
“Differences in efficiency between Formal and Informal Micro Firms in Mexico”

Antonio Báez-Morales



Institut de Recerca en Economia Aplicada Regional i Públic
Research Institute of Applied Economics

WEBSITE: www.ub-irea.com • CONTACT: irea@ub.edu



Grup de Recerca Anàlisi Quantitativa Regional
Regional Quantitative Analysis Research Group

WEBSITE: www.ub.edu/aqr/ • CONTACT: aqr@ub.edu

Universitat de Barcelona

Av. Diagonal, 690 • 08034 Barcelona

The Research Institute of Applied Economics (IREA) in Barcelona was founded in 2005, as a research institute in applied economics. Three consolidated research groups make up the institute: AQR, RISK and GiM, and a large number of members are involved in the Institute. IREA focuses on four priority lines of investigation: (i) the quantitative study of regional and urban economic activity and analysis of regional and local economic policies, (ii) study of public economic activity in markets, particularly in the fields of empirical evaluation of privatization, the regulation and competition in the markets of public services using state of industrial economy, (iii) risk analysis in finance and insurance, and (iv) the development of micro and macro econometrics applied for the analysis of economic activity, particularly for quantitative evaluation of public policies.

IREA Working Papers often represent preliminary work and are circulated to encourage discussion. Citation of such a paper should account for its provisional character. For that reason, IREA Working Papers may not be reproduced or distributed without the written consent of the author. A revised version may be available directly from the author.

Any opinions expressed here are those of the author(s) and not those of IREA. Research published in this series may include views on policy, but the institute itself takes no institutional policy positions.

Abstract

The economic role of micro firms is still the subject of much discussion and debate. While these firms can be seen as potential growth drivers, as they are usually related to entrepreneurship, a relatively high share of micro firms can also be a sign of an underdeveloped productive system, which applies especially to developing countries, where micro firms represent the majority of business activity. Unlike other studies, this research separates formal and informal micro firms in order to test whether there are efficiency differences between them, and to explain these differences. One of the novelties of the study is the use of the Oaxaca-Blinder decomposition method, which enables an analysis of the differences between both groups of firms after controlling for their different allocation of factors. Micro firms in Mexico are taken as a case study, with the Encuesta Nacional de Micronegocios (ENAMIN, or the National Micro Firm Survey), for 2008, 2010 and 2011, used to carry out the analysis. The empirical evidence suggests that output differences can be explained by endowment characteristics, while efficiency differences are explained by endowment returns. The main variables to explain the gap between the groups are the owner's level of education, the firm's age, the owner's motivations, and financing.

JEL classification: D00, D22, D24

Keywords: informality, micro firms, efficiency, productivity, decomposition method.

Antonio Baez Morales. AQR Research Group-IREA. Department of Econometrics. University of Barcelona, Av. Diagonal 690, 08034 Barcelona, Spain. E-mail: antoniobaezm@gmail.com or abaezmor8@alumnes.ub.edu

Acknowledgements

1. Introduction

There is a growing body of literature that recognizes the importance of micro firms for a country's development inasmuch as these firms represent the majority of business activity, and also that employ more workers than any other kind of firm. This is especially true for developing countries, where micro firms can be seen as an alternative to the formal wage sector, in that low wages and high unemployment levels are common characteristics; at the same time, they may also be an expression of the entrepreneurial capacity of a society. In fact, the characterization of this kind of firm has been instrumental to understanding their performance.

Micro firms have been often considered, however, as unproductive and as having undesirable characteristics, such as being too small and unlikely to grow sufficiently to be productive, being normally run by uneducated people and having a short life expectancy (La Porta and Shleifer, 2014). In fact, in most developing countries, micro firms are associated with informal activities such as street selling and also with poor-quality products (Loayza et al., 2009; Masatlioglu and Rigolini, 2006).

Although micro firm performance has been studied before, most research in this area has not dealt with the differentiation between formal and informal micro firms, with most studies focusing on bigger firms, instead of micro firms, as well as on labor market issues. The differentiation between formal and informal micro firms is applied here in order to analyze the characteristics of each group, to test whether they exhibit different performance in terms of output and efficiency, and to explain the reasons behind this.

The main aim of this study is to characterize formal and informal micro firms, to visualize the differences between them, and to explain the reasons behind them. Another novel aspect of this research is the use of Oaxaca-Blinder decomposition method to explain the output and efficiency gap between groups. While this method has been used in research into labor issues, it is used in this paper to shed light on the differences between formal and informal micro firms.

The rest of the paper is divided into five sections, in which Section 2 presents the literature review which provides an overview of the role of the micro firm, outlining the informality

issues linked to this kind of firm and what has been said about the differences between groups. Section 3 describes the database used in the research as well as the way that variables were defined, while Section 4 describes the methodology used to explain the different efficiencies and outputs between groups. Section 5 presents the research results, and Section 6 summarizes the main results and policy implications.

2. Literature review

There has been increasing study into the role of micro firms in the development of countries, inasmuch as these kinds of firms can have positive or negative effects, depending on the point of view from which they are viewed, and the countries being studied. For instance, in developed countries, owning a business and being your own boss are desirable characteristics, with this kind of firm taken as an alternative to salaried work. Unlike those in developed countries, micro firms in developing countries are associated with unregulated activities and the self-employed sector. While, most of the time, these micro firms are taken as being involved in informal subsistence activities, they are also recognized as a means of reducing poverty and social inequality (Lagarda and Urquidy, 2007).

It is important to begin by explaining the different reasons why people decide to explore this sector and start a new micro firm, as it is known that these may influence a firm's economic performance. For instance, it is said that economic performance may respond to voluntary entrance. While the entrance is as salaried worker into the informal sector, this is considered a transitory situation. Similarly, Levy (2010) states that in those cases where salaries are too low, as in most developing countries, those micro firms measured as self-employed may be less desirable. However, the main reason for entering this sector of firms is the non-pecuniary benefits such as flexibility of hours and being one's own boss (Hurst and Pugsley, 2011). As these benefits have also been found in studies carried out in developed countries, it has been proposed that micro firms in developing countries should be treated as they are in developed countries, i.e., as a desirable sector that provides, for instance, a source of low-productivity workers (Fajnzylber et al., 2006).

Some argue that micro firms are less desirable in economic terms for a society, citing their low working capital and low wages, and their poor-quality and low-value products (La

Porta and Shleifer, 2014). According to Davis et al. (2007), most non-employing micro businesses in the United States are quite small in size and have never employed staff. In this respect, Hurst and Pugsley (2011) state that only a few small businesses have a new idea to market, with most having little interest in growth and innovation. Furthermore, most micro firms are dismantled when their owners die (Benjamin and Mbaye, 2012). Unlike micro firms, larger firms have better characteristics, such as a higher education levels.

The economic performance of micro firms, however, may be affected by obstacles such as regulations which play a key role in inhibiting individual activity in order to exploit opportunities in the market, such as contract enforcement or labor market regulations (Ardagna and Lusardi, 2008). On the other hand, one of the most common obstacles for micro firms is available capital, along with credit restrictions (Hernández-Trillo et al., 2005). These factors may make a difference in the performance of a business inasmuch as it has been found that micro firms that support their activities with bank credit instead of loans from family or friends are more efficient (Aguilar et al., 2012). Similarly, Heino (2006) describes the relationship between starting a new micro firm and the methods of financing it, with, for instance, the constraints of family savings hindering the creation of micro enterprises in Mexico. However, despite liquidity restrictions, this sector of firms does not appear to be less desirable than alternative business models available in market (Fajnzylber et al., 2006).

