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Conditioning factors in the informal creation of nanoenterprises: Experimental evidence in Monterrey, Mexico

Factores condicionantes en la creación informal de nanoempresas: evidencia experimental en Monterrey, México

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Abstract

The entrepreneurship of nanoenterprises is of great importance in the economy of the metropolitan area of Monterrey due to the high number of nano entrepreneurs or self-employed people who are looking for a decent family support every day. The creation of these economic units becomes a relevant issue for the academic, political and social spheres. For this reason, the objective of this article is to analyze the factors that influence the informal creation of nanoenterprises or sole proprietorship. A controlled laboratory experiment with 385 autonomous people is implemented in which a transition matrix and a logit type binary model are applied. The experiment consists of three stages: first an analysis of the current situation is carried out, then information is revealed and people are trained on the advantages of becoming a formal nanoentrepreneur and finally an analysis is carried out on the factors that motivate this change. Among the main findings is that the factors that motivate the creation of a nano business in informality are unemployment, poorly paid jobs and improving their family income. However, in the course of the experiment, 22.12% are willing to move towards formality if there is a direct intervention model with support from management to the consolidation of a nanoenterprise.

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Resumen

El emprendimiento de nanoempresas tiene gran importancia en la economía del área metropolitana de Monterrey, Nuevo León, debido a la elevada cantidad de nanoemprendedores o personas autónomas que buscan día con día un sustento familiar decente. La creación de estas unidades económicas se vuelve un tema relevante para el ámbito académico, político y social. Por esta razón, el objetivo de este artículo es analizar los factores que influyen en la creación informal de nanoempresas o empresas unipersonales. Se implementa un experimento de laboratorio controlado con 385 personas autónomas en el que se aplica una matriz de transición y un modelo binario tipo logit. El experimento consta de tres etapas: primero se realiza un análisis de la situación actual, después se revela información y capacita a las personas sobre las ventajas de convertirse en un nanoemprendedor formal y finalmente se realiza un análisis sobre los factores que motivan dicho cambio. Entre los principales hallazgos se encuentra que los factores que motivan a crear una nanoempresa en la informalidad son el desempleo, empleos mal pagados y mejorar su ingreso familiar. No obstante, en el transcurso del experimento, el 22.12% dijo estar dispuesto a transitar hacia la formalidad si existiera un modelo de intervención directa con apoyos desde la gestión hasta la consolidación de una nanoempresa.

Código JEL: C44, C90, E26, O17
Palabras clave: nanoempresa; nanoemprendedor; economía informal; matriz de transición; logit

Introduction

The informal economy is a common and important phenomenon nowadays. Although it is known that informality is the result of companies and workers operating outside legality and is a cause of low economic growth for a country, it must be recognized that it has been a "lifesaver" for many people who, during times of crisis and in the absence of employment, are motivated to become entrepreneurs or self-employed within the informal sector, where better remunerations can often be obtained (Chávez, 2019).

The International Labor Organization (ILO, 2014) points out that nearly 60% of Mexico's economically active population (EAP) does not have social security, meaning that more than half of the employed population is involved in informality. Robles and Martinez (2018) argue that informality is a symptom of low productivity and low development in the regions of the Mexican Republic and is commonly associated with unemployment, street vending, lack of technology, and lack of social security, as well as negative effects on tax collection.

In this context, the city of Monterrey—in Mexico—is no stranger to this scenario; nano-entrepreneurs[1]—understanding by this term those non-salaried individuals who exercise in their name a business, professional, or economic activity without being subject to an employment contract—undertake informality as an alternative to generating a higher family income or due to the lack of employment. According to data from the Employers' Confederation of the Mexican Republic (COPARMEX) (2019), the rate of labor informality in Monterrey, i.e., people who do not have social security, is 37.1%. For this reason, it is possible to point out that most nano-entrepreneurs who enter the informal economy do not do so by choice but because of the lack of opportunities in the formal economy and because they have no other means of subsistence.

Nevertheless, what if a group of nano-entrepreneurs were given all the information, training, and support to move from informality to formality? Based on this question, the present study aims to analyze the behavior of nano-entrepreneurs, specifically associated with two questions: 1) will nano-entrepreneurs change their preferences throughout the experiment, and 2) what factors motivate the change of preferences? To achieve the objective of this study, a laboratory experiment was implemented to control the behavior of 385 nano-entrepreneurs located in Monterrey, Nuevo Leon.

It is worth mentioning that this article could be classified together with those that apply experimental economics, specifically the ultimatum technique or game through which it is analyzed that the behavior or decisions of the players—in this case, the nano-entrepreneurs—can change for reasons other than economic rationality—such as justice, equity, ethics, and integrity—(Palacio & Parra, 2012). Nevertheless, the main difference lies in this work exploring the object of study through a transition matrix and a binary logit model. The first enables the study of preference shifts that may occur among nano-entrepreneurs based on rounds of experiments that will take place in a controlled environment. In contrast, the second model provides insight into the impact of aggregate change enablers on nano-entrepreneurs' preferences. Hence, it is assumed that the preference for formal nano-company can be modeled by a binary response variable (see the Methodology section for more details).

