Women in global trade: challenges faced by stem micro, small, and medium-sized enterprises (msmes) in Chile

Mujeres en el comercio global: los desafíos que enfrentan las micro, pequeñas y medianas empresas en Chile

Paula Campillay Godoy*

Abstract

Globally, advancements in trade have benefited millions of women, but assuming that these benefits are distributed equitably between men and women would be a mistake. However, market opening has not generated equitable benefits between men and women, raising questions about the inequalities that limit female participation in trade (WTO, 2020).

Given that most female economic activity is in micro, small, and medium enterprises (MSMEs), implementing strategies to promote women's participation in trade involves examining how MSMEs can integrate into commercial activities (WTO, 2020). Therefore, it is essential to have studies that identify the barriers preventing the full participation of women-owned businesses in international markets.

In the current context, it is essential to explore the challenges faced by STEM micro, small, and medium enterprises (MSMEs) led by women in Chile. This study identifies four

* Master's student in International Strategy and Trade Policy at the Institute of International Studies, University of Chile. Bachelor's in Social Anthropology from the Pontifical Catholic University of Chile. Email: pacampillay@uc.cl. ORCID: https://orcid.org/0009-0001-0060-7684. Recibido: 24 de octubre de 2023. Aceptado: 28 de enero de 2024.

main obstacles: gender biases in the business environment, harmonization between family and professional responsibilities, limited availability of financing, and temporal discrepancy between technological advancements and current regulations.

Keywords: Micro, Small, and Medium Enterprises (MSMEs) – Science, Technology, Engineering, and Mathematics (STEM) – Gender – Women – International Trade.

Resumen

A nivel global, los avances en el comercio han beneficiado a millones de mujeres, pero asumir que estos beneficios se distribuyen equitativamente entre hombres y mujeres sería un error. Sin embargo, la apertura de los mercados no ha generado beneficios equitativos entre hombres y mujeres, planteando interrogantes sobre las desigualdades que limitan la participación femenina en el comercio (OMC, 2020).

Dado que la mayor parte de la actividad económica femenina se encuentra en las micro, pequeñas y medianas empresas (MIPYME), la implementación de estrategias para promover la participación de las mujeres en el comercio implica examinar cómo las MIPYME pueden integrarse en las actividades comerciales (OMC, 2020). Para ello, es fundamental contar con estudios que identifiquen cuáles son las barreras que impiden una plena participación de las empresas de mujeres en los mercados internacionales.

En el presente contexto, resulta esencial explorar los desafíos a los que se enfrentan las micro, pequeñas y medianas empresas (MIPYME) STEM dirigidas por mujeres en Chile. Este estudio identifica cuatro obstáculos principales: los sesgos de

género presentes en el entorno empresarial, la armonización entre las responsabilidades familiares y profesionales, la limitada disponibilidad de financiamiento y la discrepancia temporal entre los avances tecnológicos y las regulaciones actuales.

Palabras clave: Micro, pequeñas y medianas empresas (MYPYME) – ciencia, tecnología, ingeniería y matemática (STEM) – género – mujeres – comercio internacional.

1.- Introduction

Trade has had a transformative impact that has benefited a large number of women globally (WB and WTO, 2020). However, market openness itself has not equitably benefited men and women (WTO, 2020). The debate regarding the differential impacts of trade opens up space for questioning the inequalities that negatively affect women's participation and how they identify opportunities and challenges in trade. Research conducted by the World Bank Group has shown that countries that do not facilitate full women's participation in trade become less competitive internationally (WB, 2012).

Reducing gender disparities is crucial for driving economic development (WTO, 2020). However, the benefits derived from achieving gender equality are not limited solely to the commercial sphere. Therefore, working to close gender gaps emerges as a fundamental pillar for societal progress (WTO, 2020). Promoting women's inclusion and integrating gender perspective into foreign policy become indispensable for advancing towards more inclusive and peaceful societies, while also ensuring effective governance, fostering sustainable development, and protecting human rights (Bárcena, 2022).

Integrating women into trade necessarily involves considering how micro, small, and medium enterprises (MSMEs) can access international markets, given that women primarily lead this business segment. Therefore, it is crucial to have adequate information that allows us to identify and characterize these enterprises. Considering trade as a means to contribute to the development of societies, especially for women, it is necessary to identify the barriers that prevent the participation of women-led MSMEs in the international arena.

However, research on women-led MSMEs is scarce, especially in the case of MSMEs in the fields of science, technology, engineering, and mathematics (STEM). In general terms, studies have shown that women-led businesses tend to be smaller, operate in less profitable sectors, and participate less in trade compared to those led by men. Nonetheless, according to the Global Entrepreneurship Monitor, women-led enterprises in middle and high-income countries constitute a significant portion of new businesses with high growth potential and are expected to generate employment in the coming years (GEM, 2021a).

In this context, studying women-led STEM micro, small, and medium enterprises expands our knowledge of a business profile that has received little attention in research on entrepreneurship and women. Studying these enterprises allows us to explore how key dimensions for global economic and social development intertwine, creating a potential space that could benefit a large number of women.

This study seeks to explore the obstacles identified by women-led STEM MSMEs in Chile in their participation in trade. Among the challenges identified, four main components stand out: gender biases present in the business environment, the balance between family life and work life, access to financing, and

the temporal discrepancy between technological advancements and current regulations[1].

2. Literature review

2.1. Women in trade and entrepreneurship

Trade has exerted a transformative impact that has benefited numerous women globally (WB and WTO, 2020). However, market openness itself has not equitably benefited men and women (WTO, 2020). Studies such as Frohmann (2018) highlight that, although conventional trade policy has been conceived as impartial, its effects disproportionately impact gender. The impartiality of trade, as proposed by conventional economic theory, is questioned by authors like López and Muñoz (2018), who emphasize the importance of trade policy in contributing to the full inclusion of women in the commercial sphere.

