

Associations versus registration as alternative strategies of small firms

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Abstract Small firms, especially those in developing countries, face several serious problems: (1) costs of regulation, including corruption, (2) contract enforcement, and (3) idiosyncratic risks that leave their owners with high costs of finance. To deal with these problems, it is recognized that firms exercise choice over their degree of formality. Little attention, however, has been given to the alternative strategies that firms may choose in gaining formality and dealing with these problems. This article examines the choice between two different strategies: (1) registering with official entities, and (2) participating in private associations. We develop hypotheses concerning factors that would favor one such choice over the other and then test these hypotheses with data taken from a large sample survey of Mexican microenterprises. The results provide support, in some cases strong support, for most of the hypotheses.

Keywords Regulation costs · Contract enforcement · Efficiency of the legal system · Microenterprise · Business associations · Mexico

JEL Classifications D21 · D63 · O12 · O17 · L26

1 Introduction

Small firms in regulated environments, the world over, face three serious problems at the same time, namely, the high costs of capital, regulations, and contract enforcement. They may try to reduce the burden of regulation costs by remaining “informal” and not in full compliance with regulations. If so, they may have to pay corruption to avoid prosecution and sacrifice both possible assistance of formal institutions in enforcing contracts and their ability to reduce idiosyncratic risks by obtaining equity financing from outside investors. While considerable attention has been given to firm formality, little attention has been given to alternative strategies that firms may choose in gaining formality and the relevance of judicial efficiency.

Indeed, most of the literature of formality has focused only on compliance with government regulations. Yet, with firm formality defined in terms of compliance to rules and regulations that may help the firm reduce its vulnerability to idiosyncratic risks, it

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is clear that formality can be achieved through compliance with the rules and regulations of either governmental or private organizations (such as chambers of commerce, community organizations, trade associations, business networks or even mafias). For purposes of this article, we define it in terms of the firm registering with either (1) one or more government agencies or (2) with one or more non-governmental organizations (NGOs), and allow them to do both. The purpose of this article is to propose, then test hypotheses about the different environmental conditions and firm background factors that would influence the choices that firms would make over registration with the two types of organizations.

The empirical literature has shown that both firms and workers make frequent transitions across any defined formality-informality divide (Brusco 1990; Maloney 1999, 2002). It has also shown, that in virtually any country, firms closer to the formality pole are generally better able to deal with idiosyncratic risk and thereby better enforce contracts and obtain capital at lower cost than informal firms (Djankov et al. 2002).

While registration with both official organizations and trade associations (and other NGOs) can be taken for granted among large enterprises, such registrations are by no means very common for microenterprises for which both kinds of affiliation are likely to be costly. For this reason, our focus is on the decisions of very small firms (with 1–15 total workers, paid or unpaid). In his pioneering work on registration and compliance with the law by small Peruvian firms, de Soto (1989) argued that it is the high costs of government regulations that deter firms from registering with the authorities but he hardly mentioned memberships in private associations.¹

¹ de Soto did pay attention to private associations in his more recent book (de Soto 2000). In general, existing literature on these private associations tends to be limited to the following issues: (1) the capture of such associations by governments largely for political purposes (e.g., in Mexico, Shadlen (2002)), (2) interfirm networking and cooperation in the success of associations in certain regions, e.g., the industrial districts of Northeastern Italy or less frequently in Mexico and other Latin American countries (Rabellotti 1993; Woodruff 1998), and (3) identifying other factors affecting the success of such associations (Cronin (2004), including their role in promoting technological change or exports (Levy et al. 1998).

By treating registration with either governmental organizations or NGOs as alternative means with which small firms can achieve some degree of formality, our interest is in identifying both factors that would increase both types of registration and factors that would lead to the choice of one over the other. Specifically, we attempt to distinguish between those firm background characteristics would either increase (lower) both types of registration and those which might favor one over the other. A simple and empirically verified example of the latter is that firms engaged in illegal activities are likely not to be registered with government agencies but likely to be part of a private association or mafia. But, especially given the aforementioned work of de Soto (1989) on the role of regulation costs and that of Djankov et al. (2003) and Chemin (2004) on judicial efficiency, we also wish to identify institutional and other environmental conditions that would induce (fail to induce) both types of registrations or only one type. Finally, we would like to determine whether the two types of formality are substitutes or complements to firms in their efforts to reduce risks.

To accomplish these objectives, we draw on existing literature to propose hypotheses concerning the factors affecting the choices of microenterprises over these two strategies for attaining formality. To test these hypotheses, we need a suitable data set for microenterprises. Such data is extremely difficult to obtain due to the lack of records, the lack of time such entrepreneurs have for questionnaires, their frequently incomplete compliance with legal regulations, and their unwillingness to share information about their businesses. For these reasons, good micro-level data both on registration with authorities and associations and measures of their determinants and effects is relatively rare. One such data source is the micro-level data set from a large sample survey of Mexican microenterprises known as ENAMIN. This study makes use of the 1998 version of this survey which is described in some detail below.

The remainder of the presentation is as follows. Section 2 reviews relevant literature and proposes hypotheses. Section 3 explains the choice of Mexico as a case study of registration by microenterprises, identifies the measures of the relevant variables and the private associations with which firms may register, and provides descriptive statistics on all the variables included in our analysis. Section 4

describes the estimation problems and procedures. Section 5 presents the empirical results for the determinants of registration with government agencies on the one hand and that of associations on the other. Finally, Sect. 6 presents our conclusions.

