

AUTHOR ACCEPTED MANUSCRIPT

FINAL PUBLICATION INFORMATION

A Tale of Two Species : Revisiting the Effect of Registration Reform on Informal Business Owners in Mexico

The definitive version of the text was subsequently published in

Journal of Development Economics, 107(July 2013), 2013-03-13

Published by Elsevier

**THE FINAL PUBLISHED VERSION OF THIS MANUSCRIPT
IS AVAILABLE ON THE PUBLISHER'S PLATFORM**

This Author Accepted Manuscript is copyrighted by World Bank and published by Elsevier. It is posted here by agreement between them. Changes resulting from the publishing process—such as editing, corrections, structural formatting, and other quality control mechanisms—may not be reflected in this version of the text.

You may download, copy, and distribute this Author Accepted Manuscript for noncommercial purposes. Your license is limited by the following restrictions:

- (1) You may use this Author Accepted Manuscript for noncommercial purposes only under a CC BY-NC-ND 3.0 IGO license <http://creativecommons.org/licenses/by-nc-nd/3.0/igo/>.
- (2) The integrity of the work and identification of the author, copyright owner, and publisher must be preserved in any copy.
- (3) You must attribute this Author Accepted Manuscript in the following format: This is an Author Accepted Manuscript by Bruhn, Miriam *A Tale of Two Species : Revisiting the Effect of Registration Reform on Informal Business Owners in Mexico* © World Bank, published in the Journal of Development Economics 107(July 2013) 2013-03-13 CC BY-NC-ND 3.0 IGO <http://creativecommons.org/licenses/by-nc-nd/3.0/igo/>

A Tale of Two Species:

Revisiting the Effect of Registration Reform on Informal Business Owners in Mexico

Miriam Bruhn¹

mbruhn@worldbank.org

The World Bank

Abstract

Some argue that informal business owners are viable entrepreneurs who do not register due to complex regulation. Others claim that they are making a living while searching for a job. This paper suggests that a mix of both views is correct. I separate informal business owners into those who have characteristics similar to wage workers and to formal business owners and study the impact of a business registration reform in Mexico on these two species. Informal business owners from the wage worker species are less likely to register due to the reform, but more likely to become wage workers since the reform created jobs. Informal business owners from the formal business owner species are more likely to register, but only in municipalities with high pre-reform constraints to formal entrepreneurship. These results explain why Bruhn (2008 and 2011) finds no effect of the reform for all informal business owners taken together.

JEL codes: O12, O17, L26

Keywords: Informal sector, business registration reform, entrepreneurship

¹1818 H Street N.W., Washington, DC 20433. Phone: +1-202-458-2732. Fax: +1-202-522-1155.
I thank Eva Gutierrez and David McKenzie for valuable comments.

1. Introduction

Most firms in developing countries are informal, that is they operate without registering with the government (OECD, 2009, and data from IFC, 2010). This can pose disadvantages to firms since they may be subject to government penalties and they may not have access to low cost sources of financing, government contracts, and public contract enforcement (Jansson and Chalmers, 2001). It can also limit firms' market size since they cannot issue formal receipts to customers (McKenzie and Sakho, 2010). From the government's perspective, informality may result in lower tax collection, restricting the government's ability to finance public services (Levy, 2008).

Historically, different views have been put forward to explain why many firms operate informally. One view, associated with De Soto (1989), argues that informal business owners are viable entrepreneurs who are being held back from registering their firm due to complex regulation. This regulation includes the initial procedures for obtaining an operating license, as well as ongoing compliance costs for registered firms, such as taxes and labor contributions. Another view, expressed for example by Tokman (1992), sees informal business owners as individuals who are trying to make a living while they search for a wage job.

Several papers have developed theoretical models supporting either view². Other papers examine empirically which view is correct, leading to different conclusions (Maloney, 1999 and 2004, and La Porta and Shleifer, 2008 and 2011). Recently, some have emphasized that informal firms are heterogeneous and that a mix of both views may be correct (OECD, 2009). Self-reported statistics supports this mixed view. In World Bank Enterprise Survey data on informal firms in Madagascar, Côte d'Ivoire, and Mauritius, about 62 percent of business owners report that they started their firm to take advantage of a business opportunity, while the remainder says they were not able to find a satisfactory job elsewhere (Amin, 2009). Maloney (2004) also presents similar numbers for Brazil and Mexico.

² See for example Bennett and Estrin (2009), Bennett (2010), and Straub (2005) for models supporting the De Soto view and Fields (1975) and Fields (2004) for models supporting the Tokman view.

De Mel, McKenzie, and Woodruff (2010) investigate heterogeneity in the informal sector in Sri Lanka through discriminant analysis, a tool used by biologists to separate animals or plants into species on the basis of easily measured characteristics. The authors classify a sample of self-employed microenterprise owners into those who have personal characteristics similar to wage workers and those who have characteristics similar to larger firm owners³. Their analysis shows that about 70 percent of microenterprise owners fall into the first category and 30 percent fall into the second category.

This paper uses the context of a reform in Mexico that simplified local business registration procedures to provide further evidence for the existence of two different species of informal business owners. The business registration reform was implemented in different municipalities at different times, providing an estimation strategy for identifying its effects on formal firm creation and employment. Bruhn (2008 and 2011) shows that the reform increased the number of registered business owners, and that it also created additional wage jobs in eligible sectors. However, the results indicate that the increase in registered business owners was due to former wage earners opening businesses. Former informal business owners were not more likely to register their business after the reform, on average.

In this paper, I follow the approach of De Mel, McKenzie, and Woodruff and use discriminant analysis based on personal characteristics of informal business owners to separate them according to their potential for becoming formal business owners. The discriminant analysis classifies half of the informal business owners in my sample as wage workers and the other half as formal business owners.

I then examine the impact of the business registration reform on these two separate groups and find that informal business owners from the wage worker species are less likely to become formal business owners after the reform, but they are 22.3 percent more likely to become wage workers. This is consistent with the finding in Bruhn (2008 and 2011) that the reform led to job creation and it helps to

³ Employers and wage workers differ along many dimensions, including personal background characteristics, attitudes, and cognitive ability measures. Djankov et al (2005 and 2006) also find this to be the case in Brazil, China, and Russia.

explain why the effect of the reform on business formalization is zero for the group of all informal business owners taken together.

