

The Impact of Business Environment Reforms on New Firm Registration

Leora Klapper and Inessa Love*

June, 2011

Abstract: This paper uses panel data on the number of new firm registrations in 92 countries to study how the ease of registering a business and the magnitude of registration reforms affect new firm registrations. We find that the costs, days and procedures required for starting a business are important predictors of new firm registration. However, we find that small reforms, in general less than a 40 percent reduction in costs, days, or procedures, do not have a significant effect on new firm creation. We also find important synergies in multiple reforms of two or more business environment indicators. Finally, we show that countries with relatively weaker business environments prior to reforms require relatively larger reforms in order to impact the number of newly registered firms.

JEL Classification: G18, G38, L51, M13

Key Words: Entrepreneurship, Economic Development, Business Environment, Reforms

* Klapper and Love are in the Finance and Private Sector Development Team in the Development Research Group at the World Bank. We thank the Ewing Marion Kauffman Foundation and the World Bank Group for financial support. This paper was prepared with outstanding assistance from Douglas Randall. Thanks to Mary Hallward-Driemer, David McKenzie, and Andrei Mikhneiv for helpful comments. This paper's findings, interpretations, and conclusions are entirely those of the authors and do not necessarily represent the views of the World Bank, their Executive Directors, or the countries they represent. Corresponding author: Inessa Love, E-mail: ilove@worldbank.org Address: 1818 H St. NW, Washington, DC, 20035, Phone: 1-202-458-0590, Fax: 1-202-522-1155.

1. Introduction

Entrepreneurship is essential for the continued dynamism of the modern market economy and a greater entry rate of new businesses can foster competition and innovation (Klapper, et al., 2007; Aghion, et al., 2009; Ciccone and Papaioannou, 2007). To promote new firm registrations, many countries have focused on simplifying the registration process, seeking to reduce the costs, days or procedures required to register a business.

A methodology for measuring the effectiveness of firm registration process was originally developed by Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2002). Since 2003, the World Bank's annual Doing Business report has used this methodology to quantify the registration process in over 170 countries in its "Ease of Starting a Business" section.¹ An outstanding question, however, is whether, and to what degree, there exists an economically meaningful relationship between the costs, days and procedures to start a business and the actual number of new firms that register each year. Given the widespread recognition of the importance of business environment reforms², it is surprising that there is little research, and no cross-country panel analyses, on the real effect of these regulatory reforms. This paper aims to address this gap in the literature by examining the impact of institutional reforms on the number of new firm registrations.

Understanding the regulatory environment that promotes entrepreneurship is necessary to successfully identify appropriate policies to foster entrepreneurship in local economies. In this paper we empirically investigate the relationship between the ease of registering a business and actual new business registrations. Next, we explore the magnitude of reform in entry regulation

¹ Reports are available on-line at: www.doingbusiness.org.

² For instance, a 2008 report of the Multilateral Donor Committee for Enterprise Development states, "Reforming the business environment is a priority for development agencies and governments because of the significant influence the business environment has on the development of the private sector and therefore on economic growth and the generation of livelihoods and jobs." (DCED, 2002, p.3)

required for a significant impact on new firm registration. A priori, it is not clear what magnitude of reduction in costs (or other parameters such as days or procedures) is necessary to cause a significant impact on firm registration. In other words, what exactly constitutes a reform? Is a 20% reduction in the costs of registration sufficient or is a 50% reduction necessary to encourage a statistically significant number of firms to register? We further examine the effect of simultaneous and sequential reforms across measures of entry regulation. Finally, we examine how the impact of reform depends on the level of regulation prior to the reform.

We use a dataset that is uniquely suited for this purpose: The *World Bank Entrepreneurship Snapshots* (WBES) – a cross-country, time-series panel dataset on the number of newly registered limited liability firms. We supplement this dataset with information from Doing Business reports on the cost, time and number of procedures required for the registration of new companies. Importantly, both datasets focus comparably on only limited liability firms.

Our results show that the costs, days and procedures required for business registration are important predictors of new firm registration over time. However, small reforms, in general less than 40%, do not have a significant effect on new firm registration. In addition, reforms in multiple indicators (e.g. cost and time in setting up a business) have a larger impact on business registration and simultaneous reforms have a larger impact than sequential reforms. Furthermore, we find that a country's initial conditions matter: Reforms are more effective in countries with better pre-existing conditions for registering a business.

We offer a simple model to motivate our empirical strategy. The model demonstrates how some reforms could be classified as small or large depending on the relative magnitude of costs and benefits of registration. Our results imply that in countries with high initial registration costs, the benefits of registration are significantly below the costs of registration, likely because

of limited access to finance or rigid labor markets. This is consistent with Djankov et al. (2002) who show that high registration costs do not serve public interest, but only benefit politicians and bureaucrats.

Our study is related to literature which shows that entrepreneurship can foster competition and economic growth (Barseghyan, 2008; Klapper, et al., 2006; Djankov, et al., 2006; Black and Strahan, 2002; Hause and Du Rietz, 1984) and a reduction in informality (Antunes and Cavalcanti, 2009; Dabia-Norris, et al., 2008). Many studies have concluded that new firms are the ones most likely to grow (Lingelbach, et al., 2005; Johnson, et al., 2000) and to create new jobs (Audretsch, et al., 2006; McMillan and Woodruff, 2002). For example, studies using longitudinal data sets on the evolution of firm formation document that economic growth in both Canada and the U.S. is driven by new formal business entry rather than by the growth of existing firms (Brander, et al., 1998; Haltiwanger, 2009). In many developing and transition countries, where there was no significant private sector to start out with, new firms often strengthened reforms by improving economic conditions, as for instance in China (McMillan and Woodruff, 2002).

Previous cross-country studies have found that new firm creation is significantly related to country-level indicators of economic development and growth, the quality of the legal and regulatory environment, ease of access to finance, and prevalence of informality (Klapper, et al., 2010; Ardagna and Lusardi, 2010). Costly regulations may also impede the setting up of a businesses and stand in the way of economic growth (De Soto, 1990; Djankov et al., 2002, Bruhn, 2009). Furthermore, countries with higher entry costs have more corruption and larger unofficial economies (Djankov et al., 2002). Recent studies, however, have cast doubt on the relationship between Doing Business measures and the real world business environment as

perceived by actual business owners (Hallward-Driemeier and Pritchett, 2010). This paper helps to reconcile this recent skepticism with an analysis of the relevance of Doing Business measures using a real-world output: new firm registrations.

Importantly, this paper offers policymakers empirically-based insight into the impact of the reform process on new firm creation. For instance, insufficiently large reforms may not have the intended impact on firm registrations, resulting in a potential misallocation of money and political capital. These results can help policymakers to design interventions with the biggest impact on private sector growth.

The paper proceeds as follows. Section 2 discusses methodology that motivates our empirical strategy. Section 3 discusses our data and shows summary statistics, Section 4 shows our results, and Section 5 concludes.

2. Methodology

2.1. Theoretical intuition

We begin with a simple model of formal business registration that guides our empirical strategy. We then suggest ways to classify reforms to starting a business. In the next section, we investigate empirically the varying impact of various classifications of reforms on new firm registrations.

Assume there is a benefit to the firm of registering as a formal business (versus operating informally). This benefit might be increased access to finance, a sales tax ID to attract larger or foreign customers, better contract terms with suppliers or customers, or a reduced risk of governmental sanctions. Suppose the total sum of benefits can be represented by monetary amount b .

On the other side, there are costs to registering a formal business, such as official and non-official payments, personnel and managerial time spent dealing with required procedures, and minimum capital requirements that need to be met.³ Suppose the total cost is represented by c , which also includes the monetary value of employee time and the time value of any delays. Clearly, the firms will only chose to register when the total benefits of registration exceed total costs, i.e. $c < b$.

Since benefits can vary from firm to firm, it follows then, that there should be a negative relationship between the costs of registering a business and the number of new businesses registered. This negative relationship is our first testable hypotheses.