2 Literature review and hypotheses

Apart from the studies identified above on the effects of institutional factors on firm formality/informality and structure, there has been a recent flurry of articles relating such factors to other aspects of firm behavior. For example, Leaven and Woodruff (2003) examine the effects of the quality of the legal system, costs of regulation and trust on ownership form, and firm size. Their analysis is especially useful in explaining the oft-observed “missing middle” in the size distribution of firms in developing countries. Johnson et al. (2002) empirically analyze the effect of security of property rights on firms’ use of external finance and re-investment decisions. Djankov et al. (2003) examine the determinants of formality in judicial procedures and the effects thereof on contractual enforcement. None of these articles, however, explicitly analyzes firm formality. We know of two exceptions. First, McPherson and Liedholm (1996) attempt to capture the effects of institutional differences between Niger and Swaziland (the latter believed to have much more business-friendly institutional characteristics than the former) on firm registration. But, after controlling for firm and sector characteristics, they find no significant differences between the countries. Second, Levenson and Maloney (1998) examine the determinants of firm formality but confine their attention to non-institutional influences like firm age and size.

The role of idiosyncratic risk in this context can hardly be exaggerated. If complete investor protection could be exogenously supplied, entrepreneurs could fully diversify their idiosyncratic risk by selling shares to outside investors. But, in countries like Mexico and especially for small firms, the exogenous supply of investor protection is very limited, implying that external investors would need to be compensated with a high risk premium, thereby making the cost of equity capital prohibitively high (Himmelberg et al. 2002). As a result, insider entrepreneurs have to bear the sizable idiosyncratic risks

all by themselves.² While these risks can arise from a wide variety of sources, the most common are unexpected delays in delivery or poor product quality on the part of suppliers, and default in payment by customers.

As suggested above, firms’ decisions about whether or not to register with official agencies and NGOs would seem to be motivated by their desire to reduce the costs of idiosyncratic risk and inadequate contract enforcement in the face of market imperfections and the high costs of both regulation (including corruption) and external finance. We view the registration decision, therefore, to reflect the tradeoffs (as they see them) between the firm-specific benefits of formality and its costs, on the one hand, and (with respect to the choice between them) between their differential costs and benefits, on the other. As we shall argue, the efficiency of the judicial system and the relative costs of regulation may play important roles in influencing these tradeoffs and thereby affecting such decisions. We propose the following six hypotheses (H1–H6).

Hypothesis 1 (H1) When the judicial system is efficient in helping firms to enforce contracts, firms may prefer to register with official authorities as a means of improving their access to the legal system. However, when it is not efficient, firms may prefer to register with NGOs to obtain their collective backing in enforcing contracts without use of the judicial system.

Another important consideration may be regulation costs. In particular, based on a sample of 81 countries, Djankov et al. (2002) demonstrates the relevance of regulation costs in achieving firm formality and regulatory compliance. When such costs are high, firms may choose to avoid these regulations by being informal, but at the same time

² La Porta et al. (1998) provide an empirical analysis of the degree and quality of law enforcement, investor protection, and ownership concentration using data from 49 countries around the world. They show that countries with poor investor protection indeed have significantly smaller debt and equity markets and higher levels of ownership concentration. Such protection allows firms to attract outside investors and thereby reduce idiosyncratic risk. The environment of microenterprises in Mexico, however, is one where such protections do not apply and entrepreneurs typically have no one with whom to share their idiosyncratic risks. (See also Himmelberg et al. (2002)).

corruption is likely to be more pervasive. Using data from 75 countries, these authors found that the costs of creating a new firm varies from a low of two approvals and \$280 needed in Canada to 20 approvals and an average of \$2696 in fees in Bolivia. The authors distinguish between two different approaches that governments take: (a) the “helping hand” approach (practiced in most rich countries) wherein the government tries to protect customers and limit negative externalities, and (b) the “grabbing hand” approach, an approach followed in many developing countries, in which regulations are very costly and motivated by rent-seeking on the part of government bureaucrats.

In such a situation, Banerjee (1997) suggests that the government’s side of the problem should also be considered. He develops a theoretical model wherein a benevolent government chooses how much to regulate markets, knowing that the higher is the degree of regulation, the greater will be the bureaucrat’s power to extract corruption payments from firms. The self-serving bureaucrat, in turn, decides how strictly to apply the regulations. These interactions result in regulation costs that may vary from country to country, state to state and industry to industry but which are given to the individual firm. As a result, such differences would seem relevant to individual firms in deciding their level of formality and the organization with which to register.

H2a According to the standard Djankov et al. (2002) version (without considering corruption and interaction between the government and the bureaucrat), as the costs of regulations increase, to minimize costs small firms are less likely to register with the authorities. To minimize the risk of being detected avoiding the authorities, moreover, they would also be less likely to register with NGOs.

H2b According to the unorthodox Banerjee (1997) version (which considers rent-seeking behavior on the part of the bureaucrat and interaction between the government and the bureaucrat), as the cost of regulation rises, the rent-seeking benefits of bureaucrats increase and therefore bureaucrats threaten greater enforcement of the regulations so as to extract more corruption payments. As a result, the interactions between government and bureaucrats induce cooperation on a high-regulation regime in which both government and (corrupt) bureaucrats

benefit. Despite rampant corruption, firms are more likely to register since they anticipate greater enforcement of the regulations and the negative consequence of being caught at this. While in practice the effect captured in H2b might offset the effect of H2a in the case of registration with authorities, it would be unlikely to act as an offset to the negative effect of H2a on registration with an NGO.

Hypotheses 1 and 2 are the ones of primary interest in this article since to our knowledge these have not been explored and the data we use provides a rare opportunity to test them. Moreover, we argue that the measures of interest are exogenous to the firm registration decisions and hence are causal. The remaining hypotheses (3)–(6) are potentially two-way, implying that the relationships suggested are only associational.

