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Submitted 01-18-2023. Approved 10-23-2023

Evaluated through a double-anonymized peer review. *Ad hoc* Associate Editor: Maria Fernandez-Moya

Reviewers: Andrzej Cieslik , University of Warsaw, Department of Economics, Warszawa, Poland. Gessuir Pigatto , Universidade Estadual Paulista Júlio de Mesquita Filho, Tupã, SP, Brazil.

The reviewers did not authorize disclosure of their peer review report.

Original version | DOI: <http://dx.doi.org/10.1590/S0034-759020240202>

DETERMINANTS FOR THE INTERNATIONALIZATION OF MEXICAN MEAT COMPANIES

Determinantes para a internacionalização das empresas mexicanas de carnes

Determinantes para la internacionalización de empresas cárnicas mexicanas

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ABSTRACT

This article discusses the importance of small and medium-sized enterprises (SMEs) competing in global markets. The main objective of the empirical research presented is to identify the determinants that enable Mexican companies classified as TIF (Tipo Inspección Federal) to export their products to international markets. The research methods used included a Likert scale survey, targeting CEOs and managers in the Mexican meat industry, and the probit econometric technique that demonstrate two hypotheses. The results suggest that food safety (HACCP-H14) is an important factor for exporting, and customer-supplier satisfaction (SCPEXP-H12) makes it possible to aspire to internationalization. These findings support classical internationalization theories, such as the Uppsala model, which are discussed in the theoretical framework.

Keywords: SMEs internationalization, meat industry, innovation, network trust, food safety.

RESUMO

Este artigo aborda a relevância de as PMEs competirem nos mercados globais. O objetivo principal desta pesquisa empírica é encontrar os determinantes que permitem às empresas mexicanas TIF (Tipo Inspección Federal) exportar seus produtos nos mercados internacionais. Os principais métodos implementados foram: 1) uma pesquisa com escalas Likert realizada na indústria de carnes mexicana, considerando como público-alvo CEOs e gerentes; 2) a técnica econométrica probit que ajudou a demonstrar duas hipóteses como determinantes para a internacionalização das PMEs. Os resultados sugerem que a segurança dos alimentos (HACCP- H14) é relevante para a exportação e a satisfação de consumidores e fornecedores (SCPEXP- H12) estimula a internacionalização. Esses resultados também complementam as teorias clássicas de internacionalização descritas no referencial teórico, como o modelo Uppsala.

Palavras-chaves: Internacionalização de empresas, indústria da carne, inovação agroalimentar, rede de confiança, segurança dos alimentos.

RESUMEN

Este artículo analiza la importancia de que las pequeñas y medianas empresas (PYME) compitan en los mercados globales. El principal objetivo de esta investigación empírica es encontrar los determinantes que permiten a las empresas mexicanas clasificadas como TIF (Tipo Inspección Federal) exportar sus productos a los mercados internacionales. Los métodos implementados fueron: 1) una encuesta con escalas Likert dirigida a directores generales y gerentes de la industria cárnica mexicana; y 2) la técnica econométrica probit que ayudó a demostrar dos hipótesis como determinantes para la internacionalización de las PYME. Los resultados sugieren que la seguridad alimentaria (HACCP-H14) es un factor relevante para exportar y la satisfacción cliente-proveedor (SCPEXP-H12) posibilita aspirar a la internacionalización. Estos hallazgos respaldan las teorías clásicas de internacionalización, como el modelo Uppsala, que se analizan en el marco teórico.

Palabras clave: internacionalización de PYME, industria cárnica, innovación agroalimentaria, red de confianza, seguridad alimentaria.

INTRODUCTION

The meat sector is an important area of study due to the significance of the agrifood industry in the economy, as demonstrated by its resilience during crises such as the COVID-19 pandemic. In industrialized countries, the meat sector is particularly relevant due to its role in daily consumption as a rich source of protein. According to Godfray et al. (2018), meat provides energy and essential nutrients such as proteins, zinc, and vitamin B12.

The global demand for protein makes the meat sector a relevant field of focus for companies. To effectively compete in international markets, companies must understand the needs of these markets and be aware of current production conditions to provide high-quality goods and services to both individual consumers and business customers in different countries.

To achieve success in international markets, companies can follow theoretical models such as the Uppsala model of sequential processes proposed by Johanson and Wiedershem-Paul (1975), the innovation model proposed by Bikey and Tesar (1977), or the “Born Global” model of companies by Knight and Carvugill (1996). However, a considerable number of Mexican companies have reported difficulty in internationalizing and satisfying customers from other countries, which is observed by the country’s significant deficit in net meat exports. Therefore, this research aims to identify the determinants that enable meat SMEs to go global and export their products.

We propose a probability model to understand how likely a company is to export based on certain variables, categories, and items. The contribution of this research is twofold. First, it identifies two determinants for achieving internationalization and their respective capacity to stimulate exports when increasing effort or investment. Second, it complements the Uppsala model by identifying food safety and customer-supplier satisfaction as factors that encourage companies to export.

Therefore, our research question is: what are the determining factors for the internationalization of Mexican TIF meat small and medium-sized enterprises (SMEs)? In addition to the main objective state above, this research seeks e 1) To analyze the variables and items that can determine the internationalization for TIF meat SMEs; 2) To analyze the degree of association between the dependent variable “internationalization” and the item “innovation”; 3) To analyze the degree of association between the dependent variable “internationalization” and “food safety” (only one item which is the HACCP method); 4) To analyze the degree of association between the dependent variable “internationalization” and the item “trust.”

The appropriate quantitative method for this research, which has a binary dependent variable (internationalization), is the probabilistic model. Our findings suggest that food safety (HACCP-H14) is important in encouraging exports, and customer-supplier satisfaction (SCPEXP-H12) is necessary for internationalization. This article is structured as follows: the next section presents a literature review and the study’s theoretical basis. The subsequent section describes the methodology and data used, followed by the results and, finally, the conclusion.

LITERATURE REVIEW

Several studies have examined the internationalization of meat firms from various perspectives, including both large companies and small and medium-sized enterprises (SMEs). Our research focuses specifically on meat SMEs in Mexico. According to the statistical compendium prepared by the *Consejo Mexicano de la Carne* (Mexican Meat Council) (2021), Mexico is a significant player in the global meat industry, ranking as the ninth largest exporter, as shown in Table 1.