Suppose there is a reform that affects the costs of registering a business. This could be a reduction in required direct fees, or a reduction in the number of procedures, that can be translated to a reduction in costs because of personnel time savings. Assume that before the reform the costs are equal to $c0$, and after the reform the total cost is $c1$, which is lower than $c0$ (i.e., $c1 < c0$). The reform will only lead to new formal sector registration when post-reform costs fall below the benefits to registration, i.e. $c1 < b$.

Put another way, the reform might be effective in inducing new business registrations or not effective, depending on the relative magnitude of parameters b , $c0$ and $c1$. Specifically, there are two possible cases, which we refer to as a “small reform” or a “large reform”:

Small reform: $b < c1 < c0$

Large reform: $c1 < b < c0$

In other words, if the reform is “small” the reduction in costs is insufficient to fall below the benefits, and therefore no significant increase in new registrations will be observed. In the case of a “large” reform, the costs fall below the benefits and there will be a significant increase

³ We ignore the costs of tax payments that firms may incur after registration since we do not have data on tax payments.

in new registrations. An important assumption in our model is that only the costs change, while the benefits remain unchanged. For example, we assume that the government will not simultaneously raise taxes on formally registered businesses as it reduces the costs of registrations.

Clearly, different firms will have different benefits from registration. In other words, instead of a single benefit parameter there is a distribution of firms with various benefits. In this case b can denote the average benefit. In case the benefits are distributed uniformly, the relationship between reduction in costs and new registrations is likely to be linear – i.e. small registration improvements will lead to small increases in new registration and large improvements lead to large increases in registration.

However, if the distribution of benefits is non-uniform - i.e. if there is some mass around the average benefit, for example as in a normal distribution, the relationship between costs reduction and new registration will be non-linear. In this case the reform will be large if the costs fall below the average benefit. Thus, there may exist some threshold before which reforms have little or no impact, and after which reforms have a significant impact on new firm registrations.

So far we have shown that the impact of a reform will depend on both the relative benefits of registration and the relative reduction in costs. Both parameters are likely to vary across countries. For instance, in countries with less developed financial systems, the benefit of formal sector financing might be less accessible. In addition, some countries might only reduce registration fees by 20% while other countries might reduce fees by 50%.

To summarize, we expect that when starting costs are significantly reduced, the cost of registrations for some firms will move below the expected benefits of formal sector registration, and these firms will chose to register under the new reformed regime. The empirical tests that

follow will identify the magnitude of reforms necessary for a significant increase in the number of newly registered firms.

2.2. Empirical Strategy

Our empirical tests take advantage of cross-country and over-time variation in registration costs, time, procedures, and minimum capital requirements, in order to determine what changes in the registration process result in the most significant increase in the number of newly registered firms.

First, we test whether there exists the predicted negative relationship between regulatory barriers in starting a business and registrations. To do that we run a simple model of new firm registrations on our regulatory indicators, while capturing any country-specific unobservable factors with country fixed effects.

Second, we investigate what magnitude of reforms produce the most significant changes in newly registered businesses. Specifically, we measure reforms (the move from $c0$ to $c1$) as the percent change over time in the Doing Business ‘Starting a Business’ parameters. We also construct various indicators of ‘reform’ along the percent change continuum, using discrete cutoffs; for instance, countries that reduced costs by more than 20% (‘Reform_20’), countries that reduced costs by more than 30% (‘Reform_30’), and so on. For each of the cutoffs, we classify countries as treated (reformers, defined as change below the cutoff) or controls (non-reformers, change above the cutoff).

Our empirical strategy here is to use a difference-in-difference estimation to test the effect of one indicator of reform (e.g. ‘Reform_20’) on new firm registration. We then compare results for different cutoff points and examine the level of reform that results in the most

significant and largest in magnitude estimate of the impact. If the cutoff point is correctly classified (i.e. it is close to the “true” definition of reform in the data), the difference in difference estimation will produce the most significant and largest in magnitude estimates of the impact. However, misclassifying reforms will result in reduced observed impact. Appendix 1 presents an example of how misclassification can happen due to Type I or Type II errors.

In other words, this methodology allows us to identify which cutoff points lead to the largest and most significant increases in formally registered businesses. The closer our chosen cutoff point is to true reform point, the more significant the regression results should be. Thus, we can use the significance and magnitude of the coefficients to point out the true definition of ‘reformer’ as a specific percent change in the underlying variable.

3. Data and Descriptive Statistics

3.1 Data on New Firm Registrations

For our dependent variable, we use data from the WBES, which collects annual data on the number of newly registered firms directly from business registries and other government statistical offices worldwide.⁴ The WGBES gathers data on new corporations, which are defined here as *private companies with limited liability*. Notably, this is the same definition used by the World Bank’s Doing Business report. It is also the most prevalent business form in most countries around the world (Doing Business, 2010).

The main variable of interest is new business ‘entry density’, defined as the ratio of newly registered limited liability firms per 1,000 working age population (those ages 15-64). The final dataset includes 494 observations from 92 countries over the six-year period 2004 to

⁴ For additional information on the WBES methodology, see Klapper and Love (2011).

2009. Figure 1 shows the distribution of entry density across countries; it has a minimum value of 0.0021 (in Niger) and a maximum value of about 10.⁵

Entry density varies significantly by income groups: it ranges from 4.21 in high-income countries to less than one in lower-middle and lower income countries (Figure 2). In other words, there are on average about four limited-liability firms registered annually per 1,000 working age individuals in industrialized countries, as compared to about one firm per 1,000 individuals in developing countries. There are also significant disparities across regions, ranging from an entry density of 0.58 in Sub-Saharan African (SSA) countries to 2.26 in Europe and Central Asia (ECA). This translates roughly to an average of 55,000 newly registered limited-liability firms per year in industrialized countries, relative to about 35,000 in Latin American countries, 14,000 in South Asian economies, and 9,000 in Sub-Saharan African economies.

3.2 *Business Environment Indicators*

Our indicators of business environment regulations come from the *Starting a Business* section of the World Bank's *Doing Business* database, which provides country-level indicators to measure the efficiency of the business registration process. The first indicator, Starting Costs, captures all official fees and additional fees for legal and professional services involved in incorporating a business, and is measured as a percentage of the economy's income per capita. The second indicator is the Number of Procedures necessary to incorporate a business. Third, Starting Days, measures the time required to start a business, which is defined as the number of days that incorporation lawyers indicate is necessary to complete all required procedures with minimum follow-up with government agencies and no extra payments. Fourth, paid-in Minimum

⁵ We restricted entry density to be less than 10, which is equivalent to about the 98th percentile of the original distribution. Effectively this excludes two countries that are outliers on the number of new registrations (Iceland and New Zealand).

Capital Requirement captures the amount that an entrepreneur needs to deposit in a bank or with a notary before or shortly after registration and is recorded as a percentage of income per capita. Figure 3 shows the relationship between the explanatory variables and entry density. Figure 4 shows the distributions of the annual percent change in these four explanatory variables.

Complete variable definitions and summary statistics are shown in Tables 1 and 2. For all four indicators of Starting a Business, the mean of the annual percent change is negative, suggesting that, over time, most countries have been successful in lowering registration costs, reducing days, procedures or capital requirements.

3.3 *Classifying Reforms*

One of the goals of this paper is to explore what reductions in registration costs qualify as a true reform. To do this, we create different cutoff points that we use for reform classifications. For each of the variables of interest we classify a country as a reformer if the percent change in the variable is below the cutoff point. For example, for the variable ‘Cost Reform_20’, we classify as reformers all countries that reduced costs at least by 20%; all other countries are classified as non-reformers. We get 57 reformers using this definition (Table 3). Clearly, as we increase the cutoff, we ask for a more significant change and the number of reformers declines to 42 with at least a 30% drop in cost, 28 with a 40% cutoff, 16 with a 50% cutoff, and only 7 with a 60% cutoff. We do not explore larger (i.e. more negative) cutoffs because they produce very insufficient number of reformers.

