

# “Determinants of Micro Firm Informality in Mexican States 2008-2012”

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## *Abstract*

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Informality has been given adverse associations as a result of its economic and social consequences in developed and developing countries. The latter group of countries has been the most affected in terms of low productivity, unprotected workers and the erosion of institutional credibility. Although the determinants of informality have been studied before, the research conducted on micro firms in a developing country has been less notable. In this paper, Mexico is taken as case study due to its high level of micro firm informality and the heterogeneity among Mexican states. The aim of this paper is to analyse the determinants of micro firm informality by state, using different public sources, such as the *Encuesta Nacional de Micronegocios* (ENAMIN, or the National Micro Firm Survey), the *Instituto Nacional de Estadística* (INEGI, or the National Institute for Statistics) and the *Secretaría de Economía* (SE, or the Secretariat for Economics). Econometric panel data models were estimated for a sample of 32 states over the 2008-2012 period. Furthermore, this paper uses different definitions of informality to check the robustness of the results. The empirical evidence obtained allows us to conclude that, although economic factors are the main causes of informality, variables such as corruption and education have an important role to play.

***JEL classification:*** E26, O17, L26

***Keywords:*** microenterprises, informal economy, entrepreneurship, developing countries, institutions.

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## 1. Introduction

There has been an increasing interest in informality in recent years, taking a more significant position in economic analysis with the growth of this sector in most developing countries. According to the International Labour Organization<sup>1</sup> (ILO), the informal economy can account for half to three-quarters of all non-agricultural employment in developing countries. The growth has been attributed largely to the fact that the formal economy cannot absorb all workforces and the inability of firms to adapt to new market conditions. Even so, this sector has been considered as an alternative to reduce pressure on economies, although informal sector conditions are usually precarious in both labour and economic terms (Perry and William, 2007).

Although there have been many studies conducted on informality, most of them have been centred on labour issues, focussing on the worker's point of view. However, economic units have been largely ignored, with researchers choosing not to target firms or productive units. Furthermore, defining the informality of a firm has been always a problem for every study, with this being a crucial step through which can be found all the differences among studies on this subject. However, there is an agreement on general definitions, such as the definition of when a worker or firm falls outside the legal framework of government. In the case of firms, most of studies have opted for a definition in terms of registration due to data limitations. However, measuring informality is not the only problem, for instance, when it is analysed under different definitions, it can be seen that it varies depending on informality concept.

There are different theoretical arguments to explain why a firm can be found in the informal sector. La Porta and Schleifer (2014) summarise the predominant reasons, such as the firm being representative of an untapped reservoir of entrepreneurial energy, or that the informal entrepreneur enjoys the advantages of avoiding taxation and regulation. More

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<sup>1</sup> According to the report, 48 per cent of non-agricultural employment in North Africa; 51 per cent in Latin America; 65 per cent in Asia; and 72 per cent in sub-Saharan Africa (ILO, 2002).

radical still, they cite these firms as parasites competing unfairly or that they are the product of poverty, with the only way to reduce their number is by means of development and the expansion of economy.

Informality has been increasingly recognised as a significant factor in every country because it has economic and social consequences, with, for example, informality being linked to low productivity. Furthermore, most informal firms are small, inefficient and run by poorly educated people. If their number is not reduced, informality can clearly affect the future growth of developing countries (Perry et al.2007; Loayza 2009). With too many informal firms, governments cannot collect enough taxes, which can lead to the reduction in investment in public infrastructure, public education or the health system.

While informality has been studied by many researchers using national level data, the determinants on a regional level have not been studied enough. Moreover, to the knowledge of this author, there are no studies explaining the different extents of informality for micro firms among Mexican states, where the informal sector generated 25.0% of GDP<sup>2</sup> in 2012. In other words, in the analysis of informality, the economic unit has been overlooked.

This study aims to examine and analyse the factors which determine the informality of productive units, by state in Mexico. The structure of this paper is as follows: Section 2 presents a review of the literature in order to explore the different definitions and to reach a consensus and then provides an explanation as to what kind of informality measures are used in this study; Section 3 presents the database used in this study and the manner in which the different variables were constructed; Section 4 describes the methodology employed; econometric analysis is carried out and results discussed in Section 5; and, conclusions are summarized in Section 6.

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<sup>2</sup> According to official figures of the Instituto Nacional de Estadística y Geografía (INEGI) six out of ten employed workers are in the informal sector.

## **2. Literature overview**

### ***What is informality?***

If there is one thing on which every study agrees about informality, it is that it is not an easy concept to define and measure. The term “informality” may mean different things, depending on the point of view of the person, piece of research or institution. On the one hand, it can be considered as a bad thing, often entailing unprotected workers, street-selling, low productivity, and tax evasion, among others. On the other hand, it can often be related to entrepreneurship, which is linked to innovation. This section seeks to explain what informality is and review the main definitions and concepts.

Informality has different meanings according to each school of thought. The dualist school sees the informal sector as comprising marginal activities that provide income and safety to poor people, while the structuralist school understands the informal economy as a way to help reduce inputs and labour costs. The legalistic school views matters from a regulatory standpoint, in that micro-entrepreneurs choose this sector as a way to avoid costs, while the voluntarist school states that it is borne of attempts to avoid regulation (Alter 2012). While it is difficult to define informality, finding a simple method of doing so can help to create a proxy and thus measure it; for example, it has been proposed that formal activities are those which are recognized and regulated by states, and informal ones are those which are not (Weeks 1975).

Two definitions of informality that can clearly be found in the literature come from a productivity and legalistic standpoint respectively. The former is identified using characteristics from the area of employment, such as non-professional workers, unskilled jobs, family workers, self-employment and workers in small firms. The latter is represented by the non-compliance with the laws of the state in question in terms of labor and social security legislation (Khamis 2012), where, for instance, self-employed workers or those without access to the social security system are included in this definition of informality.

International organizations, on the other hand, have also tried to conceptualize informality. In its 2003 *Guidelines concerning a statistical definition of informal employment*, the ILO recognizes the importance of consistency and coherence in the concepts used to define informal employment, such as the approach that focuses on the enterprise itself and the approach that is based on jobs. In this way, the informal economy includes the informal sector and informal employment, with the difference being that the enterprise approach is based on production units and the latter depends on the number of employees in this sector.

Figure 1

This paper focuses its analysis on economics units, placing the informality of firms at the centre of the study. This informality can include earning activities at the level of the firm that fall outside the purview and regulatory environment of the state (Portes and Schauffler 1993; Pisani and Pagán 2004). However, it is difficult to define it as comprising “activities at the margin of government control and regulation” inasmuch as it would cover a broad range of activities, from illegal ones to others which are either legal or could depend on existing taxation and labour laws (Portes and Schauffler 1993).

Most of the time, informality definitions refer to the market-based legal production of goods and services that is deliberately concealed from public authorities (Buehn and Schneider 2012).

Whether or not the different definitions and concepts of informality are taken into account, it is possible to understand that there is no single kind of informality, and, therefore, it is plausible to say that there are different types and degrees of informality.

### ***Causes of informality***

There are many different points of view about the causes of informality, with Pisani and Pagán (2004) arguing, for instance, that we can distinguish four clear standpoints: the structuralist view that sees informality as an area of absorption for excess labour; the neo-marxist view which focuses on production processes, employment relationships and the

link between national and global economies; the legalistic approach which argues that governmental institutions and regulation have forced entrepreneurs into the informal sector; and, the microenterprise approach which tries to encourage competitive ability as a means of escaping poverty. The structuralist view shares similarities with the dualist school, which says that informal actors are excluded from opportunities due to the disparity between population and employment growth (Alter 2012).

Another explanation for informality comes from exit theory, which states that agents make an implicit cost-benefit analysis between the formal and informal sectors. For instance, micro firms can decide to avoid regulations and taxation because they have no intention to grow or no potential to do so. This theory is in line with the voluntarist school (Alter 2012). In contrast, the exclusion argument states that informality is a result of stringent and costly regulations as well as a lack of opportunities characterized by low productivity, an absence of labor benefits, irregular work conditions, high turnover, and lower rates of remuneration (Oviedo 2009). The exclusion argument is more in line with legalistic approach which states that institutions and regulation are the main factors that explain informality.