Given that the majority of women's economic activity is concentrated in micro, small, and medium enterprises (MSMEs), promoting their participation in trade involves exploring how these enterprises can integrate into commercial activities (WTO, 2020). Therefore, it is crucial to have studies that identify the barriers hindering the full participation of women-led enterprises in international markets.

In general terms, research on women-led enterprises reveals that they tend to be small, with low growth expectations, and concentrate in less profitable sectors (IDB, 2022; OECD, n.d.; OECD, 2018; WTO, 2020). Female entrepreneurs mostly gra-

1 This research was conducted to obtain the Master's degree in International Strategy and Trade Policy at the Institute of International Studies (IEI) of the University of Chile in the year 2023. The supervision of this study was carried out by Professor Dorotea López Giral, Director of the Institute of International Studies.

vitate towards the service sector, both wholesale and retail, as well as governmental areas such as health, education, and social services. Conversely, sectors like construction, transportation, and storage are predominantly male-dominated (GEM, 2022; OECD, 2018; WTO, 2020). It is noteworthy that only 2.5% of women are involved in starting businesses in the information, computer, and technology (ICT) sector, compared to 4.7% of men, despite this sector attracting the most venture capital funding globally (GEM, 2022).

Although research indicates that women-led enterprises tend to be smaller, several studies have shown that their businesses possess the same stability and resilience as those led by men (GEM, 2022; OECD, 2018). Especially, women-led enterprises in middle and high-income countries stand out for their dynamism, innovative capacity, and their focus on both domestic and international markets (GEM, 2022a). In fact, startups led by women represent a significant proportion of companies with strong growth potential and are expected to generate employment in both the present and the next five years (GEM, 2022a).

Women are also underrepresented in the total population of entrepreneurs. According to OECD estimates, in the period from 2010 to 2014, only 2% of women in the European Union reported being involved in starting new businesses, compared to 4% of men (OECD, 2018). Meanwhile, Latin America and the Caribbean show more dynamism in terms of entrepreneurship, particularly in countries like Chile, Ecuador, Brazil, Guatemala, and Colombia (GEM, 2020). While in Europe or North America, one in twenty women is involved in starting or managing a business, the proportion in Latin America and the Caribbean corresponds to one in five. However, despite Latin America and the Caribbean exhibiting significantly higher levels of female

entrepreneurship, only 13% of formal MSMEs in the region were led or owned by women (López and Persson, 2023).

2.2. Micro, small, and medium-sized enterprises (MSMEs) in Chile

Micro, small, and medium-sized enterprises (MSMEs) have been classified according to key criteria: the number of employees and annual sales volume. The Organization for Economic Co-operation and Development (OECD), along with other international organizations, defines MSMEs based on the total number of employees, which includes self-employed or own-account workers. According to this perspective, microenterprises are those that employ between 1 and 9 people, while small enterprises are characterized by having between 10 and 49 employees. Medium-sized enterprises, on the other hand, encompass a workforce of 50 to 249 people, and large enterprises employ 250 individuals or more (OECD, 2017a). This definition has been used by multiple countries, especially those without their own categorizations.

In the case of Chile, during the 1990s, there was a diversity of definitions regarding what constitutes a micro, small, and medium-sized enterprise. Throughout these years, different entities offered independent and sometimes contradictory definitions (CEPAL, 2000).

Starting in 2010, micro, small, and medium-sized enterprises became subject to the definition provided by Law No. 20.416, which classifies companies based on their annual income. According to the 2010 Law, microenterprises are those whose income in the last calendar year does not exceed 2,400 UF. On the other hand, small enterprises are those whose income exceeds 2,400 UF but is less than 25,000 UF, while

medium-sized enterprises have income exceeding 25,000 UF but do not reach 100,000 UF in the last year (Law No. 20.416, 2010, Article Second). For the purposes of the labor code and its complementary laws, companies are classified into different categories according to their size. Microenterprises are those that employ 1 to 9 workers, small enterprises have between 10 and 49 employees, medium-sized enterprises have a workforce of 50 to 199 workers, and large enterprises are those that employ more than 200 people (BCN, 2022).

According to the Global Entrepreneurship Monitor (GEM), in recent years, the importance of entrepreneurial activity at the national level has been increasing. In 2021, early-stage entrepreneurial activity (TEA) experienced progressive growth between 2006 and 2019 (GEM, 2022b). According to the most recent data provided by SUBREI, in 2020, there were a total of 1,294,132 companies registered in Chile, of which 235,569 belonged to the SME category. During the same period, Chilean exporting companies amounted to 7,600, of which 3.368 were SMEs, and it was highlighted that 530 of them made foreign sales for the first time (SUBREI, 2021a).

At the national level, the distribution between male and female entrepreneurs shows evident inequalities (GEM, 2022a). This disparity is particularly reflected in the microenterprise sector, where in 2019, 61.4% of micro-entrepreneurs were men and 38.6% were women (INE, 2020). Likewise, this gender gap is evident in business ownership. According to World Bank Group statistics at the national level in 2018, 34% of businesses were owned by women, while 66% belonged to men (WB, n.d.).

Despite this situation, Chile stands out for having a high female participation in the business sector globally. The country ranks in the highest quintile in terms of female participation in

business ownership (WB, n.d.). In fact, it stands out for having the highest average female participation in TEA compared to other countries analyzed by the GEM.

Regarding the profile of female entrepreneurs in Chile, the study "Women and Entrepreneurial Activity in Chile 2019" reveals that the majority of early-stage female entrepreneurs are in the age range of 25 to 44 years, representing 53% of the sample. In terms of education, a diverse distribution is observed, where 40% have schooling, 24% have technical-professional training, 29% have university studies, and 7% have pursued postgraduate studies (GEM, 2020).