Table 3 shows similar trends across the different business environment variables; increasing cutoffs result in a lower number of reforming countries. For example, a 50% reduction in the number of days required to start a business occurs in 32 countries in our data; however,

when we examine a 50% reduction in the number of procedures, only five countries are classified as reformers. This suggests that countries are more likely to implement large reforms in the number of days, relative to costs and procedures.

Note that since our data is a panel, a country can be identified as a reformer in more than one year. But the number of countries with repeated reforms is rather small. For example, for 20% cutoff we have 30 repeated reforms for cost, 31 for days, 11 for procedures and 20 for minimum capital. Clearly as the cutoff becomes more stringent, the number of repeated reforms goes down significantly. Thus, for 50% cutoff we only have one repeated reform for costs, six for days, none for procedures and six for min capital. For the purposes of our regression analysis, we look at the effects of the first reform for each of our definitions, i.e. we consider a country a ‘reformer’ for all subsequent years following a first reform.

Often a country that is reforming the business registration process will make changes in the process along several dimensions. For example, as the number of procedures goes down, the length of the process will also go down, and often the costs will be reduced as well. It is possible that when several changes occur simultaneously, smaller changes along each dimension will produce significant results, while a single parameter change will not.

For example, a 20% change in costs or a 20% change in the number of days that occur independently (i.e. only one change happens in a country) may not produce a significant impact on number of registered businesses because the changes are too small for new overall costs to fall below the benefits. However, if two changes are combined, in other words, if both costs and procedures are reduced at the same time, the effect of these two simultaneous changes may be significant. Using the intuition of our model, the decline in procedures can be translated into monetary value because of time savings of personnel that will be involved in the registration

process. Thus, the aggregate cost reduction as a result of two reforms may fall below the benefit and the joint reform will be identified as “large,” while each individual reform is independently too “small.”

We investigate this hypothesis by defining simultaneous reforms. In this case a country is classified as a reformer if at least two reforms occur simultaneously. We also look at cases in which three reforms occur simultaneously, although these are very rare.

In addition, it may happen that reforms occur in subsequent years. For example, the costs may be reduced in one year and in the next year the number of procedures or days will be reduced. Similarly, a single change by itself may be insufficient to induce significant number of new registrations, but when the second change occurs, there will be cumulative effect that will make a difference. To test this assumption we define sequential reforms. In other words, for each cutoff we only classify a country as a reformer when two or more reforms with a given cutoff occur sequentially. For example, for a 20% cutoff, a country is not classified as a reformer when the first reform occurs. However, when a second reform occurs, the country is classified as a reformer under our ‘two sequential reforms’ definition. Similarly, for three sequential reforms a country is only classified as a reformer only after three reforms occur within our sample frame.

Table 4 presents the number of countries classified as reformers according to each of these different definitions. Column one gives a number of “reformers” classified for each cutoff if any one of the four business environment measures previously discussed has fallen below the cutoff in any given year. We get 79 “reformers” by this definition and a 20% cutoff and only 47 for a 50% cutoff.

In Column 2 we classify country as a reformer if two or more reforms occur simultaneously in a country. These two reforms could be any of the four measures discussed

above and for now we do not make a distinction. In other words it could be reform of days and procedures, or reform of cost and days, or any other combination. We classify a country as a reformer if two reforms occur simultaneously (in the same year) or if they occur sequentially. We get fewer countries classified as reformers in the case of two reforms: 69 with cutoff of 20% and only 22 with cutoff of 50%. Clearly, this is stricter definition than the one used in column 1 and fewer countries fit this new criterion. In column 3 we tighten the definition even further and require that two or more reforms occur simultaneously, in the same year. In other words, column 3 is a subset of reformers classified in column 2. We get 51 countries for 20% cutoff and only 14 countries for 50% cutoff.

Column 4 shows the number of reformers when we change our definition to require that at least three reforms occur in a country, but they can occur simultaneously or sequentially – i.e. the first reform in one year, the second in the next year, and the third reform a year or two later (or the first reform in one year, and then the second and third simultaneously in a future year). We only classify a country as a reformer when we observe the third change happening. This definition is stricter than the one used in column two, but is not necessarily stricter than the one used in column 3. Thus, for cutoff of 20% we observe more reformers in this column than in column 3. In other words, more countries make reforms in stages than simultaneously. However, as the cutoff decreases we get about the same number of reformers as in the previous column.

In the last column we present the number of countries with three or more reforms occurring simultaneously. The numbers are significantly smaller. With 20% reforms only 28 countries are classified as reformers (relative to 51 countries with two simultaneous reforms). The numbers quickly drop as the cutoffs increase, only 14 countries are identified as reformers with a 30% cutoff and 8 or less with a 40% cutoff. These numbers suggest that despite the fact

that changes are correlated (i.e. change in procedures is more likely to be accompanied by change in days and change in costs), it is relatively rare to observe three of these changes occurring simultaneously.

4. Results

4.1 *Continuous Regression Model*

Based on our theoretical intuition, we first perform a simple, but important empirical test to investigate whether, on average, a country's registration costs are negatively related to the number of newly registered businesses. To do this we investigate within country variation, exploiting the unique panel nature of our data. In other words, we estimate the following model:

$$\text{Entry Density}_{it} = \alpha_i + \beta \text{ESB}_{it} + \text{GDPgrowth}_{it-1} + \delta_t + \varepsilon_{it} \quad (1)$$

Here, ESB stands for a given individual measure of the ease of starting a business, in this case the costs, days, procedures and minimum capital required. We allow each country to have its own country-specific error term, α_i , (i.e. country fixed effect) to capture any unobserved differences between countries that would affect the level of registration and registration costs. In addition, we control for lagged GDP growth which captures business cycle effects, which may affect both the ease of starting business regulations and new registrations (although our results are not sensitive to this control). We also include time dummies to control for any global changes in the macroeconomic environment that may affect registrations in all countries. This is important because our data covers the period of the global financial crisis. For example, Klapper and Love (2010) show that number of new registrations dropped significantly during 2009 in most countries. The time dummies will capture the average drop in registration in the year of the

crisis, relative to previous years, and eliminate the confounding impact of the crisis.⁶ In addition, the time dummies will also capture global changes in registration trends. Thus, Klapper and Love (2010) show that number of registered businesses is increasing overtime; in other words there is a trend toward more formalization. If firm registrations are increasing in all countries because of this trend, we may erroneously attribute the impact to reforms (which capture the later years of the sample) to the increasing registration trend.

Finally, we estimate this model with errors clustered on the country level to capture any serial correlation of errors within country. We run the model (separately) using contemporaneous and one year lags of business environment variables to allow for delayed effects of costs on new registrations and also to reduce endogeneity concerns.

Results are presented in Table 5. Columns 1-4 presents results using contemporaneous ESB measures and columns 5-8 present results using one year lagged values of the ESB variables. The cost of starting a business is a significant predictor of entry density, though the coefficient loses some significance when lagged. Days and procedures are both significant predictors of entry density in both specifications. Minimum capital requirement has a predicted negative sign, but is not significant at conventional levels. Taken together, the results show that there a significant negative relationship between the costs of registering a business and the number of new firm registrations. This section confirms that the data on barriers to starting a business behave in predicted ways, before proceeding to the main focus of our analysis.

4.2 Reform Regression Model

⁶ In addition, we test robustness of our results to eliminating the year 2009 from our regressions all together. This significantly reduces our sample (by about 1/6) and some of the results become statistically weaker, but the general patterns remain the same.