In the case of the informal labor market, the discussion has focused on whether this market is segmented, integrated or a combination of both (Khamis 2012; Pages and Stampini 2009). Workers decide to enter into informal sector for many reasons. Freije (2002) mentions some of them, such as informal mechanisms of social protection, credit restrictions, management risk. On the other hand, as labour protection laws can result in an implicit tax on workers or inflexible wages, informality can offer greater flexibility (Maloney 1999), for which reason, a cost-benefit analysis is carried out. On the other hand, there are some mid-term macroeconomic factors and other longer-term structural changes that can affect the formal sector, such as the reforms of the 1980s and 90s, including privatization, trade liberalization, and the modernization of the financial sector, that may have had an effect on labour markets by encouraging the substitutions of capital for labour (Freije 2002). Another example is the changes in Latin-American countries such as Brazil and Colombia which were driven by modifications in labour market regulation and social



security taxes in the early 1990s, when adjustments were carried out in macroeconomic politics such as the change from fixed to floating exchange rate (Perry et al. 2007).

The empirical literature indicates that the excessive number of standards and regulations, as well as macroeconomic behavior, are one of the main factors behind informality (Freije 2002). In other words, the excessively high barriers may cause micro firms to choose not to register. Even though it is seen as a backwards step, liquidity restrictions may lead poor people to consider investing in a microenterprise (Perry et al. 2007), although this would also indicate a lack of intent or potential for growth.

The role of governments is another very important factor that has influenced the size of the informal sector, due to their capacity to change regulation through legislation. Studies have confirmed that informality is negatively associated with business regulation, law and order, and the capacity of government to enforce regulation (Loayza 2009; Masatlioglu and Rigolini 2008). Among the different regulations that are often mentioned in the literature is taxation because it is linked to higher informality inasmuch as it represents a barrier to formality, and the transaction costs are higher (Freije 2002). Additionally, the strength and efficiency of regulation are positively associated with the reduction of informality (Loayza 2009).

It is important to mention that the variable of corruption is often used as an indicator of the level of governmental weakness (Loayza 2009). Corruption can reduce the willingness of firms and workers to pay taxes because “everybody does it is involved in corrupt practice”; thus, the provision of public good is always sub-optimal (Oviedo 2009). The willingness to pay has been represented by means of the so-called “tax morale”, or the disposition of society toward tax compliance, with empirical studies finding a positive relationship with informality (Torgler 2005; Buehn and Schneider 2012).

In the case of firm informality, its extent has been linked to size; the bigger the firm, in terms of production and employment, the lesser the informality. The reason behind this is that, as firms grow, they demand more formal services and institutions, so their exposure to

the authorities is greater (Perry et al. 2007). It should be mentioned that, according to the literature, most of firm informality is considered to occur in the smallest firms, such as family businesses or microenterprises, where labor is used intensively and there is no government regulation (Pisani and Pagán 2004).

In summary, there is no unified explanation about the causes of informality, with its causes not sole economic in nature, with informality linked to an excessively regulated economy that restricts improved performance during economic shocks and that, thus, potentially damages growth<sup>3</sup> (Loayza et al. 2009). Not only is it linked excessive regulation, but also to an insufficient enforcement of government regulation (Freije 2009).

### ***Consequences***

Informality is important not only because it represents a huge part of many economies in developing countries, but also because it has consequences from an economic and social viewpoint. It also entails undesirable effects such as; leaving families unprotected without formal mechanisms to mitigate economic shocks (Perry et al. 2007; Freije 2002); lags in growth and lower levels of growth productivity of an economy due to a greater concentration of workers in small firms (Perry et al. 2007, Freije 2002; Loayza 2009; La Porta and Schleifer 2014) which are typically small, inefficient, and run by poor entrepreneurs (La Porta and Shleifer 2014); lower fiscal capacities that may erode economic growth (Buehn and Schneider 2012); deterioration of the rule of law and the credibility of institutions (Perry et al. 2007). Informality can be an indicator of poor regulation and other governmental failures, and can also affect the ability of formal firms to innovate and to adopt other technologies (Perry et al. 2007).

The proportion of micro firms in an economy, in terms of employees, has been considered to be a good proxy of informality. The workforce is concentrated in this kind of firm, which

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<sup>3</sup> Loayza (2009) explains that informality is a distorted response because it entails the misallocation of resources and the loss, at least partially, of the advantages of legality, such as police and judicial protection, access to formal credit institutions, and participation in international markets.

can lead to efficiency losses because they cannot exploit the economies of scale that large firms can. The presence of informal firms could slow down the process of creative destruction, or the replacement of inefficient firms (Perry et al. 2007). Not only are they less efficient and less productive, but also they are at a disadvantage due to a lack of access to the credit and legal protection infrastructure to which formal firms have access (De Paula and Scheinkman 2009).

### ***How to measure the informality?***

As mentioned above, there are different ways to approach and thus measure informality. As interest in this research is focused on the productive unit, this research explores different approaches to studying it. In the case of business, many studies have considered a firm as informal one that, for instance, does not report sales, or which exists on the margins of registered compliance with labour or tax laws (Maloney 1999).

Another important aspect to identify is that there is not an only one but various degrees of informality. For example, a firm may not be registered at all and, thus, does not comply with any governmental legal requirements. On the other hand, a firm may be registered but, with respect to its employees, may not comply with labour laws, such as not registering its workers with the social security system or not paying all taxes due by underreporting sales. In other cases, some firms avoid paying their legally required contributions by hiring self-employed workers instead of salaried workers (Brandt 2011, Perry et al. 2007)

While the level of a firm's informality can be measured based on its registration with the government, this implies a wider definition inasmuch as it would include all those firms that are not commercially registered, have formal accountancy processes, make social security or tax contributions, or make payments for licenses or mercantile registers. However, measuring informality without the use of mercantile registers is the most representative method (Cardenas and Rozo 2009). Cunningham and Maloney (2001) agree with this definition because participation in the formal market and legal institutions ranges from being unregistered with tax authorities, to being registered locally or being registered

with the federal tax authorities. Di Giannatale et al. (2013) consider a micro firm to be informal if it is not registered with the treasury ministry. Other studies have used other methods to proxy firm informality. One method is similar to those which use labor informality, with a focus in terms of protection, such as those owners or workers who are not protected by the social security system. While another measure used is the size of firms, this measure varies depending on the study, where informality is measured at, for example, fewer than 16 employees, or fewer than six workers (Maloney 1999), or, in other cases, at ten employees or fewer, or, even, at less than four workers (Mondragón-Vélez et al. 2010; La Porta and Shleifer 2014). Therefore, it can be seen that there is not a unified measure and that measuring informality in this way can vary according to data availability from one study to another.

In the case the official institution of the country analyzed, the INEGI in Mexico identifies, based on the International Conference of Labor Statisticians (ICLS), some common characteristics of the informal sector from the perspective of the economic unit. These include not being registered with the government, being a small scale operation<sup>4</sup>, and the absence of formal accountancy processes<sup>5</sup> (INEGI, 2014).

## Figure 2

The point of analysis in this study, as mentioned above, is the economic unit. It tests the different levels of firm informality according to different informality measures such as self-employment and owners of micro firms<sup>6</sup>.

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4 Although small operation can be a characteristic of the informal sector, this is not a decisive element because, for instance, the simplification of bureaucracy in some countries can enable owners to do their own accounting.

5 The informal sector is taken as when firms are not registered under any specific form of national legislation, such as tax or social security law. While it is important to be clear that the economic unit from the informal sector does not comply with the fundamental registration requirements, in the case of countries such as Mexico, there are simple accountancy measures that can be applied to imply a degree of formality.

<sup>6</sup> An independent worker does not have a boss or somebody who supervises or somebody who has not given operation reasons.

### 3. Data

The database used in this research has been taken from different resources compiled by INEGI, the *Encuesta Nacional de Ocupación y Empleo* (ENOE, or the National Survey of Occupations and Work), the World Bank's Doing Business Report, *Consejo Nacional de Población* (CONAPO, or the National Council on Population), the SE, and the *Encuesta Nacional de Micronegocios* (ENAMIN, or the National Micro Firm Survey)<sup>7</sup>, which forms much of the basis of this study inasmuch as it is focused on micro firms, thus making research at a deeper level into this sector in Mexico possible. The databases used for every variable are described in Table 1. Based on the availability of the databases, the period of study is from 2008-2012, with the data obtained for every two years. The study takes its data from the 32 states in the Republic of Mexico, including the *Distrito Federal* (the metropolitan area of Mexico City).

