

**Firm Dynamics and Institutional Participation:
A Case Study on Informality of Micro-Enterprises in Peru**

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Abstract

Using panel data on micro-enterprises from Peru, we find evidence suggesting that firm dynamics explain ‘formality’, i.e. the decision to participate in societal institutions. In particular, we find that participation increases with firm size and age, implying transition of firms to formality as they grow. The distinct characteristics of sub-groups, segmented according to life-cycle criteria, further support the role of firm dynamics and life-cycle considerations for the analysis of participation.

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1. Introduction

Facing poverty and prevailing underemployment, the question of job creation to ensure higher and more stable incomes is a fundamental issue in Peru. A basic problem is that the modern, or “formal” economy cannot absorb enough workers. As a result, the proportion of self-employed is striking: 56% of the households sampled by the ENNIV¹ in 2000 have at least one self-employed household member². Correspondingly, micro-enterprises make up 96% of the country’s industry and employ 45% of the economically active population (Artieda and Wensjoe, 2002).

The micro-enterprises in Peru show the characteristics typically associated with micro-firms in developing countries: small scale of operation, low-income levels, stagnation, high mortality rates, and high informality. Furthermore, failure rates are found to be highest among the smallest and most informal firms.

Formality is generally seen as a necessary factor for the growth of firms, since it allows access to institutions that ensure property rights, enforce contracts, or give access to capital. Indeed, the traditional literature views informality as one of the explanations for the failures of micro-firms in developing countries. Informality, in turn, is caused by government-induced market distortions and regulatory inefficiencies.

This paper, however, follows Levenson and Maloney (1998) who argue that informality per se is not the cause of the deficiencies of micro-enterprises. Instead, micro-enterprises in developing countries are assumed to have dynamics similar to those in industrialised countries: entrepreneurs have differing unobserved abilities which determine the firm’s cost structure and thereby its long-run size and viability. Formality is recast as the firm’s decision about how much to participate in societal institutions, depending on the net discounted benefit to the firm. Most importantly, they argue that access to different institutions becomes more beneficial as a firm grows. Therefore, larger firms will be more willing to pay for participation, in the form of say taxes, than smaller firms will. As a result, firms transition from informality to formality as they grow to their long-run equilibrium size. The authors use cross-sectional data from Mexico to document the heterogeneity and depth of participation of micro-enterprises, and provide evidence of the importance of firm size, age and mode of production in explaining participation.

¹ The ENNIV is the World Bank “Living Standards Measurement Survey” carried out in Peru.

² In comparison, the self-employed in industrialised countries typically account for 10 to 15% of the economically active population (ILO, 2002).

Building on this approach, the present paper aims to contribute to the understanding of firm dynamics and life cycle for modelling participation. Using unbalanced panel data on micro-enterprises from Peru, we find comparable patterns of participation, although the levels of participation are consistently lower than in Mexico. Secondly, we use balanced historical data to analyse the dynamics of the micro-enterprises. Young firms are found to show the lowest degrees of participation and the highest failure rates. Over time, growing firms become increasingly formal. Nevertheless, a considerable number of firms remain small and informal through time.

The remainder of this paper is organised as follows. Section 2 highlights the main building blocks of the informality debate in order to place the approach by Levenson and Maloney (1998) in the context of the traditional informality literature. Section 3 presents the theoretical framework and the hypotheses to be tested. Section 4 reports and analyses the empirical results from Peruvian micro-enterprises using both unbalanced and balanced panel data. Finally, section 5 concludes.

2. The concept of the “Informal Sector”

To use the words of an early critic, the concept of the “informal sector” is “an utterly fuzzy one” (Peattie, 1987, p.851). This has not changed since, regardless of numerous efforts to achieve greater conceptual and definitional clarity.

The concept inherited many characteristics from the context it was born in. The dichotomy between “formal” and “informal” sectors can be seen as the latest in a line of dualistic conceptualisations stressing the contrast between two sets of economic activities, one relatively profitable and privileged, the other relatively disadvantaged. Following the tradition of economic accounting, the “informal sector” has been related to all activities that might bias the measurement of national income and the contribution of particular sectors³. Finally, the concept was born out of necessity during a series of studies on urban labour markets in Africa by the ILO. Keith Hart, to whom the term is attributed, found that the western concepts of unemployment and economic development were simply at odds with the empirical entrepreneurship in African cities (Hart, 1990).

The original “informal sector” debate neglected the relationship between informality and illegality, and focussed on economic characteristics of both the firm and the market. Correspondingly, early definitions of the “informal sector” were based on ease of entry, unregulated markets, family ownership, small scale and labour intensive modes of operation

(ILO, 1972)⁴. According to Tokman (1992), the situation changed during the 1980s. Since then, regulations in general and legality in particular, have become key conceptual issues in the analysis and policy prescription for the informal economy. In fact, in a current attempt to clarify concepts and account for the heterogeneity of activities in the “informal sector”, the ILO has redefined informality as referring to “non-compliance by either enterprises or workers with all or some of the rules and regulations in the body of national or local legislation - commercial and/or labour legislation” (ILO, 2002, p.125).

The concept of the “informal sector” has been applied to describe economic activities from the perspectives of both the worker and the firm. In either case, traditional approaches view government-induced market distortions, and regulatory inefficiencies as one of the main causes of the “informal sector”.