This article is a pioneering study analyzing nano-entrepreneurs' behavior in Nuevo León. For this purpose, data from a laboratory experiment conducted in Gesell-type rooms are used, gathering the study subjects for six months, while other studies only focus on collecting data by applying a direct cross-sectional survey. Hence the interest in contributing to the research of these topics with this methodology

[1]In this article, the term nano-entrepreneur refers to a natural person, nano-businessperson or unitary entrepreneur who, individually, performs acts of commerce in a habitual manner, thus constituting their own nano-company or business, without forming companies or associations, nor fulfilling the requirements demanded by the General Law of Commercial Companies. The creation or undertaking of such a nano-company is understood, then, as an economic unit formed by a non-salaried individual who carries out a business, professional, or economic activity in their own name without being subject to an employment contract.

since, beyond the results, hypotheses are formed (the information, training, and support given to the nano-entrepreneurs during the experiment affected their preferences to participate in the formal economy) that may be of interest for other researchers in the field of administrative sciences, since this type of experiment is commonly used in disciplines such as economics and psychology. In addition, this study is intended to set a precedent regarding the importance of having alternatives in statistical methods for analyzing nano-companies.

Review of the literature

The study of the phenomenon of nano-companies entrepreneurship is becoming very important because it influences the informal sector and, although several authors (Acs, 2006; De la Garma, 2010) argue that informal activities do not have an impact on the economic growth of a country, it is important to recognize that this sector is a relevant part of production and employment in any country, as well as being a subject of academic, political, economic, and social interest.

Globally, entrepreneurship is considered an instrument to combat poverty and unemployment (Sigalia & Carney, 2012; Rodríguez & Palavicini, 2013; Pazmiño, Merchán, & Jiménez, 2018). Nevertheless, Walton and López (2005), as well as Delgado, Cruz, and Lince (2019) argue that "many times" undertakings conducted in the informal economy generate "certain" positive effects; one of them is related to the possibility of earning income for the poorest sectors of the population, since "most of the poorest are self-employed or freelancers in very small units—which can be called nano-companies or sole proprietorships—often in unstable jobs and unregistered establishments." Nevertheless, given the permanent poverty of these people, the informal economy functions more as an option for survival than for overcoming poverty (WB, 2004; Fundación 1° de Mayo, 2011).

Baptista, Karaöz, and Mendonça (2014), Morales et al. (2015), and Texis, Ramírez, and Aguilar (2016) note that people who go into business because they have no other work option are known as necessity entrepreneurs. In this study, "nano-entrepreneurs" refers to people who are in this situation since, according to Lejarriaga (2003), nano-companies are those business units constituted by a single person (sole proprietorship). García and Fernández (2005) and Raydán (2010) add that a nano-entrepreneur can be classified as an individual entrepreneur, a natural person, or a legal entity that professionally and in their own name carries out an activity of buying and selling goods or services for a specific market or sector. Valdés (2004) recognizes the nano-entrepreneur as an autonomous worker who carries out commercial activities independently and normally does not depend on an immediate boss, nor do they have a fixed salary.

The European Observatory of SMEs (2018) and the Spanish Ministry of Economy and Enterprise (2002) recognize that sole proprietors or nano-entrepreneurs run their businesses, have no salary, live off their companies' profits, and have full managerial autonomy. In other words, nano-entrepreneurs carry out an economic activity (production and distribution of goods and services) by individually deciding how the factors of production, means, equipment, raw materials, and inputs are ordered and used to earn profits.

There is a great diversity of studies that try to explain entrepreneurship from social and business perspectives. This paper focuses on the entrepreneurial field, particularly the entrepreneurial activity of those who have created a nano-company. The theoretical basis for the phenomenon of the creation of companies through entrepreneurial activity is found in the classic works of Audretsch and Fristsch (1994) and Keeble and Walker (1994), who consider that the definition and measurement of company entrepreneurship can be approached from a social and personal perspective.

The first approach refers to those environmental factors that can, directly and indirectly, influence entrepreneurial activity, such as the entrepreneurial culture of the society in which the individual participates, the sectoral structure of economic activity, unemployment, the economic situation, the financial environment, and social capital, among others. Meanwhile, personal factors refer to family environment, dissatisfaction with salaried work, financial opportunity and capacity, need for achievement, age, professional training, and personal security. Some studies on entrepreneurial activity, influence, motivation, and business opportunity have focused mainly on identifying aspects or reasons entrepreneurs consider relevant to creating a company. The following describes some studies that help identify the elements an entrepreneur must comply with to create a nano-company or business.