In the last decade, the increase in the number of micro, small, and medium-sized enterprises led by women reflects a consistent trend at the national level. According to data provided by SUBREI, in 2020, out of a total of 3,368 micro, small, and medium-sized exporting enterprises, 215 of them were led by women, representing approximately 6.4% of the total. This percentage shows an increase of 33 individuals compared to the previous year, indicating a growing trend in female participation in foreign trade (SUBREI, 2021a).

2.2.1. Gender-focused initiatives in Chilean trade policy

In Chile, the gender approach has been recognized as a relevant aspect of the commercial sphere. The country has implemented concrete measures to address the challenges present in this field, including strengthening an institution responsible for monitoring gender issues and implementing programs that promote and support female participation in international trade. Among these initiatives, the Mujer Exporta program stands out, driven by organizations such as ProChile, with the

aim of increasing the presence of women in the export process (López & Muñoz, 2018).

Moreover, Chile has been a pioneer in integrating the gender perspective into its Free Trade Agreements, setting significant precedents with countries such as Uruguay, Canada, and Argentina. These actions have demonstrated the country's commitment to promoting gender equality in the commercial sphere (López & Muñoz, 2018).

Additionally, concerning MSMEs and their participation in the international market, Chile has integrated four specific chapters on small and medium-sized enterprises into its Trade Agreements. This effort began with Uruguay in 2016 and Argentina in 2017, followed by Brazil and Ecuador in 2022. It has also included provisions related to SMEs in eight cooperation chapters in Free Trade Agreements with countries such as Australia, China, Colombia, Indonesia, Thailand, Turkey, the European Union, Vietnam, and the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP). These agreements have proven beneficial by facilitating numerous SMEs to export their products to these countries. According to SUBREI, during the year 2020, 98% of Chilean SMEs that exported their products did so to markets with agreements in force with Chile (SUBREI, 2021a).

2.3. The entrepreneurial activity of women in the fields of science, technology, engineering and mathematics (STEM)

Digital technologies have the potential to drive more inclusive development; however, globally, the digital access gap continues to widen, especially in developing countries (ECLAC, 2020). These disparities are further accentuated among vulnerable and marginalized groups of women, such as persons

with disabilities, rural residents, and older adults (UN Women, 2023).

According to UN Women, these barriers not only hinder women's empowerment but also limit the transformative potential of technology as a whole. Over the last decade, women's digital exclusion has had a significant impact on low- and middle-income countries, reducing their gross domestic product by approximately $1 trillion. It is estimated that, without action, this loss will increase to $1.5 trillion by the year 2025 (UN Women, 2023).

Women not only face a decrease in access to digital infrastructure but also contribute to information generation to a lesser extent. This gender gap translates into a scarcity of gender-disaggregated data. Therefore, advancing the closure of the digital gap not only requires improving women's access to technologies but also including them in design and regulatory processes (UN Women, 2023).

2.3.1. Insights into women's entrepreneurship in STEM

Currently, there is a growing interest in women's entrepreneurial activity. Despite this increased attention to this field, there are still underexplored aspects, such as the relationship between trade, MSMEs, STEM, and women.

In academia, studies have been conducted that analyze women's experiences in STEM fields and their businesses. To shed light on the various profiles of women entrepreneurs, Treanor (2022) challenges the notion that gender barriers when starting a business have little impact on women from the middle or upper classes with high educational levels. Through her study, the author demonstrates that gender inequalities impact women

across the board, highlighting the importance of adopting an interpretive perspective that analyzes how gender is produced and reproduced through multi-level processes within organizations (Treanor, 2022).

Regarding the field of science, technology, engineering, and mathematics (STEM), authors Foss, Mari, and Poggesi (2021) make a significant contribution by studying the participation gap between men and women in these disciplines. They conclude that the low number of women in STEM is due to the lack of opportunities they face in their professional development in these areas (Foss, Mari, & Poggesi, 2021).

Moreover, there are two relevant studies analyzing the intersection of gender, entrepreneurship, and STEM. Firstly, Sharma (2022) delves into the motivations and challenges faced by women in STEM disciplines who choose to start their own businesses. The author identifies flexibility and lack of job offers as the main motivations, while obstacles include funding issues, lack of adequate information, shortage of networks, and bureaucratic complications (Sharma, 2022). Secondly, Barron and Ruiz (2021) studied the factors determining the intention to start a business among women studying STEM careers. The authors conclude that education and environmental or contextual factors are the most influential elements (Barron & Ruiz, 2021). This coincides with findings from previous studies conducted by international organizations such as the Inter-American Development Bank (IDB, 2020).

Regarding the benefits of entrepreneurship, Suwana (2017) and Sharma (2022) have analyzed the emancipatory dimension of entrepreneurship and its relationship with the emergence of new technologies. Suwana (2017) investigates how the use of the internet and information technologies (IT) contribute to the

expansion of microenterprises led by women in Indonesia. In this context, through entrepreneurship, women can overcome obstacles in a patriarchal society, gaining their own income, strengthening their confidence, social status, and independence (Suwana, 2017). On the other hand, Sharma (2022) analyzes ventures initiated by women who left their STEM jobs to start their own businesses. The author suggests that entrepreneurship could help women break free from limitations they face, such as lack of suitable growth opportunities and job stress (Sharma, 2022).