One strand of the literature focuses on labour markets and the resulting lack of protection of workers. Mazumdar (1983) equates the informal economy with the low-wage, low-productivity segment of the labour market, induced by government regulations and trade union rigidities. For Rauch (1991), the dimension of the informal sector is related to a binding minimum wage regulation for firms above a certain size. An alternative view is that the labour market dualism arises endogenously from efficiency wage type considerations. Differences in the characteristics of production technology are argued to lead to differences in observability of effort, inducing larger firms to pay wages above market clearing (Esfahani/Salehi-Isfahani, 1989). In these approaches, the “informal sector” is assumed to have a safety-net function, absorbing displaced workers in economic downturns, whilst they “queue” to enter formal sector employment.

Other authors depart from the firm as the basic unit rather than the disadvantaged worker. This literature focuses on issues of tax evasion and regulatory compliance, based on the assumption that government enforcement agencies seek to maximise social benefit subject to a budget constraint⁵. Loayza (1997), for example, argues that the informal economy arises when the government imposes excessive taxes and regulations, combined with low quality of institutions and weak enforcement. This approach is in the spirit of De Soto (1989), who bases his analysis on the informal economy in Lima.

In reality, there is a large degree of overlap between these approaches since most micro-enterprises constitute self-employment. In addition, empirical research provides

³ See Feige (1990), Thomas (1992).

⁴ See Bromley (1978) for a discussion of the deficiencies of the original ILO informal sector concept.

⁵ See Fenn and Veljanovski (1988) or Cowell (1990) for general models of regulatory enforcement.

evidence that the traditional view of dualistic labour markets with high earning differentials and workers queuing for jobs in the formal economy is only part of the story. Contrary to traditional assumptions, Sethuraman (1981) and Maloney (1998a, 1998b) find a significant overlap in income levels between the informal self-employed and formal salaried workers. Correspondingly, transitions and queuing occur in both directions. Actually, there are many cases of formal sector employees who choose to become informal sector entrepreneurs, and to remain largely outside of the formal regulatory structure. Sethuraman consequently redefines the informal sector as the small-scale end of an urban economic continuum. Furthermore, in contrast to Hart (ILO, 1972) and Tokman (1992), Maloney concludes that the informal sector overall behaves as an unregulated entrepreneurial sector, rather than the disadvantaged sector of a dualistic labour market.

With this overlap in mind, we in the next section define “formality” in terms of institutional participation, and discuss the relationship with the evolution of micro-enterprises à la Levenson and Maloney (1998).

3. The theoretical framework

The firm’s decision about how much to participate in societal institutions (such as national and local treasuries, governmental programs, banking system and trade organisations) depends on the discounted net benefits of participation.

The benefits of formality are numerous and include the protection of property rights, enforceable contracts and access to both capital and public risk pooling mechanisms. However, access to these institutions mainly benefits expanding or larger firms. For firms with a small scale of operation, the personal relationship between the entrepreneur and all involved parties might be sufficient to, for example, enforce implicit contracts or ensure property rights, while capital requirements might be covered by informal credit markets. The costs entailed by formality can be seen as taxes imposed by society in exchange for the benefits of access to civil institutions. These costs can be conceived as comprising an initial fixed cost f_0 (including for example registration or initial information costs) and per period costs f_t such as taxes or compliance costs. Following Levenson and Maloney (1998) we assume that a minimum degree of participation is a necessary condition for firm growth⁶ and can, therefore, be viewed as an input to production

⁶ This view also corresponds to De Soto (1989), who asserts that many aspects of “formality” are essential for the growth and efficient operation of firms, and that firms are willing to pay for these, but often denied access by oppressive bureaucracies.

$$q_t = q(l_t, k_t, z_t) \quad (1)$$

where q_t is output, l_t is labour, k_t is capital, and z_t is participation in a number of societal institutions. All inputs are assumed to be complementary, and participation increases with the success of the business. Further, participation is assumed to be a voluntary decision⁷ based on the associated benefits, and free-riders are excluded.

Levenson and Maloney embed this stylised concept of formality in the standard model of firm dynamics by Jovanovic (1982). In this model, firm heterogeneity is unrelated to any market distortions or structural characteristics found in developing countries, but instead derives from differing abilities of entrepreneurs, implying that firms face different cost structures. Efficient firms grow and survive, while inefficient firms decline and fail. The model thus gives rise to entry, growth and exit behaviour, and yields a distribution of firm sizes, because some firms discover they are more efficient than others.

Firms are price takers and have complete information except for their true cost of production. Entrepreneurial ability, θ , is randomly distributed and affects a firm's costs $C = c(q_t)x_t^e$ through a multiplier $x_t^e = \xi(\theta + \varepsilon_t)$ where $c(q_t)$ is a convex cost function; $\xi(\cdot)$ is a positive, strictly increasing and continuous function of θ , and ε_t are random firm specific shocks. Less able entrepreneurs will have large values of θ , larger x_t^e and will therefore be less efficient at all levels of output. An entrepreneur makes the best guess of x_t^e , the expectation of x_t conditional on information received prior to period t and chooses the level of output q_t to maximise expected profits:

$$\max_q [p_t q_t - c(q_t)x_t^e] \quad (2)$$

where p_t is the price-taking firm's output price. The output decision is taken before x_t is observed, that is, $c'(q_t) = (p_t / x_t^e)$ where $\partial q_t / \partial p_t > 0$, $\partial q_t / \partial x_t^e < 0$. Each period, firms receive new information on their cost structure from the level of profits. Firms that realise profits above their expected level revise their estimate of x_t^e downward since

$$\pi_t - \pi_t^e = -c(q_t)(x_t - x_t^e) \quad (3)$$

and increase their output decision thus expanding to their long run equilibrium size. Note that firms will choose to participate if the discounted benefit net of f_t over the firm's lifetime

⁷ The assumption that the firm's participation decision is voluntary differs from the standard approach in the literature on tax evasion and regulatory compliance, which considers government enforcement to be the sole determinant of compliance and treats institutions as strict public goods, ignoring the potential private benefits of participation. See Cowell (1990) and Fenn and Veljanovski (1988).

exceeds the fixed cost f_0 . The learning process, therefore, has both static and dynamic implications for the differences in the degree of participation of firms.