The reform impact on informal business owners from the formal business owner species is less clear. In the full sample, the results indicate that they are more likely to register their business due to the reform, but this effect is not statistically significant. I then divide the sample into municipalities with low and high pre-reform constraints to formal entrepreneurship. The results show that the reform had no effect on firm formalization among informal business owners from the formal business owner species in municipalities with low pre-reform constraints to entrepreneurship. However, in municipalities with high pre-reform constraints informal business owners from the formal business owner species are 26.2 percent more likely to register their business due to the reform.

Overall, these results support the argument that the informal sector consists of different types of business owners. Some operate informally due to stringent regulation and simplifying regulation can entice them to register their business. Others run informal businesses while they are looking for a job and they switch to being wage earners when more job opportunities arise. The evidence in this paper does not exclude the possibility that there could be more than two different species of informal business owners. For example, there may be a third group of individuals that does neither want to formalize nor become a wage earner. In my data, a large number of firms continue to operate informally even after the business registration reform. In fact, evidence from Bolivia and Indonesia suggests that not all informal firms benefit equally from registering and for some firms in Bolivia, formalization lowers profits (McKenzie and Sakho, 2010, and McCulloch, Schulze, and Voss, 2010, see also Perry et al, 2007).

This paper is also related to Hsieh and Klenow's (2009) argument that low aggregate productivity in developing countries is in part due to misallocation of resources across firms and that complex regulation is one factor than can contribute to this misallocation. The findings of this paper suggest that business registration reform allows individuals to better sort across occupations, thus

promoting reallocation of resources and potentially raising productivity. More broadly, the results imply that studies of regulatory reforms may need to go beyond measuring average effects since reforms can have important effects on productivity through reallocation.

The remainder of this paper is structured as follows. Section 2 describes the data and the classification of informal business owners into wage worker and formal business owner species. Section 3 discusses the business registration reform and hypotheses for how this reform affects different species of informal business owners. Section 4 lays out the identification strategy and summarizes transitions into different occupations in the pre-reform period. Section 5 presents the impact estimates of the reform on firm formalization and transitions on wage work. Section 6 concludes.

2. Mexican Employment Survey Data and Species Classification

The main data source used in this paper is the Mexican National Employment Survey (ENE), the survey that the Mexican government relies on for calculating unemployment statistics and the size of the informal sector. The ENE was conducted quarterly starting in 2000-II and covers a random sample of approximately 150,000 households. Each household remains in the survey for five consecutive quarters. I use data for 2000-II to 2004-IV (19 quarters in total)⁴.

The ENE includes detailed information on each individual's employment status and occupation. In particular, the survey asks all currently employed individuals whether they work as wage workers or whether they are employers or self-employed in their main job. I group employers and the self-employed together and call them business owners. The survey then asks these business owners whether their business is formally registered with the authorities. Close to 50 percent of business owners report that their business is not registered with the authorities. I refer to these business owners as informal

⁴ After 2004-IV, the ENE was changed to a new survey, the ENOE, and some of the questions used to define the variables in this paper were modified, limiting comparability across the two surveys.

business owners⁵. Among working age (20 to 65) individuals in the ENE, 49.5 percent are wage workers, 8.6 percent are formal business owners and 8 percent are informal business owners. The remaining individuals are not employed (either unemployed or not in the labor force).

Personal background characteristics

Following De Mel, McKenzie, and Woodruff (2010), I classify the group of informal business owners into wage worker and formal business owner species using discriminant analysis. As described in De Mel, McKenzie and Woodruff, discriminant analysis is a tool used by biologists to separate animals or plants into species on the basis of easily measured characteristics. For the species classification, De Mel, McKenzie, and Woodruff rely on a large number of background, ability, and attitude measures, collected through their own survey. I have to work with a less rich set of personal characteristics since the ENE only includes basic background characteristics for each individual: age, gender, marital status, education, whether or not the individual is a head of household, and whether or not the individual is a migrant (defined as living in a state that is different from the state where the person was born). The reason for using ENE data in this paper is that it is high frequency data with broad geographic coverage that allows me to identify informal business owners and to track them over time. These features are essential for the impact analysis performed in later sections of this paper.

Table 1 displays averages and standard deviations for the personal background characteristics, by occupation group. The sample here includes individuals in their first quarter of observation in the ENE before the business registration reform was implemented in the municipality where the individual lives. The stars on the averages for formal business owners and wage workers denote the statistical significance level of the difference in averages compared to informal business owners.

⁵ See Appendix A for a more detailed description of how the different occupation groups are defined.

The statistics in Table 1 show that informal business owners tend to be slightly younger than formal business owners, but they are 6.5 years older than wage workers, on average. A little over one third of informal business owners are female, while only 27 percent of formal business owners are female, but 40 percent of wage workers are female. Informal business owners have lower levels of education than formal business owners and wage workers, with a much larger fraction having completed only primary school as opposed to higher education. Informal business owners are 6.8 percentage points less likely to be married than formal business owners, but ten percentage points more likely to be married than wage workers. Similarly, informal business owners are less (more) likely to be heads of household than formal business owners (wage workers). Finally, close to 23 percent of informal business owners and wage workers are migrants, but this number is higher among formal business owners (26 percent).

Logistic regressions

Table 2 displays the results from logistic regressions that examine more systematically the extent to which each personal characteristic is correlated with occupational choice, controlling for other characteristics. Column 1 reports marginal coefficients for the choice of being an informal vs. formal business owner. Age, being married, being a head of household and having higher levels of education are all negatively correlated with being an informal instead of a formal business owner⁶. Females, on the other hand, are more likely to be informal instead of formal business owners. Column 2 shows that many of these correlations are reversed for the choice of being an informal business owner vs. a wage worker. Older individuals, people who are married or a head of household are more likely to be informal business owners than wage workers. However, higher levels of education are associated with a lower probability of being an informal business owner instead of a wage worker. The coefficients in Column 3

⁶ The omitted education category in the regressions is less than primary education.

indicate that age, being married, being a head of household, and having higher levels of education are correlated with being a formal business owner vs. a wage worker. In contrast, females and migrants are less likely to be formal business owners instead of wage workers.