Table 1

Taking into account the fact that it is not easy to measure the variable of interest in this study, the informality of firms, and given that there is not a single definition for it, several approaches have been used here. Based on the literature review and data availability, three ways to identify and measure informality are proposed: whether the economic unit is constituted as a legal entity; whether the economic unit has formal accountancy processes; and the sum of the previous two criteria. The three dimensions are considered for owners, the self-employed, and a combination of both<sup>8</sup>.

The first criterion for indicating informality, referring to the question as to whether the firm is constituted as a legal entity, is taken from the a question on ENAMIN survey, "Is your business or activity registered before a notary public?", to which only "Yes" and "No" answers are possible. The second criterion of informality is taken from the question, referring to the formal accountancy processes used, "In your activity or business...". When

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<sup>7</sup> The survey is representative at a national level from 2008 to 2012. The sample for each year is about 30,000 microfirms owners, but does not include agriculture workers

<sup>8</sup> The numbers of each state were subjected to a weighting factor given by ENAMIN-INEGI

the respondent answers that only a “notebook or a notepad is used for accountancy”, or “no accountancy is carried out”, the firm is considered as informal. The third criterion takes the previous two criteria to form a general indicator.

Taking into account that indicated in the literature review on the determinants of the informality of economic units, specifically for micro firms, the following variables are used to describe macroeconomic environment: Gross Domestic Product (GDP) as a measure of the size of each estate; GDP per capita (GDPpc) as measure of the wealth of the population; the unemployment rate as a cause of informality; inflation; and, Foreign Direct Investment (FDI). As another factor that is mentioned in the literature is the access or channel to financial sources (Gatti and Honorati 2008; Ayana and Reilly 2011), the bank credit (BC) was calculated as the commercial credit as a percentage of the GDP of each state.

In order to take into account the extent of heterogeneity by sector and state, the index of specialization in the economy was computed, following the same method used by Dussel<sup>9</sup> (2009). It is also known that the education level in the population is considered to be a crucial factor in informality (La Porta and Shleifer 2014), inasmuch as most small informal firms are run by people with a lower educational level.

As explained above, laws and regulations are a very important factor in determining the degree of informality. The cost of starting a business is considered an important factor inasmuch as it can reflect the level of bureaucracy and cost faced by micro firms, and thus the burden in terms of regulation and barriers (Dougherty and Escobar 2013). As taxes are considered a very important variable, the taxes collected by each state<sup>10</sup> are also measured in this study.

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<sup>9</sup> The index of specialization (EI) is computed in the following way:  $EI_{it} = (GDP_{ij} / GP_i) / (GDP_{Nj} / GDP_N)$  where the sector is represented by “i”, the state by “j” and the country N.

<sup>10</sup> It is important to mention that as most taxes in Mexico are collected at a federal level, with some taxes collected at a state level, only the following were considered: taxes (sale of used cars, etc.), rights (civil registry, etc.), products (sale of properties, etc.) and uses (fines or surtaxes) that are collected by states.

Another factor to be considered is the corruption of states, in that this can represent the biggest cost faced by firms (Oviedo 2009). This can also be a proxy of the quality of the institutions in each state and used as a variable of social stability. In addition to indicators of social stability, the global peace index produced by the Vision of Humanity organization is also included here.

#### 4. Methodology

Taking into account the fact that the information has been obtained every two years for the period of study, 2008-2012, this was organized into panel data. Thus, the econometric analysis has been conducted in order to ascertain what the determinants of informality are for micro-firm for each state in Mexico. The dependent variable is the informality of micro firms in each of the 32 states in Mexico. Therefore, the basic model is:

$$\text{Inf}_{it} = \beta_0 + \beta_1 \text{EE}_{it} + \beta_2 \text{Spe}_{it} + \beta_3 \text{Reg}_{it} + \beta_4 \text{Inst}_{it} + U_{it} \quad (1)$$

Where the variable  $\text{Inf}_{it}$  is the share of informal micro firms in the state “i” in the year “t”. The vector  $\text{EE}_{it}$  represents all independent variables for the economic environment described in the previous section, such as GDP, GDPpc, unemployment rate, inflation, FDI, bank credit. The vector  $\text{Spe}_{it}$  includes the sector of specialization as the main activity for each state, and the level of education is indicated by the average number school years completed by the Economically Active Population<sup>11</sup> (EAP). The variable “cost to start a business” is considered as a significant and reliable proxy of the regulatory environment for business. The variable for corruption is added to the study as a way of representing the level of trust in quality of the institutions, while the global peace index is considered in order to indicate the level of social stability.

The database is considered balanced inasmuch as it has the complete observations for whole units in the period of time mentioned, and, as the data is available in biannual form, the panel data is considered short, in that there are data for many individuals and few

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<sup>11</sup> They are the people aged 12 years above that in the week of reference were carrying out some kind of economic activity, or they are part of the openly unemployed population.

periods of time.

The model was subjected to the Hausman Test (Wooldridge 2003) in order to decide on the best method with which to estimate the model, between the fixed or random effect methods. This test takes as null hypothesis the question as to whether the individual effects are random, as the estimators should be similar because they are consistent. However, when the estimators are different, the other method is deemed better. After doing the test, the result was that the best method is the random effect, in that this model assumes that the unobservable individual effects are not correlated with the independent variables, or that individual effects are randomly distributed across the states. In contrast, the fixed effect assumes that the heterogeneity among states can influence the independent variables, but the characteristics are assumed as invariant in time.

As the econometric literature explains, working with panel data, in fact, measures two effects: a cross section effect and a time series effect. While these effects are not necessarily moving in the same direction because one effect can be positive and the other negative, random effect estimations compute an average of both effects, i.e., the average of the long and short run specifications (Baltagi and Griffin 1984). In order to take this into account in the analysis, these effects are computed between the estimator and fixed effect model.

## **5. Results**

In order to show an overview of the results, some descriptive statistics are presented below. In particular, Figure 3 shows the heterogeneity across the Mexican states, where, there are states with bigger economies as measured by the Gross Domestic Product (GDP), such as *Distrito Federal* (the metropolitan area of Mexico City), *Estado de Mexico* (the state adjacent to Mexico city), Nuevo León, Jalisco, Veracruz and others where the size of economy is much smaller, such as Tlaxcala, Colima, Nayarit, Baja California Sur, and Zacatecas. Furthermore, this heterogeneity is found in terms not only of size but also wealth, as measured by GDP per capita (GDPpc). In this aspect, there are states that stand out, such as Campeche, Distrito Federal, Nuevo Leon, Tabasco, while states with a



remarkably high level of poverty, such as Chiapas, Oaxaca, Guerrero, Tlaxcala, can also be found.

#### Figure 3

As can be seen from Figure 4, where informality is measured using the three methods proposed above, this research shows an increase in informality from 2008 to 2012. Figure 5, the 2012 data shows the heterogeneity of economic units among Mexican states and the different degrees of informality. For instance, states such as Baja California Sur, Colima, and Queretaro have a lower level of informality, while states such as Campeche, Guerrero, Hidalgo, Oaxaca, Puebla, are notorious for their high informality levels.

#### Figures 4 and 5

Table 2 shows the results obtained from the econometric analysis of firm informality using the three measures proposed. In the first indicator, the criterion is whether or not the micro firm is registered with the government through a notary; while the second measure is whether or not the firm has formal accountancy processes, and the third is a combination of the last two measures, i.e., when a firm is not registered and is does not apply formal accountancy. It is worth mentioning that an additional advantage of using the ENAMIN survey is that it allows for the differentiation between owners (A) and the self-employed<sup>12</sup> (B), and also the sum of both (A+B), referred to as general, as seen in Table 2.

#### Tables 2 and 3

It is interesting to note for the results for Measure I that, among the variables related to economic factors or the *macroeconomic environment*, the GDP levels are notable due to the negative and statistically significant effect on informality in general, and owners and the self-employed as well. This variable is statistically significant at one per cent for the owner while it is significant at five per cent for general informality, and it is significant at ten per cent for the self-employed.

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<sup>12</sup> Owners have at least one worker and the self-employed is alone although can be helped by relatives.

It is worth stressing that as this variable is representative of the *market size* of each state, it is not unusual that it affects both kinds of micro firms, although it does impact much more on owners. Furthermore, its negative effect is expected, inasmuch as the informality of economic units tends to decrease in a larger or growing state economy.