Table 1. Main meat exporting and importing countries

Ranking	Country	Exports	Trade balance	Ranking	Country	Imports	Trade balance
1	USA	8040	6029	1	China	8875	-8358
2	Brazil	7477	7420	2	Japan	3255	-3237
3	Europe	6150	5207	3	USA	2011	6029
4	Canada	2147	1420	4	Mexico	1875	-1169
5	Australia	1530	1294	5	South Korea	1290	-1234
6	India	1051	1051	6	Hong Kong	1230	-1230
7	Argentina	1017	974	7	Europe	943	5207
8	Thailand	855	854	8	Philippines	735	-733
9	Mexico	706	-1169	9	Canada	727	1420
10	New Zealand	623	551	10	Saudi Arabia	675	-637
Total		29596		Total		21616	

Source: Based on Mexican Meat Council (2021). Statistical compendium 2021.

On the other hand, our model proposes several variables, categories, and items for analysis, which are supported by prior internationalization studies and theoretical models. We will first discuss the theoretical background of internationalization, followed by details on the variables of innovation, food safety, and trust.

The internationalization strategies are diverse and broad, as suggested in the research of Santos et al. (2020). For the authors, meat processing firms tend to follow a dual internationalization pattern: 1) Distribution-oriented foreign direct investment (FDI), which is usually established gradually; and 2) Horizontal FDI, which is the establishment of foreign production facilities and tends to be conducted through a fast-paced expansion mode.

Another interesting research in Brazil by Santos and Batalha (2022), found that the internationalization process of meatpacking firms is assisted by four principal competencies: technical, production, sales, and logistics. The study reveals that these companies tend to pursue either a raw material seeker or local taste supplier strategy.

In addition, Magaña Magaña et al. (2020) emphasize that beef exports do not depend on quality products or institutional factors but result from volatile events related to the exchange rate and the imposition of non-tariff barriers on competing countries.

Table 2 (appendix) summarizes relevant prior studies that explain how enterprises around the world achieve international markets using different strategies. For example, Brazilian studies by Pigatto (2015) and Neto (2019) indicate that large and transnational companies use strategies such as acquisitions in various countries and directing resources toward nations with an optimal position in production and certain international trade restrictions.

Table 2. Research within the context of diverse strategies and factors that impact on the internationalization of global meat companies

Country	Internationalization approaches and strategies	Conclusions or findings	Authors - year
Ukraine	1. "Myronivsky Hliboproduct" (a technique that consists of the application of several strategies with innovative marketing); 2. Co-Branding.	It will be possible to increase the level of formalization of international marketing activities and provide a systematic and integrated approach to planning, implementing, and controlling the internationalization process. 2. The participants of this industry (suppliers, producers, intermediaries, competitor's partners) will have loyal consumers of their products (as followers, associates) who will want to be involved in the life of this club and be really involved in the promotion of their brands (product distribution) in the national and international market.	Tanasiichuk et al. (2020)
Brazil	Acquisitions of companies with financial support from BNDES (Brazilian Development Bank).	The main strategy implemented by Brazilian companies has been productive diversification through the acquisition of companies (processing and distribution industries) in producing countries that do not face great resistance to exports (Uruguay, Argentina, Australia) and in the main consumer markets (USA and Europe).	Pigatto, G., & Pigatto, G. A. S. (2015).
China	Several economic factors such as GDP, exchange rate, and common language have helped China to internationalize and export pork.	Using a single panel dataset of China and its 31 pork-importing countries for the period 1997-2016, the authors found several factors influencing China's pork exports. In line with the research question and objective, the findings reveal that China's WTO membership, BRI, and common borders have a significant positive impact on pork export flows.	Shahriar, et al. (2019).
Brazil	Geographic spatial strategy adopted by Brazilian companies.	In assessing the trade barriers affecting Brazilian beef exports, it was found that restrictive measures in the international beef trade encouraged the geographic dispersion of Brazilian companies outside the national territory, with the aim of increasing their share of the global market. The case study of multinational corporations JBS and Minerva has found that opening branches in foreign territories is a spatial strategy adopted by the companies, as the location of production facilities aims to access domestic and foreign target markets. By having a large production and marketing platform strategically positioned, Brazilian meat multinationals have established direct integration with major global markets and leveraged their operating revenues.	Neto, (2019)

Moreover, the research by [Shahriar et al. \(2019\)](#) highlights the role of China's World Trade Organization membership and engagement in the Belt and Road Initiative (BRI), as well as the role of macroeconomic variables in boosting the development of the meat industry and enabling large-scale exports of meat products.

These previous studies focused on multinational and large companies, and there is little mention of SMEs. These firms may face more challenges and barriers to exporting. Our research aims to address this gap by examining the determinants that enable meat SMEs to compete in global markets from a different perspective.

We intend to add new variables, categories, and items corresponding to innovation, food safety, and trust that have not been tested previously to internationalize Mexican meat SMEs. It is important to highlight that unlike previous studies, we calculate the probabilities of entering the global meat market.

The Uppsala model and the innovation model

First, it is worth mentioning that the theoretical models that provide the most support for this research are the Uppsala model (Model U) and the Innovation model (Model I). These models have generic explanations. They are somewhat ambiguous since they are not detailed with such precision for each industry-sector of the economy. For example, [Andersen \(1993\)](#) notes that Model U includes potential indicators but disregards operational definitions. Additionally, the author mentions uncertainty regarding the classification of procedures and variables.

These models describe a step-by-step process of internationalization, which is typical for SMEs. The steps must be taken progressively, creating the ideal conditions for the company to begin exporting.

Another interesting model, more applicable to large firms, was proposed by [Melitz \(2003\)](#). This model explains how relocating resources can increase a company's commercial capacities and reduce costs, leading to greater aggregate productivity and financial benefits. This may involve relocating production to another location or country or reversing a previous relocation.

Relationship between trust and the Uppsala model

The Uppsala model is a theoretical framework that outlines a series of sequential steps for companies to enter global markets. This model is applicable to all types of companies but is particularly relevant for SMEs. Many SMEs do not initially set out to globalize their business; they gradually expand into international markets over time, step by step.