Overall, the results in Table 2 indicate that all of the characteristics included in the analysis statistically significantly contribute to predicting who in the sample is an informal business owner, a formal business owner, or a wage worker. One caveat though is that the combined predictive power of the variables is not high, as illustrated by the relatively low R-Squared of the regressions. Unfortunately, the ENE does not include additional personal background characteristics that could improve the predictive power of the analysis. I therefore view the classification described in the following paragraph as a lower bound for how well informal business owners can be grouped into species.

Discriminant analysis

Table 3 reports the results of the logistic discriminant analysis used to classify informal business owners into wage worker and formal business owner species based on the personal characteristics listed in Table 1. This analysis first obtains the combination of personal characteristics that best separates wage workers from formal business owners. It then applies the fitted model to the group of informal business owners, predicting who belongs to the wage worker species and who belongs to the formal business owner species. Panel A of Table 3 displays as check of how successful the fitted model is at classifying individuals into species. When applying the fitted model to the groups of formal business owners and wage workers, it classifies close to 65 percent of each group correctly. For comparison, the richer set of personal background characteristics used in De Mel, McKenzie and Woodruff allows them to classify up to 79 percent of the species groups correctly. Panel B of Table 3 shows that when I apply the fitted model to the group of informal business owners, it classifies about half of them as wage workers and the other half as formal business owners.

3. Business Registration Reform and Hypotheses

I study the impact of a business registration reform in Mexico, the Rapid Business Opening System (SARE), on the occupational choices of informal business owners, keeping in mind their division into wage worker and formal business owner species. SARE simplified local business registration procedures, reducing the average the number of days, procedures, and office visits required to register a business, from 30.1 to 1.4, from 7.9 to 2.7, and from 4.2 to 1, respectively. The reform was organized by a federal agency, the Federal Commission for Improving Regulation (COFEMER), which had to coordinate with municipal governments since many business registration procedures are set locally in Mexico. As a result of this need for coordination, SARE was implemented in different municipalities at different times, starting in May 2002⁷.

Bruhn (2008) shows that the implementation of SARE increased the number of formal business owners by 5 percent. It also increased wage employment by 2.2 percent. However, the results indicate that the increase in formal business owners was due to former wage earners opening businesses. Former informal business owners were not more likely to register their business after the reform. This conclusion is based on the average effect of the reform on all informal business owners in the sample. The paper also separates informal business owners by whether they have any employees or not or by whether they have fixed or mobile premises, but it does not find an effect on business registration for any of these sub-groups of informal business owners.

Bruhn (2008) relied on business characteristics to separate informal business owners into different groups, recognizing that the informal sector is heterogeneous and trying to isolate the informal business owners that would be most likely to register their business after a reform. However, De Mel, McKenzie, and Woodruff suggest that it may be more appropriate to use the personal characteristics of

⁷ Bruhn (2008) includes a more detailed description of the reform.

business owners to classify them according to their potential for becoming formal business owners. This paper thus revisits the earlier results from Bruhn (2008) and examines the impact of SARE separately for informal business owners that belong to the wage worker and formal business owner species, according to the discriminant analysis performed in Section 2. I expect to find that only informal business owners from the formal business owner species are more likely to register their business after the implementation of SARE. In contrast, informal business owners from the wage worker species should be more likely to become wage workers after the reform since the reform also created more jobs.

Testing these hypotheses sheds light on the effect of SARE on firm formalization and transitioning to wage work for different types of informal business owners. At the same time, it provides a test of the classification of informal business owners into wage worker and formal business owner species. That is, if I find that informal business owners from the wage worker (formal business owner) species are more likely to become wage workers (formal business owners) when a reform makes it easier to do so, this confirms the validity of the species classification.

4. Identification Strategy and Transitions into Different Occupations

This paper follows the identification strategy in Bruhn (2008 and 2011) to measure the effects of SARE on business registration and transitions to wage employment of informal business owners. In particular, I exploit the fact that the reform was implemented in different municipalities at different points in time to estimate the following equation

$$y_{ict} = \alpha + \beta_c + \gamma_t + \delta SARE_{ct} + \pi Z_{ict} + \phi EC_{1999} * t + \epsilon_{ict}, \quad (1)$$

where the outcome variable y_{ict} is a dummy variable indicating the occupation (e.g. formal business owner, wage worker) of individual i living in municipality c in quarter t . The regression includes municipality fixed effects, β_c , and quarter fixed effects, γ_t . The variable $SARE_{ct}$ is the reform dummy and,

for each municipality, it is equal to one for the quarter in which the reform was implemented and for all following quarters. Control variables are the set of personal background characteristics used in the species classification exercise in Section 2, Z_{ict} , as well as variables from the 1999 Economic Census, EC_{1999} , interacted with a linear time trend, t . These variables are log GDP per capita, log number of economic establishments per 1,000 capita, log fixed assets per capita, and log investment per capita. The standard errors of the regressions are clustered at the municipality level.

The coefficient δ measures the unbiased impact of SARE on outcomes y_{ict} under the assumption that the time trends of y_{ict} would have been parallel across municipalities in the absence of the reform. Bruhn (2008 and 2011) performs a number of checks suggesting that this assumption holds. Both the levels and the pre-reforms changes in outcomes variables do not display systematic statistical differences across municipalities in the sample. In line with Bruhn (2008 and 2011), the sample used in this paper here only includes the 34 municipalities that adopted SARE by December 2004⁸. Municipalities that adopted the reform later or that have not yet adopted tend to be less comparable to the ones that adopted the reform early.

In order to study the differential effect of SARE on informal business owners in the wage worker and formal business owner species, I make use of the panel structure of the ENE⁹. For the analysis, I only keep the individuals who report being informal business owners when I first observe them in the pre-reform period. The species classification exercise in Section 2 assigns each of these individuals to a species based on the data from their first quarter of observation. I then drop the first quarter of observation for each person and use the remaining data in the regression outlined above, running separate regressions for the wage worker and formal business owner species. The standard errors for

⁸ According to COFEMER's website, by November 2011, 191 municipalities had adopted SARE (<http://www.cofemer.gob.mx/contenido.aspx?contenido=122>).