Furthermore, international organizations like the Inter-American Development Bank (IDB) have played a crucial role in expanding knowledge in this area (IDB, 2022; IDB, 2020). In 2022, the IDB, in collaboration with WxChange, conducted a study to identify the main characteristics, needs, and challenges faced by women starting businesses in STEM fields. Regarding the characterization of STEM ventures in the region, it is noteworthy that 81% of them were created in the last five years and are mainly concentrated in sectors such as EdTech (15%), FinTech (14%), and HealthTech (10%). Most of these companies are headquartered in Brazil (15%), followed by Peru (11%) and Argentina (9%). It is relevant to mention that most of these companies express interest in expanding into international markets, primarily within the region. On the other hand, it should be noted that the profile of STEM entrepreneurs is composed of 71% women under 40 years old, most of whom have a high level of education (77% with a bachelor's degree or higher and 40% with master's or doctoral degrees) (IDB, 2020).

2.4. Challenges Faced by Women-Led MSMEs

The challenges women encounter when venturing into entrepreneurship actually span throughout the entire life cycle

and often intertwine with each other. From childhood to adulthood, girls and women are affected by relational dynamics and institutional structures that restrict their voice, choice, and power in decision-making, as well as their access to resources to participate in economic activity and control resulting profits (UNICEF, 2021).

According to the Women, Business, and Law report, women only enjoy 77% of the legal rights possessed by men. The World Bank report examined laws affecting women's economic opportunity in 190 economies between 1970 and 2022, determining that around 2.4 million working-age women live in areas that do not guarantee equal rights. The report also notes that, at the current pace, it will take at least fifty years and close to 1,500 reforms to achieve gender equality in legal matters in the economies evaluated in the study (WB, 2023a).

In the field of entrepreneurship, the study evaluates aspects such as women's ability to sign contracts, register businesses, access credit, and bank accounts in different regions. In this regard, the best-rated indicators were the opening of bank accounts and the signing of contracts on equal terms, where all regions except Sub-Saharan Africa lack restrictions. However, Southeast Asia, Sub-Saharan Africa, and Latin America and the Caribbean still face legal barriers that hinder women from registering businesses. Access to credit is the worst-rated area; in this case, all regions have countries whose laws do not prohibit gender discrimination (WB, 2023b).

The lack of control over land or housing has a direct economic impact on women. Therefore, equitable access to property and inheritance are fundamental to their empowerment. Although many countries have implemented reforms to equalize property rights, legal barriers that hinder women

from accessing, owning, and managing assets still persist (UN Women, 2020).

On the other hand, UNICEF has identified seven obstacles affecting women's entrepreneurial activity: firstly, women often have lower levels of confidence and tend to underestimate the influence of external factors beyond their control; secondly, women tend to prioritize family needs over their personal aspirations; thirdly, social pressures limit professional opportunities, including entrepreneurship, by dictating roles deemed appropriate for women; fourthly, public education and lack of job opportunities negatively impact women's professional development; fifthly, access to financial information and business networks is insufficient, imposing additional barriers for women to establish and expand their businesses; finally, the shortage of female leadership in decision-making processes, along with policies and laws that do not consider gender, limits progress toward equal opportunities and women's empowerment (UNICEF, 2021).

Some of the obstacles identified by UNICEF, such as balancing family life or accessing financing, have been widely analyzed. The obstacles MSMEs face when seeking financing are a recurring topic and gain more relevance in the case of women-led businesses (Carter, 2010; Chaundhuri, Sasidharan, & Raj, 2018; Harrison & Manson, 2007; Heller, 2010; WTO, 2020; Sharma, 2022; Shoma, 2019). In various contexts, women have not been recognized as creditworthy by financial institutions. Financial systems are hesitant to take excessive risks, especially in the case of MSMEs, and this probability increases when they are led by women (Heller, 2010). On the other hand, in cases where it is usually complex or does not consider the working conditions of entrepreneurs. Due to these reasons, women often start their businesses with limited financial resources

(IDB, 2022). In other instances, women become discouraged applicants, meaning that even when meeting the requirements, they choose not to apply (IDB, 2022; OECD, 2018).

Additionally, women entrepreneurs face conflicts derived from the tension between work and family more frequently than their male counterparts (Álvarez & Gómez, 2011). The need to balance work and family life has been incorporated into business frameworks, such as the theory of the 5Ms (management, money, markets, macro-meso environment, and maternity), which have enriched traditional approaches like the 3Ms (management, money, and markets) (Allen et al., 2010). Similarly, authors like Moser (1991) have analyzed the same phenomenon through the concept of the "triple role," which studies the same phenomenon, considering three functions: reproductive, economic, and community management performed by women.

2.4.1. Challenges of STEM MSMEs in Chile: Analysis of Obstacles and Barriers

Due to the limited information available on STEM micro, small, and medium-sized enterprises (MSMEs) in Chile, it is challenging to identify the obstacles these companies experience. However, to date, there are studies that partially address the topics of interest for this analysis.

At the regional level, the study conducted by the Inter-American Development Bank (IDB) and WxChange on STEM entrepreneurship led by women in Latin America provides valuable information that can lay the groundwork for future analyses in the field. The IDB and WxChange study analyzed the motivations and challenges experienced by STEM entrepreneurs in Latin America, highlighting the main motivation

is facing challenges and pursuing personal passions (84%), solving urgent problems (61%), marketing business ideas (37%), and seeking economic independence (35%). Conversely, entrepreneurs indicated that the lack of funding and access to capital (59%) was the main identified obstacle. Other relevant challenges identified include lack of technical knowledge (39%), balancing work and personal life (26%), access to networks and mentorship (31%), adverse macroeconomic conditions (26%), and lack of high-quality human capital (IDB, 2020).