The variable corresponding to the second Measure is statistically significant at ten per cent and has a positive effect, although this is the result for general informality only, while it is not significant for the third Measure III. Table 3 shows that the significance and negative relationship are kept even when the temporal effect is included for the first Measure.

For all measures applied in this study, the variable *wealth of population*, as measured by GDPpc, is statistically significant for general informality, at five per cent, and for the self-employed, at ten per cent, with its impact in line with theory, with informality reducing along with increased among the population and the growth of micro firms. The second Measure is statistically significant for the owner and the self-employed, at ten per cent, as it is also for the general measure which, at five per cent, has the same negative relationship with informality. Statistical significance is stronger for general informality under the third Measure, at one per cent, and the self-employed, at five per cent, with owner informality maintaining in terms of significance at ten per cent.

Another variable for considering macroeconomic environment is *inflation*. Although this variable is statistically significant and has a negative effect on informality in almost all the measures, at ten percent, when the effect of time is considered, the variable becomes positive and significant at five percent for general informality. A proxy of economic instability, informality grows with this variable. This result is consistent with theory, which says that micro firms are more sensitive to changes in this kind of variable.

The *specialization sector* in each economy plays an important role, and, as shown in Table 2, for the first second and third Measures, all the cases are statistically significant and have a negative effect on the informality of economic units. General informality and self-employed work are statistically significant, at one per cent, while owner informality is

statistically significant at five per cent. These results have the same significance and effect when the effect of time is applied for the second and third Measures. Therefore, informality would be reduced when the states or regions specialize in a specific sector, which is line with Dougherty and Escobar (2013), who found similar conclusions albeit having only measured informal employment.

Interestingly, economic variables do not only affect the extent of informality, but also link to variables related to institutional quality such as *corruption*, which is statistically significant and has a positive effect, in that the more corruption found in the states, the higher the level of informality found there. Under the first Measure, this is statistically significant, at one per cent, for owners, the self-employed and the general measure. Under the second Measure, the only ones affected are the owners. Owners and the self-employed are statistically significant under the third Measure, at five per cent, while the level for general informality is significant at ten per cent. Table 3 shows that, even when the effect of time is applied to the model, the corruption variable is significant and has the same positive effect on informality.

This variable is very sensitive in a country such as Mexico where, according to Transparency International, ranks 106 out of 177 in the Corruption Perception Index 2013, with its law enforcement efforts classified as “little” in combating bribery by the OECD in 2011<sup>13</sup>.

As mentioned above, while *Foreign Direct Investment* may have an impact on informality, its impact in this analysis is limited. While, it is statistically significant at five per cent with a negative impact, this result is only obtained under the first Measure for general informality and self-employed workers, with no impact found for owners. When the effect of time is applied, its statistical significance is maintained along with the limitations mentioned above.

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<sup>13</sup> <http://www.transparency.org/country#MEX>

The variables which express the regulatory framework, such as the *cost of starting a business* are important but only under certain circumstances. While, in this research, this is only statistically significant for the first measure, the expected negative effect is confirmed for owners, at five per cent. This result may be explained by the fact that as the costs rise, these impose restrictions on the entrance of less productive firms into the market and limit entrepreneurship (Dougherty and Escobar 2013). On the other hand, variables such as *taxes*, which are considered important in the literature, have no visible effect on informality in the model.

As mentioned in the methodology section, the random effect is an average of two effects: the *between* and *time series* effect. In Appendix 1, these are computed in order to ascertain whether or not they have the same effect across the Mexican states. Interestingly, in the *between* effect, variables such as GDP, which represent the size of market, remain statistically significant, at a minimum of ten per cent, for general informality and the self-employed under any measure and at five percent for owners. All cases present a negative relationship with the informality of economic units. The variable of *bank credit* is statistically significant, for at least the second and third Measures, with the same positive effect for owners and the self-employed. These results agree with the findings of other studies, in which the economic variables remain among the most important factors in the reduction of informality from the perspective of economic units.

One of the most surprising aspects in the analysis is that the variable of corruption is statistically significant for almost all measures, except the first Measure for owners, having positive relationship with informality. As mentioned above, this variable is considered of crucial importance in countries such as Mexico, where corrupt practice is extensive and the progress made in decreasing it are not encouraging.

On other hand, the variable *education* is statistically significant, with a negative effect on micro firm informality. This finding further supports the idea that, at least to some extent, a higher education level may be translated in less informality.

In the final analysis of the time series approach, the variable *unemployment* is statistically significant, and has a positive effect. It is the self-employed who receive a greater impact under the first and second Measures, with a statistically significant level of five per cent. While the owners are only statistically significant at ten per cent under the first Measure, these observations may support the hypothesis that informality is an alternative to unfavorable labor market conditions.

## **6. Conclusions**

Informality has been object of several studies not only because it is a growing phenomenon in most developing countries, but also due to its consequences in the short and long term. However, the difficulties in studying this subject begin with the attempt to define and compute it, as there is no single method with which to identify and measure it. Most studies have concentrated on the size of labor market informality and, to a lesser extent, on the informality of economic units.

The purpose of the current study was to shed light on the main determinants of economic unit informality by state in Mexico. The key strengths of this study were that it took micro firms as the object for the study of informality, differentiating the different economic units, and thus proposing different ways to measure micro firm informality. The research was conducted for each state in a developing country for the period of 2008-2012. The main contributions of this study to this area of research are summarized below.

The investigation of micro firm informality has shown that the economic variables such as market size and wealth are the main causes for informality in each state, where, in other words, economic stability reduces informality levels. An interesting aspect is that these variables are significant under any of the measures proposed in the research. In contrast, the variable FDI has a limited effect on micro firm informality, inasmuch as it is only statistically significant under a specific kind of measure.

This study provides additional evidence with respect to the importance of the corruption variable inasmuch as it has a statically significant effect as a cause of informality in

Mexican states. The variable shows a positive influence under almost every measure considered in the study. A key policy priority should, therefore, be to plan better ways to reduce corruption, from which governments would benefit from the increased tax revenue.

Another important finding is that the variable of education has a positive effect on the reduction of informality. It has always been considered as a key variable in the development of any country, with governments, therefore, able to look to this as a tool in the efforts to reduce informality.

These findings suggest several courses of action for governments, where, specifically, they can fight against corruption and strive to improve and extend education. These are tools that should be considered of even greater importance for countries such as Mexico.

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## 8. Tables

**Table 1. Variables used in the study**

| Abbreviation | Variable                                                            | Source                                                                           |
|--------------|---------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Inf          | Informality                                                         | Instituto Nacional de Estadística y Geografía                                    |
| GDP          | Gross Domestic Product (Size)                                       | Instituto Nacional de Estadística y Geografía                                    |
| GDPpc        | Gross Domestic Product per capita (wealth)                          | -Instituto Nacional de Estadística y Geografía<br>-Consejo Nacional de Población |
| Unemployment | Unemployment                                                        | Instituto Nacional de Estadística y Geografía                                    |
| Inflation    | Inflation                                                           | Instituto Nacional de Estadística y Geografía                                    |
| FDI          | Foreign Direct Investment                                           | Secretaría de Economía                                                           |
| BC           | Bank Credit                                                         | Own elaboration with data of Secretaría de Finanzas                              |
| SE           | Sector Specialization                                               | Own elaboration with data of Instituto Nacional de Estadística y Geografía       |
| Education    | Education (Average scholar years of Economically Active Population) | Encuesta Nacional de Ocupación y Empleo                                          |
| Taxes        | Taxes                                                               | Own elaboration with data of Instituto Nacional de Estadística y Geografía       |
| SB           | Cost to start a business                                            | World Bank                                                                       |
| Corruption   | Corruption                                                          | Transparency International                                                       |
| Peace        | Social stability                                                    | Vision of Humanity                                                               |

Source: own elaboration.