Gibb and Ritchie (1982) were the first to establish the determining factors that an entrepreneur needs to create a nano or micro-business. These authors argue that there are four key factors for a successful start-up: motivation, the idea or market, resources, and skills. Likewise, Alonso and Galve (2008), Álvarez and Valencia (2008), García, Martínez, and Fernández (2010), and Kantis (2003) agree with Gibb and Ritchie, pointing out that any entrepreneurial initiative in the creation of a company depends on the determination or motivation of the individual, as well as the observations and opportunities that the individual takes advantage of in their environment.

It should not be forgotten that some of the above elements are not applicable in the case of nano-entrepreneurs, such as evaluating the idea and carrying out market studies. Davidsson and Honing (2003) and Kim, Aldrich, and Keister (2006) state that the creation of a business or company does not take place "overnight" but tends to be a process of months, and even years, in which people who are in this process are known as nascent entrepreneurs who may decide to participate in a formal and informal market in the course of its implementation.

While carrying out the business, nano-entrepreneurs can combine several factors for its creation. In summary, these factors can be classified into five groups: human capital, social capital, financial capital, cultural capital, and symbolic capital (Casas & Ibarra, 2013; Nava, 2013). These capitals not only favor the creation of businesses and companies but also enable competitiveness and can be of tangible and intangible nature (Fuentes, Osorio, & Mungaray, 2016). For example, human capital is composed of knowledge and skills acquired through a person's life experience and can be generated via the education received and applied both formally and informally (Baptista et al., 2014). For the first case, Davidsson and Honing (2003) and Backes and Moog (2013) argue that individuals with higher levels of schooling will better identify entrepreneurial opportunities.

Nonetheless, most nano-entrepreneurs generally do not have a high level of schooling, so personal experience and previous work experience helps them accumulate skills and knowledge to create a trade or business.

Coleman (1988) and Narayan and Pritchett (1999) emphasize that social capital plays an essential role in creating a company since it is the asset people gain from being in contact with others. Namely, this capital is formed by the motivation, influence or links obtained from co-workers, school, family, friends, etcetera. Regarding financial capital, according to Scott (2009), Elston and Audretsch (2011), and Rodriguez (2006), it is another meaningful factor in creating a business or company and refers to the monetary resources that people possess or access. Nevertheless, possessing the financial resources will not be enough to become an entrepreneur if one does not have the mentality of an entrepreneur. This fact is linked to the cultural capital approach, which involves people's thinking, feeling, and doing. Kim et al. (2006), Gelderen, Bosma, and Thurik (2001), Quintana (2001), and Pinillos (2001) associate this approach with the operationalization of variables such as age, education, marital status, geographical environment and work and personal experience, which coincides with the elements of human and social capital. For example, the influence of a city like Monterrey, where there are large entrepreneurs and businesses of all kinds, can impact a person's entrepreneurial aspiration, and this influence would not necessarily come from the family.

Finally, symbolic capital represents a person's influence or power over others, as well as prestige, reputation and social status. Anthopoulou (2010) and Scott (2009) argue that all people seek and yearn for such values, which translate, in this work, as the motivational element of nano-entrepreneurs since, undoubtedly, this factor permits the separation of people who create nano-businesses from those who do not. On the other hand, Kantis, Ishida, and Komori (2002) state that not all entrepreneurs seek these values since, when creating a company, some pursue profit and others do not.

All of the above enables the understanding that the creation of a nano-company can take place in different ways because it depends on the combination of capital and people's behavior, needs, and

motivation, whose determinant is the intention to start. Even though in Mexico nano-companies—or sole proprietorships—are still legally prohibited, such prohibition is not explicit in the General Law of Commercial Companies since, as stated by Garza (2010) when referring to each of the companies regulated by this law, they are companies that are constituted by "partners," that is, they are referred to in a plural manner. In addition, Article 89 of said law, corresponding to the chapter on corporations, expressly states that the first requirement for incorporation must be at least two partners. Also, the fourth section of Article 229 determines as a cause for dissolving a corporation when the number of shareholders becomes less than the minimum established by this law or when the parties of interest are united in a single person. Accordingly, and based on the review of the literature on the subject, no evidence has been found of works in which laboratory experiments have been conducted about the creation or profiles of nano-entrepreneurs. For this reason, the present study aims to fill the gap in this type of analysis.

Methodology

Experimental design

In order to quantify the behavior of nano-entrepreneurs in the city of Monterrey in Nuevo Leon, a laboratory experiment is applied and some socioeconomic, ideological, and environmental factors are controlled to find out if they differ between nano-entrepreneurs who operate informally and those who do not. In this way, it is possible to test different hypotheses, such as the difference in behaviors and preferences of formal versus non-formal nano-entrepreneurs, specifically when they are given information, training, and support for the duration of the experiment, or vice versa.