In this section we investigate the impact of reforms to the registration process on business registrations. Specifically, we test which magnitude of reforms produces the largest change in business registrations. We run the following regressions:

$$\text{Entry Density}_{it} = \alpha_i + \beta \text{Reform}_{it} + \text{GDPgrowth}_{it-1} + \delta_t + \varepsilon_{it} \quad (2)$$

Here, Reform is equal to one for all countries classified as reformers using each of the cutoffs discussed above. This dummy is equal to one for the year in which reform occurred and all years after the reform. In other words, we allow the reform to have a lasting impact on a country, not only in the year of reform. In essence this is a difference in difference approach, in which “treated” countries are the countries that have been classified as reformers versus controls (non-reformers), and the time is defined as before and after the reform. Thus, the ‘Reform_{it}’ term can be written as a combination of two dummy (0/1) variables, ‘Reform country’, which is equal to one for countries identified as reformers, and ‘After reform period’, which is a dummy equal to one for the year of the reform and all subsequent years:

$$\text{Reform}_{it} = \text{Reform Country}_i * \text{After}_t \quad (3)$$

In other words, this framework allows us to use reformer countries as controls in the years before they implemented a reform. Again, we estimate this model including lagged GDP growth, which ensures that changes in new registrations are due to the specific reforms rather than business cycle effects, country and year fixed effects and errors clustered on the country level.

4.3 *Single Reform Results*

Table 6 contains our regression results. Each cell in the table reports the coefficient of a separate regression; to save space, we only report the coefficient for the reform variable (i.e. coefficient β from model 1). We observe that for cost reform to be effective, the costs have to go down at least by 50% relative to the pre-reform level. The result is similar for the number of days measure. The largest impact for costs and number of days is observed for 60 percent reduction, but in this case only 7 countries are classified as reformers in the case of costs and 23 for number of days (Table 3).

For number of procedures even a small change of 15 percent reduction produces significant results (not shown). However, larger changes produce larger coefficients, which peak at 40 percent in terms of coefficient magnitude and statistical significance. In light of our model, for number of procedures measure the reforms appear to be sufficiently large at a 20 to 40 percent reduction. Therefore, setting a stricter cutoffs (such as 60 percent), results in more misclassification due to Type I error such as discussed in Appendix 1. This does not imply that larger reforms are ineffective. It simply suggests that in the case of procedures even smaller reforms are significant, with an optimal reduction of about 40%.

For minimal capital requirements we find the impact is a little weaker, perhaps because many countries do not impose minimum capital requirements or because these requirements are not binding. However, the reductions of 40% or 50% produce significant results.

As a robustness check, we also evaluate the impact of “negative” reforms, which refers to instances in which starting a business measures *increase*. Though the sample size for these reforms is very small (generally less than 10, even at 20 percent), we do observe a significant relationship between increases in procedures and decreases in entry density (not shown).

4.4 Simultaneous and Sequential Reform Results

Next we investigate the impact of several reforms at the same time, whether occurring simultaneously or sequentially. Table 7 presents our results. The first column presents the single reform case for comparison. In this column a country is defined as a reformer if any of the four business environment measures change by the percent specified in each cutoff. In essence it parallels results in Table 6, but now lumps all reforms together in one measure. We observe that if the reform is defined as a change in any of the four variables, the only significant results are obtained with 50% or 60% cutoff. Thus, a country must change one of the four measures by at least 50% to result in a statistically significant increase in registrations; such a large change can be safely classified as a reform.

Column 2 presents results for two reforms that can occur either in the same years or in subsequent years (i.e. sequentially). We observe that in this case even a 40% reduction in the underlying measures is sufficient to produce a significant impact. Thus, if more than one reform is occurring in a country, the magnitude of each of the reforms can be smaller because of the synergistic effect.

We observe similar results for two reforms occurring simultaneously (column 3), although the magnitudes of the coefficients are slightly larger for simultaneous reforms. For example, for a 50% cutoff the coefficient on simultaneous reforms is 0.77, while the coefficient on sequential reforms is 0.61. Even larger differences are observed for 60% cutoff: 0.61 with two sequential reforms and 1.06 with two simultaneous reforms. This suggests that there is some advantage in two reforms occurring simultaneously rather than sequentially.

Next, we investigate the impact of three reforms occurring sequentially in column 4. We find that even a 30% reduction in three out of four measures results in a significant impact on

number of registered businesses. This further confirms the synergistic impact of reforms as when three changes are occurring, each individual change can be smaller in magnitude than in the case of single or double reforms. Thus, in combination even smaller reforms produce a significant outcome.

The last column presents our results for three simultaneous reforms. The results are similar to three sequential reforms, but the coefficients again are larger for the comparable cutoffs. For example, for 30% cutoffs the three sequential reforms produce a change in 0.345 in entry density, while three simultaneous reforms produce a change of about 0.587, almost twice as large. The results for 50% and 60% change are excluded since there are only 4 and 2 countries, respectively, classified as reformers using this definition.

The coefficients in Tables 6 and 7 suggest an important economic significance of business registration reforms on the formal sector. In Table 6, the coefficients for 50% reductions in the cost, time and procedure variables are between 0.4 and 0.6. The coefficient for two sequential or simultaneous 40% reforms in Table 7 is in the same range. Taking the conservative estimate (0.4), we can then say that most effective reforms lead to an increase in entry density of 0.4. Because entry density is normalized by population, a 0.4 increase in entry density does not translate into a fixed increase in new firms across countries. Taking, for example, the average working age population of a lower middle income country in our sample – approximately 50 million – we see that an increase in entry density of 0.4 (holding everything else constant) translates into 20,000 new firms. For the average low income country in our sample – with population 10 million – an increase in entry density of 0.4 translates into 4,000 new firms. It is important to remember that a country is considered a reformer (reform dummy variable equals 1)

in all years after the reform, so the effect of a reform on entry density is cumulative and so the increase in new firms will be spread out over several years.

An important caveat to these results is that multiple reforms – either sequentially or simultaneously – might suggest that these reforms are part of a larger private sector reform package. In other words, we cannot assess with absolute certainty that the increase in new firm registrations is exclusively the result of these specific reforms and not a more general improvement in the business environment. However, even in such circumstances, our results suggest that small changes in registration parameters (in general, less than 30%) are unlikely to increase formal sector participation.

4.5 Sensitivity to Pre-reform Business Environment Levels

In this section we investigate whether the impact of reforms varies with the pre-reform level of the business environment. There are two alternative hypotheses: First hypothesis is that in weak business environments firms need larger changes to motivate them to register. For example, in countries with very high costs or requiring many procedures, small reforms (such as 20% or 30% reductions) might be insufficient to induce significant business registrations. The alternative hypothesis might also hold if in weak countries even a small change will be welcomed by the severely constrained firms.

More formally, recalling the simple model discussed earlier, the outcome of the reform depends on the distributions of costs and benefits. If in a country with very high registration costs, the benefits are also very high, then even a small change in costs may induce a significant number of new registrations. In terms of our model, in this case, the benefit is just below the pre-reform costs.

Alternatively, countries with higher registration costs might also offer fewer benefits to formal firms, so that only a large change in costs will induce a significant number of new registrations. In terms of our model, this hypothesis suggests that in countries with high initial costs, the average benefits are significantly below the costs.

To investigate these alternative hypotheses we add the interaction of the pre-reform level of the business environment to our model.

$$\text{Entry Density}_i = \alpha_i + \beta_1 \text{Reform}_{it} + (\beta_2 \text{Reform}_{it} * \text{Pre-reform_level}_i) + \text{GDPgrowth}_{it-1} + d_t + \varepsilon_{it} \quad (4)$$

The pre-reform level is defined as the level of business environment just a year before the reform (again, we only consider first reforms). Thus, it is not time-varying (hence the subscript i) and in the regression the level is subsumed in the fixed effects. In other words, this specification allows us to investigate whether the reform has more or less significant impact with different pre-reform levels. We measure the pre-reform level of the business environment as a combination of the four indicators of starting a business (cost, days, procedures and minimum capital) and construct a principal component that aggregates this measure into a single index which we refer to as ESB_PC .⁷ The index is constructed such that higher values indicate better business environment (i.e. lower costs, days, procedures and minimum capital). This variable is approximately normally distributed with mean about zero and standard deviation about one.