⁹ The ENE does not track individuals who move away from the location where they were previously surveyed, leading to panel attrition. I checked whether SARE increased panel attrition, which could bias the results, but do not find this to be the case.

these regressions are calculated using a bootstrap procedure with 1,000 repetitions, clustered at the municipality level, to take into account that informal business owner species is a predicted variable. The outcome variables (occupation dummies) in these regressions can be interpreted as occupational transition probabilities. That this, they represent the average fraction of informal business owners that is employed in each occupation during the following quarters¹⁰.

Table 4 displays the probabilities of transitioning into different occupations in the pre-reform period, indicating a high degree of mobility in the informal sector¹¹. Only 55 (44) percent of informal business owners in the formal business owner (wage worker) species remain informal business owners during the following quarters. About 12 percent of individuals in the formal business owner species switch to being formal business owners. This fraction is smaller in the wage worker species (7.3 percent)¹². On the other hand, the wage worker species is more likely to transition into wage work during the following quarters, compared to the formal business owner species. A sizable fraction of each species also ends up not being employed at all during the following quarters. Overall, the transition patterns are consistent with the species classification. Compared to the wage worker species, individuals in the formal business owner species are more likely to remain informal business owners or become formal business owners, as opposed to becoming wage workers or not employed.

As mentioned above, Bruhn (2008 and 2011) performs various tests that suggest that the identification strategy used to measure the effects of SARE is valid. Table 5 contains additional tests for the sample of informal business owners. Columns 1 and 2 display the results from taking only pre-

¹⁰ Some industries were not eligible for SARE. In this paper, I only study the impact of SARE on informal business owners in eligible industries since individuals in non-eligible industries are not able to register their business through SARE. Informal business owners in eligible industries make up 96.5 percent of informal business owners in the ENE.

¹¹ High mobility across occupational sectors has also been observed in earlier work with the Mexican Labor Market Survey (Bosch and Maloney, 2006, and Woodruff, 2007). The labor market is similarly dynamic in Brazil (Bosch and Maloney, 2010).

¹² The data does not allow me to determine for certain whether an owner registers the same business that was previously informal or whether they close the informal business and open a new, formal business. However, I assume that they register the business that was previously informal.

reform data and running a regression of each occupation dummy on a variable that indicates in which quarter the municipality implemented the reform. The coefficients show that pre-reform transition probabilities are not statistically significantly correlated with the quarter of implementation.

Columns 3 and 4 test the parallel trends identification assumption more directly. They show the coefficients from a regression of each occupation dummy variable in the pre-reform period on a time trend, the quarter of implementation variable, and the interaction of the two (scaled by 100). None of the coefficients on the interaction terms are statistically significant, indicating that transition probabilities in the pre-reform period did not display time trends that varied systematically with the quarter of reform implementation.

5. Results

5.1 Reform Impact on Informal Business Owners

Table 6 presents the estimated impacts of SARE on the occupational choices of informal business owners. Column 1 replicates the results from Bruhn (2008 and 2011), grouping all informal business owners together. The coefficients show no impact of SARE on the likelihood of being a formal business owner or a wage earner. However, when I break up informal business owners into the two different species, more nuanced results emerge.

Column 3 of Table 6 shows that informal business owners from the wage worker species are less likely to become formal business owners after the reform, but they are more likely to become wage earners. The latter finding is in line with my hypotheses and with the fact that SARE created more wage jobs in eligible sectors, as shown in Bruhn (2008 and 2011). Kaplan, Piedra and Seira (2007) also find that SARE increased the creation of formal jobs registered with the Mexican Social Security Institute (IMSS). The positive effect of SARE on transitions to wage work for individuals in the wage earner species is only statistically significant for wage jobs that provide a contract. The magnitude of this effect is equivalent

to a 22.3 percent (0.011/0.049) increase in the fraction of individuals from the wage worker species that transfer to being wage workers during the following quarters. The finding that informal business owners transition to formal jobs, i.e. jobs that provide a contract, is consistent with anecdotal evidence suggesting that a higher degree of income security is among the advantages that some informal business owners associate with wage jobs¹³.

One possible reason why individuals from the wage worker species are less likely to become formal business owners due to the reform is that they have a preference for working as wage earners rather than business owners. Another possibility is that they face increased competition from the individuals in the formal business owner species who transitioned to being formal business owners due to SARE, as discussed below. These individuals are plausibly better at running a formal business and may prevent entry into the formal sector of informal business owners from the wage earner species.

The findings for informal business owners from the formal business owner species are less clear. The results in Column 2 of Table 6 indicate that they are more likely to register their business due to the reform, but this effect is not statistically significant. To examine this result further, I study whether the effect of the reform on informal business owners from the formal business owner species varies across municipalities. In particular, the size of this effect is likely to depend on the overall constraints to formal entrepreneurship in a municipality. To gauge the size of these constraints, I use a measure of pre-reform misallocation across occupations. The discriminant analysis in Section 2 classifies some wage workers as registered business owner types (see Table 3). These individuals may be misallocated in their current occupation since their characteristics suggest that they should be registered business owners instead. The fraction of wage workers in a municipality that is classified as registered business owners could thus reflect the constraints to setting up a formal business in that municipality. This fraction varies between 0.223 and 0.392 in my sample. I divide municipalities into two groups, according to whether they have

¹³ Based on ten case studies of informal business owners conducted for the author in Puebla, Mexico, in 2009.

above or below median pre-reform constraints to formal entrepreneurship (as measured by the level of misallocation among wage workers), where the median is 0.352.

Table 7 shows the effect of the reform on informal business owners from the formal business owner species broken down by pre-reform constraints to formal entrepreneurship. Column 1 uses the full set of municipalities, for reference purposes, and displays the same effect of the reform on business formalization as also shown in Table 6. Column 2 only includes municipalities with below median pre-reform constraints to formal entrepreneurship and Column 3 includes municipalities with above median constraints to formal entrepreneurship¹⁴. The results show that the reform had no effect on firm formalization among informal business owners from the formal business owner species in municipalities with low pre-reform constraints to entrepreneurship. In municipalities with high pre-reform constraints, however, informal business owners from the formal business owner species are statistically significantly more likely to become formal business owners due to the reform. The size of this effect is equal to an increase of 0.031 in the pre-reform transition probability of becoming a formal business owner listed in Table 4 (0.118). Thus, in municipalities with high pre-reform constraints to formal entrepreneurship, the reform caused 14.9 percent instead of 11.8 percent of informal business owners to become formal business owners over the following quarters. This effect is equivalent to a 26.2 percent increase in the transition probability (0.017/0.118).