The experiment was implemented from October 2017 to March 2018, establishing six months as the period of work and observation. The experiment was conducted in three stages. The first stage consisted of a descriptive analysis of the sample of 385 nano-entrepreneurs;[2] that is, in this first approach, information was collected and analyzed through a questionnaire that captures the general characteristics of those people who have a nano-company or sole proprietorship in the region under study. For this purpose, a snowball sample was used to recruit participants; in particular, the sample was oriented toward adults of either gender who were engaged in commercial activity or self-employment. In order to recruit these nano-entrepreneurs, fieldwork was conducted, consisting of an approach to their places and areas of work, as

[2]Although there is no formal registry of nano-entrepreneurs or nano-business owners in the city of Monterrey, this study calculated the sample size for an infinite population in order to establish a list of participants where the expected proportion of success and failure would be the same (p=0.5 and q=0.5), taking into account a confidence level equal to 95% and a sampling error of 0.05.

well as to their social networks—since they offer their products and services through them—to invite them to collaborate in this research project.

In this first stage, it was mentioned to the participants that the experiment would last for one semester and that their support was needed with the recommendation of another colleague, friend or family member who was in the same situation and wished to participate in the experimental project since the objective was to study their behavior over two more stages. It was specified that the next session would be at the (rental) facilities of the Roheisen consulting firm, which has Gesell-type rooms and would last approximately two hours in December. They were also informed that they would be paid MXN 100 for each session, in addition to receiving a jersey and souvenirs from the Universidad Autónoma de Nuevo León.

The second stage of the study was to collect the preference of nano-entrepreneurs in individual entrepreneurship or self-employment on the possible advantages or positive externalities of changing their informal status to formal. In particular, this phase—experimental manipulation—focused on providing information and training to nano-entrepreneurs on the transition, processes, and advantages of becoming a formal nano-entrepreneur. At this stage, the nano-entrepreneurs were taken to the Gesell rooms, where the session's content was explained in detail. Examples, case studies, and real-life cases of micro-entrepreneurs who started in the informal sector but eventually decided to move toward formality and are now successful were presented. This motivational, explanatory and training session lasted approximately one and a half hours and ensured that the nano-entrepreneurs were familiar with the set of strategies, processes, and possible solutions for moving toward formality. Once the above was described, a question-and-answer session was held to ensure that the study subjects understood the importance of the topic. Subsequently, a survey on the perception of nano-entrepreneurs was applied and verified whether there was a change in preferences and the intention of wanting to move their nano-company toward formality.

In the third and final stage, an online questionnaire was applied to collect and corroborate sociodemographic information and other characteristics of the participants, such as the reasons why they would keep or change the status of their nano-company, its financing, the main problems they face, profits, expenses, and their aspirations for the future. This stage was carried out to perform an inferential analysis of the factors that motivate the change of preferences of the nano-entrepreneurs.

It should be clarified that this is an initial analysis to check if some of the proposals made in a laboratory experiment study mentioned at the beginning are fulfilled. Therefore, with the results of the present experiment and the experience acquired, it will be possible to consider a refinement of the instrument in the future and to carry out a study with a probabilistic sample to generalize the results.

Specification of empirical methods

The data presented in this article were analyzed using a transition matrix (TM) and a binary discrete choice logit model (logit). The former enables the identification of the number of observations that, given a specific value in a random variable X, "transition" to a value of the random variable Y (Budnick, 2007). In other words, a transition matrix indicates the conditional probabilities of the occurrence of a specific value in variable X, given a specific value of variable Y.

Taking into account the above, if it is assumed that there are different categories or forms in which a nano-company (D) can be in which the nano-entrepreneurs can only choose one, then an MT[3] can be defined as $P = [p_{ij}]$, which indicates a probability matrix that shows the probability that a group of nano-entrepreneurs will stay in the same form or category as their nano-company (in this case, i = j) or move to one of the other existing D - 1 forms during a given period. Thus, each element of the matrix, p_{ij}, shows the probability that nano-entrepreneurs who are in informality i in period t - 1 can switch to formality j in period t:

$$P = \begin{bmatrix} p_{11} & p_{12} \cdots & p_{1D} \\ p_{21} & p_{22} \cdots & p_{2D} \\ \vdots & \vdots \ddots & \vdots \\ p_{D1} & p_{D2} \cdots & p_{DD} \end{bmatrix} \quad (1)$$

The above equation shows that each cell represents the probability that a nano-entrepreneur transitions to another preference or way of creating their nano-company. That is, the MT shows the probabilities of transition from the informal to the formal, or vice versa, since it enables the transition to be constructed with i rows (preference at the beginning of the period) and j columns (preference at the end of the period).

The matrix diagonal represents the percentage of nano-entrepreneurs that retained their preference from the initial period to the end of the experiment. In contrast, the intersection of these cells represents the percentage of nano-entrepreneurs that remained, increased, or decreased in each round. Hence, the cells below and above the diagonal indicate preference movements from one nano-company creation option to another, indicating the shift from informal to formal or vice versa.