For the case of Chile, in 2022, the SUBREI published the study "Radiography of the reality of exporting SMEs," which provides fundamental information to understand the barriers faced by micro, small, and medium-sized enterprises in the country when exporting. This study considered that companies were considered "led by women" if their owner, general manager, or signatory of legal or financial documents is a woman. The questionnaire included questions aimed at evaluating the perception of the barriers they face in the export process (SUBREI, 2022a; SUBREI, 2021b).

The survey, focusing on women entrepreneurs, revealed several internal factors that hinder the export process, including financing[2] (43.1%), access to financing[3] (36.2%), establishing potential buyer networks (24.1%), and covering transportation costs (15.5%). On the other hand, among the elements identified as "very easy to overcome/obtain," railway infrastructure (25,9%), agricultural and port infrastructure (24,1%), and customs documentation (20,7%) stand out (SUBREI, 2021b).

2 The variable "financing" is defined in the database "Characterization of Chilean Exporting SMEs" as the internal sources of funding (SUBREI, 2021b)

3 The variable "access to financing" is defined in the database database "Characterization of Chilean Exporting SMEs" as the external sources of funding (SUBREI, 2021b).

This study also incorporated gender and technology indicators, revealing that 6.9% of MSMEs led by women in the STEM sector are concentrated in digital technologies. It also indicated that 65.5% of companies led by women declared investing part of their annual revenue in technology, compared to 53.3% in the case of men. Among companies led by women that invest in technology, 26.3% allocate more than 5% of their annual revenue to this purpose, compared to 20.8% of men (SUBREI, 2021b).

3. Method

This qualitative and exploratory study aims to unravel the challenges faced by micro, small, and medium-sized enterprises (MSMEs) in the fields of science, technology, engineering, and mathematics (STEM) led by women in the context of exports. To achieve this, a rigorous research process was undertaken, involving semi-structured interviews with women in leadership roles in such companies in Chile.

This study employed the definition of MSMEs established in Law No. 20.416, which classifies these companies based on their annual income. Additionally, in order to determine what enterprises constitute a women-led company, this analysis used the definition used by ProChile and SUBREI, which defines a woman-led company as one whose owner, general manager, or signatory of legal documents is a woman. The employment of this definition aimed to achieve coherence and comparability of its results with previous and future research conducted in this area.

Furthermore, for the identification and characterization of the studied companies, the definition of MSMEs established

in Law No. 20,416 of 2010 was used, which classifies these companies based on their annual income.

For the analysis of the collected data, techniques such as content analysis and co-occurrence of variables using Atlas.ti software was implemented. The use of these techniques contributed to a deeper understanding of the challenges and dynamics faced by women-led enterprises in the STEM field and their participation in exports.

4. Obstacles Identified by Women-Led STEM MSMEs

Among the main obstacles identified by the micro, small, and medium-sized enterprises (MSMEs) interviewed are gender biases present in the business environment, the balance between family life and work life, access to financing, and the temporal discrepancy between technological advancements and current regulations.

Most of the reviewed obstacles are not exclusive to women-led STEM MSMEs in Chile but reflect the interpolation of challenges experienced by these companies when establishing themselves as women's businesses in an environment traditionally associated with male firms. The following section delves deeply into how these obstacles emerge in discourse, exemplifying through excerpts from the conducted interviews.

4.1. Gender Bias in Entrepreneurship: Implications for Women's Participation and Visibility

An initial finding providing context for subsequent findings is the perception among interviewees that a greater number of gender limitations are encountered in the business environment than in STEM disciplines. In other words, women indicate ex-

periencing a more significant impact of gender stereotypes when creating, expanding, and internationalizing their businesses in the business environment than when operating in fields such as science, technology, engineering, or mathematics (STEM).

> "I think I happened to live in a stage where female participation in STEM was already increasing, so I never felt diminished by my gender during my university career, which was good on the part of my generation and the professors. Already in the world of entrepreneurship, when I started my own startup, even though I felt capable, I suffered from impostor syndrome, and when talking to suppliers, clients, and collaborators, I felt infantilized" (Interview excerpt).

Traditionally, the STEM field has been linked to significant challenges that negatively impact women, such as workplace harassment and a lack of opportunities. These factors have resulted in high dropout rates and even discouraged new women from entering these disciplines. Interestingly, interviewed women recognize that STEM in Chile continues to be a predominantly male space. However, institutional efforts have been accompanied by recent cultural changes that facilitate women's involvement in these areas. Conversely, the sociocultural dynamics characterizing the business environment, such as dealing with new clients, raise questions regarding women's participation as authorities, sometimes leading to the invisibility of their roles.

> "When we were at university, we had to think about the roles of the company, maybe due to personality issues, we considered the factor that we were getting into male-dominated industries. When choosing the person who was going to talk to the companies, we said it should not be a woman because they would not take us seriously" (Interview excerpt).

Although instruments like GEM (2022) indicate a high rate of women's participation in TEA (Total Early-stage Entrepreneurial Activity), their involvement within companies remains limited. Thus, women's contributions, even those in leadership positions, remain hidden.

> "The current process makes it difficult for women. No, actually, it's not that they don't pay attention to us; it's that maybe we don't know how to sell ourselves well. Anyway, we send men to represent the team" (Interview excerpt).

The hiding of women not only occurs regarding their functions but also reaches formal and institutional levels. The institutionalization of gender biases, although sometimes almost imperceptible, hinders women's participation in trade. Document processing is thus affected by subtle biases, ranging from subjective forms to more concrete ones that manifest materially.

> "Another important element is that the policies, the documents, everything was done for men. The documents were made for Mr. (name), and when I sent them, they told me it was wrong, they rejected them, but I couldn't edit that part, so they had to redo everything, and when I went there, they saw the amount of the fund and that the boss was a woman, that the legal representative was a woman, they couldn't believe it" (Interview excerpt).