5.2 Robustness Test of Species Classification: Reform Impact on Wage Workers

This section further tests the predictive power of the species classification by examining the reform impact on different species of wage workers. Bruhn (2008 and 2011) shows that the business registration reform in Mexico caused some wage workers to become registered business owners and

¹⁴ The sample size is not the same in Columns 2 and 3 since different municipalities include different numbers of observations in the data.

that this effect is being driven by wage workers without a contract. Columns 1 through 3 of Table 8 replicate these results.

I then apply the species classification to the group of wage workers without a contract to check whether the reform caused the ones who are registered business owner types vs. wage worker types to set up businesses. The results in Columns 4 and 5 of Table 8 suggest that the effect of the reform is three times as large for wage workers from the registered business owner species as it is for wage workers from the wage worker species, although neither of the coefficients is statistically significant. Following the analysis in Table 7, I also examine whether the effect on formal business creation by wage workers in the formal business owner species differs across municipalities with low and high pre-reform constraints to formal entrepreneurship. Similarly to the results for informal business owners, Column 6 and 7 of Table 8 show that wage workers from the formal business owner species in municipalities with low pre-reform constraints to entrepreneurship are not more likely become formal business owners after the reform. In contrast, in municipalities with high pre-reform constraints to formal entrepreneurship, wage workers from the formal business owner species are significantly more likely to open registered businesses due to the reform.

Overall, these findings confirm that the species classification can successfully predict who is more likely to open a business when it becomes easier to do so. In addition, they suggest that the reform led to a more efficient allocation across occupations for individuals who were wage workers in the pre-reform period.

6. Conclusion

This paper uses discriminant analysis to separate informal business owners into a species that has characteristics similar to formal business owners and another species that has characteristics similar to wage workers. The analysis classifies about half of the sample into each group. I then examine the

impact of a business registration reform in Mexico on these two species. The results show that informal business owners from the wage worker species are less likely to become formal business owners after the reform, but they are 22.3 percent more likely to become wage workers. This is consistent with the finding in Bruhn (2008 and 2011) that the reform led to job creation. Informal business owners from the formal business owner species are 26.2 percent more likely to register their business after the implementation of the reform in municipalities with high pre-reform constraints to formal entrepreneurship. In other municipalities, the reform had no effect on the formalization of informal business owners from the formal business owner species.

Although the reform in Mexico had positive effects, the fraction of informal business owners transitioning to being formal business owners (14.9 percent in the formal business owner species) or wage workers with a contract (6 percent in the wage worker species) after the reform is still relatively small. One reason for the small size of the effects could be that the reform studied in this paper only simplifies obtaining a municipal license, which is the second step in the formalization process. Firms need to register with the federal tax authority first before registering for a municipal license. In addition, depending on their industry and whether they have employees or not, firms may have to complete other types of registrations, such as social security and health ministry registration, after they obtain a municipal license.

The process of registering with the federal tax authority was simplified just before the municipal reform I study was introduced and this process can be completed online. That is, the registration process for federal taxes should not be a binding constraint. However, the prospect of having to pay taxes likely is a constraint and probably an important reason why not more firms register (see also Fajnzylber, Maloney, and Montes-Rojas, 2011). In addition, registration procedures with social security and other entities have not been simplified, as far as I am aware. These procedures could be another

reason why not more firms registered in response to the municipal licensing reform, although compliance with these registrations is not universal.

Another reason why not more informal business owners transitioned to formality due to reform may be that two events occurred in Mexico at about the same time as the reform that both lowered the relative benefits formality. First, a new commercial bank, *Banco Azteca*, opened close to 800 branches in October 2002. Access to credit from commercial banks is often considered to be one benefit of formalization. Commercial banks tend to charge lower interest rates than other sources of credit, such as microfinance institutions or money lenders, but they also have more stringent documentation requirements. *Banco Azteca*, however, was able to provide loans with low documentation requirements and with interest rates that were lower than those charged by non-bank lenders thanks to its unique business model and synergies with its affiliated retail chain *Elektra*. The opening of *Banco Azteca* led to a large increase in the amount of credit available to informal business owners (Bruhn and Love, forthcoming), implying that businesses did not have to formalize anymore to access lower cost sources of credit from commercial banks.

Second, in 2002, the Mexican government introduced a public health insurance program for individuals without formal social security, called *Seguro Popular*. This program may provide incentives to remain in the informal sector since it lowers the relative benefits of obtaining a job that provides formal social security (Levy, 2008). In fact, Aterido, Hallward-Driemeier and Pagés (2011) show that *Seguro Popular* is associated with a reduction in the inflow of workers into formal jobs.

Even though the estimated effects of the reform are small, the results in this paper support the argument that the informal sector consists of different types of business owners. Some operate informally due to stringent regulation and simplifying regulation can entice them to register their business. Others run informal businesses while they are looking for a job and they switch to being wage earners when more job opportunities arise. This heterogeneity among informal firms may be one reason

why a randomized control trial from Peru that tries to encourage informal firm registration through financial and technical assistance with the licensing process finds that only one out of four informal firms take up this incentive (Jaramillo, 2009). Some of the remaining informal business owners may prefer to become wage earners instead. Take-up rates of these types of program could potentially be improved by screening participating informal business owners first. As shown in this paper, even basic background characteristics can provide an insight into which informal business owners are more likely to formalize their business vs. become wage earners.

Overall, policy interventions that try to reduce the size of the informal sector may need to target both firm formalization and job creation. The business registration reform in Mexico did both since it also incentivized former wage earners to open new formal businesses, thus freeing up wage jobs and creating additional formal jobs (Bruhn 2008 and 2011, and Kaplan, Piedra and Seira, 2007).