On the other hand, the logit model enables the impact of different factors on the intention or change of preference of nano-entrepreneurs in Monterrey to be determined since this model is used to

[3]Kolman and Hill (2006) point out that the MT must have the following characteristics: a) All the elements of the matrix are non-negative and b) the sum of the elements of each row is equal to one. That is, $\sum_{j=1}^{D} p_{ij} = 1$; i. e; $0 \leq p_{ij} \leq 1$, with $\forall_i = 1, 2, \ldots D$.

quantify the behavior of a binary response variable. Martínez (2008) and Pérez (2005) argue that, in the case of this type of model, the function used is logistic, so the econometric specification is as follows:

$$Y_i = \frac{1}{1 + e^{-a-b_k X_{ki}}} + e_i = \frac{e^{a+b_k X_{ki}}}{1 + e^{a+b_k X_{ki}}} + e_i \quad (2)$$

Where: Y_i is a binary response variable for i = 1, 2, ..., N observations, X_{ki} is the vector of K independent variables for the i-th observation, and b_k is the vector of K parameters. Three logit models are constructed from Equation (2) to examine the impact of different factors on the probability of preferring a particular nano-company category (or form). The first model estimates the impact of the independent variables for the preference to remain in informality, the second for moving to formality and the third measures indifference. It is important to consider that in each model, the dependent variable is binary, with a value of 1 if it prefers the specific category and 0 if it does not. For each model, there are four groups of independent variables: 1) socioeconomic aspects, grouped in variables such as age (shows the age of the nano-entrepreneur in years completed), married (a binary variable that indicates this condition with a value of 1), gender (a binary variable that identifies if the nano-entrepreneur is male with a value of 1), schooling (reflects the educational level of the nano-entrepreneur on a scale of 0 to 9, where 0 is no education and 9 indicates the highest degree of education, i.e.., university or higher), class (measures the nano- entrepreneur's income level indicating the social class to which they belong on a scale of 1 to 5, where 1 is the highest social class and 5 is the lowest), investment (shows the average monthly investment spending made for the nano-enterprise measured in thousands of Mexican pesos), and profits (average monthly profits from commercial or service activities measured in thousands of Mexican pesos); 2) aspects of the environment, grouped into variables such as government promises (binary variable with a value of 1 if the nano-entrepreneur changes their preference due to government promises for formality), insecurity (binary variable with a value of 1 if the nano-entrepreneur changes their preference due to insecurity or extortion), unemployment (binary variable with a value of 1 if the nano-entrepreneur started because of this factor), and poorly paid jobs (binary variable with a value of 1 if the nano-entrepreneur started because the jobs they found were poorly paid); 3) symbolic aspects, grouped in variables such as business influence (binary variable with a value of 1 if the nano-entrepreneur started because of this factor), family (binary variable with a value of 1 if the nano-entrepreneur had family influence to start), business opportunity (binary variable with a value of 1 if the nano-entrepreneur started because of an opportunity), improve income (binary variable with a value of 1 if the nano-entrepreneur started because they wanted to improve the family income), and the only way (binary variable with a value of 1 if the nano-entrepreneur started because it was the only way to obtain an income); and 4) preferences,

grouped with the variables of informality, formality, and undecided (binary variables with a value of 1 if the nano-entrepreneur preferred each of the factors, respectively).

Results

This section shows the descriptive and inferential results obtained in the three stages of the experiment with the nano-entrepreneurs to discover what the situation was at the time of contacting them (first stage), as well as quantifying whether there is a transition or change of preferences derived from the presentations and interactions regarding the advantages of being a formal nano-entrepreneur (second stage) and, finally, analyzing the factors that motivated the change of preferences (third stage) of the nano-entrepreneurs in the city of Monterrey.

Descriptive analysis applied to nano-entrepreneurs

Table 1 shows the descriptive frequency statistics, showing that most of the study population are men (62.1%) and that most nano-entrepreneurs surveyed reported being between 30 and 40 years old. Most claimed to be single (57.9%), while the rest were married. In addition, many of these nano-entrepreneurs reported that their average monthly earnings ranged from MXN 13 to 19,000, with a sample average of MXN 15,376.6. The percentages of participants according to the reasons that led them to become nano-entrepreneurs are also shown. In general, the most frequent reasons for starting a nano-company were "unemployment," "low-paying jobs," "the only form of income," and "to improve family income," while the least important were "government promises."

Another interesting result is the relation between the participants who stated that their nano-companies or commercial or service activities were not duly registered before the law.[4] It can be seen that male (72.1%) and single (60.6%) nano-entrepreneurs are the ones who, for reasons of "time" and "cost," have stopped going to the corresponding institutions to legally register their nano-companies, while married nano-entrepreneurs (whether male or female) claim to be formally established (23.6%). Finally, although not less important, the most common reason for creating and not complying with the formalization of the nano-company is "unemployment" and "low-paying jobs."