Table 8 presents the results for single variable regressions (i.e., similar to Table 6) and Table 9 presents our results for our multiple reform indicators (i.e., similar to Table 7). Once again each cell (of 4 rows each) is a single regression but now we report two coefficients – the

⁷ The coefficients on the individual variables are as follows: 0.52 * Procedures + 0.43* Days + 0.61* cost +0.41* Min Capital.

reform coefficient and the interaction of reform with pre-reform levels. We observe that for almost all cutoff points and all four measures, the interactions with pre-reform levels are significantly positive, meaning that better pre-reform indicators of the regulatory environment for starting a business are associated with a larger magnitude of the reform. Thus, a country with weak pre-existing business environment levels need a larger reform to achieve the same impact on the number of registered businesses than a country with an above average business environment.

Our results show that for small reforms to the number of days or costs of starting a business (i.e. reforms of 20% -40%) the level effect of reform is not significant, while the interaction is positive. We interpret this to mean that small reforms are only effective in countries with above average pre-reform business environments (i.e. with a ESB_PC index above zero, which is about average for a standardized principal component index). Larger reforms (of 50% decline in days or costs) are effective even in countries below average business environment (because the coefficients and interaction are both significant), but their effectiveness is lower in countries with weaker starting position (i.e. the interaction is positive and significant for coefficients indicating at least an improvement of 50%).

For procedures we find, as before, that even small reforms of 20% or 30% are effective in most countries (except for the very worst initial conditions), but their effect is larger in countries with higher pre-reform ESB_PC index (i.e. better initial conditions). However, for larger reforms of 40% or 50%, the interactions are not significant, which suggests that these reforms are about equally effective regardless of the starting conditions. In other words, large reduction in procedures appear to be equally effective at any starting level of ESB_PC, but small reductions are more effective in countries with stronger pre-existing conditions.

We observe similar results in Table 9 that considers multiple reforms – most of the interactions are positive and significant, which again suggest that pre-reform conditions matter. In simpler words, these results suggest that countries that start out in a disadvantaged position (higher costs, more procedures and longer time) need larger reforms to achieve the same impact on the number of registered businesses as countries that have relatively better ex-ante business environments. Or, put another way, small reforms (in general less than 40%) are not sufficient to motivate a significant number of new firms to register formal businesses. In light of our model, these results suggest that in countries with weak business environments (high costs, long delays or a large number of procedures), the benefits of registrations are significantly lower than the existing costs for a large number of firms. These results are inconsistent with the “public interest” theory of regulation and the hypothesis that countries have high registration costs because there are high benefits of registrations, and instead support the “public choice” theory, which suggests that high registration costs exist to benefit bureaucrats and politicians (see Djankov et al., 2002).

Put another way, our results suggests a nonlinear relationship between the starting a business measures and entry density. As discussed earlier, in Table 5 we found a significant negative relationship between entry density and the logged values of the starting a business measures. In a similar continuous framework we have also investigated other non-linear functional forms, such as quadratic model and piece-wise regressions, all of which confirm a non-linear relationship. These results (not reported) serve as a useful robustness check on our main analysis, which uses a specific functional form that defines reforms using discrete cutoff points. Our preferred functional form (i.e. the reported results) has the most relevance for policy

makers, who need help in discerning which magnitude of reductions in costs, procedures or days is most beneficial for encouraging the most new business registrations.

5. Conclusion

In this paper we test the real relationship between the Doing Business “Ease of Starting a Business” measures and annual new firm registrations. We also offer an empirically based, quantitative approach to identifying business environment ‘reformers’. Our results show that the ease of starting a business is a significant predictor of new business registrations but that small reforms, in general less than a 40% reduction in costs, days or number of procedures, do not have a significant effect on new firm registration. This suggests that ‘token’ reforms, perhaps motivated by political or multilateral pressures to reform, do not have the intended effect on private sector activity. Furthermore, we show that countries with relatively weaker business environments require relatively larger reforms in order to impact new firm registration. It might be the case that countries with weaker business environments also have fewer benefits for formal sector registration (such as access to formal financial and labor markets) and therefore larger reductions in costs are necessary to incentivize firms to incur the costs of formal registration.

We also show that there is a synergistic impact of reforms. In the case of two sequential reforms, each of the reforms can be smaller than if they occurred independently. In addition, two reforms occurring simultaneously have more impact than if they occur over a longer period of time.

Our results highlight the importance of defining reforms in a way that is consistent with expected outcomes, i.e. in this case the number of newly registered businesses. The methodology developed in this paper can offer alternative classifications of reformers, which can

be useful to policymakers, researchers, and practitioners working to improve the business environment and promote private sector development. Our results can also be helpful to motivate policymakers to make larger, and more significant, reforms.

References

- Ardagna, Silvia and Annamaria Lusardi, 2010. "Firm Performance and Regulation Explaining International Differences in Entrepreneurship: The Role of Individual Characteristics and Regulatory Constraints" NBER Volume on International Differences in Entrepreneurship, Joshua Lerner and Antoineete Shoar, eds., University of Chicago Press: Chicago.
- Aghion, Philippe, Richard Blundell, Rachel Griffith, Peter Howitt and Susanne Prantl, 2009. "The Effects of Entry on Incumbent Innovation and Productivity",
- Antunes, Antonio and Tiago Cavalcanti, 2009. "Start-Up Costs, Limited Enforcement and the Hidden Economy", *Review of Economics and Statistics* 91(1): 20-32. *Review of Economics and Statistics* 91(1): 20-32.
- Audretsch, D.B., Keilbach, M.C., Lehmann, E.E., 2006. Entrepreneurship and Economic Growth, Oxford: Oxford University Press.
- Barseghyan, Levon, 2008. "Entry Costs and Cross-Country Differences in Productivity and Output", *Journal of Economic Growth*, 13:145–167.
- Baumol, W.J., Litan, R.E., Schramm, C.J., 2007. Good Capitalism, Bad Capitalism and the Economics of Growth and Prosperity, New Haven: Yale University Press.
- Baumol, W.J. (2010). *The microtheory of innovative entrepreneurship*. Princeton: Princeton University Press.
- Berkowitz and DeJong, 2010. "The Emergence of Bank-Issued Credit in Russia: an Empirical Characterization", The University of Pittsburg Working Paper.
- Bertrand, Marianne and Francis Kramarz, 2001. "Does Entry Regulation Hinder Job Creation? Evidence from the French Retail Industry", *Quarterly Journal of Economics* 117 (4), 1369–413.
- Black, S. E., Strahan, P. E., 2002. "Entrepreneurship and bank credit availability." *Journal of Finance* 57.
- Brander, J., Hendricks, K., Amit, R., Whistler, D., 1998. "The engine of growth hypothesis: On the relationship between firm size and employment growth work," The University of British Columbia working paper.
- Chavis, L., L. Klapper, I. Love, 2009. "The Impact of the Business Environment on Young Firm Financing", World Bank Policy Research Working Paper.