Another important argument made against micro firms is that most of them are informal that, in other words, they are breaking law in some way. Whether informality is a problem or not depends on each theoretical approach, with the dualist school, for instance, seeing this as a marginal activity that provides income and security to poor people who, although they would prefer to be employed in the formal sector, are excluded. The structuralist school sees informality as a way to help reduce inputs and labor cost. The legalistic school sees informality as a problem related to regulations, in which economic agents try to avoid costs and benefit-cost analysis (Chen, 2012).

In practical terms, this informal sector of firms can even be seen as a strategic response to competition from larger firms (Farell, 2004), inasmuch as many economic units in this sector encounter capital shortfalls due to a lack of institutional credit and social security, as

well as employee job instability. Most informal economic units do not move to the formal sector and remain in the same conditions without any improvement for many years (La Porta and Shleifer, 2014). In addition, governments collect lower tax revenue due to a lack of information on earnings from this sector (Aguilar et al., 2012).

The question as to whether micro firms choose the informal sector, however, may be explained by government failures which, for instance, may influence whether or not a society perceives the benefits of paying taxes, such as the quality of public services. Known as *tax morale*, this can affect the decisions of economic agents, and thus promote involvement in the informal sector. Thus, in the case of a low tax morale, many economic units may see no point in formality (Benjamin and Mbaye, 2012; Jaramillo, 2009).

The problems with informality begin with attempts to measure it. For instance, the informality of an economic unit has been measured approximately through business size, in terms of the number of employees, where a firm with few employees might be considered as informal. While registration with government agencies has been also used as another measure of informality, the problem with this measurement method is that a business can be registered with one government agency but not others. The firm's accounts are another way of measuring informality, with this measurement considered a good indication inasmuch as firms do not usually formally register their activities. Business mobility has been also used because this kind of firm does not have a fixed workplace.

Most studies recognize, however, that it is not easy to measure informality regardless of the measurement method, largely due to data availability. Furthermore, it is impossible to talk about unique informality, as there are firms that are breaking all laws, and others only breaking some laws (Benjamin and Mbaye, 2012).

Productivity is a key point to understanding economic development in any society, inasmuch as it represents a measurement of the efficiency with which a country, firm or worker produces goods and services. In this regard, economic growth is considered as coming from the creation of highly productive formal, rather than informal, firms, and micro firms much less so. The problem is that most informal firms are too small to be sufficiently productive, with, for instance, a sample of poor countries revealing that, on

average, an informal firm employs four workers while a formal firm employs 126 workers (La Porta and Shleifer, 2014)

The problem of being an informal firm is that, in general terms, they are less productive and less efficient (La Porta and Shleifer, 2014; La Porta and Shleifer, 2008 Fajnzylber et al., 2011). It has been found that when newly created firms choose to operate in the formal sector, they show better revenue levels, employ more workers and have more working capital (La Porta and Shleifer, 2014).

The differences in productivity, however, are only found in smaller firms, inasmuch as bigger informal firms may have productivity levels as high as formal firms while remaining informal (Benjamin and Mbaye, 2012). This means that productivity differences are more notable in small firms than in large firms. It is very important to make the distinction between large and small firms in order to better explain the productivity differences for each sector and size of firm.

The size of a firm has been considered as a criterion for informality, with micro firms often assumed to be informal without any distinction being made. Nevertheless, there may also be differences in terms of efficiency in this sector of firms. In this regard, Otero et al. (2013) find that informal micro firms in Mexico are less efficient than formal ones. These efficiency differences may be also expressed in terms of wages and growth rates. La Porta and Shleifer (2014) conclude that the productivity of informal firms is too low for them to compete in the formal sector.

The motivation to begin a new business is another possible variable that can explain the efficiency differences between formal and informal firms inasmuch as the latter sector of firms can be seen as way of sheltering from adverse conditions in formal labor market. Put in these terms, then, micro firms may simply represent a way of subsisting, rather than a form of entrepreneurship, and, as such, are unlikely to grow, which may explain some of the differences between groups (Aguilar et al., 2012; Perry et al. 2007).

The human capital variable has been another factor used to explain efficiency differences between formal and informal firms. It is said, for instance, that formal firms are often run by educated people who find it more profitable to run a bigger formal firm than an informal

one. In empirical studies, this variable is statistically significant in explaining productivity levels, although the formation of human capital is more important for managers than workers in this kind of firm (La Porta and Shleifer, 2008; Gennaioli et al., 2013; Akoten et al., 2006; Gelb et al., 2009). It has even been found that entrepreneurs with more educated spouses have higher earnings (McKenzie and Woodruff, 2006). However, the problem with measuring human capital is that most measurements do not take into account labor experience, which is known to play an important role in explaining performance for any kind of firm (Lagarda and Urquidy, 2007).

Capital endowment may be one of the main differences between formal and informal micro firms, inasmuch as it is expected that a firm with better endowments achieves better performance in economic terms. A study carried out on Turkish micro firms confirms that formal firms are more capital intensive than informal micro firms, although this was not the case for Egyptian micro firms (Hendy and Zaki, 2013).

Capital differences can be explained largely due to a lack of access to formal credit inasmuch as many micro firms do not comply with the standard requirements of the formal financial system. In this sense, empirical studies have found that micro firms with access to bank loans, moneylenders or formal credit from clients and suppliers are more efficient than those who depend on credit from family or friends (Hernández-Trillo et al. 2005)

Factors other than credit access or finance issues, such as better market strategies or the characteristics of micro firms and their owners (Fajnzylber et al., 2011; Akoten et al. 2006), may better explain the performance differences between formal and informal micro firms. In this regard, for instance, a lack of ability or even a lack of desire to grow would be reflected in poor performance (De Mel et al., 2010). Besides, variables, such as hours worked, whether or not the micro firm is supported by relatives, or marital status, can have a more important influence on performance (Fajnzylber et al., 2011).

It is important to take into account a broader context where, for instance, the macroeconomic environment can influence micro firm performance through the impact of factors, such as economic shocks, on formal and informal firms. In the same way, the geographical characteristics of the region in which firms operate may influence

productivity and efficiency. Furthermore, law enforcement may affect the business environment and thus the performance levels between groups (Gelb et al., 2009), with government having a very important role to play in terms of their obligations for law enforcement and the provision of a good business environment. Governmental failures may limit the ability of a micro firm to reach optimal size and performance. In practical terms, unequal access to public services can generate differences in productivity (Steel and Snodgrass, 2008). In sum, policies that improve the business environment, such as the provision of access to formal credit, facilities to enable formalization, and management training, can cause differences between the groups (Mano et al., 2012).

3. Data and descriptive variables

The database used in this research has been taken from the *Instituto Nacional de Geografía y Estadística* (INEGI, or the National Institute for Statistics), in particular from the *Encuesta Nacional de Micronegocios* (ENAMIN, or the National Micro Firm Survey). This survey is focused on micro firm owners in Mexico, covering businesses of up to six people in the trade, service and construction sectors, and up to sixteen people in the case of the manufacturing sector. This provides a better perspective on the characteristics, organization, expenditure and revenue of this kind of economic unit. The study period includes the years 2008, 2010 and 2012. While the survey conducted interviews with about 30,000 micro firm owners, after the application of different filters, such as the dropping of missing values and outliers, etc., the sample is reduced to about 12,000 micro firms each year. Representative to a national level, the survey sample takes data from the 32 states of the Republic of Mexico, including the *Distrito Federal* (the metropolitan area of Mexico City).