4.2. Balance Between Family Life and Work Life

The burden of responsibilities was referenced as an obstacle in all interviews with women. The need to balance family and work life was not only identified as a challenge when fully participating in trade but also constituted an obstacle from

the early stages, dating back to the decision-making process determining the creation of the companies.

Although the tension between work and family has been widely reviewed in works on MSMEs and women, it is essential to consider the fundamental role played by economic, social, and cultural factors that distinguish the studied contexts. In this sense, it is necessary to remember that women do not constitute a homogeneous group and experience this overload of functions in differentiated ways.

Thus, traditional conceptions, such as those that present entrepreneurship as a flexible solution to reconcile responsibilities or as a response to the difficulties women face in entering the job market, might be problematized in the case of the studied companies. The perception of women's businesses as complementary sources of income in the home often stems from a traditional family model and gender roles associated with its members. However, women in STEM disciplines highlight family and gender dynamics, where women occupy spaces and roles commonly described as masculine.

Additionally, it is worth mentioning that, when starting their ventures, the interviewed women held formal jobs or were pursuing higher education. Due to the time demands posed by the creation of a micro, small, or medium-sized enterprise, the interviewees had to quit their jobs or reduce their involvement in them. This implies that, in certain cases, women gave up working under a fixed schedule or having access to daycare and other benefits associated with the corporate environment.

> "I postponed my maternity until I could do it, but I found that this decision can have a high cost. In vitro fertilization becomes an exhausting option. The responsibility of paying for

> daycare falls on me, which reduces the incentives to undertake and start a family. Some women have decided to start a business to obtain flexibility and thus be able to have a family, but I love my profession and want to undertake it without giving up the family aspect. It seems as if the children raise themselves, and this is an overwhelming feeling. But it's always us women who are forced to postpone ourselves" (Interview excerpt).

4.3. Access to Financing

Access to financing was widely identified as an obstacle in studies on STEM micro, small, and medium-sized enterprises. Because these companies heavily depend on the innovative component and the incorporation of new technologies, the need for financing is growing and constant. Thus, financing the research and piloting of new components is a significant barrier that compromises the competitiveness of these companies in international markets.

The high amounts required by these firms to continue their activities challenge two fundamental aspects: the risk associated with micro, small, and medium-sized enterprises and female leadership. STEM companies constitute highly innovative initiatives with promising growth, besides positioning themselves in the sector that concentrates the highest venture capital investment globally (GEM, 2022). This raises questions about the traditional functioning of loan and investment systems since it proposes a new model of women-led companies, which historically have been characterized as less innovative, unprofitable, and high-risk. In other words, the profound interpretation regarding how STEM MSMEs understand access to financing as a barrier ultimately complicates the relationship between gender and risk.

> "At the banking level, initially, I received a lot of money from CORFO; it was a very high fund because it was the first one in which there was collaboration with the Ministry of Environment. In my case, it was a very high amount because I had incredible risk and with a higher risk for women" (Interview excerpt).

4.4. Discrepancy Between Technological Advances and Existing Regulations

A factor hindering the incorporation of STEM MSMEs into commerce is the identification of a temporal discrepancy between technological advances and existing regulations. This element is closely related to access to financing and extends beyond micro, small, and medium-sized enterprises led by women in the STEM field.

Time was identified as a key factor in ensuring the competitiveness of MSMEs both nationally and internationally. The need to incorporate new technology and constantly update operating systems presents financial and regulatory challenges. The fundamental role of innovation leads these companies to challenge the limits and timeliness of regulatory processes in a context where technology progresses at a faster pace than the system's ability to adapt and establish appropriate regulations.

> "For these types of projects, scientific validation is necessary, for peers to validate it, write about it, and publish it in papers or articles. In these cases, regulations come afterward" (Excerpt from interview).

The challenge of integrating emerging or non-existent technologies into existing regulations complicates the ability of MSMEs to achieve optimal growth efficiently. In this scenario, funding and regulatory frameworks for research and develop-

ment are crucial for establishing new businesses and expanding internationally. However, this complex interplay poses a threat to the competitiveness of Chilean companies in terms of innovation and their ability to enter new markets.

5. Discussion

In general terms, the challenges identified from the conducted interviews align with those highlighted in previous studies. Access to financing, bureaucratic aspects, and balancing work and family life emerge recurrently in studies on micro, small, and medium-sized enterprises (MSMEs) led by women. However, this alignment requires a deep analysis to reveal how women in the STEM field interpret these barriers in their specific contexts.

It is important to note that women are not a homogeneous population, nor are their enterprises. Studies on women's entrepreneurial activity often reduce them to a few categories, simplifying the profile of female entrepreneurs. This results in a lack of disaggregated quantitative and qualitative data on women's businesses. Moreover, the study of women-owned businesses limits itself to a small number of variables, while men's businesses have been extensively characterized based on multiple specific criteria beyond biological sex as an analytical variable. Therefore, it's necessary to explore in greater depth the various ways in which women participate in businesses and how they and their enterprises are linked to commerce.

Although the majority of women's businesses are small and focus on low-profit sectors, there exists a significant group of highly innovative businesses with great growth potential, whose experience has been under-documented. As evidenced by this study, the obstacles faced by these enterprises are quite similar

to those identified in studies on MSMEs and women. However, there are economic, political, geographical, and sociocultural conditions that shape a particular experience. Hence, it's crucial to question how access to financing as a barrier translates into the daily lives of different women-owned businesses.

Addressing the study of STEM MSMEs based on fixed categories of what constitutes a women-owned business considerably limits the available tools for carrying out a detailed and complex analysis. In the case of the studied MSMEs, they present a profile of entrepreneurs with traditionally male-oriented training, leading unconventional businesses in what is generally considered a "women's business." Thus, STEM entrepreneurs find themselves in an intermediate space characterized by ambiguity between the feminine and the masculine. This particular position leads them to face common obstacles to both men's and women's businesses.