- Ciccone, Antonio and Elias Papaioannou, 2007. "Red Tape and Delayed Entry", *Journal of the European Economic Association* 5 (2–3): 444–58.
- Dabla-Norris, Era, Mark Gradstein and Gabriela Inchauste, 2008. "What Causes Firms to Hide Output? The Determinants of Informality", *Journal of Development Economics* 85 (1): 1–27.
- DCED, 2008. Supporting Business Environment Reforms, Donor Committee for Enterprise Development: Washington, DC.
- De Soto, H., 1990. The Other Path, Harper and Row: New York.
- Djankov, S., La Porta, R., F. Lopez-de-Silanes, and Shleifer, A. 2002. "The regulation of entry", *Quarterly Journal of Economics* 117.
- Djankov, Simeon, Caralee McLiesh and Rita Ramalho, 2006. "Regulation and Growth", *Economics Letters* 92 (3): 395–401.
- Fonseca, Raquel, Paloma Lopez-Garcia and Christopher Pissarides, 2001. "Entrepreneurship, Start-Up Costs and Employment", *European Economic Review* 45 (4–6): 692–705.
- Hallward-Driemeier, M., Pritchett, L., 2011. "How business is done and the 'doing business' indicators: the investment climate when firms have climate control." World Bank Working Paper Series no. 5563.
- Haltiwanger, J., Jarmin, R., Miranda, J., 2009. "Jobs Created from Business Startups in the United States," Kauffman Foundation.
- Hause, J. C., Du Rietz, G., 1984. "Entry, industry growth, and the microdynamics of industry supply." *Journal of Political Economy* 92.
- Johnson, S., McMillan, J., Woodruff, C., 2000. "Entrepreneurs and the Ordering of Institutional Reform: Poland, Slovakia, Romania, Russia and Ukraine Compared," *Economics of Transition* 81:1.
- Klapper, L., Amit, R., Guillen, R., 2010. "Entrepreneurship and Firm Formation Across Countries", NBER Volume on International Differences in Entrepreneurship, Joshua Lerner and Antoineete Shoar, eds., University of Chicago Press: Chicago.
- Klapper, L. and I. Love, 2011. "The Impact of the Financial Crisis on New Firm Registration", *Economics Letters*, Forthcoming.
- Lingelbach, D., L., De la Vina, Asel P., 2005. "What's Distinctive about Growth-Oriented Entrepreneurship in Developing Countries?" Center for Global Entrepreneurship Working Paper, UTSA College of Business.

McMillan, J., Woodruff, C., 2002. "The Central Role of Entrepreneurs in Transition Economies," *Journal of Economic Perspectives*, 16:3.

Wim, N., 2008. "Entrepreneurship in Economic Development", UNU World Institute for Development Economics Research, Research Paper No. 2008/20.

Schramm, C.J., 2004. "Building Entrepreneurial Economies", *Foreign Affairs*, 83.

Van Praag, C.M., Versloot, P.H., 2007. "What is the Value of Entrepreneurship? A Review of Recent Research", Jena: Max Planck Institute of Economics and Friedrich Schiller University Research Papers.

