and Small Business, 1(1–2), 1–20.

Psacharopoulos, G., Patrinos, H. (1994). Indigenous people and poverty in Latin America. Finance & Development, 31(4), 41–41.

Ramírez-Urquidy, M. (2022). Economic downturns and regional entrepreneurship dynamics in Mexico: Trends and policy implications. Problemas del Desarrollo, 53(210), 115–157.

Ratten, V., Dana, L. P. (2017). Gendered perspective of indigenous entrepreneurship. Small Enterprise Research, 24(1), 62–72.

Razali, N. M., Wah, Y. B. (2011). Power comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors and Anderson-Darling tests. Journal of Statistical Modeling and Analytics, 2(1), 21–33.

Rodríguez-Fernández, A., Sánchez-Santa B., Estévez López, E. (2011). Las mujeres emprendedoras en las comunidades indígenas. In: García Castaño, F. J., Iordanishvili, N. K. (editors). Actas del I Congreso Internacional sobre Migraciones en Andalucía. Instituto de Migraciones. pp. 59–66.

Saatcioglu, B., Corus, C. (2014). Poverty and intersectionality: A multidimensional look into the lives of the impoverished. Journal of Macromarketing, 34(2), 122–132. https://doi.org/10.1177/0276146713520600

Schumpeter, J. A. (1911). The theory of economic development. Duncker & Humblot.

Shahriar, A. Z. M. (2018). Gender differences in entrepreneurial propensity: Evidence from matrilineal and patriarchal societies. Journal of Business Venturing, 33(6), 762–779.

Shields, S. A. (2008). Gender: An intersectionality perspective. Sex Roles, 59(5–6), 301–311. https://doi.org/10.1007/s11199-008-9501-8

Sorzano, M., Flores, Y., Lugo, C. (2023). Capacitación en emprendimiento para el fomento del empoderamiento económico de mujeres privadas de la libertad en la frontera norte de México. In: Santiago, C. K., Sánchez, C. I. (editors). Desigualdad regional y empobrecimiento: Gestión de los territorios con inclusión social. UNAM-AMECIDER. pp. 243–256.

Stavenhagen, R. (1992). Los derechos de los indígenas: Algunos problemas conceptuales. Nueva Antropología, 13(44), 83–99.

Taylor, Y., Hines, S., Casey, M. E. (2010). In: Theorizing intersectionality and sexuality. Palgrave Macmillan.

Tovar, Y. S., Ángel, M., García, M., Flores, J. E. M. (2021). Diferencias en los determinantes del éxito en el emprendimiento en México, una perspectiva de género. Revista Venezolana de Gerencia, 26(96), 880–902.

Trepte, S., Loy, L. S. (2017). Social identity theory and self-categorization theory. In: Rössler, P., Hoffner, C. A., van Zoonen, L. (editors). The International Encyclopedia of Media Effects. Wiley-Blackwell. pp. 1–13.

Vázquez-Maguirre, M. (2019). El desarrollo sostenible a través de empresas sociales en comunidades indígenas de América Latina. Estudios sociales. Revista de alimentación contemporánea y desarrollo regional, 29(53), e19617. https://doi.org/10.24836/es.v29i53.617

Whitford, M., Ruhanen, L. (2019). Indigenous tourism research, past and present: Where to from here? In: Sustainable Tourism and Indigenous Peoples. Routledge. pp. 14–33.

Wilson, C. (2001). In: Decolonizing methodologies: Research and indigenous peoples. Zed Books.

Yunus, M. (1998). Poverty alleviation: Is economics any help? Lessons from the Grameen Bank Experience. Journal of International Affairs, 52(1), 47–65.

Zapalska, A., Brozik, D. (2017). Māori female entrepreneurship in tourism industry. Tourism: An International Interdisciplinary Journal, 65(2), 156–172.

Appendix A

To test the hypothesis, an ANOVA model is used. The analysis starts with the null hypothesis H_0, which states that there are no differences in the means between the analyzed groups:

$$H_0 = \underline{X}_1 = \underline{X}_2 = \underline{X}_3 = \underline{X}_k$$

The alternative hypothesis H_1 is defined as: There are differences in the means between the H_1 analyzed groups.

$$H_1 \neq \underline{X}_1 \neq \underline{X}_2 \neq \underline{X}_3 \neq \underline{X}_k \; es\; decir\; \underline{X}_i \neq \underline{X}_j \; para\; algun\; i \neq j$$

The ANOVA test itself provides an overall *p*-value to determine if there are statistically significant differences among group means. If the ANOVA *p*-value is less than 0.05, it indicates that at least one group differs significantly from the others.