H3 Firms with the following characteristics (in existence longer, already using formal accounting procedures, with fixed (as opposed to itinerant) locations, better educated managers, other favorable background characteristics (such as having had more relevant previous experience), and doing business with large suppliers and/or large customers) would be more likely to register with both authorities and NGOs.

The rationale for some of these characteristics is as follows. To use the courts to resolve conflicts, firms are very likely to have to reveal formal accounts over several years. Hence, firms already using formal accounting would have lower marginal costs of attaining formality either through registration with authorities or memberships in NGOs.³ Similarly, firms with longer track records (longer time in existence) would be more likely to be larger and less able to have escaped government regulations. Also, firms with managers who were better educated or had more relevant experience prior to starting the present firm, would be better able to make use of the judicial procedures offered by the judicial system and the services provided by NGOs. On the other hand, since

³ Likewise, in the case of firms with large suppliers or customers and/or fixed locations, the rationale would be that in such cases one party or the other would be vulnerable to holdup problems associated with investment in product specificity and would view registration with the authorities and memberships in associations as means of lowering their vulnerability to these problems.

registered firms may be better able than unregistered ones to recruit educated and experienced managers and attract larger customers, some of these relationships could be two-way.

H4 Firms that report problems in dealing with the government would be less likely registered with the government but more likely registered with NGOs to deal with their problems.

H5 Firms reporting problems with customers (often because of difficulty in receiving payment) would more likely be registered with both authorities and NGOs.

H6 Firms that receive payment in advance would have less reason to go to court to collect on unpaid bills and thus would have less reason to be registered with authorities but more reason to be registered with NGOs so as to make their customers trust them for subsequent delivery. But, as with hypotheses H3, the causality in H4-H6 could also go in the other direction, e.g., from lack of registration with authorities to problems with government and the need for advanced payments from customers.

3 The Mexican microenterprise survey and the empirical specification

For each of the following reasons, Mexico constitutes a rather ideal case study for examining the above hypotheses relating the degree of firm formality and firm choices between registration with authorities and/or NGOs to relevant firm characteristics and institutional factors. First, the roles of microenterprises and informality in Mexico are rather representatives of those in developing countries in general (where the informal sector, constitutes between one-third and three-fourths of non-agricultural employment (Charmes 1990 and Chen 2005)) and microenterprises are of very considerable and growing importance. According to data from the National Employment Survey (Encuesta Nacional de Empleo) of 1995, 53.4% of Mexico's labor force was employed in small, non-agricultural firms, or in microenterprises (defined as firms with 15 or fewer workers). Indeed, no less than 16.7% were employed in single worker enterprises where the owner is the only worker. Employment in such enterprises has grown rapidly (e.g., by 15.7% between 1991 and 1995).

Second, Mexican microenterprises are known to be very heterogeneous, including both street cart owners and high tech service suppliers, operating in different parts of the country virtually in every sector of economic activity, and headed by entrepreneurs of very different levels of education and socioeconomic backgrounds. As our descriptive statistics show, some operate with no capital and others with much. Some sell to large factories or merchants but others to individuals on the street or in markets. Some operate in the home while others have their own premises. Some register with authorities, some with private associations and many with neither (Robaud 1995). Only in the late 1990s did it become useful to examine the determinants and effects of registrations with private associations because prior to 1996, registration in sectoral associations and chambers in which both government and large enterprises played dominating roles, was compulsory. After 1996, however, when membership in the designated corporatist was no longer required, there rose a number of smaller associations catering more to the interests of small enterprises (Shadlen 2000, 2002) and memberships in the old associations declined sharply.⁴ Especially relevant is that small Mexican firms face considerable variation in institutional and regulatory circumstances across space.

Third, and most importantly for our analysis, an impressively large survey of Mexican microenterprises (Encuesta Nacional de Micronegocios or ENAMIN) has been undertaken by Mexico's National Institute of Statistics (INEGI) periodically beginning in 1994. The present study makes use of the 1998 ENAMIN survey with usable data on about 12,000 firms. The ENAMIN samples are randomly selected from households in each of three quite distinct socioeconomic status categories: those who are self-employed, working in firms with no more than 15 workers (based on the urban portion of the aforementioned National Employment Surveys covering the employed population aged 12 or above) and living in urban areas. The ENAMIN survey contains information on the background of the entrepreneur

⁴ Shadlen (2002), moreover, shows that the attempts of the major political parties to organize the numerous small microentrepreneurs into their party organizations failed because the interests of such entrepreneurs were not congruent with those of other popular groups like workers or consumers.

(education, previous occupation and experience, the existence of partners both at origin and at present), characteristics of the enterprise (its size, sector of activity, region of activity, principal suppliers and customers, use of accounting, locus of production, means of payment, problems reported with both customers and authorities), and its registration with both official organizations and private associations (as identified below).

Fourth, since according to several of the hypotheses put forward in Sect. 2, institutional considerations could also affect the benefits and costs of registration to microenterprises, another major advantage is the existence of data on both the costs of regulation and the efficiency of the courts in settling debts and other contractual breaches that vary considerably from place to place.

For an indicator of judicial efficiency relevant to H1, we make use of the survey carried out in the same year (1998) by the Center for the Study of Law at the Instituto Tecnológico Autónomo de México (ITAM/GMA 1998). Lawyers working for banks were asked to assign scores on a 1–5 scale to the efficiency of the legal system in each state on each of the seven criteria: the quality of judges, the impartiality of judges, the adequacy of judicial resources, the efficiency of the enforcement or rulings and of administration, the completeness of property registries, and the adequacy of local legislation to enforce contracts. The individual scores on these different criteria were then averaged for each state. This serves as our Judicial Efficiency Index by state for the year 1998.