Firstly, the properties of the cost function imply that a lower cost multiplier raises the profit maximising level of output. That is, at a given point in time, old firms differ in size because some discover that they are more efficient than others. Institutional participation among older firms thus reflects the underlying distribution of entrepreneurial ability θ .

Secondly, since large firms are further away from the failure bound⁸, they have a higher survival probability and therefore a longer expected lifetime. This implies that large firms will choose to participate at an early age, while smaller firms will need more information about their viability, and therefore take the participation decision later.

Finally, the learning process broadly defines firm trajectories of growth and participation over time. Unexpectedly good information on profits leads to a downward revision of x_{t+1}^e and a rise in q_{t+1} above q_t , which implies that the firm grows, while becoming more confident that it will survive. Both firm growth and higher expected lifetime have a positive impact on the choice of the degree of participation. A young but inefficient firm, for example, will stop growing at a relatively small size. Its expected discounted value of participation may not exceed the one-time cost of participation, f_0 , until it is assured of its long-run viability, if ever. In contrast to these “small survivors”, a firm realising large unexpected profits will revise downward its x_{t+1}^e sharply, and choose output q_{t+1} at a much higher level than q_t . These “large survivors” also start small but rapidly expand to a large long-run size, potentially deciding to participate at an early age.

In sum, the model predicts that firms with viable cost structures transition from informality to formality as they grow. Small size of micro-enterprises, and lack of growth and societal participation may be due to differences in individual abilities and the noisy process of discovering them, instead of due to market distortions or regulatory inefficiencies. In particular, the framework predicts a positive relationship between firm size and participation. Larger firms not only have higher per period benefits, but also receive those benefits over a longer expected lifetime. Additionally, the model predicts a positive relationship between firm age and participation. Older firms are likely to have longer expected lifetimes because they obtain better information on their costs and are less likely to fail⁹. Therefore, among the

⁸ Jovanovic (1982) shows that there exists a common failure bound for all firms in an industry, defined as a minimum output level, below which no firm can profitably operate.

⁹ Note that older firms are on average also larger. However, the positive relationship between firm age and participation might not be only due to the larger size.

younger firms only the largest might initially choose to participate, while the smaller ones may do so later.

The testable implications of the model are:

- a. There is heterogeneity in the degree of participation by firms.
- b. There is a positive relationship between participation, firm size and years in business.

In particular, young, small and inefficient firms are disproportionately informal¹⁰. This leads to the specification of the following model:

$$\Pr(\text{participation}_i) = \beta_0 + \beta_1 \text{size}_i + \beta_2 \text{age}_i + \varepsilon_i \quad (4)$$

We approximate size by (log) real gross monthly revenue¹¹, age is the number of years the firm has been in business, and ε is an idiosyncratic error term. We also include qualitative variables to control for time and sector of activity where appropriate. The probability of participation can be measured in different ways: (a) as an indicator variable for any participation in a given institution, or (b) as the degree of participation among several institutions. In all cases the null hypothesis is that $\beta_1 > 0$ and $\beta_2 > 0$.

That is, participation should be a positive function of both firm size and firm age.

- c. If the mode of operation and formality are jointly determined, firm expansion involving greater capital stock requires larger permanent work sites, and at the same time more participation to establish property rights and legalise contracts.
- d. Firms participate in an increasing number of societal institutions as they grow.
- e. If the distribution of entrepreneurial ability and the learning process are similar across countries, then the underlying patterns of firm entry and exit in developed and developing countries should also be similar. The high mortality rates of “informal sector” firms might then not be evidence of their inferiority, but may instead reflect the high turnover among self-employed encountered also in industrialised countries.

4. The data and empirical results

4.1. The data

The data used to shed light on the nature of informality in Peru was extracted from the Peruvian Living Standards Measurement Survey (LSMS) of 1994, 1997 and 2000 compiled

¹⁰ This implication is in line with many characterisations of the “informal sector” (see Thomas (1992) or Portes (1994) for overviews) in which informality is assumed to be the cause of inefficiency. Note that in our framework the opposite is assumed: inefficiency causes informality.

¹¹ Given that less than 4% of the sample have zero revenues, we drop them from the sample when using log real revenues.

by The World Bank and The Instituto Cuánto¹². Although the geographic coverage of the surveys varies, they contain a subset of panel observations of households that have been interviewed in more than one year.

The particular section of the LSMS used to conduct our tests, focuses on independent non-agricultural economic activities. In 2000, around 56% of the households interviewed declared at least one self-employed household member¹³. Information was then collected on the business that is most important for the household. The survey covers firm characteristics such as the type of activity, years in business, the number of paid and unpaid workers, the type of worksite, revenue, details on costs and capital stock¹⁴. We deflate revenues and costs using the CPI. The survey also provides information on compliance with or participation in certain institutions, such as registration with the national treasury, tax payments and indirect labour costs¹⁵.

The sample has been restricted to firms with a maximum of ten workers¹⁶, which corresponds to the size limit used for the definition of micro-enterprises by the Peruvian law on small and medium enterprises¹⁷. The resulting sample sizes are 2471, 2422 and 2231 household-run businesses in 2000, 1997 and 1994, respectively.