As explained above, informality is not easy to define and much less to measure. Although many ways of identifying and measuring it have been proposed, this paper uses criteria taken from the survey to identify formal and informal micro firms. The interviewee had to complete the sentence “In your activity or business...”, with the options “using a notebook

or a notepad to keep accounts” or “accounts are not kept” among the possible answers, which, if chosen, lead to the micro firm being classified as informal¹.

The criterion used in this study to classify micro firms as either formal or informal is considered the most appropriate because it is inferred from a hidden question. When the interviewee is explicitly asked whether the micro firm is registered with the government, it is highly likely that the interviewee will lie to avoid exposure to the financial authorities. Furthermore, informal micro firms’ accounts are not usually officially registered, which is one of their most remarkable and representative characteristics. (INEGI, 2014; Benjamin and Mbaye, 2012; Cardenas and Rozo, 2009)

The variables listed below are obtained in order to measure the productivity and efficiency of micro firms. The output variable is computed by obtaining micro firm income with the question “What is the amount of income generated by the business in the past month for the following items?” The survey gives the total amount of income. The capital variable is computed using the following question “If you had to sell the tools, equipment, machinery, furniture, equipment, land, vehicles and property that have been used in your trade or business, for how much would you sell them?”, with the survey providing an estimated amount of capital. The labor variable is computed using the number of employees in the business, including owner.

According to the literature, the variable of education is considered as playing an important role in explaining efficiency differences, and obtained based on educational level, ranging from zero (uneducated) to nine (PhD). The age of the firm is another variable considered in this study, with the expectation that it has a positive effect on firm efficiency. The motivation for starting a business is considered important as this can influence micro firm performance, and is taken from the following question “What was the main reason for which you started this business or activity?” To capture an *active* motivation, the following answers are considered: “I had money and found a good opportunity”, or “I wanted to do a

¹ While other studies (Otero et al., 2013) have used the criterion of being registered with Mexico’s financial authorities to define micro firms as informal, this explicit question has been modified from ENAMIN for the period of study featured in this research. In this way, the method proposed is considered as better reflecting the concept of informality.

job according to my trade, career or profession”; on the other hand, a different answer leads to the motivation being considered as *passive*.

Based on the literature, the formal financing of the micro business is considered as playing an important role in their performance, with the data for which being taken from the following question: “Where did you get the money to start this business or activity?” Micro firms are considered as having used a formal credit institution when the financing comes from commercial banking, government programs, supplier credit, or small formal financial institutions, etc. Table 1 summarizes the variables used in this research:

Table 1

As an overview of micro firms in Mexico, Table 2 presents descriptive statistics for the years 2008, 2010 and 2012. While the mean output in the sample for the three years is approximately 15,000 Mexican pesos, differences emerge when the sample is split between formal and informal micro firms. For instance, the mean output of formal micro firms is 36,196 pesos, while for informal micro firms this is only 9,129 pesos, with the difference amounting to about 27,067 pesos. While the mean capital for the full sample is 64,110 pesos, there is a notable difference between groups inasmuch as formal micro firms count on 184,062 pesos of capital, with informal micro firms counting on only 26,037 pesos.

Table 2

While the mean of number of workers, including the owner, is 1.69 for the full sample, this number changes when it is split, with formal micro firms having a mean of 2.31 workers and informal micro firms a mean of 1.49 workers. Another important difference is the owner’s level of education, with the mean for formal firms being 4.69, indicating that they have at least a high school education, while the average for owners of informal micro firms is 3.18, indicating a middle school education. Another important variable is the age of the business, where the full sample has a mean of 10 years, but, again, a notable difference appears between the groups, with formal micro firms having been, on average, in business for 11.8 years, while informal micro firms have been in business for only 9.49 years.

4. Methodology

In light of the fact that, over the years, many theoretical papers have suggested different approaches to measuring productivity and efficiency and have obtained different results, there is no single measurement of them. Although it is not easy to measure, three recognized methodologies have been developed and widely applied to compute productivity: the econometric approach, index number and distance function. The econometric approach consists of the estimation of production function in order to obtain the contribution of inputs in the production of the output, with the Total Factor Productivity (TFP) then computed as a “residual”². The index number methodology consists in preparing an index that takes into account the quantities and prices of inputs and outputs³. Finally, the main idea with the distance functions approach is that there is not an economic agent that can exceed an “ideal” frontier, with the distance between this and the frontier representing the individual (in)efficiencies⁴.

The methodology for measuring productivity depends largely on the availability and makeup of the database and, as such, the use of each methodology has advantages and disadvantages. Taking into account the availability and framework of the ENAMIN survey, the distance function approach is considered the best option for estimating efficiency. The most efficient micro firms have a higher output-input ratio and are situated in the frontier of production, with the distance between any given firm and this frontier interpreted as the technical “(in)efficiency” of a micro firm.

The advantage of using this methodology is that it separates productivity based on at least two components: the technical efficiency (movement toward the production frontier) and the technical change (outward shifts due to innovation or new organization). The estimation method is conducted by means of the stochastic frontier model approach, consisting of econometric estimations of parametric function that take into account the random errors

² The best known work conducted in this area was Solow (1957), who developed a macroeconomic level study. At the level of individual firms, there are works such as Olley and Pakes (1996).

³ See Balk (1998) for better view of the microeconomic foundation for the index number of price and productivity

⁴ See Coelli and Perelman (2000) for a better framework for the stochastic frontier.

which explain measurement errors and other random factors. The efficiency range is from zero to one, where the higher the score, the more efficient the micro firm.

Stochastic frontier model

According to the data available in the ENAMIN survey, the stochastic frontier model is the best method for measuring the efficiency differences between formal and informal micro firms in Mexico, as explained below:

$$Y_i = \beta_0 + \beta_1 K_i + \beta_2 L_i + \delta X_i + \varepsilon_i \quad (1)$$

$$\varepsilon_i = v_i + \mu_i \quad (2)$$

$$Y_i = \beta_0 + \beta_1 K_i + \beta_2 L_i + \delta X_i + \gamma F_i + \varepsilon_i \quad (3)$$

Where variable Y_i represents the log of output expressed in Mexican pesos of micro firm “i”, variable K_i is the log of capital that includes tools, equipment, machinery, and furniture, etc., and variable L_i is the log of the number of workers including owners. Variable X_i is a vector of control variables such as geographical region and sector of the economy.

Equation 2 shows the composed error ε_i , which is the sum or difference of a normally distributed disturbance, v_i , which is the measurement and specification error, and the disturbance, μ_i , which represents (in)efficiency. The terms v_i and μ_i are assumed to be independent of each other and i.i.d. across observations.