Although studies on women's entrepreneurial activity have received increasing attention, the incorporation of a gender perspective remains one of the main challenges. Sometimes, women are still included in the business debate as subjects with fixed characteristics defined based on cultural constructs about biological sex. This opposition between the feminine and the masculine as structuring principles of studies on women's entrepreneurship hinders the analysis of gender experience in businesses and commerce. Understanding gender as a performative and socially determined act allows for a broader understanding of the multiple ways in which women engage in commerce activities. This conception also makes it possible to examine how, through their participation in economic activities, women negotiate a series of meanings and symbolisms, challenging traditional gender roles.

Gender performativity, as described by Butler (2007), helps reinterpret the role of women in STEM, in their businesses, and in commerce. This perspective provides an opportunity to rethink traditional roles attributed to men and women in commerce. This dynamic generates tension that challenges the boundaries of gender when incorporated into studies on MSMEs, prompting a problematization of various other concepts such as family structures, care systems, and visibility.

Lastly, as Baier, Mulder, and Walsh (2021) point out, the fourth industrial revolution and Industry 4.0 have transformed the paradigm of international business. New phases of globalization have been built on unprecedented technological and institutional advances. In the current context marked by digital transformation and rapid technological advances, it's essential to address gender disparities persisting in access to opportunities and resources for women-led businesses to promote equity and inclusive development in the business sphere. Analyzing the complex relationship between the concepts raised in this study requires recognizing that commerce and trade policy do not operate in a neutral gender vacuum. Similarly, science and technology constitute a space where pre-existing social and power relations are reconfigured and reinforced. Therefore, a critical analysis of power relations converging in the space where commerce, gender, and science intersect provides insightful insight into inequality and privilege.

6. Conclusion

The relationship between gender and trade is complex and warrants further investigation in the Latin American context (López and Muñoz, 2018). While trade has significantly driven the economic and social development of women, challenges regarding gender equity still persist (WTO, 2020). Studies like

Frohmann's (2018) have shown that trade policies can differentially affect men and women. While this poses a challenge, the relationship between trade and gender also demonstrates the significant transformative potential that trade policy encapsulates in contributing to closing gender gaps.

To promote women's inclusion in trade, it is essential to have gender-disaggregated data and specific studies that highlight the various ways in which women participate in the business realm. However, in the case of Science, Technology, Engineering, and Mathematics (STEM) micro, small, and medium enterprises (MSMEs), information is scarce. Therefore, it is crucial to continue expanding our understanding of the obstacles and opportunities present for female entrepreneurs in this sector.

This study aimed to approach the barriers faced by women in STEM MSMEs in trade. It identified four main obstacles: gender biases in the business environment, the balancing act between family and professional responsibilities, limited access to financing, and the temporal mismatch between technological advancements and current regulations. These challenges align with findings from research on MSMEs led by women. However, to better understand the experience of women venturing into the STEM field, it is necessary to consider a range of economic, political, and sociocultural factors that shape the specific contexts in which they operate.

Ultimately, STEM MSMEs represent an intriguing case study as they occupy an intermediate position between business models conventionally associated with men and women. This uniqueness exposes these enterprises to uncommon challenges within the realm of research on female entrepreneurship. Analyzing these entities urges us to adopt a broader gender

perspective and question how this factor has been considered in the study of women's economic activity.

References

Allen, E., Bruin, A., Brush, C., and Welter, F. (2010). *Gender Embeddedness of Women Entrepreneurs: An Empirical Test of the 5"M"*. pp. 1-12.

Álvarez, A., and Gómez, I. (2011). Work-Family Conflict in Professional Women Employed under the Employment Mode. *Pensamiento Psicológico, Vol. 9* (16), pp. 89-106.

Baier, H., Walsh, D., and Mulder, N. (2021). The digital transformation of exporting SMEs from a theoretical and practical perspective. *Project Document (LC/TS. 2021/156) Santiago, Economic Commission for Latin America and the Caribbean (ECLAC)*. Retrieved from https://repositorio.cepal.org/handle/11362/47450

Banco Central de Chile. (n.d.). *Unit of Account*. Retrieved from https://si3.bcentral.cl/estadisticas/Principal1/Metodologias/EMF/UF.pdf

Barron, E., & Ruiz, L. E. (2021). *Understanding the Entrepreneurial Intention of Women in STEM Fields*. Springer.

Economic Commission for Latin America and the Caribbean (ECLAC). (2011). *Removing Barriers: Financing SMEs in Latin America*. Retrieved from https://repositorio.cepal.org/bitstream/handle/11362/35358/1/S2011124_es.pdf

Economic Commission for Latin America and the Caribbean (ECLAC). (2000). *Small and Medium-sized Industrial Enterprises in Chile*. Retrieved from https://www.cepal.org/sites/default/files/publication/files/4451/S00070611_es.pdf

Directorate General for Export Promotion (ProChile) and Undersecretariat for International Economic Relations (SUBREI). (2021). 4th *Radiography of the participation of women-led companies in Chilean exports*. Retrieved from https://www.

subrei.gob.cl/docs/default-source/estudios-y-documentos/otros-documentos/4ta-radiografiade5897c234194700a-0b7251301a9c186.pdf?sfvrsn=9fed8127_1

Foss, L., Mari, M., & Poggesi, S. (2021). *Women's Entrepreneurship in STEM Disciplines: Issues and Perspectives*. Springer.