For the first part of the empirical analysis, we use all cross-sectional observations, identifying those firms included for several years. Subsequently, we constructed a balanced panel based on 606 households that were interviewed in 1994, 1997 and 2000. Of these households not all had a firm, nor did firms necessarily exist during all three years. Consequently, the panel contains 1031 observations on 648 firms, of which 399 firms are in the panel for only one year, 115 are in two years, and 134 are in all three years. In both panels, we use the codes for activities, goods and services to identify whether the firms of one household were the same in different years.

Recall that the survey only includes the most important business per household, and that we consider firms with ten or less workers. Consequently, a firm might “exit” the sample if it goes out of business, grows to more than ten workers, or if another of the household’s

¹² In Peru, the LSMS survey has been conducted six times since 1985/6. The data from the first survey has been criticised for being non-representative because of its limited coverage, whilst the survey from 1990 was implemented at the height of the economic crisis.

¹³ Of those households with self-employed members, roughly 25% had two self-employed, and 7% declared three self-employed household members.

¹⁴ This section of the questionnaire has remained basically unchanged since 1994. Only the identification of unpaid workers was added as from 1997.

¹⁵ Such as contributions to the public health and pension system (ESSALUD), the private pension system (AFP), or payroll taxes (FONAVI).

¹⁶ These constitute 99.29% of the sample in 2000.

¹⁷ See “Ley de Promoción y Formalización de la Micro y Pequeña Empresa” at <http://www.prompyme.gob.pe>.

firms becomes the most important one. Correspondingly, a firm may “enter” the sample if it is newly founded or if it was created prior to previous interviews but was either not operating or not the most important firm for the household at the time of previous interviews.

Finally, note that some firms have stated different years of creation, possibly because of the informal and sporadic nature of their activities. After identifying the firm, we assumed that the year of creation reported the first time is the “true” year of creation and correspondingly yields the “true” age of the firm.

4.2. Patterns of participation

Table 1 shows the summary statistics for all sectors and per sector of activity. On average, firms have been in business for almost 9 years. Although the sample contains firms with up to ten workers, they have on average one paid and one unpaid worker. Within the period under study, 41% of the sampled firms have paid workers whereas 86% have unpaid workers. This highlights the fact that we are mainly dealing with self-employment and family-run enterprises. Of the entire sample, 37% of firms have their worksite within the household, 13% operate in other fixed premises and 40% are mobile. Only 22% of firms are registered with the national treasury, and only 28% pay any taxes¹⁸. Of those firms that have paid workers, only 4% pay some indirect labour costs, i.e. social security contributions and/or payroll tax.

Separating firms in the production, resale and service sectors shows that there are indeed sector-specific differences. On average, firms in the production sector tend to be older, have the highest number of paid workers, and operate more from the household than their counterparts. Firms in the resale sector tend to have the highest number of unpaid workers, and are more likely to operate from fixed premises outside the household, be registered with the national treasury, and pay council or other taxes¹⁹. In contrast, firms in the service sector are more likely to be mobile businesses and pay indirect labour costs. Consequently, although the following analysis is performed using the aggregate data, we will disaggregate at the sector level where appropriate.

a. Heterogeneity of Participation

Table 2 presents cross tabulations between participation in different institutions, and illustrates that formality among Peruvian micro-enterprises is indeed very heterogeneous.

¹⁸ The taxes identified in the survey are council tax and other taxes.

¹⁹ The observation that the most visible firms such as retailers are more likely to pay taxes than less visible ones, corresponds to both De Soto (1989) and predictions of the literature on regulatory and tax enforcement (Cowell, 1990).

A striking example illustrating that participation in one institution need not imply participation in others is given in the first row of table 2. Among all firms in the sample, 22% are registered with the national treasury and 28% pay some taxes. Note that this does not imply that all registered firms pay taxes or that non-registered firms do not pay taxes. In fact, only 71% of registered firms pay (any) taxes, whereas 14% of non-registered firms do²⁰. Furthermore, of all firms that have both paid workers and have been in business for more than three years, only 33% are registered, 37% pay taxes, and 4% pay indirect labour costs. This clearly shows that informality covers many dimensions and that possible complementarities between different institutions may need to be considered when modelling regulatory and tax compliance.

b. Participation in institutions

At first glance, the data in table 3 displays a strong positive relationship between firm size and the degree of participation in individual institutions. The relationship between participation and firm age is also positive, although less strong.

Table 4 reports the results from fitting probit regressions for the different types of institutions, and the estimated marginal effects evaluated at the mean. The qualitative dependent variable takes the value of one if participation is positive and zero if there is no participation. For the estimates pertaining to registration with the national treasury and tax compliance, the coefficients on both firm size and age have the expected positive signs and are statistically significant at conventional levels.

The impact of size on participation is found to be much stronger than the impact of age. The effect of an increase in log revenue by one unit increases the rate of registration and the rate of tax compliance in similar magnitudes (around 14%). In contrast, an additional year in business increases registration or tax compliance by only 0.01%. In terms of indirect labour costs, firm age is not significant but the coefficient on firm's revenue is significantly positive although lower than for other institutions. An increase in log revenue by one unit leads to an increase in the probability of complying with indirect labour costs of only 2%.

When disaggregating by sectors (production, resale and services), the results regarding the impact of firm size on participation are similar. Years in business, however, only explain registration in the resale and service sector and tax compliance in the resale sector. Comparing the impact of changes in the regressors on the probability of participation, there are no large variations between sectors.