[4] 76.4% of the participants indicated that they have not been duly registered because the formal incorporation of a business or nano-company involves a series of legal and administrative procedures that are time-consuming. Hence the interest in changing this type of perception with the experiment carried out in the present study.

Table 1
General characteristics of nano-entrepreneurs in Monterrey

Component		Total		Informality	
		Frequency	%	Frequency	%
Gender	Male	239	62.1	212	72.1
	Female	146	37.9	82	27.9
	Total	385	100.0	294	100.0
Age	Under 21 years old	28	7.2	17	5.8
	21 to 29 years old	86	22.3	71	24.1
	30 to 40 years old	199	51.8	154	52.4
	Over 41 years old	72	18.7	52	17.7
	Total	385	100.0	294	100.0
Marital Status	Single	223	57.9	178	60.6
	Married	162	42.1	116	39.4
	Total	385	100.0	294	100.0
Education	No studies	29	7.5	19	6.5
	Primary	78	20.3	68	23.1
	Secondary	62	16.1	52	17.7
	Preparatory	87	22.6	63	21.4
	University education	129	33.5	92	31.3
	Total	385	100.0	294	100.0
Earnings	Less than MXN 5 000	49	12.7	35	11.9
	From MXN 6 000 to 12 000	116	30.2	82	27.8
	From MXN 13 000 to 19 000	194	50.3	131	44.6
	Over MXN 20 000	26	6.8	46	15.7
	Total	385	100.0	294	100.0
Reasons for becoming a nano-entrepreneur	Improve income	43	11.3	35	11.9
	Promises	14	3.6	9	3.1
	Unemployment	106	27.5	86	29.3
	Underpaid	91	23.6	71	24.1
	Business influence	21	5.5	14	4.8
	Family influence	33	8.6	27	9.1
	Business opportunity	29	7.5	19	6.5
	Only form of income	48	12.4	33	11.2
	Total	385	100.0	294	100.0

Source: created by the author

Analysis of changes in nano-entrepreneurs' preferences

Table 2 presents the results of the transition matrix, which helps to determine whether there has been a change of preferences by the nano-entrepreneurs from the first stage (current situation or profile) to the second stage (applied experiment). Before interpreting the results described in the following table, it is necessary to understand that the sample of participants in this analysis was reduced to 217 nano-entrepreneurs since, to guarantee that the matrix was consistent in the stages, the preferences had to be

recategorized in each of the stages. That is, some nano-entrepreneurs interviewed in the first stage did not attend or did not participate in the later stages. Therefore, it was decided to carry out the analysis with those nano-entrepreneurs who were interviewed or participated in all stages.

Table 2
Transition matrix of nano-entrepreneurs' preferences

	Preference second stage			
Preference first stage	Informality	Formality	Undecided	Total
	91	48	8	147
Informality	61.90	32.65	5.45	100.0
	41.93	22.12	3.69	67.74
	0	47	3	50
Formality	0.0	94.0	6.0	100.0
	0.0	21.66	1.38	23.04
	0	9	11	20
Undecided	0.0	45.0	55.0	100.0
	0.0	4.15	5.07	9.22
	91	104	22	217
Total	41.93	47.93	10.14	100.0
	41.93	47.93	10.14	100.0

Source: created by the author

In the table above, each cell has a combination of i rows and j columns, where it is possible to form interpretations of the behavior of the nano-entrepreneurs through the cells. For example, regarding the nano-entrepreneurs who claimed to be participating in the labor or service market informally (cell i = 1 and j = 1), it shows a retention (or decision) of 91 participants in the second stage. In contrast, in the first stage, 147 participants expressed a preference for this category or way of working (see the last column labeled Total).

On dividing these two numbers (91 / 147), it is observed that the decision to remain in informality is 61.90% and represents 41.93% of the total number of nano-entrepreneurs who decided to participate in the full experiment.

For the nano-entrepreneurs who claimed to be formal (cell i =2, j =2), it is observed that out of 50 participants in the first stage, 47 maintained their decision or preference, 94%. This figure is equivalent to 21.66% of the total interviews in the two stages. Meanwhile, the information in cell i = 3 and j = 3 shows the undecided nano-entrepreneurs who were retained in 55% of the participants who selected this option in the first stage (11 out of 20 participants), representing 5.07% of the respondents in the experiment.

Concerning the changes in preference among participants, the transition matrix analysis presents information on such behaviors, for example, nano-entrepreneurs who, in the first stage, prefer to remain

informal or become formal in the second stage. To explain the above, it should be clear that this type of information is found in the cells, not in the main diagonal.

Cells i = 1 and j = 2 show the number of participants who preferred to remain informal in the first stage but chose to become formal in the second stage. This percentage is 32.65% and represents 22.12% of the total number of respondents in the experiment. It can also be seen that the transition of participants in the informal category toward uncertainty or indecision was 5.45% (cell i = 1 and j = 3), which represents 3.69% of the total number of nano-entrepreneurs in the experiment.