**Table 2. Determinants of micro firms informality**

| VARIABLES        | Measure I               |                         |                         | Measure II            |                       |                        | Measure III            |                        |                         |
|------------------|-------------------------|-------------------------|-------------------------|-----------------------|-----------------------|------------------------|------------------------|------------------------|-------------------------|
|                  | General<br>(A+B)        | Owner<br>(A)            | Self-Employment<br>(B)  | General<br>(A+B)      | Owner<br>(A)          | Self-Employment<br>(B) | General<br>(A+B)       | Owner<br>(A)           | Self-Employment<br>(B)  |
| GDP              | -0.00880**<br>(0.00417) | -0.0274***<br>(0.00798) | -0.00741*<br>(0.00414)  | 0.0285*<br>(0.0170)   | 0.00435<br>(0.0430)   | 0.0157<br>(0.0136)     | 0.0206<br>(0.0169)     | -0.00629<br>(0.0438)   | 0.00828<br>(0.0135)     |
| GDPpc            | -0.0240**<br>(0.0113)   | -0.0138<br>(0.0216)     | -0.0219*<br>(0.0112)    | -0.114**<br>(0.0471)  | -0.229*<br>(0.119)    | -0.0717*<br>(0.0379)   | -0.125***<br>(0.0471)  | -0.229*<br>(0.121)     | -0.0846**<br>(0.0378)   |
| Unemployment     | -0.00506<br>(0.0102)    | 0.0302<br>(0.0196)      | -0.00678<br>(0.0101)    | -0.0125<br>(0.0339)   | -0.0698<br>(0.101)    | 0.00203<br>(0.0286)    | -0.0278<br>(0.0361)    | -0.0710<br>(0.104)     | -0.0139<br>(0.0300)     |
| Inflation        | -0.0134<br>(0.00868)    | -0.0433***<br>(0.0166)  | -0.0142*<br>(0.00862)   | -0.0416*<br>(0.0249)  | -0.148*<br>(0.0807)   | -0.0480**<br>(0.0213)  | -0.0556**<br>(0.0270)  | -0.117<br>(0.0831)     | -0.0668***<br>(0.0228)  |
| FDI              | -0.00392**<br>(0.00179) | -0.00415<br>(0.00342)   | -0.00405**<br>(0.00177) | -0.00516<br>(0.00545) | -0.00678<br>(0.0174)  | -0.00729<br>(0.00467)  | -0.00601<br>(0.00594)  | -0.0147<br>(0.0178)    | -0.00755<br>(0.00500)   |
| BC               | 0.0109*<br>(0.00637)    | 0.0232*<br>(0.0122)     | 0.0102<br>(0.00632)     | 0.0164<br>(0.0214)    | 0.0456<br>(0.0643)    | 0.0186<br>(0.0181)     | 0.0251<br>(0.0229)     | 0.0697<br>(0.0657)     | 0.0268<br>(0.0191)      |
| SE               | -0.0465***<br>(0.0159)  | -0.0589*<br>(0.0303)    | -0.0444***<br>(0.0157)  | -0.203***<br>(0.0607) | -0.324**<br>(0.161)   | -0.152***<br>(0.0492)  | -0.217***<br>(0.0615)  | -0.336**<br>(0.165)    | -0.171***<br>(0.0498)   |
| Education        | 0.0286<br>(0.0605)      | -0.269**<br>(0.116)     | 0.0547<br>(0.0600)      | 0.0290<br>(0.225)     | -0.0278<br>(0.622)    | 0.00788<br>(0.186)     | 0.0905<br>(0.233)      | 0.0409<br>(0.634)      | 0.0701<br>(0.191)       |
| Taxes            | 0.00556<br>(0.00699)    | 0.00755<br>(0.0134)     | 0.00605<br>(0.00694)    | 0.0336<br>(0.0226)    | 0.0161<br>(0.0690)    | 0.0248<br>(0.0191)     | 0.0301<br>(0.0242)     | 0.00369<br>(0.0707)    | 0.0224<br>(0.0202)      |
| SB               | -0.00705<br>(0.00653)   | -0.0250**<br>(0.0125)   | -0.000675<br>(0.00648)  | 0.00174<br>(0.0256)   | -0.0835<br>(0.0682)   | 0.00634<br>(0.0209)    | -0.00165<br>(0.0262)   | -0.0964<br>(0.0694)    | 0.00659<br>(0.0212)     |
| Corruption       | 0.0220***<br>(0.00647)  | 0.0331***<br>(0.0124)   | 0.0196***<br>(0.00642)  | 0.0138<br>(0.0171)    | 0.135**<br>(0.0594)   | 0.0119<br>(0.0149)     | 0.0360*<br>(0.0191)    | 0.152**<br>(0.0613)    | 0.0330**<br>(0.0164)    |
| Peace            | -0.000410<br>(0.000292) | -0.000385<br>(0.000560) | -0.000270<br>(0.000290) | 0.000383<br>(0.00109) | 0.000617<br>(0.00304) | 0.000407<br>(0.000907) | -0.000152<br>(0.00114) | -0.000610<br>(0.00310) | -6.78e-05<br>(0.000934) |
| Constant         | 4.859***<br>(0.0922)    | 5.551***<br>(0.177)     | 4.762***<br>(0.0915)    | 5.235***<br>(0.392)   | 6.625***<br>(0.980)   | 5.003***<br>(0.314)    | 5.300***<br>(0.390)    | 6.487***<br>(0.994)    | 5.083***<br>(0.312)     |
| Observations     | 87                      | 87                      | 87                      | 87                    | 87                    | 87                     | 87                     | 87                     | 87                      |
| Number of states | 32                      | 32                      | 32                      | 32                    | 32                    | 32                     | 32                     | 32                     | 32                      |
| r2_w             | 0.220                   | 0.342                   | 0.213                   | 0.353                 | 0.136                 | 0.453                  | 0.365                  | 0.0991                 | 0.483                   |
| r2_b             | 0.732                   | 0.708                   | 0.618                   | 0.364                 | 0.452                 | 0.284                  | 0.439                  | 0.485                  | 0.379                   |
| r2_o             | 0.452                   | 0.517                   | 0.376                   | 0.359                 | 0.367                 | 0.328                  | 0.419                  | 0.373                  | 0.410                   |