Not long after that (2001), the Monterrey Institute of Technology (ITESM) conducted a survey of business owners “The Survey of Governance and the Development of Enterprises in Mexico” (EGDE). At least 100 firms in each state responded to the survey’s questions about regulatory costs (specifically the costs of establishing a business relative to the firm’s revenue). Per unit of output at least, these scores were found to be high by international standards and to vary considerably from one state to another in Mexico.⁵ This constitutes the Cost of Regulation Index relevant to hypothesis H2.

ENAMIN is the source of our measures for not only registration but also of accounting which we consider to be potentially endogenous to the registration decisions. For this reason, as detailed below, we choose different ways of treating the potential endogeneity problem. With respect to registration, it distinguishes among registration with the Federal Ministry of Public Finance, local state ministries of public finance, other authorities, and three types of private NGOs (numerous sectoral associations, chambers of the specific activity in which the firm is working and the Business Owner’s Association).

Given our focus on the effects of judicial efficiency and the cost of regulation on the two alternative strategies for achieving firm formality, in Table 1 we show the means of the probability of being registered with the Ministry of Public Finance and a private association for the full sample and for sub-samples facing low and high values of these indicators. For the full sample, almost 37% of the microenterprises were reported to be registered with the Ministry of Public Finance. On average, however, a firm is 3% more likely to be registered with the Ministry when the level of judicial efficiency is high than when it is low. It is also about 2% more likely to do so when the cost of regulation is low. Although the differences in means are smaller and not statistically significant in the case of registration with a private association (NGO), in both cases firms facing higher indexes are more likely to be registered with at least one such organization. The differences, moreover, are suggestive of some of the hypotheses put forward above. Indeed, much of what is done below is to see what happens to such differences once we control for various other characteristics of the entrepreneur, firm, industry and location and deal with other methodological problems. In the process, we also examine the effects of: (a) the firm characteristics mentioned in H3, (b) the reports of problems with authorities and customers (relevant to H4 and H5, respectively) and finally (c) a dummy variable for payment in advance (relevant to H6).

Additional characteristics of the firm relevant to explaining the decision to use formal accounting or income statements (such as the existence of workers other than the entrepreneur, or partners at the time in which the firm was created, or location in Mexico City where professional accounting services are more widely available and accounting more common) are

⁵ Laeven and Woodruff (2003) have also made use of these same indicators, among others, in relating the quality of the legal system to firm size and ownership in 1998.

Table 1 Summary statistics on firm registrations with the ministry of public finance and NGOs in the full sample and groups classified by levels of judicial efficiency and cost of regulation

	Min. of Public finance	NGO	Min. of Public finance	NGO
Full Sample				
N	11975	11975		
Mean	0.366	0.126		
Std. Dev.	0.48	0.33		
	Judicial efficiency		Cost of regulation	
	Low (1.69–3.6)		Low (1.32–4.43)	
N	8494	8494	8494	8494
Mean	0.357	0.124	0.371	0.126
Std. Dev.	0.479	0.329	0.483	0.332
	High (3.6–4.59)		High (4.43–05.57)	
N	3481	3481	3481	3481
Mean	0.387	0.132	0.350	0.127
Std. Dev.	0.487	0.338	0.477	0.333

also taken from ENAMIN. Descriptive statistics on all these variables, including the index of judicial efficiency in contract enforcement from ITAM/GMA 1998 and the costs of regulation from EGDE are given in Table 2.

Note that over a third of the enterprises were registered with the Ministry of Public Finance and over 14% with private NGOs, mostly classified as trade associations. While many firms were registered with more than one official entity and many others were registered with more than one private entity, only 978 firms (about 8.2% of the sample) were registered with both private and official entities. Another 12.9% were registered with official entities of the individual states. Some 27.3% of the enterprises made use of formal accounting. Less than a third had a fixed location.⁶ While one firm had 15 workers, on average each firm had (including the entrepreneur) only 1.57 workers. While ENAMIN also had data on capital, the vast majority of firms reported no capital but was believed often missing rather than zero. Since the majority of those firms which did report capital had constructed it themselves, the values assigned could not be considered reliable. For these reasons we decided not to use these data. The average entrepreneur had 7.6 years of education and had been in business for 7.7 years.

Almost half received their supplies from wholesalers; less than 10% sold to a factory or merchant; while almost 10% were established with a partner, only 3% had partners at the time of the survey.

4 Empirical methodology

Given that the choices of whether or not to register with an official organization and/or a private association would be jointly made, in Tables 3 and 4, we present the results obtained by estimating jointly the probabilities of registering with an official entity and with a private organization. The inclusion of the use of formal accounting into the analysis complicates matters inasmuch as one could imagine at least that the decision to use formal accounting could be made jointly with those with respect to registration. We proceed to identify the various ways we have dealt with this problem.

In the first two columns of Table 3, we present bivariate probit estimates of the two types of registration in which the accounting decision is considered to be pre-determined in the registration decisions. Note that the use of accounting has strong positive influences on registration with both the Ministry of Public Finance and NGO. As explained below, endogeneity of the use of accounting could not be rejected with a Hausman test, so we subsequently relax the exogeneity assumption in different ways, in each case presenting alternative sets of results. In the second set of results (in the last three

⁶ Having a fixed or semi-fixed location here is viewed as pre-determined to the choice of registration inasmuch as the location type can be viewed as part of a detailed definition of the industry or activity type.