Frohmann, A. (2017). *Gender Equality and Trade Policy. SECO. Working Paper.* Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3113197

Global Entrepreneurship Monitor (GEM). (2022a). *GEM 2021/2022 Women's Entrepreneurship Report: From Crisis to Opportunity.* [Webpage]. Retrieved from https://www.gemconsortium.org/report/gem-202122-womens-entrepreneurship-report-from-crisis-to-opportunit

Global Entrepreneurship Monitor (GEM). (2020). *Women and Entrepreneurial Activity Chile/2019*. Retrieved from https://negocios.udd.cl/gemchile/files/2021/01/Reporte-Mujeres-y-Actividad-Emprendedora-2019-1.pdf

Instituto Nacional de Estadísticas (INE). (2020). *Results of the VI EME 2019*. Retrieved from https://www.ine.gob.cl/docs/default-source/microentrepreneurship/publicaciones-y-anuarios/documentos/síntesis-de-resultados-vi-eme-2019.pdf?sfvrsn=ec123f9a_4

Inter-American Development Bank (IDB). (2022). *Best Practices for Financing Women-Owned SMEs in Latin America and the Caribbean: Recommendations for National Development Banks*. Retrieved from https://publications.iadb.org/publications/spanish/viewer/Mejores-practicas-para-el-financiamiento-de-mipymes-de-mujeres-en-America-Latina-y-el-Caribe.pdf

Inter-American Development Bank (IDB). (2020). *The Rise of STEMPreneurs: A study on women entrepreneurs in STEM areas in Latin America and the Caribbean.* Retrieved from https://publications.iadb.org/publications/spanish/viewer/wX_Insights_2020_El_ascenso_de_las_mujeres_STEMpre-

neurs_Un_estudio_sobre_emprendedoras_en_%C3%A-1reas_STEM_de_Am%C3%A9rica_Latina_y_el_Caribe.pdf

López, C., & Persson, S. (January 20, 2023). Women-Owned Businesses and Value Chains: How Do We Strengthen the Ties? *Inter-American Development Bank (IDB) Blog*. Retrieved from https://blogs.iadb.org/igualdad/es/empresas-de-mujeres-y-cadenas-productivas/

Law No. 20,416. *National Library of the National Congress of Chile*, Santiago de Chile, February 3, 2010. Retrieved from https://www.bcn.cl/leychile/navegar?idNorma=1010668&idVersion=2020-09-08

Library of the National Congress (BCN). (2022). *Chilean SMEs in the year 2022. Minutas Series No. 25-22*. Retrieved from https://obtienearchivo.bcn.cl/obtienearchivo?id=repositorio/10221/33318/1/N_25_22_Las_mipymes_chilenas_en_el_2022.pdf

López, D., and Muñoz, F. (2018). Trade Policy and Women in the Pacific Alliance. *Agenda Internacional, 36*, pp. 133-150.

Organization for Economic Cooperation and Development (OECD). (2018). *Policy Brief on Women's Entrepreneurship*. Retrieved from https://read.oecd-ilibrary.org/economics/policy-brief-on-women-s-entrepreneurship_dd2d79e7-en#page1

Organization for Economic Cooperation and Development (OECD). (2017a). *Entrepreneurship at a Glance 2017*. Retrieved from https://read.oecd-ilibrary.org/employment/entrepreneurship-at-a-glance-2017_entrepreneur_aag-2017-en#page1

Organization for Economic Cooperation and Development (OECD). (n.d.). *Is the Gender Gap in Entrepreneurship Closing? OECD Home*. [Webpage]. Retrieved from https://www.oecd.org/cfe/smes/inclusive-entrepreneurship/gender.htm

Sharma, L. (2022). Assessing the "entrepreneurship as emancipation" perspective among women in STEM. *Management Decision, Vol. 60*(6), pp. 1585-1605.

Suwana, F. (2017). Empowering Indonesian women through building digital media literacy. *Kasetsart Journal of Social Science, Vol. 38*(3), pp. 212-217.

Treanor, L. (2022). Genfer, STEM Women and Entrepreneurship: A Review and Future Research Directions. *International Journal of Gender and Entrepreneurship, Vol 14* (4), p. 499-520.

Undersecretariat for International Economic Relations (SUBREI). (2021a). *Characterization of Chilean exporting companies*. Retrieved from https://www.subrei.gob.cl/docs/default-source/estudios-y-documentos/otros-documentos/caracterización-exportadoras-2011-2020.pdf?sfvrsn=37ec7e6_1

Undersecretariat for International Economic Relations (SUREI). (2021b). *Characterization of Chilean exporting SMEs [Data set]. Microsoft Excel*. Retrieved from https://www.subrei.gob.cl/estudios-y-documentos/documentos/detalle-otras-fichas-y-reportes/radiograf%C3%ADa-de-la-realidad-de-las-pyme-exportadoras

World Bank Group (WBG) and World Trade Organization (WTO). (2020). *Women and Trade: The Role of Trade in Promoting Gender Equality*. Retrieved from https://www.wto.org/english/res_e/booksp_e/women_trade_pub2807_e.pdf

World Bank Group (WBG). (2012). *World Development Report 2012: Gender Equality and Development*. Retrieved from https://reliefweb.int/report/world/world-development-report-2012-gender-equality-and-development?gad_source=1&gclid=Cj0KCQjwk6SwBhDPARIsAJ59GwfWjXbZmsBbI7-VibR22UaVnROJfBbygdeVKAIAk-BOY3PxBrIbeMMaAoasEALw_wcB

World Bank Group (WBG). (n.d.). Gender Portal Data: Chile. *The World Data Bank*. Retrieved from https://genderdata.worldbank.org/countries/chile

World Trade Organization (WTO). (2020). *Women and Trade: The role of trade in promoting gender equality*. Retrieved

from https://www.wto.org/english/res_e/booksp_e/women_trade_pub2807_e.pdf