Standard Errors in parentheses. \*\*\* P<0.01 , \*\* p<0.05 , \* 1p<0.1

**Table 3. Regressions with trend effect**

| VARIABLES        | Measure I               |                         |                         | Measure II            |                       |                        | Measure III            |                        |                        |
|------------------|-------------------------|-------------------------|-------------------------|-----------------------|-----------------------|------------------------|------------------------|------------------------|------------------------|
|                  | General<br>(A+B)        | Owner<br>(A)            | Self-Employed<br>(B)    | General<br>(A+B)      | Owner<br>(A)          | Self-Employed<br>(B)   | General<br>(A+B)       | Owner<br>(A)           | Self-Employment<br>(B) |
| GDP              | -0.00633*<br>(0.00368)  | -0.0245***<br>(0.00772) | -0.00534<br>(0.00382)   | 0.0320**<br>(0.0161)  | 0.0133<br>(0.0426)    | 0.0191<br>(0.0128)     | 0.0257<br>(0.0157)     | 0.00444<br>(0.0429)    | 0.0129<br>(0.0125)     |
| GDPpc            | -0.00989<br>(0.0103)    | 0.00306<br>(0.0216)     | -0.0100<br>(0.0107)     | -0.0613<br>(0.0470)   | -0.159<br>(0.123)     | -0.0306<br>(0.0377)    | -0.0693<br>(0.0463)    | -0.147<br>(0.124)      | -0.0392<br>(0.0367)    |
| Unemployment     | 0.00234<br>(0.00905)    | 0.0389**<br>(0.0190)    | -0.000592<br>(0.00940)  | 0.000170<br>(0.0319)  | -0.0386<br>(0.101)    | 0.0142<br>(0.0270)     | -0.0106<br>(0.0336)    | -0.0334<br>(0.102)     | 0.00228<br>(0.0278)    |
| Inflation        | 0.0275**<br>(0.0113)    | 0.00574<br>(0.0237)     | 0.0201*<br>(0.0117)     | 0.0281<br>(0.0310)    | 0.00987<br>(0.116)    | 0.0146<br>(0.0272)     | 0.0328<br>(0.0343)     | 0.0742<br>(0.119)      | 0.0140<br>(0.0294)     |
| FDI              | -0.00319**<br>(0.00157) | -0.00324<br>(0.00329)   | -0.00343**<br>(0.00163) | -0.00288<br>(0.00513) | -0.00306<br>(0.0172)  | -0.00537<br>(0.00441)  | -0.00330<br>(0.00552)  | -0.0103<br>(0.0175)    | -0.00525<br>(0.00462)  |
| BC               | 0.00352<br>(0.00576)    | 0.0144<br>(0.0121)      | 0.00398<br>(0.00599)    | -0.00400<br>(0.0208)  | 0.0131<br>(0.0656)    | 0.00180<br>(0.0177)    | 0.00188<br>(0.0220)    | 0.0313<br>(0.0664)     | 0.00716<br>(0.0182)    |
| SE               | -0.0165<br>(0.0151)     | -0.0232<br>(0.0318)     | -0.0194<br>(0.0157)     | -0.107*<br>(0.0639)   | -0.184<br>(0.176)     | -0.0752<br>(0.0517)    | -0.112*<br>(0.0636)    | -0.171<br>(0.177)      | -0.0834<br>(0.0510)    |
| Education        | -0.0250<br>(0.0540)     | -0.333***<br>(0.113)    | 0.00984<br>(0.0561)     | -0.196<br>(0.221)     | -0.312<br>(0.631)     | -0.167<br>(0.182)      | -0.144<br>(0.225)      | -0.292<br>(0.636)      | -0.120<br>(0.182)      |
| Taxes            | -0.00598<br>(0.00655)   | -0.00628<br>(0.0138)    | -0.00362<br>(0.00680)   | 0.00315<br>(0.0230)   | -0.0365<br>(0.0735)   | -0.000887<br>(0.0195)  | -0.00557<br>(0.0243)   | -0.0590<br>(0.0745)    | -0.00840<br>(0.0202)   |
| SB               | 0.00195<br>(0.00599)    | -0.0142<br>(0.0126)     | 0.00686<br>(0.00622)    | 0.0325<br>(0.0257)    | -0.0398<br>(0.0711)   | 0.0309<br>(0.0210)     | 0.0320<br>(0.0259)     | -0.0449<br>(0.0715)    | 0.0344*<br>(0.0208)    |
| Corruption       | 0.0192***<br>(0.00568)  | 0.0298**<br>(0.0119)    | 0.0173***<br>(0.00590)  | 0.0127<br>(0.0159)    | 0.129**<br>(0.0585)   | 0.0107<br>(0.0139)     | 0.0335*<br>(0.0175)    | 0.144**<br>(0.0599)    | 0.0306**<br>(0.0150)   |
| Peace            | -0.000309<br>(0.000256) | -0.000267<br>(0.000539) | -0.000186<br>(0.000266) | 0.000402<br>(0.00102) | 0.000867<br>(0.00299) | 0.000445<br>(0.000851) | -9.45e-05<br>(0.00105) | -0.000292<br>(0.00302) | 8.13e-06<br>(0.000857) |
| Trend effect     | 0.0233***<br>(0.00475)  | 0.0278***<br>(0.00997)  | 0.0195***<br>(0.00494)  | 0.0471***<br>(0.0139) | 0.0924*<br>(0.0496)   | 0.0404***<br>(0.0121)  | 0.0565***<br>(0.0152)  | 0.111**<br>(0.0507)    | 0.0500***<br>(0.0129)  |
| Constant         | 4.668***<br>(0.0895)    | 5.324***<br>(0.188)     | 4.603***<br>(0.0929)    | 4.857***<br>(0.385)   | 5.866***<br>(1.046)   | 4.674***<br>(0.311)    | 4.838***<br>(0.383)    | 5.574***<br>(1.054)    | 4.672***<br>(0.306)    |
| Observations     | 87                      | 87                      | 87                      | 87                    | 87                    | 87                     | 87                     | 87                     | 87                     |
| Number of states | 32                      | 32                      | 32                      | 32                    | 32                    | 32                     | 32                     | 32                     | 32                     |
| r2_w             | 0.408                   | 0.410                   | 0.342                   | 0.448                 | 0.161                 | 0.516                  | 0.472                  | 0.140                  | 0.561                  |
| r2_b             | 0.797                   | 0.732                   | 0.694                   | 0.440                 | 0.501                 | 0.384                  | 0.530                  | 0.542                  | 0.508                  |
| r2_o             | 0.588                   | 0.563                   | 0.486                   | 0.436                 | 0.401                 | 0.419                  | 0.510                  | 0.417                  | 0.520                  |

Standard Errors in parentheses. \*\*\* P<0.01 , \*\* p<0.05 , \* 1p<0.1

### Annex 1. Estimations with between effect

| VARIABLES        | Measure I                |                        |                         | Measure II            |                       |                       | Measure III           |                       |                        |
|------------------|--------------------------|------------------------|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|
|                  | General<br>(A+B)         | Owner<br>(A)           | Self-Employed<br>(B)    | General<br>(A+B)      | Owner<br>(A)          | Self-Employed<br>(B)  | General<br>(A+B)      | Owner<br>(A)          | Self-Employment<br>(B) |
| GDP              | -0.0108*<br>(0.00548)    | -0.0160<br>(0.0124)    | -0.0106*<br>(0.00596)   | -0.0419<br>(0.0287)   | -0.150**<br>(0.0687)  | -0.0303<br>(0.0222)   | -0.0513*<br>(0.0268)  | -0.152**<br>(0.0681)  | -0.0403*<br>(0.0209)   |
| GDPpc            | -0.00418<br>(0.0122)     | -0.00493<br>(0.0276)   | -0.00464<br>(0.0133)    | -0.00391<br>(0.0637)  | -0.0330<br>(0.153)    | 0.00380<br>(0.0492)   | 0.0108<br>(0.0595)    | -0.0299<br>(0.151)    | 0.0191<br>(0.0465)     |
| Unemployment     | 0.00897<br>(0.0119)      | 0.0338<br>(0.0269)     | 0.00572<br>(0.0129)     | -0.0172<br>(0.0622)   | -0.0429<br>(0.149)    | -0.0185<br>(0.0481)   | 0.000139<br>(0.0581)  | -0.0488<br>(0.148)    | 0.000320<br>(0.0454)   |
| Inflation        | 0.0105<br>(0.0231)       | 0.0109<br>(0.0523)     | 0.00901<br>(0.0251)     | -0.0454<br>(0.121)    | -0.103<br>(0.289)     | -0.0415<br>(0.0934)   | -0.0493<br>(0.113)    | -0.0539<br>(0.287)    | -0.0480<br>(0.0882)    |
| FDI              | -0.00588***<br>(0.00195) | -0.00756<br>(0.00441)  | -0.00582**<br>(0.00212) | 0.0173<br>(0.0102)    | 0.0331<br>(0.0244)    | 0.0129<br>(0.00788)   | 0.0128<br>(0.00953)   | 0.0243<br>(0.0242)    | 0.00873<br>(0.00745)   |
| BC               | 0.00843<br>(0.00798)     | 0.000394<br>(0.0181)   | 0.0110<br>(0.00869)     | 0.0745*<br>(0.0417)   | 0.198*<br>(0.100)     | 0.0575*<br>(0.0323)   | 0.0796*<br>(0.0390)   | 0.216**<br>(0.0992)   | 0.0618*<br>(0.0305)    |
| SE               | -0.0227<br>(0.0165)      | -0.0279<br>(0.0374)    | -0.0282<br>(0.0180)     | -0.133<br>(0.0864)    | -0.331<br>(0.207)     | -0.0927<br>(0.0668)   | -0.127<br>(0.0807)    | -0.311<br>(0.205)     | -0.0883<br>(0.0631)    |
| Education        | -0.0512<br>(0.0745)      | -0.194<br>(0.169)      | -0.0216<br>(0.0811)     | -0.711*<br>(0.390)    | -1.386<br>(0.934)     | -0.506<br>(0.301)     | -0.778**<br>(0.364)   | -1.318<br>(0.927)     | -0.583*<br>(0.285)     |
| Taxes            | -0.00178<br>(0.00775)    | 0.00346<br>(0.0176)    | 0.00122<br>(0.00844)    | -0.0502<br>(0.0405)   | -0.120<br>(0.0972)    | -0.0481<br>(0.0313)   | -0.0544<br>(0.0379)   | -0.159<br>(0.0963)    | -0.0502<br>(0.0296)    |
| SB               | 0.000433<br>(0.00684)    | -0.0266<br>(0.0155)    | 0.00594<br>(0.00745)    | 0.0231<br>(0.0358)    | -0.0875<br>(0.0858)   | 0.0337<br>(0.0277)    | 0.0322<br>(0.0335)    | -0.0894<br>(0.0850)   | 0.0441<br>(0.0261)     |
| Corruption       | 0.0259**<br>(0.0117)     | 0.00772<br>(0.0266)    | 0.0244*<br>(0.0128)     | 0.237***<br>(0.0615)  | 0.582***<br>(0.147)   | 0.169***<br>(0.0475)  | 0.257***<br>(0.0575)  | 0.582***<br>(0.146)   | 0.190***<br>(0.0449)   |
| Peace            | -0.000492<br>(0.000329)  | 0.000286<br>(0.000745) | -0.000419<br>(0.000358) | -0.00154<br>(0.00172) | -0.00151<br>(0.00412) | -0.00129<br>(0.00133) | -0.00195<br>(0.00161) | -0.00292<br>(0.00409) | -0.00162<br>(0.00126)  |
| Constant         | 4.758***<br>(0.128)      | 5.167***<br>(0.290)    | 4.693***<br>(0.139)     | 5.851***<br>(0.670)   | 7.867***<br>(1.606)   | 5.388***<br>(0.518)   | 5.841***<br>(0.627)   | 7.582***<br>(1.593)   | 5.399***<br>(0.490)    |
| Observations     | 87                       | 87                     | 87                      | 87                    | 87                    | 87                    | 87                    | 87                    | 87                     |
| R-squared        | 0.803                    | 0.745                  | 0.698                   | 0.742                 | 0.727                 | 0.707                 | 0.784                 | 0.743                 | 0.757                  |
| Number of states | 32                       | 32                     | 32                      | 32                    | 32                    | 32                    | 32                    | 32                    | 32                     |
| p                | 0.000182                 | 0.00154                | 0.00587                 | 0.00168               | 0.00266               | 0.00457               | 0.000398              | 0.00162               | 0.00106                |
| r2_w             | 2.85e-05                 | 0.00670                | 0.00253                 | 0.0153                | 0.000627              | 0.0229                | 0.00172               | 0.000512              | 0.00145                |
| r2_b             | 0.803                    | 0.745                  | 0.698                   | 0.742                 | 0.727                 | 0.707                 | 0.784                 | 0.743                 | 0.757                  |
| r2_o             | 0.295                    | 0.356                  | 0.232                   | 0.264                 | 0.243                 | 0.187                 | 0.292                 | 0.245                 | 0.227                  |