²⁰ About half of these firms pay council taxes and half pay other taxes, while hardly any firms in this group pay both.

We use a similar procedure to test for depth of participation, measured by the fraction of institutions a firm participates in. The fraction of institutions encompasses whether a firm is registered with the national treasury, pays council tax, any other tax, or indirect labour costs. For all firms and by sector of activity, the results reported in table 5 show that the estimated coefficients of firm size and age are both positive and statistically significant.

Overall, the data supports the prediction that as the firm grows and becomes older, the firm is not only more likely to participate in a given institution but it is also more likely to participate in a larger number of different institutions.

c. Mode of Operation

Permanent worksite is a dummy variable taking the value one for firms that operate from a fixed site (excluding the household) and zero otherwise. If mode of operation is jointly determined with the degree of participation, then it is possible to regress equation (4) using permanent worksite instead of participation as the dependent variable. As expected, table 6 shows that firm size and age are positively and significantly related to the permanence of worksite. Although the controls for sector of activity are not statistically significant, regressions per sector show that real revenue has the expected signs, while age is only significantly positive in the resale sector²¹. Overall, these results indicate that the mode of operation, like participation, is influenced by a firm's dynamics.

4.3. Firm dynamics and participation

Next, we use balanced longitudinal data to re-examine the dynamic predictions of the model. Although the number of firms in the balanced panel is small, the results support the hypothesis of the importance of firm life-cycle considerations for the analysis of participation

a. Entry and exit rates

Table 7 shows that the number of firms in the sample in each year, as well as the proportions of firms entering, exiting, or remaining in operation are surprisingly constant over time²². The proportion of firms that have remained in business since the previous survey (survivors) is only around 55%. In addition, over 40% of those firms which are in the survey one year have left by the next. The turnover of the micro-enterprises in the survey samples is

²¹ These are not reported but available from the authors upon request.

²² Given that 1994 is our initial survey, we cannot distinguish whether firms older than two years have been in business continuously or if they are re-entries. Note that there is a large degree of overlap between the firms in the different groups. For example, observations of a firm that enters in 1994, remains in business in 1997 but exits by 2000, will be in all three groups.

thus very high. Note however, that the construction of the panel leads to an overestimation of entry and exit rates compared to reality.

Although the entry rates to the sample are as high as 46%, only around 20% of the firms sampled in one period really are newly founded businesses. Another 22-27% of the sample corresponds to firms entering the sample for the first time, despite having existed for a longer time. These “re-entries” are firms that have not been in constant operation or were not reported as most important for the household in the previous surveys.

The data also shows different survival rates for the different groups of firms. Of the new entries in 1997, 63% have exited by 2000, as have 53% of the re-entries, and 28% of the survivors of 1997. This indicates that the failure rates are highest among new entries, which is consistent with the predictions of the Jovanovic model (1982).

b. Characteristics of entering, re-entering, exiting and surviving firms

These groups have quite distinct characteristics with regard not only to their survival rates, but also their average size and age, mode of operation and participation in societal institutions (table 8). As shown below, these differences are found to be consistent with our predictions on firm dynamics and participation.

The group of survivors has the highest average level of net real revenue. The mode of operation, as indicated by the type of worksite, is also more permanent than in the other groups (52% of the survivors operate from the household, and 16% from another fixed location). Surprisingly, however, they are not more likely to have paid workers. In fact, the survivors have the highest proportion of firms with unpaid workers and the highest average number of unpaid workers. They are, however, the group in which the rates of participation in all institutions, except for indirect labour cost compliance, is highest (33% of these firms are registered with the national treasury, and 39% pay some tax). The average fraction of institutions in which firms participate is also highest. These findings imply that larger firms (in terms of net real revenue), with a higher expected lifetime or probability of survival, have higher degrees of participation.

Exiting firms have the lowest average age (7 years), but not the lowest net real revenue, as one might expect. Their mode of operation is similar to that of new and re-entrants: all groups have low proportions of firms operating from the household (around 40%), and high proportions of mobile enterprises (47%) compared to the survivors. Surprisingly, exiting firms have the highest average number of paid workers and the lowest average number of unpaid workers. Their rates of participation are low and similar to both

groups of entrants. These characteristics support the predictions that exit rates are higher among both younger and more informal firms.

Re-entering firms have the highest average age (12 years), but the lowest real net revenue (negative on average). They are most likely to be in the service sector, least likely to have any paid or unpaid workers, but the most likely to pay some indirect labour costs (11%) compared to the other groups²³. The participation rates in the remaining institutions are low as is the case for new entrants. These characteristics are consistent with the prediction that small and inefficient firms are disproportionately informal.

Finally, new entrants are the most likely to be mobile (47%) and have the lowest participation rates. Only 14% are registered, 17% pay some taxes, and less than 1% pay indirect labour costs. These findings are consistent with the prediction that young firms are disproportionately informal.

Although the analysis is coarse, segmenting the micro-enterprises according to where they stand in their life cycle reinforces the importance of firm dynamics and life-cycle considerations for the analysis of participation.

c. Participation in institutions

As before, we test the predictions for the participation in individual institutions and fit a probit regression to equation (4). The results reported in table 9 confirm that without exceptions, the estimated coefficient on firm size is significantly positive. Age, however, only has a significantly positive effect on participation (excluding labour costs) in the regressions for all firms and new entrants. It is not surprising that the estimated coefficients of age in the re-entering and exiting groups are insignificant or negative after controlling for real revenue. Nonetheless, we would expect not only a positive but also significant estimated coefficient on age for the firms remaining in business. Testing for depth of participation (table 10), we obtain similar results. The analysis of the panel of micro-enterprises, therefore, generally lends support to the dynamic predictions of the framework.