Tukey HSD test

The Tukey's HSD test is a post-hoc analysis used to compare all possible pairs of group means following an ANOVA test. It identifies which specific means are significantly different while controlling the family-wise error rate. The formalization involves the following steps:

The difference between two group means $(\underline{X}_i - \underline{X}_j)$ is compared against a critical value.

$$\text{HSD} = q_{\alpha,k,df} \times \sqrt{\frac{MS\ error}{n}}$$

$q_{\alpha,k,df}$ = is the critical value of the studentized range distribution for a significance level α, k, groups, y df degrees of freedom for the error.

$MS\ error$ = is the mean square error obtained from the ANOVA.

n = is the number of observations per group, assuming equal sample sizes; if the sample sizes are unequal, the average group size is used.

Finally, it is tested whether the absolute value of the difference between the means of two groups is greater than or equal to the HSD. If this condition is met, the difference between the compared groups is considered significant.

$$\left|\underline{X}_i - \underline{X}_j\right| \geq HSD$$

Tukey's test provides P-Adjusted (*P-Adj*) values for pairwise comparisons, indicating whether the observed differences are statistically significant after correcting for multiple comparisons.

Appendix B

Table B1. Responses with zero sales totals by year and group.

Year	Number of "0" values	% of total observations	Indigenous	No Indigenous	Men	Women
2016	509	2.83%	160	349	170	339
2018	503	2.65%	179	324	173	330
2020	747	3.03%	279	468	224	523
2022	571	2.39%	189	382	177	394

Table B2. Comparison of ANOVA and Welch ANOVA results for income determinants (2016–2022).

Period	Model	Method	F statistics (Global or Combined)	DF (num, denom)	*p*-value
2016	Sex and Ethnicity	Traditional	Ethnicity: 15.24 Sex: 136.0 Interaction: 1.33	–	p(Ethnicity) = 9.52×10^{-5} p(Sex) < 2×10^{-16} p(Int) = 0.25
		Welch	42.59	(3, 6703.2)	< 2.2×10^{-16}
	Education and Ethnicity	Traditional	Ethnicity: 15.19 Education: 19.55 Interaction: 1.85		p(Ethnicity) = 9.76×10^{-5} p(Education) = 4.55×10^{-16} p(Int) = 0.117
		Welch	33.63	(9, 615.42)	< 2.2×10^{-16}
	Sector and Ethnicity	Traditional	Ethnicity: 15.12 Sector: 0.77 Interaction: 0.08	–	p(Ethnicity) = 0.000101 p(Sector) = 0.462 p(Int) = 0.924
		Welch	13.37	(5, 7258)	5.39×10^{-13}
2018	Sex and Ethnicity	Traditional	Indigenous: 116.33 Sex: 810.76 Interaction: 4.14	–	$p < 2 \times 10^{-16}$, $p < 2 \times 10^{-16}$, p = 0.042
		Welch	346.58	(3, 8807.3)	< 2.2×10^{-16}
	Education and Ethnicity	Traditional	Indigenous: 112.76 Education: 51.11 Interaction: ($p \approx 0.066$)	–	$p < 2 \times 10^{-16}$, $p < 2 \times 10^{-16}$, $p \approx 0.066$
		Welch	44.18	(9, 529.4)	< 2.2×10^{-16}
	Sector and Ethnicity	Traditional	Indigenous: 111.80 Sector: 17.49 Interaction: 5.67	–	$p < 2 \times 10^{-16}$, $p = 2.57 \times 10^{-8}$, p = 0.00346
		Welch	53.86	(5, 8096.9)	< 2.2×10^{-16}

Table B2. (*Continued*).