References

- Amin, Mohammad. 2010. "Labor Productivity in the Informal Sector: Necessity Vs. Opportunity Firms." The World Bank, mimeo.
- Aterido, Reyes, Mary Hallward-Driemeier, and Carmen Pagés. 2011. "Does Expanding Health Insurance beyond Formal-Sector Workers Encourage Informality? Measuring the Impact of Mexico's *Seguro Popular*." World Bank Policy Research Working Paper No. 5785.
- Bennett, John and Saul Estrin. 2009. Entrepreneurial entry in developing economies. In R. Kanbur & J. Svejnar (Eds.), *Labour markets and economic development*. Abingdon, UK: Routledge.
- Bennett, John. 2010. "Informal firms in developing countries: entrepreneurial stepping stone or consolation prize?" *Small Business Economics* 34(1): 53-63.
- Bosch, Mariano and William F. Maloney. 2006. "Gross worker flows in the presence of informal labor markets: the Mexican experience 1987-2002" World Bank Policy Research Working Paper No. 3883.
- Bosch, Mariano and William F. Maloney. 2010. "Comparative Analysis of Labor Market Dynamics using Markov Processes: An Application to Informality." *Labor Economics*, 17(4): 621-631.
- Bruhn, Miriam. 2008. "License to Sell: The Effect of Business Registration Reform on Entrepreneurial Activity in Mexico." World Bank Policy Research Working Paper No. 4538.
- Bruhn, Miriam. 2011. "License to Sell: The Effect of Business Registration Reform on Entrepreneurial Activity in Mexico." *Review of Economics and Statistics*, 93(1): 382-386.
- Bruhn, Miriam and Inessa Love. "The Real Impact of Improved Access to Finance: Evidence from Mexico." *The Journal of Finance*, forthcoming.
- De Mel, Suresh, David McKenzie, and Christopher Woodruff. 2010. "Who Are the Microenterprise Owners? Evidence from Sri Lanka on Tokman v. de Soto." in *International Differences in Entrepreneurship*, J. Lerner and A. Schoar (eds.), pp.63-87.
- De Soto, Hernando. 1989. *The Other Path: The Invisible Revolution in the Third World*, New York, NY: Harper & Row.
- Djankov Simeon, Edward Miguel, Yingyi Qian, Gerard Roland, and Ekaterina Zhuravskaya. 2005. "Who are Russia's Entrepreneurs?" *Journal of the European Economic Association*, Vol 3(2-3), pp. 1-11.
- Djankov, Simeon, Yingyi Qian, Gerard Roland, and Ekaterina Zhuravskaya. 2006. "Entrepreneurship in Brazil, China, and Russia." CEFIR Working Paper No. w0066.
- Fajnzylber, Pablo, William F. Maloney, and Gabriel V. Montes-Rojas. 2011. "Does formality improve micro-firm performance? Evidence from the Brazilian SIMPLES program." *Journal of Development Economics* 94 (2): 262-276.
- Fields, Gary, 1975, "Rural-Urban Migration, Urban Unemployment and Underemployment, and Job Search Activities in LDC's." *Journal of Development Economics*, Vol. 2, pp. 165-88.

- Fields, Gary, 2004, "A Guide to Multisector Labor Market Models," Working paper, Cornell University.
- Hsieh, Chang-Tai and Peter J. Klenow. 2009. "Misallocation and Manufacturing TFP in China and India." *The Quarterly Journal of Economics*, 124(4): 1403-48.
- IFC (International Finance Corporation). 2010. MSME Country Indicators. <http://www.ifc.org/ifcext/globalfm.nsf/Content/MSME-CountryIndicators>
- Jansson, Tor, and Geoffrey Chalmers. 2001. "The Case for Business Registration Reform in Latin America." IADB Sustainable Development Department Best Practices Series, MSM-110.
- Jaramillo, Miguel. 2009. "Is there Demand for Formality among Informal Firms? Evidence from microfirms in downtown Lima." Deutsches Institut für Entwicklungspolitik Discussion Paper 12/2009
- La Porta, Rafael and Andrei Shleifer. 2008. "The Unofficial Economy and Economic Development." NBER Working Paper No. 14520.
- . 2011. *The Unofficial Economy in Africa*. NBER Working Papers 16821, National Bureau of Economic Research, Inc.
- Levy, Santiago. 2008. *Good Intentions, Bad Outcomes: Social Policy, Informality, and Economic Growth in Mexico*. Brookings Institution Press.
- Kaplan David, Eduardo Piedra, and Enrique Seira. 2007. "Entry Regulation and Business Start-ups: Evidence from Mexico." World Bank Policy Research Working Paper No. 4322.
- Maloney, William. 1999. "Does informality imply Segmentation in Urban Labor Markets? Evidence from Sectoral Transitions in Mexico." *World Bank Economic Review*, 13 (2): 275-302.
- Maloney, William. 2004. "Informality Revisited." *World Development*, 32 (7): 1159-1178.
- McKenzie, David, and Yaye Seynabou Sakho. 2010. "Does it pay firms to register for taxes? The impact of formality on firm profitability." *Journal of Development Economics* 91 (1): 15-24.
- McCulloch, Neil, Günther G Schulze, and Janina Voss. 2009. *What Determines Firms' Decisions to Formalize? Empirical Evidence from Rural Indonesia*. Proceedings of the German Development Economics Conference, Frankfurt a.M. 2009. Verein für Socialpolitik, Research Committee Development Economics.
- OECD (Organisation for Economic Co-operation and Development). 2009. "Is Informal Normal? Towards More and Better Jobs in Developing Countries," Edited by Johannes P. Jütting and Juan R. de Laiglesia.
- Perry, Guillermo, William Maloney, Omar Arias, Pablo Fajnzylber, Andrew Mason and Jaime Saavedra. 2007. *Informality: Exit and Exclusion*. World Bank Latin America and Caribbean Studies: World Bank, Washington D.C.
- Straub, Stéphane. 2005. "Informal Sector: The Credit Market Channel." *Journal of Development Economics* 78: 299-321.

Tokman, Victor. 1992. *Beyond Regulation: The Informal Sector in Latin America*. Bolder: Lynne Rienner Publishers.