Equation 3 incorporates the F_i variable, which is a dummy variable with the value of one for a formal micro firm, and zero for others, in order to obtain an overview of the influence of (in)formality on output.

$$E_i = \beta_0 + \beta_1 Z_i + \beta_2 F_i + \varepsilon_i \quad (4)$$

Oaxaca-Blinder decomposition method

Once the stochastic frontier model has been estimated, it is possible to obtain an efficiency measure for micro firms, μ_i , which is renamed as variable E_i in Equation 4. It is then possible to run the regression with the vector Z_i , which contains the main available

variables that, according to the literature review, affect efficiency such as owner education, age of business, financing and motivation for starting the business. As with Equation 3, the dummy variable for formality, F_i , is included in Equation 4, in order to analyze whether it affects micro firm efficiency.

$$E_{fo,i} = Z_{fo,i}\beta_{fo,i} + u_{fo,i} \quad (5)$$

$$E_{in,i} = Z_{in,i}\beta_{in,i} + u_{in,i} \quad (6)$$

$$E_{fo,i} - E_{in,i} = (Z_{fo,i} - Z_{in,i})\beta_{fo,i} + Z_{in,i}(\beta_{fo,i} - \beta_{in,i}) \quad (7)$$

A novel aspect of the research is the use of Oaxaca-Blinder decomposition method, which enables a better analysis of the efficiency differences between groups. Although Oaxaca-Blinder decomposition method has often been used to study labor market outcomes for different groups (such as sex or race) by mean of decomposing mean differences, it can be used to explain efficiency differences between formal and informal micro firms. In this way, two separate equations of output and efficiency (Equations 5 and 6) can be estimated in order to obtain the returns enabled by the different characteristics of both groups of firm. Vectors Z_{fo} and Z_{in} represent the micro firms' characteristics or endowments, β represents the micro firm endowment returns, and u_i is the error term. The subscripts “fo” and “in” refer to formal and informal micro firms respectively.

Finally, Equation 7 decomposes the average efficiency differential between formal and informal micro firms using two components, with the first referring to the differential in characteristics between formal and informal micro firms that have the same endowment returns as formal micro firms. The second part refers to the efficiency differential which allows for differentiating endowment returns for formal and informal micro firms when they have the same endowments.

5. Results

In order to compare and highlight the efficiency differences between informal and formal micro firms, Figures 1 and 2 show the results of graphing the main variables (capital and labor) with efficiency and output for both formal and informal micro firms. In the three

figures, formal micro firms (represented by the black dots) are located higher than the informal micro firms (represented by the grey dots), indicating greater efficiency and production. In addition, figures 3, 4, and 5 show the efficiency differences calculated from the mean of the density graphs, which confirm that formal and informal micro firms exhibit different behavior in terms of efficiency and output.

Figures 1 and 2

Figures 3, 4, and 5

Stochastic frontier results

Table 3 shows the results obtained from the regressions carried out using the stochastic frontier method to compute micro firm efficiency. As stated above, the model is computed taking into account the two main production factors of capital and labor, with the geographic area and the economic sector included for the three years, and with *output* as the dependent variable. As shown in Model 1, the independent variables are statistically significant, with coefficients of 0.780 and 0.286 for the labor and capital factors respectively in 2012. Model 2 adds the formal dummy variable, which takes the value of one for a formal micro firm and the value of zero for an informal micro firm. In this way, it can be seen that, with a positive effect of one per cent, the coefficient associated with *formal* variable is statistically significant. In others word, a first glance suggests that formal micro firms exhibit different performance from informal micro firms.

Table 3

Once the efficiency level of the micro firms has been computed, with a range between zero and one (the higher the score, the greater the efficiency), the *efficiency* variable is taken as a dependent variable. Table 4 shows the results of run *efficiency* variable with the variables of interest:

Table 4

In the three years featured in this study, the coefficient of *formal* variable, one of the main variables of interest, is statistically significant at one per cent and has a positive effect on

efficiency, with, for instance, the highest coefficient of 0.029 in 2012. This result strengthens the conclusions drawn from the results mentioned above, which indicate that formal micro firms have better efficiency levels than informal micro firms, and, thus, better performance.

The education variable has the expected positive effect and, at one per cent, is statistically significant for the period studied, with, for instance, the coefficient being 0.0293 in 2012, which is the second highest impact on efficiency. At one per cent, the age of the firm is statistically significant and has a positive effect on efficiency, with a coefficient of 0.003 in 2012. The motivation to start a business has a positive influence on the efficiency level, and is statistically significant at one per cent with a coefficient of 0.0149. Access to formal financing is statistically significant, with a positive effect on efficiency and a coefficient of 0.0194 in 2012. Although the described results are for 2012, the basic thrust of the analysis is the same for 2008 and 2010.

Oaxaca-Blinder results

Table 5 shows the results of Oaxaca-Blinder decomposition in order to explain the output and efficiency differences between formal and informal micro firms. This method has the advantage of enabling the separation of the *endowment* and *endowment return* effects. Group 1 is made up of informal micro firms, with the formal micro firms found in Group 2. It can be seen from Table 5 that the output differences, or output gap, between groups are, for instance, 1.11, 1.28 and 1.23, in 2008, 2010 and 2012 respectively. Table 5 also shows the *efficiency* differences between groups with the coefficients 0.035, 0.036 and 0.042 for period covered in this study. These results confirm the difference between groups, as well as showing that formal micro firms exhibit better performance, in terms of production and efficiency, than informal micro firms.

Table 5

The endowment differences can be also seen in Table 5, which shows the mean increase (or decrease) for formal micro firms when formal micro firms had the same characteristic of informal micro firms. It can be deduced that the output differences between groups are explained largely due to the *characteristic* or *endowment* differences between micro firms.

For instance, the 1.213 output gap is explained by the differences of 0.890 in micro firm endowments in 2012, with most of this gap explained mainly by capital and labor factors. In the same way, this result could be observed for the other two years featured in this study. These findings suggest that a large part of the output gap is explained by capital differences between groups, so this difference explains 0.50 points of 0.890 in 2012. In this regard, Hendy and Zaki (2013) have found similar results for micro firms connected to the turkey industry, with the group of formal micro firms more capital intensive than their informal counterparts.

Labor is the second most important variable for explaining the output differences, contributing 0.26 out of 0.89 endowment differences. Furthermore, this shows that if the formal micro firms had the same labor characteristics as the informal micro firms, their output would be lower. Usually, an informal micro firm tends to have fewer employees than a formal one, and is also less productive (La Porta and Shleifer, 2008)

The results confirm that the *education* variable plays an important role in explaining output differences, explaining the majority of differences among all variables – excluding capital and labor – with a coefficient 0.078 in 2012. In this regard, the education variable is in line with most results reported in the literature, and has always had a very important role in any society. the sense of analysis is the same for 2008 and 2010.

The *motivation* variable is statistically significant at one per cent and explains – excluding capital and labor – 0.014 out of 1.141 of the endowment differences recorded in 2012, indicating its importance in explaining output differences. The *age of the firm* variable is the third most important in explaining the output differences, with a coefficient of 0.009 in 2012, supporting the idea that the age of the firm is significant in explaining performance differences between groups. Finally, although the financing variable has the lowest coefficient, it is statistically significant at one per cent, thus indicating its importance. The same findings are found for the years 2008 and 2010.

Interestingly, while the decomposition method applied to explain efficiency differences shows similar results to output difference analysis, this is only in terms of variable importance but not in terms of endowments and endowment return analysis. For instance,

the *endowment returns* variable explains 0.030 out of 0.429, while the firms' endowments or characteristics explain only 0.012 in 2012. In other words, the methods used to exploit endowments explain most of the efficiency differences between groups.

The importance of the *education* variable in explaining efficiency differences between formal and informal micro firms is strengthened by these results. The variable explains most of the efficiency differences, with a coefficient of 0.012 in 2012. This result is similar to that found by other authors (La Porta and Shleifer, 2008; Gennaioli et al., 2013; Akoten et al., 2006; Gelb et al., 2009), who recorded the same importance and significance with this variable.