Another important element in the updated Uppsala model of [Johanson and Vahlne \(2009\)](#) is the "network position." This factor was identified in the original model as "market commitment." Authors assume that the internationalization process takes place within a network. Relationships are characterized by specific levels of knowledge, trust, and commitment that may be unevenly distributed among the parties involved and, therefore, may differ in how they promote successful

internationalization. However, a potentially rewarding process is that in which the company's outcome for learning, trusting, and commitment building is to obtain a more favorable network position and establish partnerships.

Thus, we decided to add a category in our model consistent with trust and commitment building named customer and supplier satisfaction. Based on the Uppsala model, we believe these factors are basic pillars to compete in new markets and obtain a better network position.

The innovation model of internationalization

According to the innovation model (Model I) of internationalization, the desire to enter global markets and offer products is already considered an innovation, which is driven by the intentions and decisions of the company CEO or owner.

Several authors have contributed to this school of thought (Wu, 1962; Andersen, 1993; Bilkey & Teasar, 1977; Cavusgil, 1980; Reid, 1981). This model indicates that companies begin to internationalize by submitting an export innovation, then export regularly to a “psychologically closer” country, and finally export to other nations that are psychologically “further away” (Bilkey & Tesar, 1977, p. 93).

These innovation models also lead to knowledge acquisition, and not only at the stage of entering an external market. The beginning of internationalization is the acquisition of knowledge to introduce innovations and new developments related to management. Table 3 shows different phases of the Model I of internationalization.

Table 3. Different phases of the Model I

Phases of the company's internationalization process (Cavusgil, 1980)	
PHASES	CRITICAL ACTIVITIES
Domestic marketing	Local market concerns
Pre-export phase	Deliberate search for information and preliminary assessment of the feasibility of undertaking an international marketing activity
Test implementation	Initiation of limited international marketing
Active involvement	Systematic exploration to expand marketing activity (sales, direct export).
Committed participation	Asset utilization based on international business opportunities

On the other hand, the Oslo Manual (OECD/Eurostat, 2018, p. 20) proposes indicators that might be considered innovations. Its definition of innovation is:

“An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit’s previous products or processes and has been made available to potential users (product) or put into use by the unit (process).”

Furthermore, the Oslo Manual is considered an important reference to determine factors and variables that measure organizational innovation. Table 4 shows the indicators from the Oslo Manual to measure the degree of innovation in companies. We have used them as a base to create the categories and items for our proposed model.

Table 4. Innovation indicators

Topic in general	Indicator
Product innovation/value-added products	Participation of innovative products in companies with one or more types of product innovation.
Product innovation development method.	Share of companies with one or more types of product innovations that developed these innovations through imitation, adaptation, collaboration, or entirely in-house.
Collaboration	Collaboration participation of companies that collaborated with other parties on innovation activities (by type of partner or location of partner)
Digital platforms	Percentage of business using digital platforms or software to sell or buy goods or services.
Advanced use of technologies	Proportion of companies in the industry using advanced, enabling, or emerging technology.

Matarazzo et al. (2020) explained an interesting context about the combination of digitalization and internationalization, particularly effective in promoting SMEs’ growth on a global scale. The benefits of digital technologies for SMEs extend beyond the internet and include establishing strong relationships with international customers, such as through social networks. Another remarkable research suggests that innovation is important for agrifood companies to export. Ensuring the traceability of products is crucial for consumers’ safety and trust. Thus, a new technological tool is necessary to improve traceability that can be developed through an innovation strategy (García-Álvarez et al., 2019).

According to García-Álvarez et al. (2019), a competitive environment facilitates the development of collaborative innovation in SMEs. This innovation directs products, processes, and organizational innovation toward meeting the consumers’ demands. In addition, Barreiro (2011) emphasizes the freedom to innovate through the European Commission. He expresses the ambition to make the European food industry competitive by promoting innovation. This can reduce producers’ costs by taking advantage of distribution.

Alternatively, a quantitative study made on producers in Southern Brazil by Oaigen et al. (2013) concluded that the meat production systems are competitive due to the attitude of

entrepreneurs, mainly regarding the use of **production technology and management tools**, which is very satisfactory.

Sereia and Câmara (2015) conducted a study in the Brazilian state of Paraná, examining the companies' decision to innovate. They concluded that these companies prioritized adopting new process technologies, which led to the development of new products. However, the emphasis was on the adoption of new production processes.

Nevertheless, what is product innovation in the meat industry? According to an interview with Chris DuBois, vice president of a Chicago-based market research firm (Mitchel, 2019), the value-added meat products department is leading in sales. Value-added products include marinated cuts, cooked ribs, kabobs, corned beef, fresh hamburgers, and shaved steak for use in tacos, fajitas, stir-fries, and sandwiches (Mitchel, 2019).

Food safety literature

Food safety has become a requirement for trading food products in other countries, leading many companies to adopt appropriate processes such as Hazard Analysis and Critical Control Points (HACCP). This is important to customers and consumers because food must meet hygiene and sanitation standards to prevent illnesses. According to Davidson et al. (2017), food safety involves ensuring that food is safe to eat and free from dangerous levels of harmful infectious and toxic agents. Further, according to the research by Santos et al. (2020), food safety issues play a central role in internationalization decisions.

Achieving food safety can be a significant factor in the internationalization of meat companies. However, it is not easy as many certifications must be met to export products to other countries, with some countries having more stringent requirements than others.

In Mexico, the most basic certification is the TIF, which certifies certain capacities and processes for food safety. However, this certification is not always enough for exporting. TIF companies represent a starting point for food safety, which is why these Mexican companies were chosen as the focus of this research.

The study by Murphy et al. (2015) defines importers' willingness to pay for pork in 7 predetermined quality categories (food safety, customer service, eating quality, product specification, packaging and condition on arrival, visual characteristics, and production history). In addition, the authors conducted a survey between November 2009 and April 2010 in China, Japan, Hong Kong, Russia, and Mexico, concluding that:

1. More than 70% of respondents in Hong Kong/China, Japan, and Mexico responded that purchase price influenced the decision to buy imported pork.
2. Food safety was the most important quality category (price was not included as part of quality) for imported pork, followed by customer specifications.