We also conducted several checks for robustness²⁴ using both the unbalanced and balanced panel data. We tested the model using net (log) real monthly revenue²⁵ instead of gross (log) real revenue, we dropped firms in business for more than 50 years, included a dummy variable for fixed site as an additional regressor, and ran separate cross-sectional regressions. Overall, the results were similar to the ones presented.

²³ In comparison, only 3.4% of the survivors pay any indirect labour costs.

²⁴ These results are not reported but available from the authors upon request.

5. Conclusions

Using panel data on micro-enterprises from Peru, we find evidence suggesting that firm dynamics explain ‘formality’ i.e. the decision to participate in societal institutions. Although the degree of participation is generally very low, the patterns of participation are heterogeneous across micro-enterprises, indicating that the traditional duality of formal versus informal sector firms obscures many aspects. Over time, participation (and depth of participation) is found to increase in firm size and age. That is, firms move from informality to formality as they grow to their long-run size. These dynamics are further illustrated by the relationship found between a firm’s life-cycle and its degree of participation. Firms entering business start off small and have the highest failure rates. As a result, new entrants display very low degrees of participation. As firms grow, they become more confident about their survival probabilities, switch to more permanent modes of operation and participate in an increasing number of institutions. However, not all firms grow over time. In fact, there is a considerable number of long-lived firms which remain small, both in terms of the workforce and revenues, and operate with interruptions. These firms exhibit very low degrees of participation.

The results obtained from our panel data are comparable to those reported by Levenson and Maloney (1998) for micro-enterprises in Mexico. Although the Peruvian micro-enterprises display consistently lower rates of participation, the patterns of participation across different firm characteristics are similar.

Since De Soto’s (1989) critique of the “mercantilist” Peruvian State, many efforts have been made to reduce the costs of regulatory compliance for micro-enterprises. Nevertheless, the data show that the rates of participation are still low among micro-enterprises. More importantly, the findings suggest that participation might not per se improve the viability and growth of micro-enterprises. In fact, our evidence suggests the importance of other factors, such as entrepreneurial ability and market opportunities, in determining the firm’s life-cycle and hence participation.

There are, however, some caveats. The framework does not embed the traditional approach of government enforcement or the relative costs and benefits of participation. In addition, the firm’s participation decision is not modelled explicitly, but derived from the implications of Jovanovic’s (1982) noisy learning model. We leave the latter for future

²⁵ When testing with (log) real net revenues, we constructed two variables: one for firms with positive profits and another with negative profits.

research. Finally, given the methodology applied in creating the balanced panel data and the different sub-groups, some care should be taken when interpreting the results from our dynamic analysis.

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Table 1
Unbalanced data: summary statistics of micro-enterprise sectors

Variable	All Sectors			Production			Resale			Services		
	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	N
Real gross monthly revenue	1182.30	2725.70	5975	1012.78	2294.94	860	1400.18	3091.00	2620	1010.35	2427.56	2438
(log) real gross monthly revenue	6.28	1.32	5735	5.96	1.48	804	6.53	1.22	2540	6.13	1.32	2336
Real net revenue	-213.82	25892.26	5695	140.55	4034.72	823	-297.44	27086.42	2540	-268.62	29195.75	2278
Years in business	8.94	10.53	6387	11.69	11.24	919	7.73	9.85	2738	9.16	10.60	2667
Number of paid workers	0.66	1.13	6398	0.87	1.41	921	0.58	0.97	2741	0.68	1.18	2673
Any paid workers	0.41	0.49	6398	0.45	0.50	921	0.38	0.49	2741	0.42	0.49	2673
Number of unpaid workers	1.22	0.91	4385	0.40	1.09	618	1.41	0.98	1853	0.98	0.69	1861
Any unpaid workers	0.86	0.35	4385	0.87	0.34	618	0.89	0.31	1853	0.82	0.38	1861
Registered national treasury	0.22	0.41	6395	0.22	0.41	921	0.26	0.44	2740	0.19	0.39	2671
Paid any council tax	0.11	0.31	5696	0.07	0.26	823	0.16	0.37	2540	0.07	0.25	2279
Paid any other tax	0.22	0.41	5696	0.19	0.39	823	0.29	0.46	2540	0.14	0.35	2279
Paid any taxes	0.28	0.45	5696	0.22	0.41	823	0.38	0.49	2540	0.18	0.38	2279
Paid indirect labour cost	0.04	0.20	2335	0.03	0.18	372	0.03	0.18	967	0.05	0.22	982
Fraction of all institutions	0.15	0.23	5693	0.13	0.22	823	0.19	0.25	2539	0.11	0.21	2277
Worksite in household	0.37	0.48	7124	0.65	0.48	921	0.43	0.50	2741	0.31	0.46	2673
Other fixed worksite	0.13	0.34	7124	0.12	0.33	921	0.18	0.38	2741	0.12	0.32	2673
Mobile worksite	0.40	0.49	7124	0.23	0.42	921	0.39	0.49	2741	0.57	0.50	2673

Table 2**Incidence of registration with national treasury and payment of taxes by various firm characteristics**