Figure 1. Distribution of Entry Density

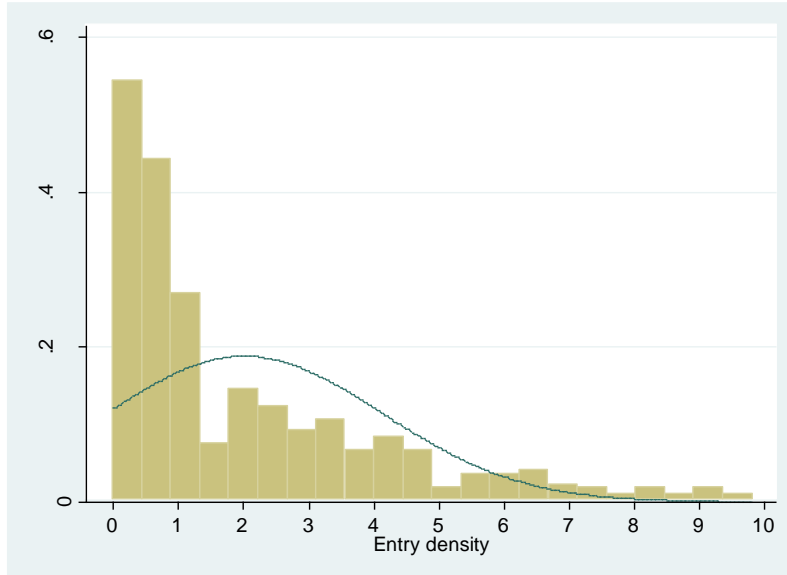


Figure 2: Entry Density across Regions and Income Groups

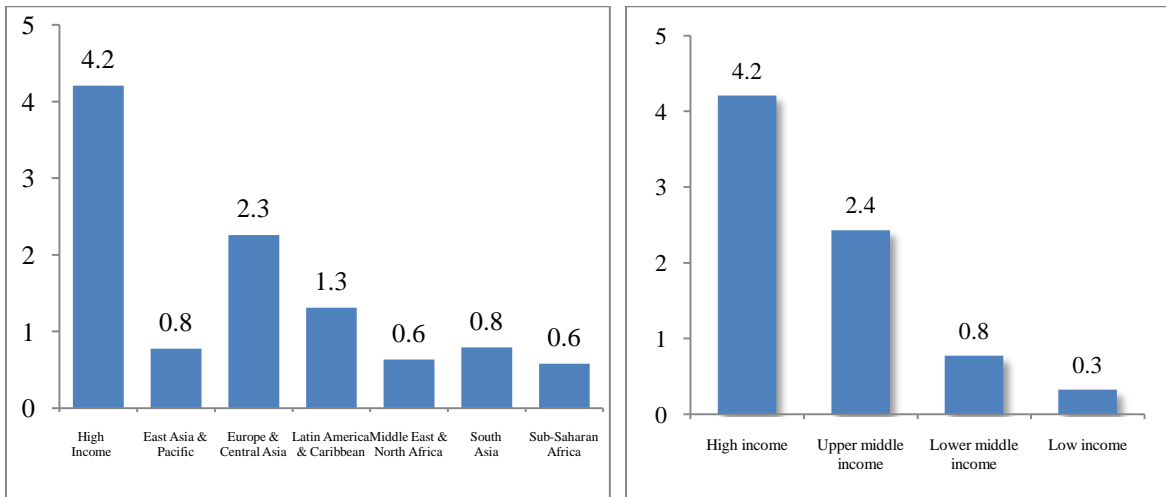


Figure 3. Scatter plots of Business Environment Variables

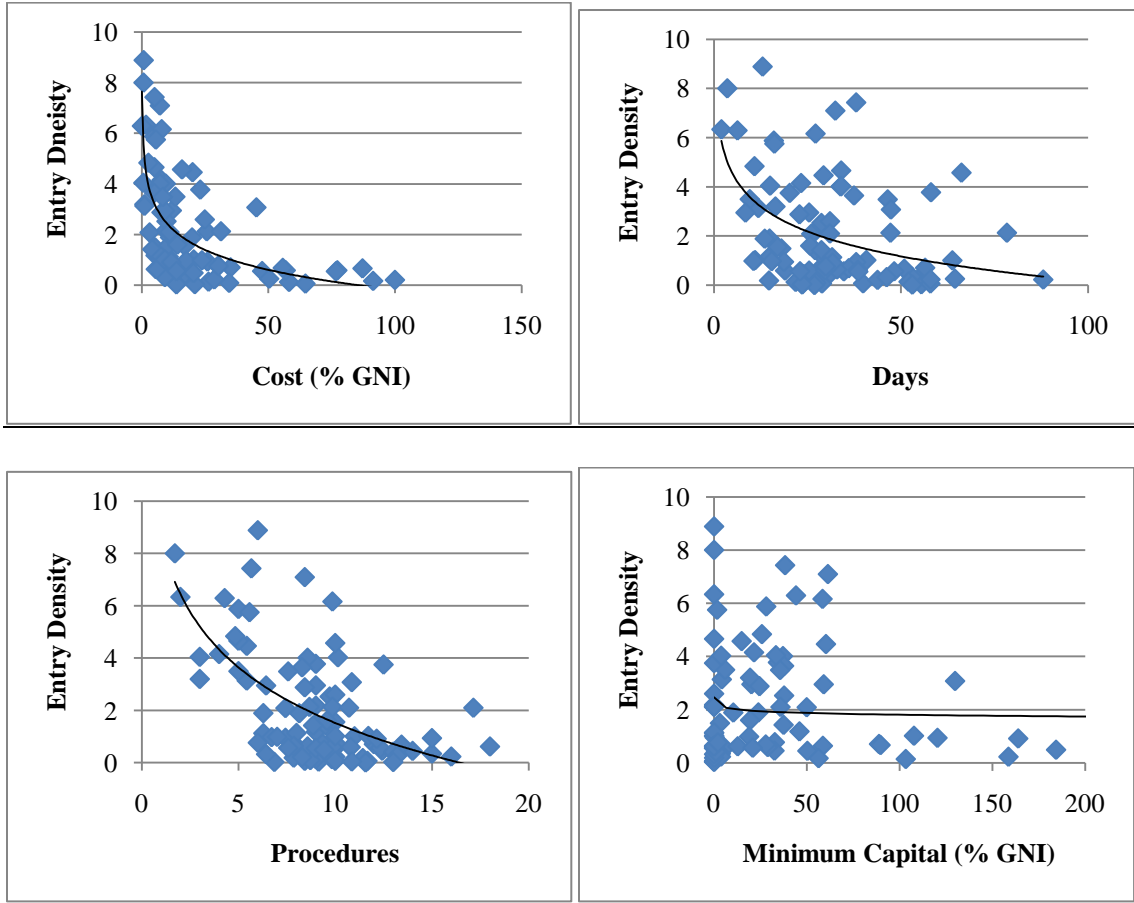


Figure 4. Histograms of Percent Changes in Business Environment Variables

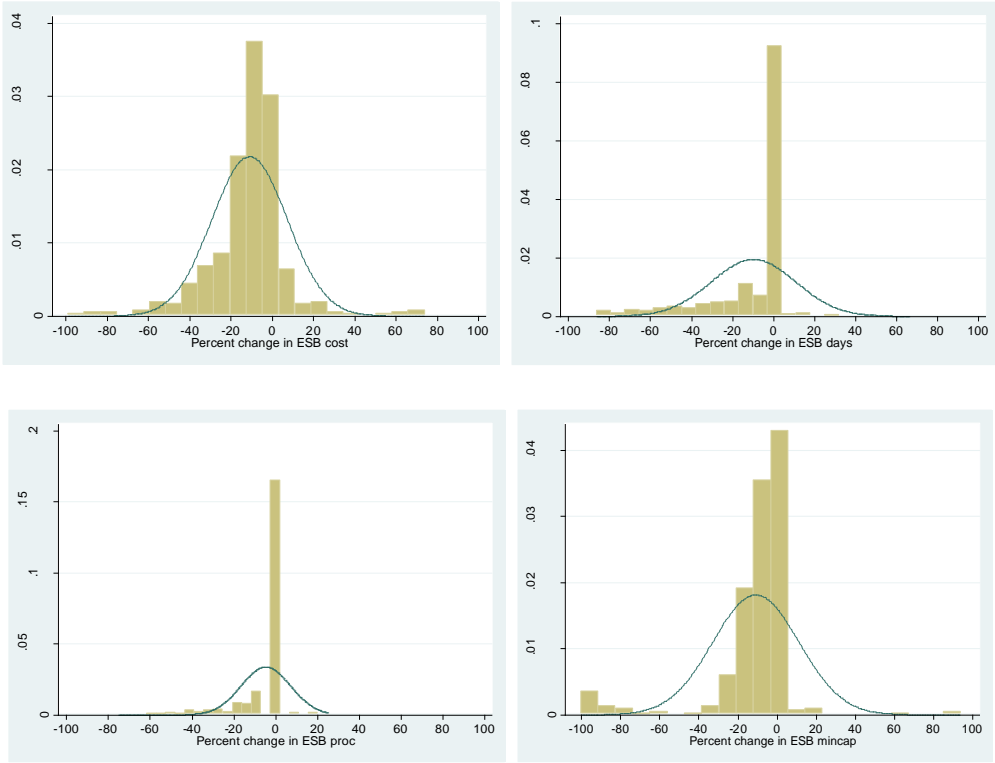


Table 1: Variable Definitions

Variable	Description
density_new	Entry density, defined as new firms registered per working age population (normalized by 1,000) (<i>World Bank Entrepreneurship Snapshots, 2010</i>)
L.log_gdpgr	Lagged GDP growth (<i>WB-WD, 2010</i>)
esb_cost	Cost to register a business. Cost is recorded as a percentage of the economy's income per capita. It includes all official fees and fees for legal or professional services if such services are required by law (<i>Doing Business</i>)
esb_cost_ch	Annual % change in cost of starting a business
esb_days	Time needed to register a business. Time is recorded in calendar days. The measure captures the median duration that incorporation lawyers indicate is necessary to complete a procedure with minimum follow-up with government agencies and no extra payments. It is assumed that the minimum time required for each procedure is 1 day. (<i>Doing Business</i>)
esb_days_ch	Annual % change in days to start a business (<i>Doing Business</i>)
esb_proc	Procedures to register a business. A procedure is defined as any interaction of the company founders with external parties (for example, government agencies, lawyers, auditors or notaries). (<i>Doing Business</i>)
esb_proc_ch	Annual % change in procedures to start a business
esb_mincap	The paid-in minimum capital requirement reflects the amount that the entrepreneur needs to deposit in a bank or with a notary before registration and up to 3 months following incorporation and is recorded as a percentage of the economy's income per capita. Recorded as a percentage of the economy's income per capita.
esb_mincap_ch	Annual % change in minimum capital required to start a business

Table 2: Summary Statistics

Variable	N	Mean	SD	p50	Min	Max
density_new	496	2.03	2.11	1.16	0.0021	9.81
L.gdpgr	496	5.56	3.57	5.34	-1.1	34.5
esb_cost	496	34.12	59.5	12	0.1	480.1
esb_cost_ch	496	-11.19	18.54	-8.91	-98.82	73.95
esb_days	496	36.43	64.64	26	2	694
esb_days_ch	496	-9.97	20.72	0	-86.21	66.67
esb_proc	496	8.76	3.48	9	1	18
esb_proc_ch	496	-4.86	11.89	0	-75	25
esb_mincap	496	87.71	207.42	15.5	0.1	1821.9
esb_mincap_ch	496	-10.06	27.4	-5.54	-99.97	283.33

Table 3: Number of Reforms with Different Cutoff Points, by Country

Cutoff	1 Proc reform	2 Days reform	3 Cost reform	4 Min Cap reform
20%	40	58	57	40
30%	28	50	42	29
40%	16	43	28	24
50%	5	32	16	23
60%	3	23	7	22

Table 4: Number of Simultaneous or Sequential Reforms, by Country

Cutoff	1 One or more reform	2 Two or more reforms occurring sequentially	3 Two or more reforms occurring simultaneously	4 Three or more reforms occurring sequentially	5 Three or more reforms occurring simultaneously
20%	79	69	51	53	28
30%	70	51	35	30	14
40%	60	34	22	17	8
50%	47	22	14	12	4
60%	37	17	8	6	2

Table 5: The Impact of Business Environment on New Firm Creation

This table uses an unbalanced panel dataset of 494 observations from 92 countries for the six-year period 2004 to 2009. All variables are defined in Table 1. The dependent variable is annual entry density. Columns 1-3 use contemporaneous independent variables and columns 5-8 use one-year lagged independent variables (GDP growth is always lagged one year). All models include country and year fixed effects, and standard errors clustered at the country-level. *, **, and *** indicate significance at 10%, 5%, and 1%, respectively.