Remarkably, the variable age of the firm has a larger coefficient in *endowment return* than *endowment*, with 0.0210 and 0.001 respectively in 2012. This may be an indication that micro firm owners' business experience affects the efficiency differences between formal and informal firms. This result is notable inasmuch as this issue is not often covered by these kind of studies (Lagarda and Urquidy, 2007). On the other hand, the *motivation* variable is statistically significant at one per cent, a result which strengthens the idea that the motivation to start a business is important for explaining efficiency differences. Otero et al. (2013) find similar results for explaining efficiency. The *financing* variable has a positive effect and is statistically significant at ten per cent in explaining the efficiency differences between formal and informal micro firms, a finding which is in line with Hernández-Trillo et al. (2005). They found that the methods of financing a micro firm matter in efficiency and output terms, although this variable is only statistically significant at ten per cent and has a small coefficient.

Robustness checks

In order to support the results above, the econometric analysis and the Oaxaca-Blinder decomposition method have been applied to different measurements of (in)formality for micro firms such as: i) micro firm is registered before a notary (formal 2); ii) micro firm is registered before a notary and it does not have any kind of accounting (formal 3); iii) micro

firm is registered before some governmental institution⁵ (formal 4). Annex 1 shows the results of Oaxaca-Blinder decomposition method for 2012⁶. Basically the results are the same to those shown above for both output and efficiency analysis. The former shows that endowments of micro firms are more important to explain the differences between formal and informal micro firms. The latter shows that the return of endowments explains in a better way the differences between groups. The importance of independent variables remains the same with education variable being the most important when it is excluded capital and labor.

6. Conclusions

The role of micro firms has been discussed from different points of view in economic terms, where this kind of firm can be seen as an example of entrepreneurship or, on the other hand, as an economic unit that takes advantage of its informal position to compete unfairly. This type of business represents the majority of business activity, and is especially significant in developing countries, where it is seen as an alternative to the traditional employment sector. Nevertheless, most of the time, the micro firm is considered unproductive and informal, due to its size.

This study differentiates between two categories of micro firm, formal and informal, and then provides an explanation as to why there are efficiency differences between groups. One novel aspect of this study is the use of Oaxaca-Blinder decomposition method to determine why formal micro firms are more efficient than informal ones. To the knowledge of this author, this methodology has not been used before in this kind of research, which features an economic unit as the main object of study. Furthermore, this study is focused on a developing country, Mexico, in which this occurrence kind of firm is wide and growing. The sample size is representative to a national level for the years 2008, 2010 and 2012.

Unlike other studies, this research makes a distinction between micro firms, highlighting the importance of distinguishing between them as either formal or informal, rather than in

⁵ It is asked whether micro firm is registered before: i) municipality; ii) Secretariat for Economics; iii) Secretariat of Health; iv) another option; v) no one. In 2008 survey is not possible to know the detailed answer to the option (iv), in this way, this measurement was considered unreliable.

⁶ The results for 2008 and 2010 are available on request to the author.

terms of their size, and, thus, showing the differences in output and efficiency terms. The majority of the output differences are due to endowment differences between groups, in that the characteristics formal firms are superior to their informal counterparts. Interestingly, when the efficiency analysis is carried out, the endowment return has more weight in the explanation of the gap between groups, in that the formal micro firms take more advantage of their endowments.

The detailed analysis shows that the education variable explains the majority of the output and efficiency differences between formal and informal firms. The age of the firm is another variable that helps to explain the differences between groups. Similarly, the motivation variable plays an important role in clarifying the differences. Finally, while the financing variable has less statistical weight, it is significant in the econometric model.

7. References

Aguilar Barceló, J. G., Mungaray Lagarda, A., Ledezma Torres, D., Hernández Campos, C. M., & Taxis Flores, M. (2012). La microempresarialidad informal en México durante los años noventa: un análisis de la dinámica de flujos laborales. *Región Y Sociedad*, 24(54), 05–33.

Akoten, J. E., Sawada, Y., & Otsuka, K. (2006). The determinants of credit access and its impacts on micro and small enterprises: The case of garment producers in Kenya. *Economic Development and Cultural Change*, 54(4), 927–944.

Ardagna, S., & Lusardi, A. (2008). *Explaining international differences in entrepreneurship: The role of individual characteristics and regulatory constraints*. National Bureau of Economic Research.

Balk, B. M. (1998). *Industrial price, quantity, and productivity indices: the micro-economic theory and an application*. Kluwer Academic Dordrecht.

Benjamin, N. C., & Mbaye, A. A. (2012). The Informal Sector, Productivity, and Enforcement in West Africa: A Firm-level Analysis. *Review of Development Economics*, 16(4), 664–680.

Bosch, M., & Maloney, W. F. (2010). Comparative analysis of labor market dynamics using Markov processes: An application to informality. *Labour Economics*, 17(4), 621–631.

Cárdenas, M. & Roza, V. S. (2009) Firm Informality in Colombia: Problems and Solutions. *Desarrollo y Sociedad* (63):211–43.

- Chen, M. A. (2012). The informal economy: Definitions, theories and policies. *Women in Informal Economy Globalizing and Organizing: WIEGO Working Paper*, (1). Retrieved from http://wiego.org/sites/wiego.org/files/publications/files/Chen_WIEGO_WP1.pdf
- Coelli, T., & Perelman, S. (2000). Technical efficiency of European railways: a distance function approach. *Applied Economics*, 32(15), 1967–1976.
- Davis, S. J., Haltiwanger, J., Jarmin, R. S., Krizan, C. J., Miranda, J., Nucci, A., & Sandusky, K. (2007). *Measuring the dynamics of young and small businesses: Integrating the employer and nonemployer universes*. National Bureau of Economic Research. Retrieved from <http://www.nber.org/papers/w13226>
- De Mel, S., McKenzie, D., & Woodruff, C. (2010). Who are the microenterprise owners? Evidence from Sri Lanka on Tokman versus De Soto. In *International differences in entrepreneurship* (pp. 63–87). University of Chicago Press.
- Fajnzylber, P., Maloney, W., & Rojas, G. M. (2006). Microenterprise dynamics in developing countries: How similar are they to those in the industrialized world? Evidence from Mexico. *The World Bank Economic Review*, 20(3), 389–419.
- Fajnzylber, P., Maloney, W. F., & Montes-Rojas, G. V. (2011). Does formality improve micro-firm performance? Evidence from the Brazilian SIMPLES program. *Journal of Development Economics*, 94(2), 262–276.
- Farrell, D. (2004). The hidden dangers of the informal economy. *McKinsey Quarterly*, 26–37.
- Gelb, A., Mengistae, T., Ramachandran, V., & Shah, M. K. (2009). To Formalize or not to formalize? Comparisons of microenterprise data from Southern and East Africa. *Comparisons of Microenterprise Data from Southern and East Africa* (July 20, 2009).
- Gennaioli, N., Porta, R. L., Lopez-de-Silanes, F., & Shleifer, A. (2013). *Human capital and regional development*. Quarterly Journal of Economics.
- Heino, H. (2006). Use of borrowed start-up capital and micro enterprises in Mexico: existence of liquidity constraints. *Portuguese Economic Journal*, 5(1), 1–30.
- Hernández-Trillo, F., Pagán, J. A., & Paxton, J. (2005). Start-up capital, microenterprises and technical efficiency in Mexico. *Review of Development Economics*, 9(3), 434–447.
- Hendy, R., & Zaki, C. (2013). On informality and productivity of micro and small enterprises: Evidence from MENA countries. *International Journal of Entrepreneurship and Small Business*, 19(4), 438–470.

Hurst, E., & Pugsley, B. W. (2011). *What do small businesses do?*. National Bureau of Economic Research.