Table 2 Summary statistics of the variables used in the analysis (Source: El Instituto Nacional de Estadística, Geografía e Informática INEGI)

Variable name	Min	Max	Mean	Std
Registered with Minist. of Publ. Finance (1)	0	1	0.366	0.482
Registered in private association (2)	0	1	0.141	0.348
Registered with chamber of activity (3)	0	1	0.053	0.225
Registered with (1) and either (2) or (3)	0	1	0.082	0.027
Registered with trade org	0	1	0.074	0.262
Regist with business owners' assoc	0	1	0.025	0.157
Registered with state treasury/finance	0	1	0.129	0.335
Formal or Inc/Exp accounting	0	1	0.273	0.446
Labor	0	15	1.566	1.039
Age of business	0	50	7.763	8.799
Manufacturing	0	1	0.095	0.293
Construction	0	1	0.054	0.2269
Service, rental	0	1	0.479	0.5
Finance, communication	0	1	0.006	0.078
Technical	0	1	0.042	0.2
Health	0	1	0.025	0.155
Previous Occ.: Salaried worker	0	1	0.297	0.457
Previous Occ.: Self-employed	0	1	0.103	0.304
Previous Occ.: Not given up	0	1	0.059	0.235
Fixed location of work	0	1	0.323	0.468
Semifixed location of work	0	1	0.069	0.253
Capital	0	6100500	38717	134904
Years of education	0	20	7.59	4.8
Supplier wholesaler or large factory	0	1	0.47	0.499
Supplier small factory	0	1	0.019	0.138
Customer: Large factory/Merchant	0	1	0.041	0.199
Customer: Small factory/Merchant	0	1	0.051	0.221
Sold on advance payment	0	1	0.927	0.26
Problems with the authorities	0	1	0.389	0.193
Problems with customers	0	1	0.081	0.273
Judicial efficiency index	1.7	4.59	2.776	0.504
Cost of regulation index	1.3	5.57	3.571	1.046
Have fixed wage workers	0	1	0.156	0.363
Have partners	0	1	0.031	0.173
Have non-wage workers	0	1	0.171	0.376
Don't employ any workers	0	1	0.669	0.471
Motive of starting up business: No other job found	0	1	0.128	0.334
Sidewalk improvised Loc.	0	1	0.023	0.15
Sidewalk fixed location	0	1	0.022	0.147
Market improvised	0	1	0.022	0.147
Market fixed	0	1	0.015	0.122
Door to door marketing	0	1	0.047	0.213
Semifixed/Mobile location	0	1	0.418	0.493
Work at home	0	1	0.05	0.218

Table 2 continued

Variable name	Min	Max	Mean	Std
Established with/by others	0	1	0.098	0.298
Materials purch: on account	0	1	0.73	0.444
Materials purchase: on credit	0	1	0.077	0.267
Materials purch.: on adv. paymt	0	1	0.002	0.041
Output	0	129000	2660	5064
Mexico City	0	1	0.696	0.254
Number of observations: 11,975				

columns of Table 3), we present the joint probability results from a multivariate probit two-stage procedure (P2SLS) for a system of three equations, where accounting is now determined jointly with the two registration decisions.

Following Maddala (1983), the structural form for the first set of estimates can be represented as:⁷

$$\begin{aligned} y_1^* &= \alpha_1 y_2^* + \beta_1 X_1 + u_1 \\ y_2^* &= \alpha_2 y_1^* + \beta_2 X_2 + u_2. \end{aligned} \quad (1)$$

We can rewrite (1) in the following reduced forms:

$$\begin{aligned} y_1^* &= \Pi_1 X + v_1 \\ y_2^* &= \Pi_2 X + v_2. \end{aligned}$$

Since y_1^* and y_2^* are observed as binary variables, only Π_1/σ_1 and Π_2/σ_2 can be estimated, where $\sigma_1^2 = \text{var}(v_1)$ and $\sigma_2^2 = \text{var}(v_2)$. Hence, denoting $y_1^{**} = y_1^*/\sigma_1$ and $y_2^{**} = y_2^*/\sigma_2$, the structural equations are

$$\begin{aligned} y_1^{**} &= \alpha_1 \frac{\sigma_2}{\sigma_1} y_2^{**} + \frac{\beta_1'}{\sigma_1} X_1 + \frac{u_1}{\sigma_1} \\ y_2^{**} &= \alpha_2 \frac{\sigma_1}{\sigma_2} y_1^{**} + \frac{\beta_2'}{\sigma_2} X_2 + \frac{u_2}{\sigma_2}, \end{aligned} \quad (2)$$

First, the reduced forms of (1) are estimated using probit ML. Then, substituting the predicted values of y_1^{**} and y_2^{**} into the structural equations (2), the second stage ML estimates are obtained for the parameters: $\alpha_1 \frac{\sigma_2}{\sigma_1}, \frac{\beta_1}{\sigma_1}, \alpha_2 \frac{\sigma_1}{\sigma_2}$, and $\frac{\beta_2}{\sigma_2}$. Denote $\theta_1 = \left(\alpha_1 \frac{\sigma_2}{\sigma_1}, \frac{\beta_1}{\sigma_1} \right)$ and $\theta_2 = \left(\alpha_2 \frac{\sigma_1}{\sigma_2}, \frac{\beta_2}{\sigma_2} \right)$. In deriving the asymptotic covariance matrix of the two-stage estimates, we follow Amemiya (1979). $\hat{\theta}_2$ can be obtained by maximizing the likelihood function

$L(\hat{\theta}_1, \theta_2)$ where the parameters from the first equation are replaced by their first stage estimates:

$$\begin{aligned} \hat{\theta}_2 - \theta_2 &\doteq \\ &- \left(E \frac{\partial^2 \log L}{\partial \theta_2 \partial \theta_2'} \right)^{-1} \left[\frac{\partial \log L}{\partial \theta_2} + E \frac{\partial^2 \log L}{\partial \theta_2 \partial \theta_1'} (\hat{\theta}_1 - \theta_1) \right], \end{aligned} \quad (3)$$

where $\doteq$ indicates that both sides have the same asymptotic distribution and $\hat{\theta}_1$ and $\hat{\theta}_2$ are consistent estimators of θ_1 and θ_2 . The covariance matrix of $\hat{\theta}_1$ is derived in a similar way.