On the other hand, Pond et al. (2016), in their article on Mexico, describe that foodborne diseases are the leading cause of mortality in preschool children (1 to 4 years) in Mexico. In children aged 5 to 14 years, foodborne diseases are the tenth leading cause of death. In a study by Varela et al. (2007) to determine food safety, they also investigated the contamination of beef carcasses in a slaughter plant in Guadalajara, Mexico. The results of the study showed noticeable bacterial contamination.

Finally, after showing our theoretical support for our proposed model, Table 5 presents the hypotheses we intend to confirm or reject in this empirical study.

Table 5. Definition of the Items and Hypotheses of the probit model

ITEM Definition	Hypothesis
Ad1= Adoption of machinery	H1. The adoption of machinery is positively associated with the internationalization of meat firms.
Ad2= Adoption of software - digital platforms	H2. The adoption of software - digital platforms - is positively associated with the internationalization of meat companies.
Adexp= Adoption of cutting-edge technology	H3. The adoption of cutting-edge technology accounts positively for the internationalization of companies.
Ctech= Collaboration with other companies to acquire technologies	H4. Collaboration with other companies to acquire technology is positively associated with the internationalization of meat enterprises.
Cinprods= Collaborations to innovate in meat products	H5. Collaboration to innovate in meat products is positively associated with the internationalization of the firms.
Innovaprod= Innovation and design of meat products	H6. Innovation and design of meat products are positively associated with the internationalization of enterprises.
Inprodex= Product innovation for export	H7. The innovation of exportable products is positively associated with the internationalization of meat companies.
Icomp= Information sharing with customers	H8. Sharing information with customer is positively associated with the internationalization of meat companies.
Icomp2 = Sharing information with suppliers	H9. Sharing information with customer and suppliers is positively associated with the internationalization of meat companies.
Scli= Customer Satisfaction	H10. Customer satisfaction is positively associated with the internationalization of meat firms.
Spro = Supplier Satisfaction	H11. Supplier satisfaction technology adoption is positively associated with the internationalization of meat enterprises.
Scpexp= Customer-supplier satisfaction for export aspiration	H12. Customer and supplier satisfaction to aspire to export is positively associated with the internationalization of meat companies.
Communicacp= Effective customer-supplier communication	H13. Effective customer-supplier communication is positively associated with the internationalization of meat firms.
Haccp= Food Safety	H14. Food safety is positively associated with the internationalization of meat companies.

METHODOLOGY & DATA

Table 6 complements the previous section and provides the theoretical support for the variables, categories, and items proposed in our model.

Table 6. Theoretical support for each variable and item

Authors	Theoretical support	Variable-categories support	Model items that support the theory	What is the relationship between the empirical model and theory?
Johanson & Vahlne (2009)	Uppsala (U)	TRUST	SCLI-SPRO (Customer-supplier satisfaction). SCPEXP (Trust with customer-supplier to aspire to export).	The affective dimension of building trust is stronger, as the authors believe it deserves a similar status to the cognitive dimension. Relationships are characterized by specific levels of knowledge, trust, and commitment that may be unevenly distributed among the parties involved in the network, therefore, may differ in how they promote successful internationalization.
Paterson et al. (2008). Fischer (2013). Johanson & Vahlne (2009)	EMPIRICAL STUDIES Uppsala (U)	TRUST	COMUNIEXP (share information that assists the exports). ICOMP (Share information with customers). ICOMP2 (Share information with suppliers).	The factors: "Shared information" and "reliability" have a relative importance to build trust among the members of the industry or food chain. Effective communication seems to have an immediate impact on building trust.
Johanson & Vahlne (2009) Murphy et al. (2015)	Uppsala (U) EMPIRICAL STUDIES	FOOD SAFETY	HACCP (food safety processes).	RELATIONSHIP COMMITMENT DECISIONS: This variable implies that the firm decides to increase or decrease the level of commitment to one or more relationships in its network. In an extreme case scenario, if companies want to comply with commitment, they must provide food safety. International meat importers have a high degree of willingness to pay for food safety.
Bilkey & Teaser, (1977; Cavusgil, 1980 & Reid, 1981). Oslo Manual (2018).	INTERNACIONALIZATION INNOVACIÓN MODEL (IM)	INNOVATION	INNOVAPROD (Products innovation). INPRODEX (Product innovation- added value products for exports).	INNOVATION IN THE MANAGEMENT OF THE COMPANY. This model (IM) assumes that each step to export is considered an innovation. The beginning of internationalization is the acquisition of knowledge to introduce innovations and new developments related to management.

Continue

Table 6. Theoretical support for each variable and item

Concludes

Authors	Theoretical support	Variable-categories support	Model items that support the theory	What is the relationship between the empirical model and theory?
Manual de Oslo (2018). Bilkey & Teaser, (1977); Cavusgil, 1980 & Reid, 1981) Sereia & da Camara (2015)	INNOVATION (Companies cooperation)	INNOVATION	AD1, AD2 (Collaboration for the acquisition of technology & software) ADEXP (Adoption of cutting-edge technology). CINPRODS (Collaboration to innovate in exportable products) CTECH (Collaboration with other companies to acquire technologies)	Proportion of companies in the industry using advanced, enabling, or emerging technology. Participation of companies with one or more types of product innovations that developed these innovations through imitation, adaptation, collaboration, or entirely in-house. Proportion of collaboration of companies that collaborated with others on innovation activities (by partner type or partner location).

An image of our proposed probit model for internationalization is shown in Figure 1 (classification of the model), which presents the generic variables, the categories, and the fourteen items (hypotheses).