INEGI (2014) La informalidad Laboral. Encuesta Nacional de Ocupación y Empleo. Marco Conceptual y Metodológico. Webpage of Instituto Nacional de Estadística y Geografía. http://www.inegi.org.mx/est/contenidos/Proyectos/encuestas/hogares/regulares/enoe/doc/Informalidad_marco-met.pdf

Jaramillo, M. (2009). Is there Demand for Formality among Informal Firms. Evidence from Microfirms in Downtown Lima. German Development Institute Discussion Paper 12/2009

Lagarda, A. M., & Urquidy, M. R. (2007). Capital humano y productividad en microempresas. *Investigación Económica*, 81–115.

La Porta, R. & Shleifer, A. (2008). *The unofficial economy and economic development*. National Bureau of Economic Research.

La Porta, R., & Shleifer, A. (2014). *Informality and development*. National Bureau of Economic Research.

Levy, S. (2010). *Good intentions, bad outcomes: Social policy, informality, and economic growth in Mexico*. Brookings Institution Press.

Loayza, N., Servén, L., & Sugawara, N. (2009). Informality in Latin America and the Caribbean. *World Bank Policy Research Working Paper Series*, Vol.

Mano, Y., Iddrisu, A., Yoshino, Y., & Sonobe, T. (2012). How can micro and small enterprises in Sub-Saharan Africa become more productive? The impacts of experimental basic managerial training. *World Development*, 40(3), 458–468.

McKenzie, D. J., & Woodruff, C. (2006). Do entry costs provide an empirical basis for poverty traps? Evidence from Mexican microenterprises. *Economic Development and Cultural Change*, 55(1), 3–42.

Masatlioglu, Y., & Rigolini, J. (2008). Informality traps. *The BE Journal of Economic Analysis & Policy*, 8(1).

Olley, G. S., & Pakes, A. (1992). *The dynamics of productivity in the telecommunications equipment industry*. National Bureau of Economic Research.

Otero, R., Pagán, J., & Lovett, S. (2013). Microenterprise Origins and Efficiency in Mexico. *International Journal of Business and Economics*, 12(1), 73–83.

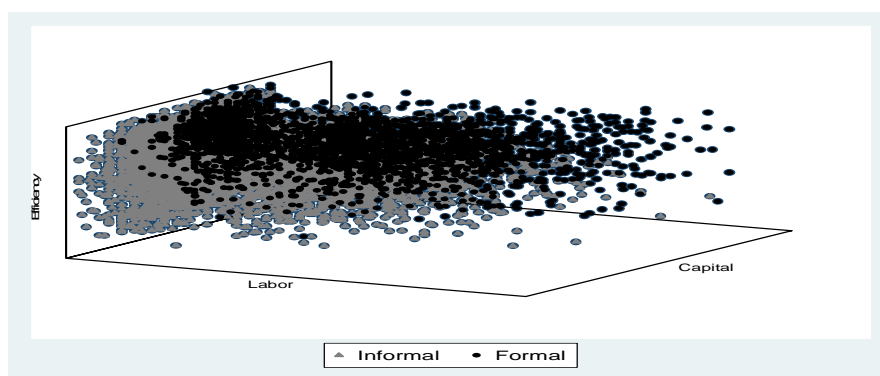
Perry Guillermo E., William F. Maloney, Omar S. Arias, Pablo Fajnzylber, Andrew D. Mason, and Jaime Saavedra-Chanduvi (2007) *Informality: Exit and Exclusion*. Washington, DC: World Bank.

Solow, R. M. (1957). Technical change and the aggregate production function. *The Review of Economics and Statistics*, 312–320.

Steel, W. F., & Snodgrass, D. (2008). World Bank Region Analysis on the Informal Economy. *Raising Productivity and Reducing Risk of Household Enterprises Diagnostic Methodology Framework. For WEIGO Network and World Bank PREM Network. Draft Sept.*

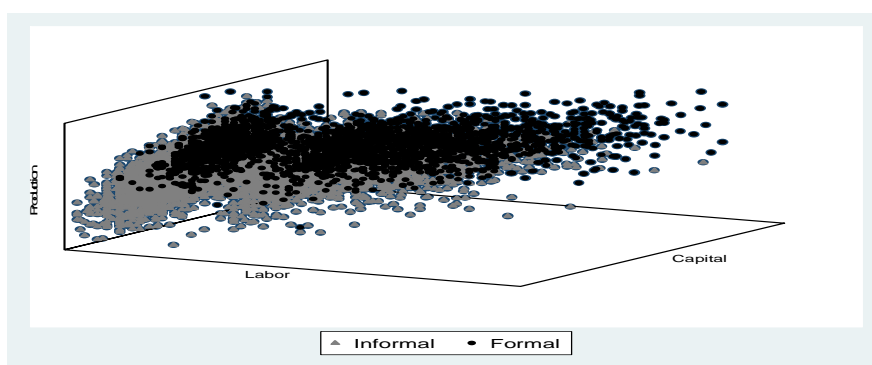
8. Figures

Figure 1. Capital, Labor and Efficiency - 2012



Source: own elaboration

Figure 2. Capital, Labor and Output – 2012



Source: own elaboration

Figure 3. 2008

Density Efficiency

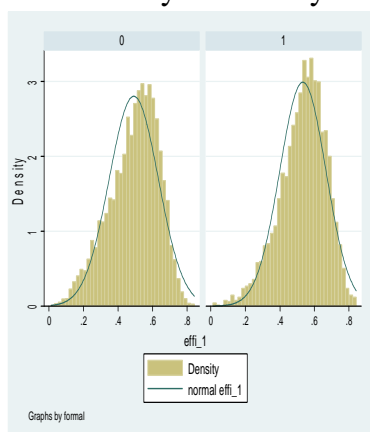


Figure 4. 2010

Density Efficiency

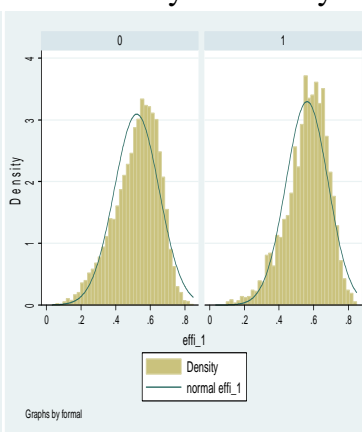
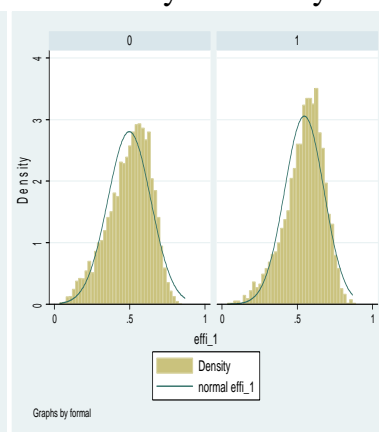


Figure 5. 2012

Density Efficiency



Source: own elaboration

9. Tables

Table 1. Definitions of variables

Variable	Definition	Source
Output	Total amount expressed in money	ENAMIN
Capital	Estimated amount of capital expressed in money	ENAMIN
Labor	Number of workers including owner	ENAMIN
Education	Schooling of owner: from cero(no schooling) nine (Ph.D.)	ENAMIN
Firm Age	Age of micro firm	ENAMIN
Motivation	Motivation to begin the business: active (entrepreneurship) passive (necessity)	ENAMIN
Financing	The money to begin the business comes from: formal credit (bank credit, government, etc.) or informal credit (relatives, friends, etc.)	ENAMIN

Table 2. Descriptive Statistics.