Regarding the category of undecided participants, it is noticeable that none (0.0%) in the first stage preferred to switch to informality in the second stage (cell i = 3, j =1), while 45% (cell i = 3, j = 2) switched to formality. Relative to the subsample of 217 participants, these percentages were 0.0% and 4.15%, respectively.

Logit model estimates

Table 3 presents the results of the estimation of three logit models in order to examine the impact of different factors motivating preference change in nano-entrepreneurs (first model). The second model estimates the impact of the independent variables for the preference for informality and the third for formality. It is important to remember that in each model, the dependent variable is binary (1 = if the category in question is preferred, and 0 if not). The four groups defined in the previous section (socioeconomic, environmental, symbolic, and preferences) are used as independent variables for each model.

Table 3
Marginal effects of the independent variables for logit models

Variables	dy/dx		
	Total	Informality	Formality
Age	-.001 (.002)	.004 (.008)	-.005 (.009)
Married	.069** (.032)	-.134** (.059)	.117** (.049)
Male	.095** (.044)	.094** (.043)	-.091** (.043)
Education	.013 (.043)	-.016 (.060)	.004 (.033)
Class	.016 (.013)	.027* (.016)	.014 (.017)
Investment	.000002 (.00001)	-.00002 (.00002)	.00001 (.00001)
Earnings	.000006	.00002**	-.00018*

Variables	dy/dx		
	Total	Informality	Formality
	(.00001)	(.00001)	(.00001)
Promises	-.043	.053	.038
	(.039)	(.061)	(.051)
Insecurity	.011	.012*	.015
	(.059)	(.007)	(.048)
Unemployment	.111***	.122**	.106
	(.038)	(.052)	(.071)
Underpaid	.149**	.109***	-.136**
	(.060)	(.038)	(.059)
Business	.046	.021	.022
	(.181)	(.179)	(.144)
Improve income	.100**	.087	.070
	(.051)	(.172)	(.133)
Opportunity	.048	.003	.001
	(.191)	(.181)	(.149)
Only way	.313*	.350**	-.227
	(.167)	(.161)	(.152)
Informality	.311*	.182**	-.138*
	(.167)	(.084)	(.081)
Formality	.081***	-.069**	.032**
	(.021)	(.032)	(.016)
Undecided	-.182	-.191	.173**
	(.156)	(.164)	(.087)
McFadden's R^2	0.365	0.220	0.146
Correctly classified	88.3%	76.6%	73.1%
Y=Pr(y) (predict)	0.690	0.620	0.556

* Significant at 10%. ** Significant at 5%. *** Significant at 1% (Standard error in parentheses)
Source: created by the author

Concerning the socioeconomic characteristics of the nano-entrepreneurs, it can be seen that the estimated coefficient for the variable Male is positive and relevant in the category of informality, which means a preference of male participants for informality. Likewise, it can be concluded that these participants (male) feel less affinity toward formality.

Regarding the Married variable, there is a greater willingness to prefer formality and a lesser willingness to prefer informality. Similarly, if the Earnings variable is observed, it can be highlighted that the probability of participants choosing informality due to the earnings they obtain in this sector is much higher than that of those participants who prefer formality.

On the other hand, the coefficient of the Class variable is meaningful only for the informality model. This positive value implies that the more the nano-entrepreneur is in the lower social strata, the more likely they are to choose informality. Another interesting finding is that of those participants who claimed in the experiment that they are in the informal sector despite the existence of insecurity in their area or place of work, as it would be expected that these nano-entrepreneurs would decide to leave the

informal sector due to extortion, payoffs, robberies, etcetera. Nevertheless, the results show a positive and relevant impact on the Insecurity variable with the informality model.

Regarding the variables Unemployment, Underpaid and Only Way, it is identified that they have a relevant impact on the three models; for example, the three factors mentioned are determinants for participants to prefer to choose informality. The negative impact of the variable Underpaid in the formality model is striking since it can be interpreted that this effect is distributed in informality but with a positive effect. In other words, nano-entrepreneurs who are in the formal sector but for external reasons cannot make a profit—as they would like, besides paying taxes and legal forms—may at some point prefer to go informal (i.e., it is observed that the coefficient -0.012 negatively affects the participants who say they are formal and benefits, to a greater extent, the informal ones, 0.016).

Last but not least, interesting results are found for the preference variables (Informality, Formality, and Undecided); for example, in the model of preference for formality, if the participant selected informality in the first stage, the impact was significant and negative. At the same time, when analyzing the coefficient value for the Formality variable in the preference model in favor of informality, it is observed that the nano-entrepreneurs who preferred formality in the first stage were reluctant to choose informality.

An additional piece of information provided by the estimates of the Informality, Formality, and Undecided variables is the security of the participants in each category. For example, it can be seen that the nano-entrepreneurs who show "greater security in their decision" are those who prefer to remain in informality (0.410), followed by those who prefer formality (0.554). Finally, the impact of the variable Undecided is only significant for the formality model since the participants who had not defined (or did not want to answer) their preference in the first stage showed a positive and significant impact on the probability (0.096) of preferring this category in the second stage.