Figure 1. Classification of the model

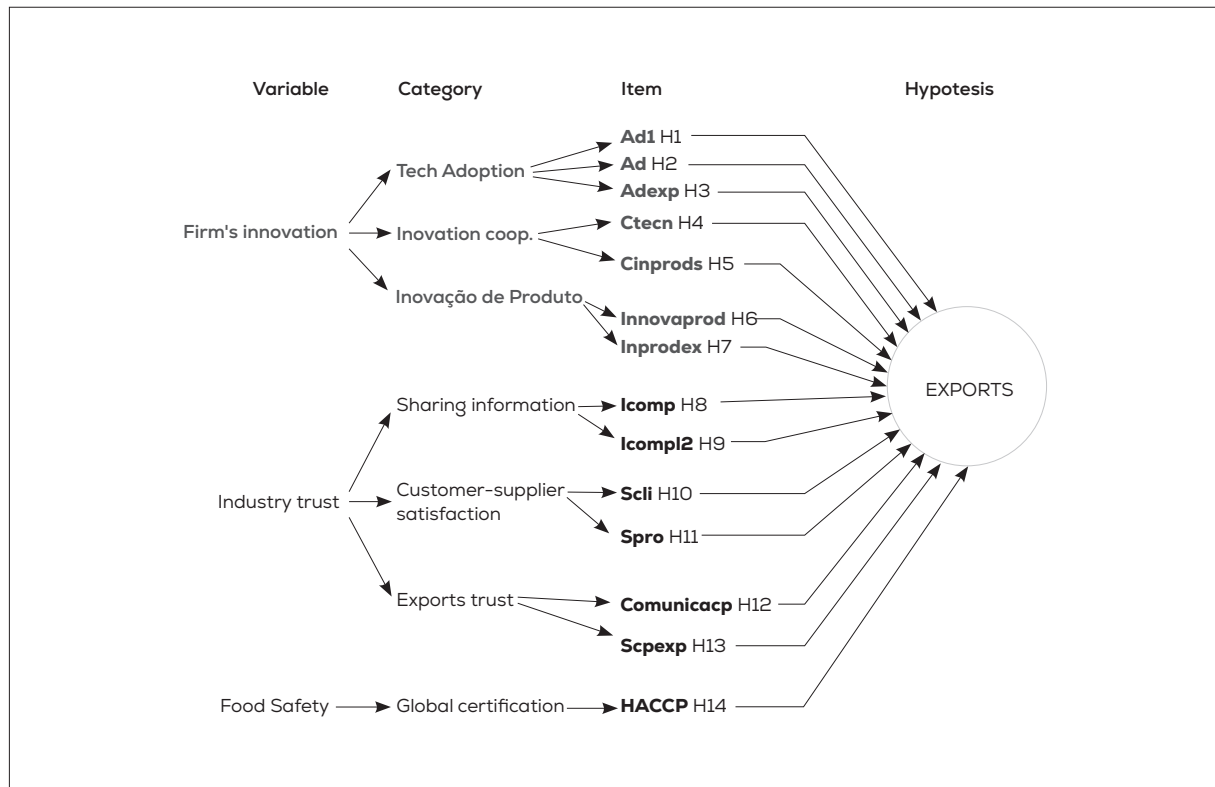


Figure 1 also shows each hypothesis, represented by the letter “H” followed by a number that refers to the hypothesis number. The descriptions of the items and hypotheses for the probit model were presented above in Table 5.

Our research focused on TIF meat SMEs. Of the 99 companies surveyed, 47% currently export products. The questionnaires were answered by the companies’ CEOs or owners based on their experience in the industry. The survey aimed to gather insights, opinions, or evaluations from decision-makers within the SMEs and understand their opinions on the variables and items related to achieving internationalization.

The 5-point Likert scale was used to capture levels of affirmation or refusal with options regarding frequency (from never to always), importance (from not important to very important), agreement (from strongly disagree to strongly agree), among others. This scale was adopted since “Likert built his scale as a means to capture an infinite number of attitudes in an ordinal scale format” (Likert, 1932, in Rinkert, 2014: 2), where the premise is to approximate measurement of respondent’s perceptions for statistical analysis purposes.

In this research, as we will see later, discrete and non-continuous values were captured, so the technique is used for practical purposes rather than discussing the nature of its use or its suitability; the technique also obeys the sample size and the statistical properties of the sample (such as whether it has a normal distribution, bias, or measures of dispersion) rather than theoretically. This study uses the Likert scale to statistically process ordinal data and propose non-linear probability models. Descriptive statistics were added later to account for the behavior of each variable used in the model, frequency, and contingency tables. Likewise, the dependent variable is dichotomous; it only contains two values: a company that exports (value one) and a company that does not export (value zero).

Sample

There were 463 TIF meat companies in Mexico at the time of the research. We sent an email to the “National Service of Health, Safety, and Food Quality” (SENASICA) requesting support in distributing a survey to the managers and owners of these companies. The survey was sent electronically in 2021, and SENASICA distributed it to TIF meat companies via a link in *Google Forms* (85% percent of these companies were SMEs, those firms answered the survey). Out of the 393 SMEs that received the survey, only 99 responded, representing 25% of the TIF meat SMEs in Mexico.

Quantitative method

As previously mentioned, the technique implemented was a probit regression (probability regression). This is suitable for our research since it allows us to execute Likert scales with a set of independent variables (our items) and a binary dependent variable. For this research, the

binary variable was a response from the companies' CEO' or owners, where they answered YES or NO if their company currently exports, i.e., we assume: $E(Y|X)=P(Y=1|X)=\Phi(\beta_0+\beta_1X)$.

This technique determines the likelihood of a company to export based on the results of the proposed items, which are presented in the form of Likert scales. The technique provides a probability value indicating the likelihood of a company to export based on its responses to the survey items.

Hanck et al. (2019) comment that the Probit coefficient β_1 is the change in Z associated with a one-unit change in X . Although the effect on Z of a change in X is linear, the link between Z and the dependent variable Y is not linear since Φ is a non-linear function of X .

This technique was used in other studies to determine the exports of certain sectors in various countries. For example, Serrano et al. (2016) used a longitudinal panel in Spain between 1994 and 2012. It was composed of a sample of 342 Spanish companies involved in the food, meat, beverage, and tobacco industries. In this case, a dynamic Heckman-Probit model was implemented. Their results find that SMEs can achieve internationalization through business collaboration.

In a study on Brazilian SMEs furniture manufacturers, Boehe (2013) used a probit model with a binary dependent variable (propensity to export) to test the hypotheses. The author found that the local collaborative intensity of a firm is positively related to its export intensity and that both relationships are moderated by the firm's distance from the local network center.