Woodruff, Christopher, 2007, "Self Employment: Engine of Growth or Self-Help Safety Net?" in Paci and Serneels, Eds., *Employment and Shared Growth*. Washington, DC: The World Bank.

Appendix A. Definition of Occupation Variables

Not Employed Dummy: The not employed dummy is equal to one minus a dummy for being employed, where someone who is employed either

1. Worked for pay for at least one hour during the past week, or
2. Was on paid vacation, leave or on strike during the past week, or
3. Didn't work during the past week for other reasons, but has a job and will return to work within one month, or
4. Helped somebody else without pay in their business.

Conceptually, the not employed dummy thus covers both individuals who are out of the labor force and those who are unemployed.

The following occupation dummies are coded based on the occupation that the respondent considers to be their main job. About three percent of the sample declares having more than one job.

Wage Earner Dummy: This dummy is equal to one for people who

1. Are employed according to the definition above, and
2. Who chose the option of "worker" or "member of a cooperative" as the answer to the question about which position they held in their main job.

Among wage earners, I further distinguish between the ones who have and don't have a contract, based on a question that asks "Under what type of contract did you work in your main job during the past week?" Possible answers are (1) open ended written contract (2) written contract for fixed amount of time (3) verbal contract (4) other. Wage workers who report options (1) or (2) are classified as "with contract" and wage workers who choose option (3) or (4) are classified as "without contract".

Formal and Informal Business Owner Dummies: The formal business owner dummy is equal to one for people who

1. Are employed according to the definition above, and
2. Chose the option of "boss" or "self-employed" as the answer to the question about which position they held in their main job, and
3. Are classified into category 2 or 4 of the survey question "What is the name of your business?" The instructions to interviewers specify that the word "name" here refers to the legal name under which the business is registered with the authorities. After asking this question, the interviewer has to further classify the business into one of the following categories 1) state-owned company, 2) industrial,

commercial or services chain, 3) cooperative or trade union, 4) any other economic entity with name and/or register, 5) business owner or self-employed whose business does not have any (legal) name and/or register, 6) worker in a business without (legal) name and/or register, 7) worker in the US. All “bosses” or “self-employed” in my sample have values 2, 4, 5, or 7 for this question. I drop individuals with value 7. For category 4, the instructions tell the interviewer that any type of official registration is sufficient, such as federal tax registration, health ministry registration, or municipal government registration. Since the business registration reform studied in this paper simplifies obtaining a municipal license, I would ideally like to know whether the firm has a municipal registration only, which is unfortunately not observable in the data. Firms need to register with the federal tax authority first before registering for a municipal license, implying that my measure may overstate the number of firms registered with the municipal government. Other types of registrations, such as the health ministry registration typically come after registration with the municipal authorities, meaning that these types of registrations capture what is relevant for this study. An additional caveat is that the instructions also specify that anybody with a professional license who has an unregistered business should be classified as registered here. Note that neither tax registration nor professional licensing should change due to the reform (unless a business gets registered for taxes since the owner also wants to register it for a municipal license), meaning that the estimated effect of the reform on the number of registered businesses should only come from additional businesses with municipal licenses.

People who comply with criteria 1 and 2, but are classified into category 5 (business owner or self-employed whose business does not have any (legal) name and/or register) under the survey question, “What is the name of your business?” make up the group that I call “informal business owners”.

Table 1: Personal Background Characteristics

	Averages and standard deviations (in brackets)		
	Informal business owners	Formal business owners	Wage workers
Age	40.830 (11.702)	41.178*** (10.796)	34.271*** (34.271)
Female	0.361 (0.480)	0.274*** (0.446)	0.400*** (0.490)
Highest education level			
Primary	0.314 (0.464)	0.196*** (0.397)	0.195*** (0.396)
Secondary	0.210 (0.408)	0.213 (0.410)	0.259*** (0.438)
High school	0.132 (0.339)	0.209*** (0.406)	0.250*** (0.433)
University	0.036 (0.185)	0.280*** (0.449)	0.190*** (0.392)
Married	0.721 (0.449)	0.789*** (0.408)	0.620*** (0.485)
Head of household	0.594 (0.491)	0.690*** (0.463)	0.465*** (0.499)
Migrant	0.226 (0.418)	0.261*** (0.439)	0.229 (0.420)
Observations	32,368	34,285	205,984

Notes: The sample includes individuals in their first quarter of observation in the Mexican Labor Market Survey (ENE) before the business registration reform was implemented in the municipality where the individual lives. The stars on the averages for formal business owners and wage workers denote the statistical significance level of the difference in averages compared to informal business owners. Significance levels: *10 percent, **5 percent, ***1 percent.

Table 2: Logistic Regressions

	Informal vs. formal business owners	Informal business owners vs. wage workers	Formal business owners vs. wage workers
	(1)	(2)	(3)
Age	-0.005*** (0.000)	0.003*** (0.000)	0.005*** (0.000)
Female	0.027*** 0.006	0.002 0.002	-0.027*** 0.002
Highest education level			
Primary	-0.179*** (0.006)	-0.032*** (0.001)	0.035*** (0.003)
Secondary	-0.308*** (0.005)	-0.069*** (0.001)	0.045*** (0.003)
High school	-0.386*** (0.005)	-0.095*** (0.001)	0.055*** (0.003)
University	-0.552*** (0.003)	-0.136*** (0.001)	0.099*** (0.003)
Married	-0.083*** (0.005)	0.016*** (0.001)	0.037*** (0.002)
Head of household	-0.074*** (0.006)	0.010*** (0.002)	0.036*** (0.002)
Migrant	0.000 (0.005)	-0.002 (0.001)	-0.005*** (0.001)
Pseudo R2	0.151	0.111	0.079
Observations	66,653	238,352	240,269

Notes: The sample includes individuals in their first quarter of observation in the Mexican Labor Market Survey (ENE) before the business registration reform was implemented in the municipality where the individual lives. Coefficients are marginal effects from a logit regression. Robust standard errors in parentheses. The omitted education category is less than primary education. Significance levels: *10 percent, **5 percent, ***1 percent.