Discussion of results

Given the results of this study, it can be concluded that the proposed laboratory experiment to identify the conditioning factors that influence the creation or preference of a nano-company coincides with the findings presented by the studies of González (2015) and Valencia (2012) regarding that the integration or formation of this economic unit usually occurs on the initiative of a person in such a way that such relation becomes man-company. This relation performs all the functions of a for-profit organization, but one of its particular characteristics is that it is not formal and may remain so for a long time.

It is important to point out that this study is a pioneer in using a controlled experiment analysis on the topic of nano-companies and that it was also modeled with a transition matrix and a logit model

since its main purpose was to quantify the factors that motivated the change of preferences and creation of this economic unit given its conditions of informality and to observe if these factors affect its transition to formality. However, it was impossible to find studies with results of the same magnitude; likewise, no studies were found on applying these techniques with a particular focus on nano-companies. Some international research such as Ljungberg (2011), García et al. (2008), López, Lejarriaga, and Iturrioz (2007), García and Fernández (2005), Lejarriaga (2005), and Lejarriaga (2003) address the origin, creation, and operation of nano-companies, finding that these economic units can be formed with one or up to three people who have common interests to participate in any market and, in this way, obtain financial profits for the services, goods or products they offer. At the same time, national studies such as those of Castillo and Vela (2013) and Aguilar, Mungaray, and Ramírez (2014) find that the influence of the social and domestic environment impacts the choice of autonomous or self-employment in Mexico. Specifically, it is conjectured that together with the structural aspects of the economy that have prevented the creation of formal jobs, some socio-cultural elements promote such a choice, which may be related to the generations of workers, given that employed parents tend to transmit certain informal human capital to their descendants, specifically among women. Similarly, Alvarado, Dávila, and Vázquez (2018) and Alvarado, Ortiz, and Morales (2018) state that the dimensions or factors that can give rise to the initiation of sole proprietorships are unemployment, relations between like-minded groups or individuals, demographic processes, social relations (business opportunity), disinterest in legal processes, conflict relations, and flexible schedules, as well as the intention to improve family income.

Conclusions

In this article, a controlled laboratory experiment was conducted from October 2017 to March 2018 in Monterrey in Nuevo Leon. During this period, it was sought to understand the factors that motivate the creation of nano-companies. In addition, an attempt was made to quantify the differences between informal vs. formal nano-entrepreneurs. The discussion derived from this study confirms the heterogeneity of the people participating in the experiment, since at the time of creating their nano-companies, the main motives that influence them are unemployment, underpaid jobs, improving family income, and the profits obtained by being the sole owner or head of their one-person company. It was also identified that participants in the informal sector could change their preference or move toward formality as long as they are aware of the process, procedures, requirements, and advantages of having a nano-company within the framework of the law.

The findings of this study suggest some public policy measures to prevent future nano-entrepreneurs or nano-business owners from choosing informality. These include immediate or short-term

policies, such as improving business start-up services, specifically in the costs and time required to obtain the operating license, and creating a department or area in charge of applying a direct intervention model with all those interested in creating a nano-company from the management to the consolidation of the economic unit, as well as long-term policies such as implementing, through the educational system, a culture of legality, as well as fairs or programs of entrepreneurship with social responsibility.

One condition to achieve this is to detect the areas with the highest levels of informality in order to provide advice and training to nano-entrepreneurs, including diagnostics, training, accompaniment, monitoring, evaluations, and completion of formal nano-companies, thus minimizing preferences to remain in the illegal sector, since this sector generates a significant economic spillover. Nevertheless, if nano-entrepreneurs move toward formality, it will undoubtedly generate greater positive externalities.

Academic limitations

From an academic point of view, the present work has sought to contribute to studies on nano-companies, a topic that has often been neglected. The research is conducted in Monterrey, one of the most important cities in Mexico. At the national level, there are few empirical studies on the quantification of those factors that influence the creation of a nano-company, as well as the application of a laboratory experiment to identify the change of preferences of nano-entrepreneurs toward formality, since most studies focus on the qualitative and descriptive analysis of informality. In this case, a discrete binary choice logit model is used, and the effects or preference changes of the participants are explored through a transition matrix.

Although the analysis performed in this research may have limitations concerning the representativeness of the sample or biases in the techniques used, it is a valid procedure to represent the systematic variation of a longitudinal data set. Accordingly, an attempt has been made to carry out rigorous work on applying a controlled laboratory experiment in the social sciences. In this respect, the limitations and opportunities for improvement are known. For example, at a conceptual level, the results have raised some questions that require the study of other variables that have not been analyzed in this work and that could improve knowledge of the probability of nano-entrepreneurs moving toward formality, such as carrying out a comparative analysis by municipality, region, state, gender, and educational level.

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