Variable	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
	Full sample				Formal Micro firms				Informal Micro Firms			
	2008											
Output	12875	36214.96	10	1000000	27247	61092.89	12	1000000	7768	18766.05	10	700000
Capital	47246.70	195814.20	1.00	6000000.00	123304.50	343061.30	3.00	6000000.00	20221.23	85862.19	1.00	4000000.00
Labor	1.59	1.04	1.00	13.00	2.10	1.38	1.00	13.00	1.41	0.81	1.00	11.00
Education	3.47	1.97	0.00	9.00	4.58	2.12	0.00	9.00	3.07	1.76	0.00	9.00
n	12324				3231				9093			
	2010											
Output	16152	72410.44	11	3300000	37071	119433.30	80	3300000	9224	45435.37	11	2750000
Capital	70503.08	305624.90	1.00	9000000.00	204837.00	573824.50	9.00	9000000.00	26019.20	85870.80	1.00	3000000.00
Labor	1.74	1.24	1.00	16.00	2.39	1.73	1.00	16.00	1.52	0.93	1.00	14.25
Education	3.55	1.96	0.00	9.00	4.64	2.11	0.00	9.00	3.19	1.77	0.00	8.00
N	11553				2874				8679			
	2012											
Output	17924	53514.10	40	1800000	44271	104228.50	80	1800000	10395	17991.99	40	430000
Capital	74581.19	338829.10	5.00	8000000.00	224046.70	620844.40	100.00	8000000.00	31872.17	171157.80	5.00	8000000.00
Labor	1.74	1.23	1.00	16.00	2.45	1.78	1.00	15.00	1.53	0.93	1.00	16.00
Education	3.64	1.97	0.00	9.00	4.85	2.13	0.00	9.00	3.29	1.77	0.00	9.00
n	11978				2662				9316			
	Promedio											
Output	15650.10	54046.50	20.33	2033333.33	36196.42	94918.23	57.33	2033333.33	9129.16	27397.80	20.33	1293333.33
Capital	64110.32	280089.40	2.33	7666666.67	184062.73	512576.73	37.33	7666666.67	26037.53	114296.93	2.33	5000000.00
Labor	1.69	1.17	1.00	15.00	2.31	1.63	1.00	14.67	1.49	0.89	1.00	13.75
Education	3.55	1.97	0.00	9.00	4.69	2.12	0.00	9.00	3.18	1.77	0.00	8.67

Source: Own elaboration

Table 3. Stochastic frontiers method. Output as dependent variable

Variables	2008		2010		2012	
	Output	Output	Output	Output	Output	Output
Capital	0.285*** (0.00482)	0.253*** (0.00514)	0.273*** (0.00511)	0.238*** (0.00547)	0.286*** (0.00505)	0.252*** (0.00533)
Labor	0.736*** (0.0217)	0.669*** (0.0217)	0.748*** (0.0205)	0.685*** (0.0206)	0.780*** (0.0200)	0.710*** (0.0201)
Northeast	0.0452 (0.0433)	0.0612 (0.0428)	-0.0848* (0.0443)	-0.0645 (0.0438)	-0.0481 (0.0439)	-0.0343 (0.0433)
Northwest	0.243*** (0.0386)	0.252*** (0.0382)	0.0315 (0.0380)	0.0328 (0.0375)	0.174*** (0.0375)	0.183*** (0.0370)
West	0.223*** (0.0369)	0.216*** (0.0365)	0.0506 (0.0375)	0.0430 (0.0371)	0.193*** (0.0361)	0.173*** (0.0356)
East	0.178*** (0.0400)	0.189*** (0.0395)	-0.156*** (0.0410)	-0.141*** (0.0405)	0.106*** (0.0391)	0.119*** (0.0385)
Northcentral	0.0931** (0.0395)	0.0961** (0.0391)	-0.0518 (0.0393)	-0.0380 (0.0388)	0.130*** (0.0390)	0.128*** (0.0384)
Southcentral	0.0812* (0.0448)	0.0998** (0.0443)	-0.0562 (0.0456)	-0.0444 (0.0451)	0.120*** (0.0440)	0.138*** (0.0434)
Southeast	0.130*** (0.0389)	0.137*** (0.0385)	-0.0583 (0.0382)	-0.0566 (0.0377)	0.146*** (0.0376)	0.153*** (0.0371)
Manufac	-0.182*** (0.0279)	-0.171*** (0.0276)	-0.194*** (0.0283)	-0.175*** (0.0279)	-0.145*** (0.0279)	-0.121*** (0.0276)
Commerc	0.0487** (0.0224)	0.0317 (0.0222)	0.0588*** (0.0227)	0.0481** (0.0224)	0.0959*** (0.0222)	0.0882*** (0.0220)
Formal =1		0.412*** (0.0248)		0.433*** (0.0258)		0.462*** (0.0260)
Constant	6.502*** (0.0567)	6.697*** (0.0571)	6.697*** (0.0624)	6.933*** (0.0628)	6.623*** (0.0594)	6.863*** (0.0598)
Insig2v	-0.262*** (0.0345)	-0.300*** (0.0348)	-0.234*** (0.0377)	-0.270*** (0.0374)	-0.310*** (0.0364)	-0.360*** (0.0363)
Insig2u	0.175*** (0.0638)	0.181*** (0.0620)	-0.0287 (0.0855)	-0.0253 (0.0819)	0.130* (0.0672)	0.147** (0.0634)
N	12324	12324	11553	11553	11978	11978
sigma_u	1.091	1.095	0.986	0.987	1.067	1.076
sigma_v	0.877	0.861	0.890	0.874	0.856	0.835
chi2_c	130.4	139.6	66.56	73.15	109.1	123.6
Cmd	frontier	frontier	frontier	frontier	frontier	frontier
Function	production	production	production	production	production	production
Ll	-18572	-18435	-17145	-17006	-17774	-17617

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

Table 4. OLS. Efficiency as dependent variable.

Variables	2008 Efficiency	2010 Efficiency	2012 Efficiency
Education	0.0269*** (0.00314)	0.0233*** (0.00298)	0.0293*** (0.00317)
Firm age	0.00857*** (0.00142)	0.00562*** (0.00132)	0.00359** (0.00142)
Formal =1	0.0219*** (0.00325)	0.0253*** (0.00309)	0.0298*** (0.00343)
Motivation	0.0223*** (0.00314)	0.0180*** (0.00357)	0.0149*** (0.00348)
Financing	0.0116** (0.00550)	0.00782 (0.00555)	0.0194*** (0.00552)
Constant	0.444*** (0.00493)	0.482*** (0.00468)	0.456*** (0.00509)
Observations	10,479	9,893	10,326
R-squared	0.028	0.027	0.029
N	10479	9893	10326
cmd	regress	regress	regress

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

Table 5. Oaxaca-Blinder decomposition method.