Furthermore, since the relationship of the independent values vs. the binary variable is not linear, the model will show a Mc Fadden's Pseudo R-squared. Therefore, we do not use the Ordinary Least Squares (OLS) approach. Rather, the parameters are estimated by maximum likelihood, which is reached through an iterative process in the STATA software used to execute this model.

Probit model equation

The proposed equation for running the probit model treats each Likert-scaled item as a variable to determine whether these items explain the internationalization of Mexican meat companies. The marginal effects and beta coefficients will be calculated to provide a probability for each item (variable X) with respect to internationalization (Y). This will allow us to determine whether the supports our hypotheses.

Proposed probit model equation:

$$P(\text{Export} = 1|x) = [G(\beta_0 + \beta_1 ad1 + \beta_2 ad2 + \beta_3 adexp + \beta_4 ctech + \beta_5 cinprods + \beta_6 innovaprod + \beta_7 inprodex + \beta_8 icomp + \beta_9 icomp2 + \beta_{10} scli + \beta_{11} spro + \beta_{12} scpexp + \beta_{13} comuniexp + \beta_{14} haccp)]$$

Application of the model

The methodology we used to run our model is outlined below:

1. Cronbach's Alpha test was conducted to assess the validity of our questionnaire and the correlations between all the items of the variables. Table 7 shows the results, which indicate that our instrument is reliable for conducting a survey with TIF meat SMEs, with a value of 0.88, i.e., close to 1.
2. Next, we ran correlations based on the values of the items quantified in Likert scales before executing our probit model. This allowed us to identify and remove items with high correlations to avoid multicollinearity issues within the model. Table 8 shows the results of the correlation matrix.

Table 7. Results of the Cronbach's Alpha test

Item	Obs	Sign	Item-test correlation	Item-test correlation	Average Interitem correlation	alpha
y	99	+	0.7412	0.6890	0.3129	0.8723
ad1	99	+	0.5894	0.5158	0.3270	0.8793
ad2	99	+	0.4900	0.4057	0.3361	0.8837
mejproces	99	+	0.6584	0.5937	0.3206	0.8762
adexp	99	+	0.7227	0.6676	0.3146	0.8732
ctech	99	+	0.6440	0.5774	0.3219	0.8769
cinprods	99	+	0.6272	0.5582	0.3235	0.8776
innovaprod	99	+	0.4360	0.3469	0.3411	0.8859
inprodex	99	+	0.7542	0.7041	0.3117	0.8717
icomp	99	+	0.4424	0.3538	0.3405	0.8857
icomp2	99	+	0.3396	0.2439	0.3500	0.8898
comuniexp	99	+	0.7889	0.7448	0.3085	0.8700
scli	99	+	0.5130	0.4309	0.3340	0.8827
spro	99	+	0.5319	0.4518	0.3323	0.8819
scpexp	99	+	0.8024	0.7606	0.3073	0.8693
haccp	99	+	0.6189	0.5489	0.3242	0.8780
Test scale					0.3254	0.8853

Table 8. Results of the correlation matrix

Variables	y	ad1	ad2	mejproces	adexp	ctech	cinprods	innovaprod	inprodex	icomp	icomp2	comuniexp	scli	spro	scpexp	haccp
y	1															
ad1	0.263*	1														
ad2	0.262*	0.504*	1													
mejproces	0.414*	0.634*	0.406*	1												
adexp	0.589*	0.368*	0.171	0.457*	1											
ctech	0.352*	0.444*	0.308*	0.413*	0.478*	1										
cinprods	0.475*	0.339*	0.115	0.329*	0.444*	0.486*	1									
innovaprod	0.252*	0.154	0.077	0.318*	0.297*	0.324*	0.217*	1								
inprodex	0.610*	0.406*	0.103	0.426*	0.660*	0.463*	0.681*	0.369*	1							
icomp	0.174	0.117	0.288*	0.145	0.152	0.285*	0.15	0.188	0.15	1						
icomp2	0.072	0.038	0.255*	0.078	0.113	0.157	0.038	-0.03	0.055	0.617*	1					
comuniexp	0.718*	0.392*	0.285*	0.403*	0.646*	0.429*	0.521*	0.331*	0.716*	0.194	0.079	1				
scli	0.301*	0.263*	0.188	0.312*	0.275*	0.189	0.118	0.157	0.257*	0.219*	0.275*	0.266*	1			
spro	0.306*	0.211*	0.249*	0.250*	0.328*	0.194	0.182	0.141	0.285*	0.139	0.300*	0.323*	0.630*	1		
scpexp	0.757*	0.352*	0.313*	0.368*	0.631*	0.416*	0.590*	0.339*	0.721*	0.192	0.115	0.899*	0.285*	0.342*	1	
haccp	0.646*	0.233*	0.232*	0.435*	0.401*	0.311*	0.397*	0.09	0.415*	0.281*	0.127	0.452*	0.240*	0.281*	0.463*	1

Note: * $p < 0.05$.

There were no outliers or abnormalities in the correlation matrix that could negatively impact the model or its significance. Therefore, all items were categorized and used to run the probit model and calculate marginal effects. The probit model was executed as shown in Table 9 (all variables).

Table 9. Probit results

Variable	All variables		Selected variables	
	Marginal Effects	Delta method std. error.	Marginal Effects	Delta method std. error.
ad1	-0.115**	-0.0541		
ad2	0.046	-0.0433	0.00326	-0.0375
Mejproces	0.0552	-0.0414	0.0152	-0.0285
Adexp	-0.0161	-0.0472		
Ctech	0.00174	-0.0272		
Cinprods	-0.0147	-0.0234	-0.00619	-0.0238
Innovaprod	-0.00941	-0.0214	-0.0185	-0.0183
Inprodex	0.00109	-0.0343		
Icomp	-0.0652	-0.065		
icomp2	0.0291	-0.0478	-0.00752	-0.0251
Comuniexp	0.042	-0.0482	0.0403	-0.0354
Scli	0.0207	-0.0803	-0.00646	-0.0731
Spro	-0.104	-0.0966	-0.0378	-0.0746
Scpexp	0.123*	-0.0643	0.0820**	-0.0345
Haccp	0.150**	-0.0601	0.118***	-0.028

Note: standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Despite having a stable pseudo-R-squared value of 0.78, several items were insignificant and may have affected the significance of other items or variables. The items labeled “adexp,” “ctech,” and “inprodex” were found to be the least significant, with P values close to 1, indicating that they have little influence on internationalization. Additionally, we discarded the item labeled “AD1” because it had a negative marginal effect on internationalization, which does not align with theory and does not make sense. We also discarded the item labeled ICOMP because sharing information with customers and suppliers had a similar impact, so it was unnecessary to include them separately. Running the model without this item improved its performance.