But, once formal accounting is assumed to be endogenous, we have a system of three equations. In this case, we use a multivariate probit procedure, which is an extension of model (1) to a system of three equations. Since the calculation of bivariate normal probabilities using the same ML method becomes computationally impractical with more than two equations, we use instead the maximum simulated likelihood (MSL) method identified by Greene (2003, p. 931) and Capellari and Jenkins (2006).⁸ To ensure that the system of equations is identified, since formal accounting is included among the explanatory variables in the first and the second equations, we include the four additional exogenous explanatory variables in the third equation to preserve the order condition for the system identification. As explained below, these variables have very significant influences on accounting, the results of the Smith and Blundell (1986), test reject the hypothesis that the

⁷ Since both registration types are binary, while both y_1^* and y_2^* are estimated continuous response variables, they are defined as follows: $\begin{cases} y_i = 1 & \text{if } y_i^* > 0 \\ y_i = 0 & \text{otherwise} \end{cases}$, $i = 1, 2$, where the $y_1(y_2)$ dummy variable is one if registered with the official entity (any private association) and zero otherwise.

⁸ The latter's computational algorithm is based on the Geweke, Hajivassiliou, and Keane (GHK) recursive simulator (Geweke 1989). For further reference on multivariate probit estimation, see Heckman (1978) and Greene (2003, p. 714). Our application of the method is almost identical to the example illustrated by Greene (2003, 715–719).

Table 3 Multivariate probit and P2SLS estimates for registration with Ministry of Public Finance and any Private Organization (NGO) without instrumenting for formal or Income/expenditure accounting

Specification	(1) Bivariate probit		(2) Multivariate probit		
	Min. of Public Finance	NGO	Min. of Public Finance	NGO	Formal or Inc/Exp accounting
Dependent variable: Registered with					
Formal or Inc/Exp accounting	2.75***	0.48***	3.09***	0.71***	
Age of business	0.02***	0.01***	0.01***	0.01***	0.02***
Judicial efficiency index	0.06*	-0.07***	0.06*	-0.07***	0.04
Cost of regulation index	0.02	-0.01	0.02	-0.01	-0.02
Manufacturing, construction	-0.36***	-0.20***	-0.31***	-0.17***	-0.44***
Service, rental	0.29***	0.48***	0.28***	0.48***	-0.05
Commerce, finance, tech, health	0.41***	0.09	0.38***	0.08	0.25***
Previous Occ.: salaried worker	0.17***	0.15***	0.14***	0.13***	0.26***
Previous Occ.: Self-employed	0.09*	0.13***	0.08	0.12**	0.11**
Previous Occ.: Not given up. temp.	-0.04	0.09	-0.01	0.11*	-0.30***
Semifixed location of work	0.04	0.64***	0.07	0.67***	-0.20***
Work at home of the client	-0.81***	-0.36***	-0.71***	-0.31***	-0.91***
Years of education	0.06***	0.02	0.05***	0.01**	0.09***
Supplier wholesaler or large factory	0.40***	0.13***	0.34***	0.10***	0.43***
Customer: Large factory/Merchant	0.26**	0.14*	0.18*	0.09	0.59***
Customer: Small factory/Merchant	0.16**	-0.24***	0.11	-0.27***	0.44***
Sold on advance payment	-0.13*	0.14*	-0.1	0.15**	-0.21***
Problems with the authorities	-0.17**	0.31***	-0.16*	0.31***	-0.1
Problems with customers	0.03	0.07	0.01	0.05	0.19***
Motive of starting up the business: no other job found					-0.23***
Don't employ any workers					-0.83***
Established with/by others					0.12***
Region Mexico City					0.11*
Constant term	-1.97***	-1.87***	-1.98***	-1.88***	-0.95***
Number of observations	11975	11975	11975	11975	
Pseudo- R^2	0.44	0.19		0.47	

Notes: The predicted values for Formal or Inc/Exp Accounting are obtained from probit regression. *** Indicates significant at 1% level, ** indicates significant at 5% level, and * indicates significant at 10% level

Table 3 continued

Correlation coefficient (ρ) values between the two equations estimated from Table 3 Bivariate Probit Model (for registration with the Ministry of Public Finance and an NGO in the full sample and by level of judicial efficiency and cost of regulation)			
	Corr. coeffic. (ρ)	χ^2	Prob $\chi^2 > 0$
The whole sample	0.31	214.3	0.00
Judicial efficiency	(Data range: 1.69–4.59)		
High (3.6–4.59)	0.29	54.2	0.00
Medium (2.7–3.59)	0.30	68.6	0.00
Low (1.69–2.69)	0.34	95.7	0.00
Cost of regulation	(Data range: 1.31–5.57)		
High (4.5–5.57)	0.19	19.2	0.00
Low (1.31–4.4)	0.35	202.6	0.00

residuals of the second stage are independent of the first stage instruments. Hence, they do not satisfy the criteria for valid instruments, a common result of strong instruments used for a variable which has very strong effects on the endogenous variables of interest.⁹ Finally, therefore, in Table 4 we fall back on bivariate probit estimates of the two registration equations based on inclusion of the instruments for accounting instead of accounting itself.