Standard Errors in parentheses. \*\*\* P<0.01 , \*\* p<0.05 , \* 1p<0.1

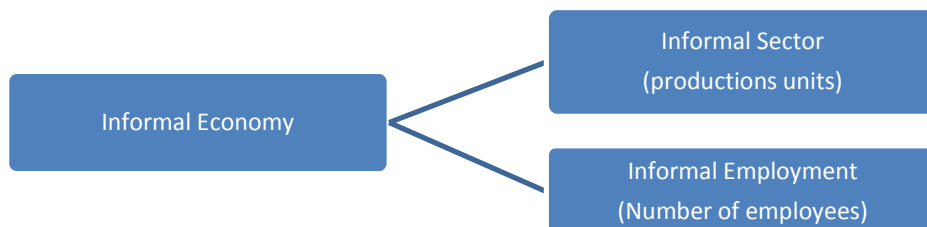
## Annex 2. Estimations with time series effect

| VARIABLES        | Measure I               |                       |                        | Measure II            |                      |                       | Measure III           |                       |                        |
|------------------|-------------------------|-----------------------|------------------------|-----------------------|----------------------|-----------------------|-----------------------|-----------------------|------------------------|
|                  | General<br>(A+B)        | Owner<br>(A)          | Self-Employed<br>(B)   | General<br>(A+B)      | Owner<br>(A)         | Self-Employed<br>(B)  | General<br>(A+B)      | Owner<br>(A)          | Self-Employment<br>(B) |
| GDP              | 0.0408<br>(0.179)       | -0.131<br>(0.333)     | 0.0192<br>(0.183)      | 0.375<br>(0.330)      | 1.040<br>(1.389)     | 0.247<br>(0.294)      | 0.275<br>(0.374)      | 1.327<br>(1.419)      | 0.135<br>(0.328)       |
| GDPpc            | 0.273<br>(0.240)        | 0.802*<br>(0.446)     | 0.161<br>(0.245)       | 0.0783<br>(0.442)     | -1.022<br>(1.860)    | 0.201<br>(0.393)      | 0.240<br>(0.500)      | -0.648<br>(1.901)     | 0.329<br>(0.440)       |
| Unemployment     | 0.0346<br>(0.0298)      | 0.109*<br>(0.0554)    | 0.0152<br>(0.0305)     | 0.0958*<br>(0.0549)   | 0.0341<br>(0.231)    | 0.121**<br>(0.0489)   | 0.101<br>(0.0622)     | 0.151<br>(0.236)      | 0.115**<br>(0.0546)    |
| Inflation        | 0.00252<br>(0.0169)     | -0.0298<br>(0.0315)   | -0.00884<br>(0.0173)   | 0.000495<br>(0.0312)  | -0.169<br>(0.131)    | -0.00516<br>(0.0278)  | -0.00527<br>(0.0354)  | -0.0993<br>(0.134)    | -0.0173<br>(0.0311)    |
| FDI              | 0.000818<br>(0.00328)   | 0.00569<br>(0.00610)  | -0.000384<br>(0.00335) | -0.00249<br>(0.00604) | 0.00491<br>(0.0254)  | -0.00581<br>(0.00538) | -0.00133<br>(0.00684) | -0.000498<br>(0.0260) | -0.00435<br>(0.00601)  |
| BC               | 0.00864<br>(0.0131)     | 0.0403<br>(0.0244)    | 0.00453<br>(0.0134)    | -0.00329<br>(0.0242)  | -0.0438<br>(0.102)   | -0.00458<br>(0.0215)  | 0.00440<br>(0.0274)   | -0.0611<br>(0.104)    | 0.00487<br>(0.0241)    |
| SE               | 0.286<br>(0.214)        | 0.501<br>(0.398)      | 0.135<br>(0.219)       | 0.276<br>(0.395)      | -0.455<br>(1.662)    | 0.248<br>(0.351)      | 0.302<br>(0.447)      | 0.101<br>(1.698)      | 0.228<br>(0.393)       |
| Education        | 0.161<br>(0.212)        | -0.352<br>(0.395)     | 0.163<br>(0.217)       | -0.0253<br>(0.391)    | -0.683<br>(1.648)    | -0.139<br>(0.348)     | 0.125<br>(0.443)      | -0.816<br>(1.684)     | 0.0353<br>(0.390)      |
| Taxes            | -0.00983<br>(0.0148)    | -0.0194<br>(0.0275)   | -0.00552<br>(0.0151)   | 0.0339<br>(0.0273)    | 0.131<br>(0.115)     | 0.0304<br>(0.0243)    | 0.0270<br>(0.0309)    | 0.144<br>(0.117)      | 0.0226<br>(0.0271)     |
| SB               | 0.00392<br>(0.0222)     | 0.000395<br>(0.0412)  | 0.00723<br>(0.0227)    | 0.0433<br>(0.0408)    | 0.125<br>(0.172)     | 0.0199<br>(0.0363)    | 0.0302<br>(0.0462)    | 0.143<br>(0.176)      | 0.00479<br>(0.0406)    |
| Corruption       | 0.00637<br>(0.00955)    | 0.0170<br>(0.0178)    | 0.00647<br>(0.00977)   | -0.0218<br>(0.0176)   | -0.00809<br>(0.0741) | -0.0231<br>(0.0157)   | -0.0133<br>(0.0199)   | -0.00692<br>(0.0757)  | -0.0132<br>(0.0175)    |
| Peace            | -0.000202<br>(0.000773) | -0.00181<br>(0.00144) | 0.000223<br>(0.000791) | 0.00128<br>(0.00142)  | 0.00300<br>(0.00600) | 0.00124<br>(0.00127)  | 0.000534<br>(0.00161) | 0.00201<br>(0.00613)  | 0.000550<br>(0.00142)  |
| Constant         | 0.468<br>(1.828)        | -2.528<br>(3.399)     | 2.060<br>(1.868)       | -1.384<br>(3.367)     | 4.147<br>(14.17)     | -0.834<br>(2.997)     | -2.335<br>(3.814)     | -3.727<br>(14.49)     | -1.284<br>(3.352)      |
| Observations     | 87                      | 87                    | 87                     | 87                    | 87                   | 87                    | 87                    | 87                    | 87                     |
| R-squared        | 0.379                   | 0.475                 | 0.308                  | 0.487                 | 0.265                | 0.572                 | 0.510                 | 0.260                 | 0.605                  |
| Number of states | 32                      | 32                    | 32                     | 32                    | 32                   | 32                    | 32                    | 32                    | 32                     |
| p                | 0.0301                  | 0.00224               | 0.129                  | 0.00150               | 0.259                | 6.29e-05              | 0.000697              | 0.278                 | 1.47e-05               |
| r2_w             | 0.379                   | 0.475                 | 0.308                  | 0.487                 | 0.265                | 0.572                 | 0.510                 | 0.260                 | 0.605                  |
| r2_b             | 0.431                   | 0.324                 | 0.250                  | 0.000851              | 0.0419               | 6.99e-05              | 0.0116                | 0.00606               | 0.0213                 |
| r2_o             | 0.165                   | 0.142                 | 0.0706                 | 0.00264               | 0.0461               | 0.000393              | 0.00546               | 0.00771               | 0.00883                |