The probit model was run again, excluding items with high P-values. The selected variables can be seen in Table 9 above. The items SCPEXP and HACCP were significant in explaining the internationalization of meat companies (values emphasized in Table 9).

Marginal effects were calculated to determine the variability or relationship of change between the items and Y. This provides a better interpretation of the beta coefficients estimated using the probit technique. The results of the marginal effects can be see emphasized in the same Table 9.

Factor analysis

Additionally, as a measure to corroborate the classification of the explanatory variables of the model, we implemented an exploratory factor analysis. This allowed us to validate the internal structure of the classification of the variables through factor loadings. It is worth mentioning that this method yields maximum factor loadings that can be repeated in more than one factor.

RESULTS

After calculating the marginal effects, we identified the significant items that explain the internationalization of TIF meat SMEs. The interpretation of the statistically significant items in the probit model suggests the following:

1. If Mexican TIF meat SMEs willing to export their products double the efforts to generate customer-supplier satisfaction “SCPEXP” (H12), the likelihood of these firms’ achieving internationalization increases by 8%.
2. If Mexican TIF meat SMEs double their efforts to ensure food safety using the “HACCP” method (H14), their likelihood of going global increases by 12%.

Only two hypotheses (H12 and H14) were confirmed. The rest of the hypotheses (H1-H11) and H13 were rejected because they do not explain the internationalization of Mexican TIF meat SMEs.

It is interesting to note that, despite the broad theoretical support for Model I (innovation and sequential steps for internationalization), the results suggest that certain aspects of innovation, such as the adoption of technology, product innovation, and collaboration to innovate, do not explain the meat firms’ ability to compete in global markets. This could indicate that other factors may be more important for the internationalization of firms in this particular sector. It would be interesting to explore this topic further and identify other factors that may play a role in the internationalization of firms in the meat food sector.

The results of the probit model were somewhat unexpected in terms of innovation. However, it is valuable to discover that none of the proposed items significantly explain internationalization. This information can be used to advise CEOs and business owners that this may not be the most effective way to compete in global markets. It is possible that a different type of innovation, such as marketing innovation, may be more effective in attracting potential customers and

sales abroad, as suggested by the results of Tanasiichuk et al. (2020). This is also supported by the classic theoretical model of Cavusgil (1980), which suggests that innovative marketing activities can help achieve internationalization.

According to Barney's (1991) theory of resources and capabilities, acquiring technologies such as machinery and software can provide a company with valuable and differentiated resources, which can help it achieve better competencies. Nonetheless, this study found that this does not work for achieving internationalization. It may be that having advanced machinery is not enough if the company does not have effective marketing management or trained human resources to enter foreign markets. Similarly, product innovation alone may not be sufficient for exporting, as it must be combined with a global vision from the owner, directors, or managers. This relationship between management capabilities and internationalization has been demonstrated in many studies, which is why it was not considered in this research.

As we mentioned previously, trust is an essential component of conducting business, particularly in the context of international transactions. The Uppsala model, a widely accepted theoretical framework for understanding the internationalization process of firms, emphasizes the importance of trust in overcoming psychological barriers such as distance, language, and customs. This is supported by empirical research, including studies by Paterson et al. (2008) and Fischer (2013), which have demonstrated the role of trust in facilitating global transactions.

However, for the probit quantitative method, and given the Likert scales we used to empirically demonstrate the causality between these hypothesized item of trust: (ICOMP-H8; ICOMP2 -H9; SCLI-H10; SPRO-H11; COMMUNICACP-H12; SCPEXP-H13), we found that most items were not determinants and reliable in explaining the internationalization of Mexican meat companies. Only SCPEXP (Customer and supplier satisfaction to **aspire** to export) was a determinant, which, with a confidence level of 95% and an error margin of 5%, explains and predicts firms' internationalization.

This item is expressed as follows to be answered with a Likert scale from 1 to 5:

"Thanks to the satisfaction of customers and/or suppliers, meat companies aspire to compete in global markets"

In the food industry, customer-supplier satisfaction is achieved through the fulfillment of quality standards, timely order fulfillment, high service levels, and the efficient management of business relationships.

If foreign customers trust Mexican producers and the service they provide, then the likelihood that they will recommend their products to others within their network may increase. According to our results, there is an 8% increase in this probability. This can open doors for Mexican companies. However, as mentioned in the theoretical framework, trust is built over time and requires consistent effort to maintain, much like interpersonal relationships. We had hoped for more statistically significant results regarding the role of trust in explaining internationalization.

The food safety variable is composed of only one item (HACCP- H14 - *P value* 0.002). It was mentioned previously that this variable-item could be a determinant for internationalization. Therefore, H14 is confirmed.

The odd fact is that no studies or empirical research were found that have defined this variable as a determinant in exporting through quantitative techniques in agrifood industries. Thus, this research contributes due to its innovative approach, considering that HACCP processes (Hazard Analysis and Critical Control Point System) are fundamental for internationalization in the food sector, including meat.

Although international certifications associated with the Global Food Safety Initiative (GFSI) were not considered necessary for achieving export success, it is important to note that processes based on the HACCP method can help companies obtain various types of certifications, both local and international. Some may question why other items were not included in this research. It was not necessary because the HACCP method proved to be a reliable and significant predictor of internationalization within our model.

Our results can encourage future research to consider this variable as fundamental and for companies in the Mexican meat sector to increase their efforts to improve their competencies and capacities with global standards in order to reach new commercial horizons.

Also, after running the marginal effects in the STATA software, this yields a beta coefficient of 0.118, suggesting that with a double effort to implement HACCP processes, the probability of internationalization of these companies increases by 12%.