5 Empirical results

Given that there is a single official entity of primary importance, the Ministry of Public Finance, but many different private organizations, for estimation purposes, we view the basic choices of registration for achieving firm formality as being with the Ministry of Public Finance (i.e., the authorities)¹⁰, any private organization, or none at all. Registration with the Ministry of Public Finance implies that the firm will be unable to avoid taxation, tax payments representing a substantial part of the costs of this type of registration. But such costs also include the costs of paperwork and waiting on lines in government offices. Registration with an NGO is likely to involve both membership fees (and perhaps annual dues) and opportunity costs of time to attend meetings. The main benefits of registration with the Ministry of Public Finance derive from a higher perceived legality of the firm that in turn increases both the firm's access to the judicial system and the usefulness of such access in enforcing contracts and reducing idiosyncratic risk and thereby the cost of capital. The main benefits of registration with an NGO are likely to be networking with each other, customers and suppliers, informal sanctioning of customers or suppliers that renege on their contracts and, in some cases, access to legal or technical services.

⁹ In the second specification of the reduced form, where we use only two of the four instruments, the test results do not reject the validity of the instruments for the equation when the dependent variable is the registration with informal organizations. But, once again they fail to support their validity for the equation when the dependent variable is the registration with the authorities.

¹⁰ The other official entities are omitted since they would be relevant primarily to firms in a single sector (such as health) rather than to all firms.

Table 4 The reduced form results: bivariate probit estimates for registration with Ministry of Public Finance and any NGO, when Formal or Income/Expenditure Accounting is replaced with the instruments from the third equation in the structural form listed in Table 3

Reduced form specification	(1) Bivariate Probit		(2) Bivariate Probit	
	Min. of Public Finance	NGO	Min. of Public Finance	NGO
Dependent variable: Registered with				
Motive of starting up the business: No other job found	− 0.25***	0.04	− 0.28***	0.02
Don't employ any workers	− 0.81***	− 0.38***		
Established with/by others	0.10**	0.01		
Region Mexico City	0.01	0.24***	0.01	0.24***
Age of business	0.02***	0.02***	0.02***	0.02***
Judicial efficiency index	0.07***	− 0.08**	0.05*	− 0.09***
Cost of regulation index	0.01	− 0.03*	− 0.01	− 0.04**
Manufacturing, construction	− 0.52***	− 0.26***	− 0.49***	− 0.25***
Service, rental	0.10***	0.44***	0.18***	0.47***
Commerce, finance, tech, health	0.43***	0.16**	0.32***	0.11
Previous Occ.: Salaried worker	0.27***	0.16***	0.30***	0.18***
Previous Occ.: Self-employed	0.13***	0.12**	0.18***	0.14***
Previous Occ.: Not given up, temp.	− 0.23***	0.05	− 0.20***	0.05
Semifixed location of work	− 0.04	0.66***	− 0.18***	0.59***
Work at home of the client	− 1.04***	− 0.41***	− 1.15***	− 0.49***
Years of education	0.09***	0.03***	0.09***	0.03***
Supplier wholesaler or large factory	0.50***	0.16**	0.58***	0.21***
Customer: Large Factory/Merchant	0.54***	0.19**	0.62***	0.24***
Customer: Small Factory/Merchant	0.42***	− 0.20**	0.41***	− 0.18**
Sold on advance payment	− 0.21***	0.12	− 0.23***	0.11
Problems with the authorities	− 0.15**	0.28***	− 0.11	0.29***
Problems with customers	0.13***	0.09	0.16***	0.11*
Constant term	− 0.96***	− 1.49***	− 1.40***	− 1.70***
Number of observations	11,975	11,975	11,975	11,975
Pseudo- R^2	0.51	0.22	0.45	0.20

As indicated above, the first two columns of Table 3 present the bivariate probit estimates for each of these two types of registration with the accounting decision assumed to exogenous.¹¹ Of primary interest are the positive influence of the Judicial Efficiency

Index on Registration with the Ministry of Public Finance and the negative one on Registration with an NGO. The former is significant at the 10% level and the latter at the 5% level. These results support hypothesis H1. The absence of any significant effects of the Cost of Regulation Index, however, means that there is no support for either H2a or H2b, but the result is not inconsistent with their both being operative but more or less off-setting each other (since their effects are opposite). The significant negative effect of Problems with Authorities on Registration with Authorities and the significant positive one on Registration with an NGO is supportive of H4. While the statistically insignificant effects of Problems with Customers fail to support H5, the fact that the effect of Sold on Advance

¹¹ To account for possible heteroscedasticity of the residuals due to the possible variation of the data at the state level, all the specifications in Tables 3 and 4 are estimated using the robust variance-covariance matrix of the estimators. We also use Veal and Zimmermann (1992) to calculate the pseudo- R^2 measure for estimations with binary dependent variables. This is essentially the normalized Aldrich and Nelson (1984) measure of pseudo- R^2 , estimated using the following formula: $\text{Pseudo-}R^2 = -\frac{2(I_M - I_0)}{2(I_M - I_0) + N} \frac{N - 2I_0}{2I_0}$, where N is the number of observations, I_M is the maximized likelihood value of the model, and I_0 is the maximized likelihood value when the non-intercept coefficients are restricted to zero.

Payment is negative (and significant at the 10% level) on Registration with the Ministry but positive (and again significant at the 10% level) on Registration with an NGO is at least modestly supportive of H6.