	All firms				Firms with RUC		
	N	%	% regis with RUC	% pay taxes	N	%	% pay taxes
1. All firms	6395 (5696)	100.0 (89.1)	22.03	27.65	1358	100.0	71.28
2. Paid workers >0	2592 (2335)	100.0 (90.1)	29.13	34.13	727	100.0	72.21
2a. and indirect labour costs = 0	2237 (2240)	86.3 (86.4)	28.83	32.19	645	0.89	70.23
2b. and indirect labour costs >0	95	3.7	86.32	80.0	82	0.11	87.80
3. In business >3 years	3846 (3479)	100.0 (90.46)	26.11	31.30	972	100.0	71.60
4. Paid workers >0, >3 years	1577 (1433)	100.0 (90.87))	32.85	36.64	500	100.0	72.20
4a. and indirect labour costs = 0	1364	86.43	32.36	34.31	441	88.2	69.61
4b. and indirect labour costs >0	69	4.38	85.51	82.61	59	11.8	91.53

* The numbers in brackets indicate that there are missing values for the variable whether firms pay taxes. For example, in the group of all firms, 22.03% of 6395 firms have RUC, while 27.65% of 5696 firms pay taxes.

Table 3
The relationship between formality and firm size and age

Real gross revenue decile	Registered with treasury		Any taxes paid		Compliance with indirect labour costs	
	Mean	N	Mean	N	Mean	N
1 st decile	0.06	601	0.05	387	0.01	123
2 nd decile	0.03	597	0.06	567	0.00	187
3 rd decile	0.06	594	0.10	579	0.01	199
4 th decile	0.12	597	0.15	593	0.00	198
5 th decile	0.16	598	0.22	592	0.01	207
6 th decile	0.24	597	0.30	592	0.01	217
7 th decile	0.26	598	0.32	595	0.02	256
8 th decile	0.32	601	0.38	602	0.05	239
9 th decile	0.42	592	0.46	592	0.06	302
10 th decile	0.64	597	0.63	596	0.14	407

Years in business	Registered with treasury		Any taxes paid		Compliance with indirect labour costs	
	Mean	N	Mean	N	Mean	N
Less than 1 yr	0.12	662	0.16	569	0.01	226
1 year	0.15	713	0.22	597	0.03	265
2 years	0.19	629	0.25	567	0.03	230
3 years	0.18	545	0.25	484	0.04	181
4 years	0.23	399	0.29	352	0.04	159
5 years	0.25	445	0.31	398	0.05	146
6-7 years	0.25	428	0.33	375	0.03	118
8-9 years	0.26	351	0.35	320	0.05	135
10-12 years	0.27	620	0.30	566	0.05	246
13-15 years	0.27	412	0.31	382	0.06	175
16-19 years	0.33	209	0.33	193	0.04	85
20-29 years	0.28	605	0.32	558	0.05	237
30 yrs or more	0.23	366	0.26	325	0.05	123

Table 4
Participation in societal institutions

Variables	Registered with treasury		Pays any taxes		Indirect labour costs	
	coefficient	mg effect	coefficient	mg effect	coefficient	mg effect
All sectors						
(log) real gross revenue	0.50 (17.56)	0.14	0.43 (17.77)	0.13	0.52 (7.25)	0.02
years in business	0.01 (5.66)	3E-3	0.01 (4.64)	3E-3	0.00 (0.6)	1E-4
Production	0.39 (1.90)	0.12	0.36 (1.86)	0.12	-0.56 (1.55)	-0.02
Resale	0.33 (1.65)	0.09	0.77 (4.09)	0.24	-0.62 (1.87)	-0.03
Services	0.21 (1.03)	0.06	0.20 (1.06)	0.06	-0.22 (0.65)	-0.01
N	5723		5635		2299	
Production						
(log) real gross revenue	0.55 (4.97)	0.13	0.52 (4.77)	0.11	0.65 (2.96)	0.11
years in business	0.02 (2.54)	4E-3	0.02 (2.2)	3E-3	0.01 (0.78)	2E-03
N	802		798		365	
Resale						
(log) real gross revenue	0.47 (10.83)	0.15	0.35 (10.83)	0.13	0.34 (3.11)	0.02
years in business	0.01 (3.47)	3E-3	0.01 (3.85)	5E-3	4E-4 (0.60)	2E-4
N	2537		2519		948	
Services						
(log) real gross revenue	0.51 (12.21)	0.12	0.49 (13.49)	0.11	0.63 (8.52)	0.03
years in business	0.01 (3.76)	3E-3	5E-3 (1.86)	1E-3	-1E-3 (0.16)	-6E-5
N	2329		2265		972	

The probit regressions include also a constant and year dummies. Standard errors are heteroscedasticity corrected and absolute values of z statistics are presented in parentheses.

Table 5
Depth of participation in societal institutions

Fraction of all institutions in which firm participates	All Sectors	Production	Resale	Services
(log) real gross revenue	0.08 (26.22)	0.08 (13.93)	0.07 (15.22)	0.06 (17.71)
Years in business	2E-3 (6.13)	2E-3 (2.94)	2E-3 (4.59)	1E-3 (2.79)
Production	0.6 (2.92)			
Resale	0.8 (4.03)			
Service	0.3 (3.28)			
N	5633	798	2519	2263

Population-averaged panel estimation including also a constant and year dummies. Standard errors are heteroscedasticity corrected and absolute values of z statistics are presented in parentheses.