Based on this empirical evidence, the meat industry and SENASICA, in particular, which is the institution that regulates food safety in Mexico and that supported this research to carry out the distribution of the survey, will be very enthusiastic. It will be encouraging for SENASICA to know that their effort and work is relevant not only to export but in general to have a world free of contaminants that are harmful to human health.

This 12% probability was the highest among all the statistically significant items, indicating that this variable carries more weight. It is hoped that Mexican companies will be able to effectively implement processes based on the HACCP method.

Considering the exploratory factor analysis, we were inquisitive to understand the classification of the variables in each of the seven categories. After performing the analysis, we obtained seven factors (equivalent to the seven categories of our model). Consequently, we appreciate that some items can be combined to form a factor. These values range from 0 to 1, in which the maximum factor loading is 1. In Table 10, darker shades of gray indicate higher loadings:

1. In factor 1, we can observe that items SCPEXP and COMUNIEXP can be combined to form a single factor. This is relevant because, in our model, SCPEXP was a determining factor in achieving internationalization. By linking it with effective communication, companies can provide better customer service, make partnerships, and reach more countries through networks.

2. From factors 2 to 5, we see that the new factors (combined elements) make clear sense because of their similarities. Sharing information with customers and suppliers is summarized in one factor (ICOMP, ICOMP2). It also makes sense for customer and supplier satisfaction to be combined into a single factor (SPRO, SCLI). The same applies to the acquisition of machinery and digital platforms (AD1, AD2). Finally, as far as inter-company collaboration is concerned, it falls under factor 5.
3. Another piece of information that is consistent for us is the HACCP item, which was also a statistically significant determinant for exporting and should not be combined with another factor (uniqueness).

Table 10. Factor analysis results

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Uniqueness
ad1	0.3087	-0.0121	0.1409	0.6129	0.1989	0.0619	0.0636	0.4615
ad2	0.1823	0.2508	0.119	0.628	-0.0756	-0.0513	-0.048	0.4846
adexp	0.6488	0.0577	0.1922	0.1114	0.2004	0.101	0.2552	0.4109
ctech	0.3994	0.1983	0.042	0.3414	0.3507	0.2132	0.1265	0.4984
cinprods	0.5815	0.0465	-0.0078	0.0878	0.5171	-0.0228	-0.0277	0.3833
innovaprod	0.3353	0.0619	0.0604	0.0335	0.0896	0.4193	0.0256	0.6945
inprodex	0.7553	0.0071	0.1311	0.0314	0.3994	0.1231	0.0919	0.2283
icomp	0.1327	0.7423	0.0541	0.1099	0.0658	0.0748	0.0057	0.4064
icomp2	0.013	0.7055	0.2328	0.0513	-0.0161	-0.0627	0.0061	0.4411
comuniexp	0.9104	0.059	0.1041	0.1485	-0.0158	0.029	0.0291	0.1328
scli	0.1883	0.1652	0.676	0.1068	0.0296	0.0527	0.0168	0.465
spro	0.2534	0.1395	0.691	0.0975	0.0198	-0.0253	0.0084	0.4282
scpexp	0.9195	0.0848	0.1249	0.1223	0.0292	-0.0032	-0.0742	0.1104
haccp	0.451	0.1949	0.1506	0.1191	0.1943	-0.1834	0.0632	0.6464
Higher factor loadings	scpexp*	icomp*	spro*	ad2*	cinprods*	innovaprod*	adexp	Innovaprod
	comuniexp*	icomp2*	scli*	ad1*	inprodex			haccp*
				Ctech	ctech*			
Category	Exports trust	Sharing information	Customer-supplier satisfaction	Tech adoption	Innovation cooperation	Product innovation	-	Global certification

* Items correctly classified in their respective categories.

CONCLUSIONS

This research is significant for both SENASICA and TIF companies due to the findings and outcomes that have been discussed. In modern times, it is important to establish connections between academia, industry, and government institutions. This was one of the initial goals of this research, and it has been achieved.

The most important results of this empirical study can be summarized as follows:

- Food safety, as measured by the implementation of the HACCP system (H14), is crucial for competing in global markets (*P-value 0.002*). This finding contributes to the literature as no previous study has achieved this objective. While the theoretical relevance of food safety was discussed extensively in this research, the results obtained using the probit model provide empirical support.
- It is found that if companies increase the effort to satisfy their customers and suppliers, they can aspire to internationalize (SCPEXP, H12) and *P-Value 0.05*. This could be because more trust is generated within the internationalization network (primary intermediaries, secondary intermediaries, customers, and final consumers).
- Our factor analysis revealed that a combination of SCPEXP and COMMUNICACP items can be effective for meat companies looking to build trust with their customers. This will enable customers to help expand their network base abroad. To achieve this, it is recommended that companies establish effective communication channels via email and video calls, address questions promptly, and provide post-sales service. Ultimately, this will help meat companies to reach new horizons.

This research makes a valuable contribution to the field of knowledge and the research line of enterprise internationalization. Classic models such as Uppsala model (Model-U) and the innovation model (Model I) are generic, and their principles may not apply to all industries in the economy. In the case of the meat products industry, safety is a fundamental concern, and customer-supplier satisfaction is a key element in building trust. These findings could serve as a complement to the Uppsala model.

Finally, the findings of this research could be applied to other types of food, whether agricultural or industrial. As discussed in the theoretical framework, food safety is a universal concern that applies to all types of food. These probabilities should be considered in future research on this topic.

One limitation of our research is that our former target sample was 135 companies to run the model. However, only 99 answered the survey with Likert scales. Everything possible was done through SENASICA, but it was not enough. Therefore, future research could consider a larger sample. Besides, the study of national or state companies should be included to understand their strategies.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

AUTHORS' CONTRIBUTION

Hugo César Enríquez García Conceptualization, , formal analysis, funding acquisition; Investigation; Methodology; Project administration; Resources; Software; Supervision; Validation; Visualization; Writing – original draft; Writing – proofreading and editing.

Javier Gonzalo Rodríguez Ruíz , data curation, formal analysis, funding acquisition; ; Methodology; ; Resources; Software; Supervision; Validation; Visualization; Writing – original draft; Writing – proofreading and editing.