Variables	2008 Output	2010 Output	2012 Output	2008 Efficiency	2010 Efficiency	2012 Efficiency
Informal	8.262*** (0.0146)	8.406*** (0.0143)	8.596*** (0.0140)	0.495*** (0.00166)	0.521*** (0.00154)	0.500*** (0.00161)
Formal	9.381*** (0.0227)	9.591*** (0.0236)	9.833*** (0.0249)	0.530*** (0.00248)	0.558*** (0.00237)	0.542*** (0.00267)
Difference	-1.119*** (0.0270)	-1.185*** (0.0276)	-1.237*** (0.0285)	-0.0356*** (0.00298)	-0.0367*** (0.00283)	-0.0429*** (0.00312)
Endowments						
Total	-0.831*** (0.0224)	-0.840*** (0.0234)	-0.890*** (0.0241)	-0.0133*** (0.00153)	-0.0110*** (0.00144)	-0.0122*** (0.00151)
Capital	-0.489*** (0.0170)	-0.492*** (0.0177)	-0.507*** (0.0172)			
Labor	-0.205*** (0.0122)	-0.232*** (0.0131)	-0.262*** (0.0138)			
Education	-0.0797*** (0.0108)	-0.0658*** (0.0102)	-0.0781*** (0.0102)	-0.00761*** (0.00135)	-0.00637*** (0.00121)	-0.00859*** (0.00133)
Firm age	-0.0151*** (0.00295)	-0.0155*** (0.00385)	-0.00977*** (0.00325)	-0.00214*** (0.000397)	-0.00218*** (0.000481)	-0.00147*** (0.000442)
Motivation	-0.0267*** (0.00420)	-0.0193*** (0.00454)	-0.0140*** (0.00448)	-0.00306*** (0.000529)	-0.00232*** (0.000558)	-0.00183*** (0.000603)
Financing	-0.00502*** (0.00191)	-0.00198* (0.00114)	-0.00243* (0.00132)	-0.000471** (0.000235)	-0.000116 (0.000121)	-0.000262* (0.000150)
Region	-0.0104*** (0.00325)	-0.0128*** (0.00317)	-0.0163*** (0.00405)			
Returns						
Total	-0.287*** (0.0288)	-0.345*** (0.0296)	-0.347*** (0.0294)	-0.0223*** (0.00331)	-0.0258*** (0.00314)	-0.0308*** (0.00342)
Capital	0.581*** (0.140)	0.655*** (0.152)	0.775*** (0.153)			
Labor	-0.0373 (0.0267)	-0.0705** (0.0296)	-0.0787*** (0.0302)			
Education	-0.169** (0.0733)	-0.222*** (0.0759)	-0.224*** (0.0776)	-0.0171* (0.00914)	-0.0172* (0.00892)	-0.0190* (0.00996)
Firm age	0.125** (0.0512)	0.0724 (0.0549)	0.120** (0.0558)	0.0209*** (0.00654)	0.0172*** (0.00657)	0.0210*** (0.00729)
Motivation	0.0314* (0.0176)	0.0180 (0.0146)	-0.00222 (0.0170)	0.00397* (0.00225)	0.00174 (0.00176)	-0.00112 (0.00224)
Financing	0.00369 (0.00774)	-0.00123 (0.00662)	0.00227 (0.00692)	0.000800 (0.000990)	-0.000217 (0.000797)	0.000383 (0.000909)
Region	-0.0522 (0.0822)	-0.0787 (0.0875)	0.177** (0.0825)			
Constant	-0.770*** (0.165)	-0.718*** (0.174)	-1.116*** (0.176)	-0.0309*** (0.0117)	-0.0272** (0.0113)	-0.0320** (0.0128)
Observations	10,479	9,893	10,326	10,479	9,893	10,326
Informal	7463	7181	7817	7463	7181	7817
Formal	3016	2712	2509	3016	2712	2509

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

Annex 1. Robustness checks

VARIABLES	2012					
	Formal 2 Output	Formal 3 Output	Formal 4 Output	Formal 2 Efficiency	Formal 3 Efficiency	Formal 4 Efficiency
Informal	8.856*** (0.0132)	8.857*** (0.0131)	8.528*** (0.0162)	0.509*** (0.00142)	0.509*** (0.00141)	0.501*** (0.00182)
Formal	10.05*** (0.0840)	10.53*** (0.0964)	9.453*** (0.0196)	0.542*** (0.00768)	0.566*** (0.00900)	0.523*** (0.00215)
Difference	-1.191*** (0.0851)	-1.676*** (0.0973)	-0.926*** (0.0255)	-0.0336*** (0.00781)	-0.0572*** (0.00911)	-0.0218*** (0.00282)
Endowments						
Total	-0.956*** (0.0563)	-1.273*** (0.0637)	-0.762*** (0.0214)	-0.0144*** (0.00161)	-0.0189*** (0.00194)	-0.00826*** (0.00109)
Capital	-0.464*** (0.0309)	-0.593*** (0.0355)	-0.470*** (0.0168)			
Labor	-0.361*** (0.0322)	-0.501*** (0.0396)	-0.213*** (0.0120)			
Education	-0.103*** (0.0118)	-0.140*** (0.0145)	-0.0444*** (0.00712)	-0.0112*** (0.00138)	-0.0152*** (0.00173)	-0.00531*** (0.000919)
Firm age	-0.00717*** (0.00273)	-0.00830*** (0.00314)	-0.00655** (0.00275)	-0.000955*** (0.000363)	-0.00111*** (0.000418)	-0.00113*** (0.000376)
Motivation	-0.0115*** (0.00396)	-0.0154*** (0.00501)	-0.00806*** (0.00260)	-0.00156*** (0.000532)	-0.00208*** (0.000673)	-0.00114*** (0.000351)
Financing	-0.00619* (0.00348)	-0.00397 (0.00369)	-0.00551*** (0.00185)	-0.000711* (0.000410)	-0.000455 (0.000426)	- (0.000238)
Region	-0.00347 (0.00521)	-0.0122** (0.00585)	-0.0149*** (0.00335)			
Returns						
Total	-0.235*** (0.0619)	-0.403*** (0.0755)	-0.163*** (0.0258)	-0.0192** (0.00766)	-0.0383*** (0.00897)	-0.0135*** (0.00297)
Capital	0.339 (0.346)	0.947** (0.458)	0.948*** (0.126)			
Labor	-0.124 (0.0775)	-0.213* (0.110)	-0.0551** (0.0248)			
Education	-0.570*** (0.197)	-0.517* (0.270)	-0.327*** (0.0640)	-0.0746*** (0.0233)	-0.0621** (0.0314)	-0.0269*** (0.00827)
Firm age	-0.167 (0.147)	0.0940 (0.186)	-0.00394 (0.0458)	-0.0204 (0.0186)	0.0109 (0.0227)	0.00682 (0.00611)
Motivation	0.00329 (0.0391)	-0.0171 (0.0516)	-0.00124 (0.0128)	0.00132 (0.00498)	-0.00418 (0.00636)	0.000290 (0.00172)
Financing	0.0407** (0.0205)	0.0382 (0.0236)	0.00815 (0.00672)	0.00511** (0.00258)	0.00442 (0.00286)	0.00125 (0.000900)
Region	-0.0844 (0.194)	-0.490* (0.257)	0.187*** (0.0695)			
Constant	0.327	-0.245	-0.920***	0.0694**	0.0126	0.00499

	(0.409)	(0.557)	(0.140)	(0.0315)	(0.0407)	(0.0106)
Observations	10,326	10,326	10,326	10,326	10,326	10,326
Informal	9972	10083	6213	9972	10083	6213
Formal	354	243	4113	354	243	4113

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



Institut de Recerca en Economia Aplicada Regional i Públic
Research Institute of Applied Economics

WEBSITE: www.ub-irea.com • **CONTACT:** irea@ub.edu



Grup de Recerca Anàlisi Quantitativa Regional
Regional Quantitative Analysis Research Group

WEBSITE: www.ub.edu/aqr/ • **CONTACT:** aqr@ub.edu