Table 3: Species Classification

Panel A: Formal business owner and wage worker samples	
% of formal business owners correctly classified	65.41
% of wage workers correctly classified	64.09
Panel B: Informal business owner sample	
% classified as formal business owner	49.37
% classified as wage worker	50.63

Table 4: Transition Probabilities in Pre-Reform Period

Average fraction of informal business owners that is employed in each occupation during the following quarters		
	Species:	
	Formal business owner	Wage worker
Informal business owner	0.551	0.441
Formal business owner	0.118	0.073
Wage worker	0.154	0.228
with contract	0.037	0.049
without contract	0.117	0.179
Not employed	0.137	0.225

Notes: This table only includes informal business owners in SARE eligible industries. About 4 percent of these individuals transition to occupations in non-eligible industries (mostly to being wage workers). These transition probabilities are not reported above, which is why the probabilities in the table do not add up to one.

Table 5: Are Pre-Reform Transition Probabilities Correlated with SARE Implementation Dates?

Dependent variables: Occupation dummies	Coefficient on quarter of implementation		Coefficient on quarter of implementation interacted with a time trend	
	Species:			
	Formal business owner	Wage worker	Formal business owner	Wage worker
	(1)	(2)	(3)	(4)
Informal business owner	0.007 (0.004)	0.003 (0.004)	0.010 (0.080)	0.026 (0.076)
Formal business owner	-0.004 (0.003)	-0.003 (0.002)	0.009 (0.050)	-0.006 (0.034)
Wage worker	-0.002 (0.002)	0.000 (0.002)	-0.037 (0.035)	-0.009 (0.045)
with contract	-0.002 (0.002)	-0.002 (0.002)	-0.031 (0.027)	-0.028 (0.023)
without contract	-0.000 (0.002)	0.002 (0.002)	-0.005 (0.028)	0.019 (0.040)
Not employed	0.001 (0.002)	0.000 (0.002)	0.026 (0.035)	0.001 (0.044)

Notes: This table only includes informal business owners in SARE eligible industries and all occupation dummy variables refer to eligible industries. All regressions use only pre-reform data. Columns 1 and 2 display the results from running a regression of each occupation dummy on a variable that indicates in which quarter the municipality implemented the reform. Columns 3 and 4 show the coefficients from a regression of each occupation dummy variable on a time trend, the quarter of implementation variable, and the interaction of the two (scaled by 100). Bootstrapped standard errors, based on 1,000 replications clustered at the municipality level, in parentheses. Significance levels: *10 percent, **5 percent, ***1 percent.

Table 6: Reform Impact on Informal Business Owners

Dependent variables: Occupation dummies	Coefficients on SARE dummy		
	Species:		
	All	Formal business owner	Wage worker
	(1)	(2)	(3)
Informal business owner	0.013 (0.013)	0.022 (0.013)	0.003 (0.019)
Formal business owner	-0.000 (0.006)	0.013 (0.010)	-0.014** (0.007)
Wage worker	-0.000 (0.008)	-0.013 (0.010)	0.013 (0.013)
with contract	0.002 (0.003)	-0.005 (0.005)	0.011* (0.006)
without contract	-0.003 (0.007)	-0.008 (0.008)	0.003 (0.011)
Not employed	-0.010* (0.005)	-0.018** (0.007)	-0.001 (0.009)
Observations	81,980	42,125	39,855

Notes: This table only includes informal business owners in SARE eligible industries and all dependent variables refer to eligible industries. Regressions include quarter and municipality fixed effects, the personal background characteristics listed in Table 1, as well as 1999 Economic Census variables at the municipality level interacted with a linear time trend. Column 1: Robust standard errors, clustered at the municipality level, in parentheses. Columns 2 and 3: Bootstrapped standard errors, based on 1,000 replications clustered at the municipality level, in parentheses. Significance levels: *10 percent, **5 percent, ***1 percent.

Table 7: Reform Impact on Informal Business Owners from the Formal Business Owner Species by Pre-Reform Constraints to Formal Entrepreneurship

	Coefficient on SARE dummy		
	Municipalities:		
	All	Low pre-reform constraints to formal entrepreneurship	High pre-reform constraints to formal entrepreneurship
	(1)	(2)	(3)
Dependent variable: Occupation dummy			
Formal business owner	0.013 (0.010)	-0.013 (0.018)	0.031*** (0.010)
Observations	42,125	14,703	27,422

Notes: This table only includes informal business owners from the formal business owner species in SARE eligible industries. The dependent variable refers to formal businesses in eligible industries. Pre-reform constraints to formal entrepreneurship are measured as share of wage workers in a municipality who are classified as formal business owner types as opposed to wage worker types. Low and high constraints refer to above and below the median share (0.352). Regressions include quarter and municipality fixed effects, the personal background characteristics listed in Table 1, as well as 1999 Economic Census variables at the municipality level interacted with a linear time trend. Bootstrapped standard errors, based on 1,000 replications clustered at the municipality level, in parentheses. Significance levels: *10 percent, **5 percent, ***1 percent.

Table 8: Reform Impact on Wage Workers

	Coefficient on SARE dummy						
	Subsample:						
	Wage workers without contract						
	Formal business owner species						
	Municipalities:						
Dependent variable:	All wage workers	Wage workers with contract	All	Wage worker species	All	Low pre-reform constraints to formal entrepreneurship	High pre-reform constraints to formal entrepreneurship
Occupation dummy	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Formal business owner	0.003* (0.001)	0.001 (0.001)	0.006* (0.003)	0.003 (0.003)	0.012 (0.008)	0.004 (0.020)	0.014** (0.007)
Observations	517,797	353,764	164,033	115,501	48,532	17,022	31,510

Notes: This table includes individuals who were wage workers in the pre-reform period. The dependent variable refers to formal businesses in eligible industries. Pre-reform constraints to formal entrepreneurship are measured as share of wage workers in a municipality who are classified as formal business owner types as opposed to wage worker types. Low and high constraints refer to above and below the median share (0.352). Regressions include quarter and municipality fixed effects, the personal background characteristics listed in Table 1, as well as 1999 Economic Census variables at the municipality level interacted with a linear time trend. Columns 1 to 3: Robust standard errors, clustered at the municipality level, in parentheses. Columns 4 to 7: Bootstrapped standard errors, based on 1,000 replications clustered at the municipality level, in parentheses. Significance levels: *10 percent, **5 percent, ***1 percent.