Table 6
Permanence of worksite

All sectors	coefficient	marginal effect
(log) real gross revenue	0.31 (13.58)	0.07
Years in business	8E-3 (3.96)	2E-3
Production	-0.13 (0.70)	-0.3
Resale	0.22 (01.2)	-5E-3
Service	-0.17 (0.93)	-0.4
N	5725	

The probit regressions also include a constant and year dummies. Standard errors are heteroscedasticity corrected and absolute values of z statistics are presented in parentheses

Table 7
Balanced data: Proportions of firms entering, exiting or remaining in business

	1992 - 94	1995 - 97	1998 - 2000
Firm entries	108 (31.8%)	155 (45.6%)	153 (43.6%)
new entries (< 2 yrs)	108 (31.8%)	82 (24.1%)	59 (16.8%)
re-entries (> 2 yrs)	n.a.	73 (21.5%)	94 (26.8%)
Survivors	232 (68.2%)	185 (54.4%)	198 (56.4%)
Firm exits, which in previous period were	n.a.	- 155	- 142
new entries	n.a.	65	52
re-entries	n.a.	n.a.	39
survivors	n.a.	90	51
N	340	340	351

Table 8
Balanced data: summary statistics of micro-enterprise segments

Variable	Remained in Business			Exiting Firms			Re-entrants			New entrants		
	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	N
Real gross monthly revenue	1279.62	1889.94	590	885.69	1444.72	279	955.61	1959.68	151	792.29	1333.67	228
(log) real gross monthly revenue	6.49	1.26	569	6.15	1.25	256	5.90	1.45	150	6.08	1.16	215
Real net revenue	117.24	3648.05	571	79.02	1606.28	253	-8189.63	102417.3	148	66.87	2498.82	213
Years in business	12.07	8.96	615	6.97	8.45	297	12.32	9.33	167	0.988	0.775	249
Number of paid workers	0.753	1.14	615	0.795	0.970	297	0.228	0.869	167	0.687	0.962	249
Any paid workers	0.467	0.499	615	0.562	0.497	297	0.120	0.326	167	0.486	0.501	249
Number of unpaid workers	1.44	1.11	383	1.08	0.782	142	1.13	0.926	167	1.10	0.813	141
Any unpaid workers	0.883	0.322	383	0.852	0.356	142	0.814	0.390	167	0.858	0.350	141
Registered national treasury	0.332	0.471	615	0.145	0.352	297	0.150	0.358	167	0.137	0.344	249
Paid any council tax	0.145	0.353	571	0.079	0.270	253	0.095	0.294	148	0.075	0.264	213
Paid any other tax	0.327	0.470	571	0.158	0.366	253	0.115	0.320	148	0.127	0.333	213
Paid any taxes	0.387	0.488	571	0.198	0.399	253	0.189	0.393	148	0.169	0.376	213
Paid indirect labour cost	0.034	0.181	265	0.007	0.083	144	0.105	0.315	19	0.009	0.097	106
Fraction of all institutions	0.210	0.255	571	0.100	0.185	253	0.100	0.181	148	0.090	0.184	213
Worksite in household	0.522	0.500	615	0.401	0.491	297	0.425	0.496	167	0.410	0.493	249
Other fixed worksite	0.161	0.368	615	0.138	0.346	297	0.114	0.318	167	0.116	0.321	249
Mobile worksite	0.317	0.466	615	0.461	0.499	297	0.461	0.500	167	0.474	0.500	249

Table 9
Balanced data: participation in societal institutions

Variables	Registered with federal treasury		Pays any taxes		Indirect labour costs	
	coefficient	mg effect	coefficient	mg effect	coefficient	mg effect
All firms						
(log) real gross revenue	0.44 (7.52)	0.14	0.34 (6.65)	0.11	0.61 (4.44)	0.01
years in business	0.02 (3.09)	0.01	0.13 (2.63)	5E-3	7E-4 (0.04)	1E-7
N	933		927		351	
Firms remaining in business						
(log) real gross revenue	0.47 (5.98)	0.17	0.33 (5.06)	0.12	0.51 (3.35)	0.01
years in business	0.01 (1.21)	3E-3	6E-3 (0.81)	2E-3	3E-3 (0.12)	7E-5
N	569		568		261	
Exiting firms						
(log) real gross revenue	0.34 (3.85)	0.07	0.26 (3.25)	0.07	0.76 (2.98)	5E-3
years in business	0.01 (0.87)	2E-3	6E-4 (0.05)	2E-4	-0.02 (1.54)	-2E-4
N	255		249		58	
Re-entrants						
(log) real gross revenue	0.38 (2.78)	0.08	0.36 (3.15)	0.08	1.46 (1.61)	8E-3
years in business	0.01 (0.80)	2E-3	-0.02 (1.44)	-2E-3	-0.07 (0.82)	-3E-3
N	149		147		13	
New entrants						
(log) real gross revenue	0.25 (2.48)	0.05	0.21 (1.99)	0.05	0.57 (1.86)	0.02
years in business	0.31 (2.00)	0.06	0.37 (2.55)	0.08	-0.17 (0.86)	-5E-3
N	215		212		26	

The probit (cluster) regressions also include a constant, and both sector and year dummies. Standard errors are heteroscedasticity corrected and absolute values of z statistics are presented in parentheses.

Table 10
Balanced data: Depth of participation in societal institutions

Fraction of all institutions in which firm participates	All firms	Firms remaining	Exiting firms	Re-entrants	New entrants
(log) real gross revenue	0.07 (9.95)	0.08 (8.01)	0.04 (4.59)	0.05 (3.89)	0.03 (2.89)
years in business	3E-3 (3.18)	1E-3 (1.14)	3E-3 (0.27)	-5E-04 (0.38)	0.05 (3.04)
N	927	568	251	147	212

OLS cluster estimation including also a constant and both sector and year dummies. Standard errors are heteroscedasticity corrected and absolute values of z statistics are presented in parentheses.