Period	Model	Method	*F* statistics (Global or Combined)	DF (num, denom)	*p*-value
2020	Sex and Ethnicity	Traditional	Ethnicity: 113.33 Sex: 1062.90 Interaction: 12.57	–	$p < 2 \times 10^{-16}$, $p < 2 \times 10^{-16}$, $p = 0.000393$
		Welch	343.13	(3, 11275)	$< 2.2 \times 10^{-16}$
	Education and Ethnicity	Traditional	Ethnicity: 108.93 Education: 18.62 Interaction: ($p \approx 0.104$)	–	$p < 2 \times 10^{-16}$, $p = 2.72 \times 10^{-15}$, $p \approx 0.104$
		Welch	36.76	(9, 921.74)	$< 2.2 \times 10^{-16}$
	Sector and Ethnicity	Traditional	Ethnicity: 108.67 Sector: 0.183 Interaction: 9.12	–	$p < 2 \times 10^{-16}$, $p = 0.832$, $p = 0.00011$
		Welch	31.23	(5, 10411)	$< 2.2 \times 10^{-16}$
2022	Sex and Ethnicity	Traditional	Ethnicity: 134.47 Sex: 870.56 Interaction: 8.40	–	$p < 2 \times 10^{-16}$, $p < 2 \times 10^{-16}$, $p = 0.00376$
		Welch	360.09	(3, 10688)	$< 2.2 \times 10^{-16}$
	Education and Ethnicity	Traditional	Etnia: 130.92 Education: 52.96 Interaction: 4.82	–	$p < 2 \times 10^{-16}$, $p < 2 \times 10^{-16}$, $p = 0.000692$
		Welch	64.3	(9, 876.74)	$< 2.2 \times 10^{-16}$
	Sector and Ethnicity	Traditional	Ethnicity: 129.80 Sector: 9.22 Interaction: 2.09	–	$p < 2 \times 10^{-16}$, $p = 9.99 \times 10^{-5}$, $p = 0.124$
		Welch	37.48	(5, 9492.6)	$< 2.2 \times 10^{-16}$

Table B3. Kruskal–Wallis results (2016–2022).

Model—Period	Kruskal–Wallis pvalue	Representative Dunn Posthoc Results (padj)
Sex and Ethnicity—2016	$< 2 \times 10^{16}$	*Indigenous.Man vs. Indigenous.Women*: 2.17×10^{248} *No indigenous.Man vs. No indigenous.Women*: 3.58×10^{154}
Sex and Ethnicity—2018	$< 2 \times 10^{16}$	*Indigenous.Man vs. Indigenous.Women*: $\sim 1.18 \times 10^{180}$ *Indigenous.Women vs. No indigenous.Man*: $< 2 \times 10^{16}$
Sex and Ethnicity—2020	$< 2 \times 10^{16}$	*Indigenous.Man vs. Indigenous.Women*: $\sim 2.44 \times 10^{177}$ *Indigenous.Women vs. No indigenous.Man*: 0.000000
Sex and Ethnicity—2022	$< 2 \times 10^{16}$	*Indigenous.Man vs. Indigenous.Women*: $\sim 5.57\ 10^{163}$ *No indigenous.Man vs. No indigenous.Women*: 0.000000
Education and Ethnicity—2016	$< 2 \times 10^{16}$	*Indigenous.Basic vs. Indigenous.High School*: $\sim 6.23\ 10^{6}$ *Indigenous.High School vs. Indigenous.None*: $\sim 8.23\ 10^{12}$
Education and Ethnicity—2018	$< 2 \times 10^{16}$	*Indigenous.Basic vs. Indigenous.None*: $\sim 9.62\ 10^{13}$ *Indigenous.High School vs. Indigenous.None*: $\sim 1.08\ 10^{13}$

Table B3. (*Continued*).

Model—Period	**Kruskal–Wallis pvalue**	**Representative Dunn Posthoc Results (padj)**
Education and Ethnicity—2020	$< 2 \times 10^{16}$	Key pairwise comparisons (e.g., between Indigenous and No indigenous groups at the same education level) yielded extremely low pvalues (often $< 2\ 10^{16}$)
Education and Ethnicity—2022	$< 2 \times 10^{16}$	*Indigenous.High School vs. No indigenous.High School*: ~0.00056 *Indigenous.Basic vs. No indigenous.Basic*: (extremely low, indicating significant differences)
Sector and Ethnicity—2016	$< 2.2 \times 10^{16}$	Global differences are robust for ethnicity; only a few contrasts (e.g., between some sector combinations) reached significance (e.g., a representative pair: *padj* ≈ 0.01)
Sector and Ethnicity—2018	$< 2 \times 10^{16}$	Several contrasts are significant; for instance, differences between *Indigenous.Commerce vs. Indigenous.Industry* and among some "No indigenous" groups yielded very low *padj* values.
Sector and Ethnicity—2020	$< 2 \times 10^{16}$	Key contrasts are highly significant—for example, some comparisons (e.g., *Indigenous.Commerce vs. Indigenous.Services*) produced very low *padj* values
Sector and Ethnicity—2022	$< 2\ 10^{16}$	Posthoc analysis confirms global differences; for example, *No indigenous.Industry vs. No indigenous.Services* shows a very marked difference