Standard Errors in parentheses. \*\*\* P<0.01 , \*\* p<0.05 , \* 1p<0.1

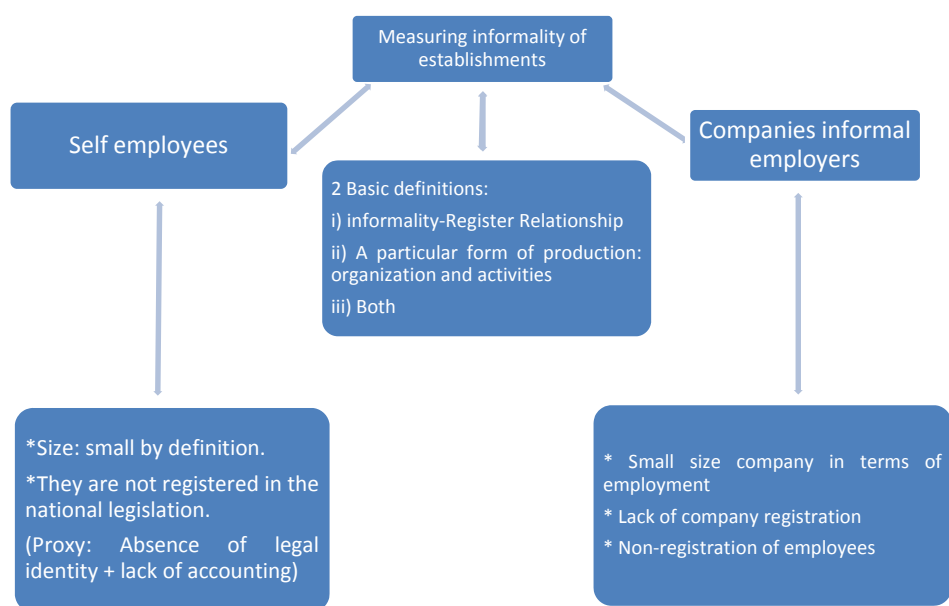
## 9. Figures

**Figure 1. Informal Economy**



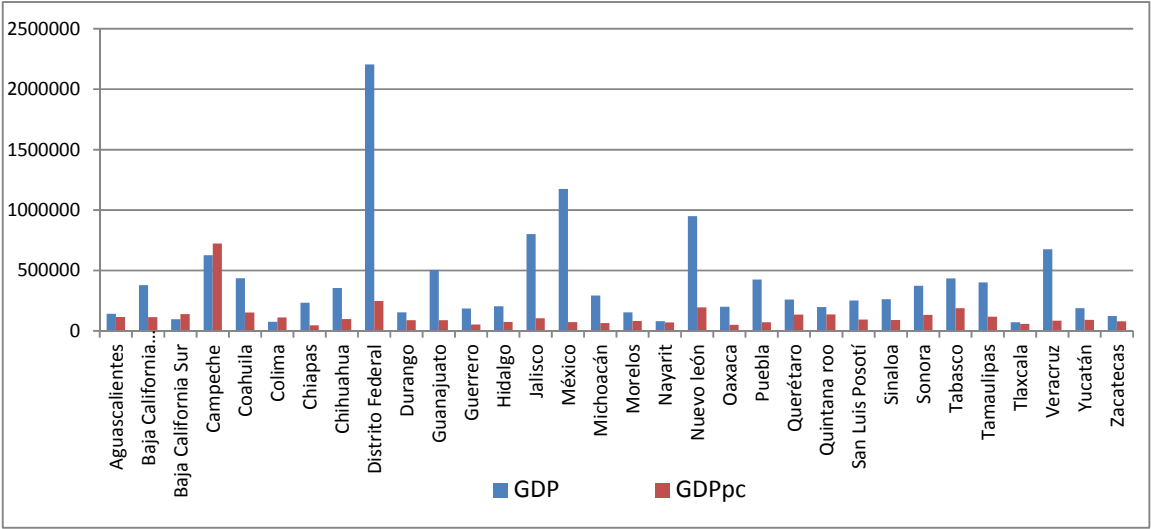
Source: own elaboration.

**Figure 2. Measuring informality of Establishments**



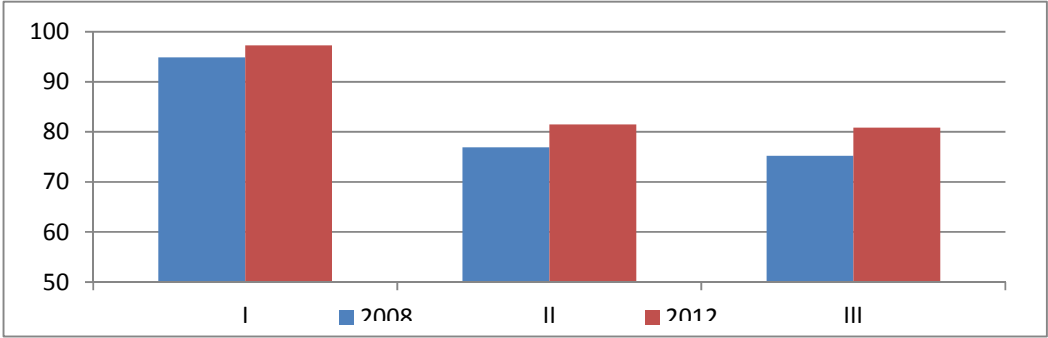
Source: own elaboration.

Figure 3. GDP and GDP per capita by state



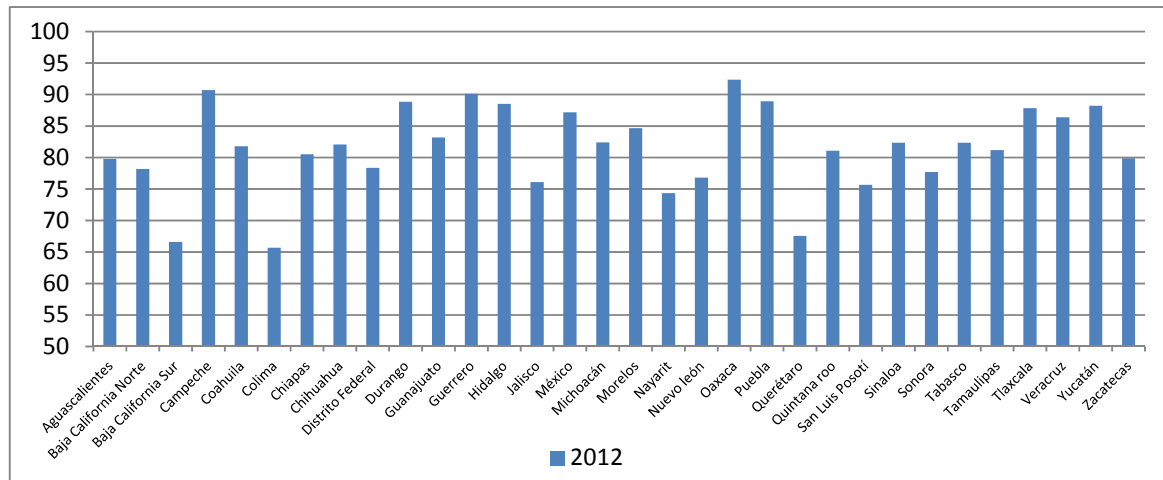
Source: own elaboration.

Figure 4. Three different ways to measure Micro Firm informality



Source: own elaboration.

**Figure 5. Heterogeneity of micro firms informality by state**



Source: own elaboration.





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