The positive and significant (mostly at the 1% level) effects on both types of registration of Accounting, Age of Business, Years of Education, Previous Occupation: Salaried Worker, Previous Occupation: Self-employed, Supplier: Wholesaler or Large Factory, and Customer: Large Factory or Merchant and the negative and significant ones of Work at Home of the Client are all consistent with H3.

When Accounting is instrumented as in the second set of estimates in Table 3, the instruments have the expected effects on Accounting (in the first stage equation) and (instrumented) Accounting again has the expected positive effects on the two types of registration. With some minor exceptions, all the other results remain as they were when accounting was treated as exogenous. As noted above, however, in neither registration equation did the results of the Smith and Blundell (1986) test for exogeneity fail to reject the hypothesis that the error terms in the second stage equations were not independent of the instruments.

As a result, we then turn to the bivariate probit estimates of the reduced form equations for both types of registration presented in Table 4. We present two sets of reduced form results. In the first two columns are the estimates using all four of the instruments utilized in Table 3. In the last two columns of the table we restrict our attention to the more unambiguously exogenous variables, namely, Motive for Starting the Business: No Job Found and Location in Mexico City. As expected, starting the business because of being unemployed and not having any other workers (family or otherwise) have negative and highly significant effects on registration with the authorities while Established with Others and Region Mexico City have significant positive effects on at least one type of registration. Most of the other effects are unaffected. Some notable exceptions, however, are: (1) that Problems with Customers now has significant positive effects on one or both types of registration, thus supporting H5, and (2) that the Cost of Regulation Index, while still having an insignificant effect on registration with authorities now has a significant negative effect on Registration

with Private Organization, thus supporting the combination of H2a and H2b.

As the reader may recall, one of the queries raised at the outset was whether registrations with official and private agencies are substitutes or complements to one another. At the bottom of Table 3 are the correlation coefficients between the two equations (ρ). For the full sample, $\rho = 0.31$ with a value of χ^2 suggesting that the relationship is one of complementarity and that it is highly significant. Note, however, that for a subsample of firms facing a high cost of regulation, the value of ρ falls to 0.19, indicating that the degree of complementarity between the two types of registration falls with the cost of regulation. This is consistent with the findings with respect to the cost of regulation in the reduced form estimates in Table 4. Similarly, $\rho = 0.29$ for high judicial efficiency, while ρ increases to 0.34 in a subsample of firms facing low judicial efficiency, meaning that as the judicial efficiency increases, the degree of complementarity between the two types of registrations falls.

6 Conclusions

Based on existing literature and the rationale given above, six different hypotheses were proposed concerning the effects of various firm characteristics and institutional characteristics would have on the choice between registration with authorities and that with NGOs. These are viewed as alternative strategies for attaining formality in an effort to deal with the various problems facing small firms in developing countries. While some firms choose to register with both government authorities and private organizations, more choose to register with only one of these types and many to register with neither type.

In the empirical analysis, we have jointly estimated with two stage probit estimation techniques the likelihood of achieving formality by registration with authorities and with private associations, respectively. Our estimates have been based on the large sample of Mexican microenterprises in 1998 from the 1998 ENAMIN survey, and supplemented by complementary surveys concerning the variation in the perceived costs of regulation and efficiency of the judicial system across the different states of Mexico. The empirical results provide surprisingly strong support for all six hypotheses (H1–H6). In the case of

H2, however, it suggests that both the standard version H2a and the less standard version (H2b) may be operative, explaining why on balance the cost of regulation may have no significant effect on registration with the authorities but a significant negative one in the case of registration with an association.

Elsewhere (Sukiassyan and Nugent 2005), we show that registration with private NGOs is at least as productive as registration with government authorities in assisting the surveyed Mexican microenterprises to access credit (both formal and informal). As a result, our results underscore the importance of heretofore largely overlooked memberships in NGOs as a strategy for increasing formality. As hypothesized, microenterprises find registration with private NGOs may be especially beneficial in conditions where they perceive judicial efficiency to be low. While, in general, the two approaches to formality seem to be complementary to one another, when either judicial efficiency or the cost of regulation is especially high, the two approaches may be somewhat more like substitutes. In other words, when the cost of regulation is high and judicial efficiency low, memberships in NGOs linking producers to their suppliers or customers, and sector-specific chambers may provide a very useful alternative to registration with official agencies as a means of contract enforcement. On the other hand, in circumstances where the costs of regulation are especially high but enforcement is also high and corruption rampant, firms may have to register with authorities anyway. Countries that may be interested in increasing registration with authorities and therefore tax collection from small firms would do well to improve judicial efficiency and other means of contract enforcement.¹² Further research, however, is needed to determine how judicial inefficiency can best be reduced.

Since in its present form, the study suffers from several methodological and data problems, it would be highly desirable to extend the study in several directions. To construct measures of firm characteristics that are more clearly predetermined, it would be desirable to obtain survey data with more

retrospective data. Second, to mitigate the problem of relevant unobserved characteristics, it would be highly desirable to develop and make use of panel surveys instead of cross-section ones of the type that was used here. Such data would also allow one to use more sophisticated methods for examining the effects of official and NGO registration.

Apart from such methodological issues, considering the seeming importance of memberships in NGO revealed in this study and the considerable heterogeneity among private NGOs, further research on the role of memberships in different types of private associations is warranted. Such research could help answer questions like: Which types of associations prove most useful and which characteristics of these associations make them more useful? What specific services do they provide and what governance conditions assure that these associations supply the services that their members want and need?

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¹² The importance of improving judicial efficiency for contract enforcement and firm performance in quite different contexts have also been stressed by Djankov et al. (2003) and Chemin (2004).

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