Variables	Entry Density							
	Contemporaneous RHS				Lagged RHS			
	1	2	3	4	5	6	7	8
Log Cost (% income per capita)	-0.259*				-0.184			
	[0.058]				[0.222]			
Log Time (days)		-0.258*				-0.217*		
		[0.056]				[0.065]		
Log Procedures (number)			-0.584***				-0.529**	
			[0.002]				[0.012]	
Log Min. Capital (% income per capita)				-0.037				-0.02
				[0.369]				[0.627]
Year=2005	0.100*	0.084	0.106**	0.106**	0.095*	0.081	0.086	0.107**
	[0.060]	[0.126]	[0.039]	[0.046]	[0.088]	[0.147]	[0.104]	[0.042]
Year=2006	0.288***	0.273***	0.304***	0.318***	0.292***	0.267***	0.292***	0.317***
	[0.001]	[0.005]	[0.000]	[0.000]	[0.002]	[0.005]	[0.001]	[0.000]
Year=2007	0.480***	0.458***	0.494***	0.525***	0.496***	0.462***	0.492***	0.537***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Year=2008	0.386***	0.370***	0.386***	0.466***	0.432***	0.390***	0.420***	0.488***
	[0.001]	[0.002]	[0.000]	[0.000]	[0.000]	[0.001]	[0.000]	[0.000]
Year=2009	0.019	0.013	0.007	0.145	0.084	0.046	0.053	0.174
	[0.883]	[0.926]	[0.953]	[0.219]	[0.540]	[0.726]	[0.700]	[0.138]
Lagged: GDP growth	0.007	0.007	0.008	0.011	0.01	0.011	0.013	0.011
	[0.680]	[0.669]	[0.581]	[0.503]	[0.527]	[0.482]	[0.403]	[0.489]
Constant	2.477***	2.596***	2.965***	1.762***	2.254***	2.463***	2.847***	1.721***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	496	496	496	496	492	492	492	492
R-squared	0.955	0.956	0.956	0.955	0.955	0.955	0.955	0.955
Adjusted R-squared	0.944	0.945	0.946	0.944	0.944	0.945	0.944	0.943

Table 6: Regression Results for Single Reform Variable

This table uses an unbalanced panel dataset of 494 observations from 92 countries for the six-year period 2004 to 2009. All variables are defined in Table 1. The dependent variable is annual entry density. The reported independent variable is a reform dummy denoted by the reform variable (columns 1-4) and the cutoff level in each row. Each box represents a separate regression. All models include country and year fixed effects and control for lagged GDP growth. Standard errors are clustered at the country-level. P-values are in squared brackets. ***, **, * and ^a represent significance at 1%, 5%, 10% and 15% level respectively.

Cutoff	1 Proc Reform	2 Days Reform	3 Cost Reform	4 Min Cap Reform
20%	0.371** [0.017]	-0.008 [0.950]	0.008 [0.944]	0.29 [0.103]
30%	0.387** [0.046]	0.12 [0.478]	0.003 [0.985]	0.221 [0.239]
40%	0.408** [0.018]	0.19 [0.317]	0.091 [0.611]	0.377* [0.097]
50%	0.357* [0.082]	0.404** [0.035]	0.573** [0.032]	0.377* [0.097]
60%	N/A	0.566** [0.023]	0.618*** [0.006]	0.384 [0.113]

Table 7: Regression Results for Simultaneous or Sequential Reforms

This table uses an unbalanced panel dataset of 494 observations from 92 countries for the six-year period 2004 to 2009. All variables are defined in Table 1. The dependent variable is annual entry density. The reported independent variable is a reform dummy denoted by the reform combination (columns 1-5) and the cutoff level in each row. Each box represents a separate regression. All models include country and year fixed effects and control for lagged GDP growth. Standard errors are clustered at the country-level. P-values are in squared brackets. ***,**, * and ^a represent significance at 1%, 5%, 10% and 15% level respectively.

Cutoff	1 One or more Reform	2 Two or more Reforms occurring sequentially	3 Two or more Reforms occurring simultaneously	4 Three or more reforms occurring sequentially	5 Three or more reforms occurring simultaneously
20%	-0.016 [0.890]	0.138 [0.229]	0.197 [0.232]	0.04 [0.760]	0.286 [0.199]
30%	-0.091 [0.437]	0.171 [0.195]	0.245 [0.227]	0.345** [0.045]	0.587* [0.071]
40%	-0.019 [0.888]	0.408** [0.010]	0.425 [0.126]	0.586** [0.023]	0.879* [0.056]
50%	0.291** [0.040]	0.609*** [0.002]	0.772** [0.024]	0.584* [0.065]	N/A
60%	0.391** [0.029]	0.613** [0.011]	1.063** [0.039]	0.577*** [0.000]	N/A

Table 8: Regression Results for Single Reform Variable, with Interactions

This table uses an unbalanced panel dataset of 492 observations from 92 countries for the six-year period 2004 to 2009. All variables are defined in Table 1. The dependent variable is annual entry density. The reported independent variable is a reform dummy denoted by the reform variable in the top rows and the cutoff level in the left columns and an interaction term between the reform dummy and the pre-reform principal component index of the “Starting a Business” (ESB_PC) measures. Each box represents a separate regression. All models include country and year fixed effects and control for lagged GDP growth. Standard errors are clustered at the country-level. P-values are in squared brackets. ***, **, * and ^a represent significance at 1%, 5%, 10% and 15% level respectively.

Cutoff	Variable	1	2	3	4
		Proc Reform	Days Reform	Cost Reform	Min Cap Reform
20%	Reform	0.327** [0.030]	0.021 [0.876]	0.034 [0.786]	0.328* [0.063]
	Reform*pre-reform ESB_PC	0.278** [0.048]	0.105** [0.032]	0.074* [0.066]	0.171** [0.022]
30%	Reform	0.396** [0.023]	0.186 [0.269]	0.04 [0.790]	0.208 [0.240]
	Reform*pre-reform ESB_PC	0.276* [0.064]	0.182** [0.022]	0.086** [0.046]	0.167* [0.092]
40%	Reform	0.339* [0.096]	0.154 [0.397]	0.117 [0.513]	0.401* [0.059]
	Reform*pre-reform ESB_PC	0.062 [0.612]	0.331*** [0.001]	0.094** [0.011]	0.240* [0.058]
50%	Reform	0.354** [0.046]	0.333** [0.034]	0.627** [0.013]	0.401* [0.059]
	Reform*pre-reform ESB_PC	0.225 [0.133]	0.437*** [0.002]	0.227** [0.025]	0.240* [0.058]
60%	Reform		0.452** [0.011]	0.679*** [0.000]	0.419* [0.064]
	Reform*pre-reform ESB_PC	N/A	0.28 [0.211]	0.433** [0.034]	0.251* [0.061]

Table 9: Regression Results for Multiple Reform Variable, with Interactions

This table uses an unbalanced panel dataset of 492 observations from 92 countries for the six-year period 2004 to 2009. All variables are defined in Table 1. The dependent variable is annual entry density. The reported independent variable is a reform dummy denoted by the reform variable in the top rows and the cutoff level in the left columns and an interaction term between the reform dummy and the pre-reform principal component index of the “Starting a Business” (ESB_PC) measures. Each box represents a separate regression. All models include country and year fixed effects and control for lagged GDP growth. Standard errors are clustered at the country-level. P-values are in squared brackets. ***, **, * and ^a represent significance at 1%, 5%, 10% and 15% level respectively.

Cutoff	Variable	One or more Reform	Two or more Reforms occurring sequentially	Two or more Reforms occurring simultaneously	Three or more reforms occurring sequentially	Three or more reforms occurring simultaneously
20%	Reform	-0.048 [0.681]	0.138 [0.236]	0.204 [0.212]	0.095 [0.515]	0.377 [0.133]
	Reform*pre-reform ESB_PC	0.068* [0.072]	0.082** [0.042]	0.168* [0.053]	0.072 [0.283]	0.304 [0.184]
30%	Reform	-0.064 [0.600]	0.209 [0.102]	0.277 [0.185]	0.391** [0.043]	0.617** [0.032]
	Reform*pre-reform ESB_PC	0.103** [0.022]	0.126*** [0.004]	0.179 [0.106]	0.271 [0.111]	0.513* [0.087]
40%	Reform	-0.014 [0.919]	0.417*** [0.006]	0.402 [0.185]	0.415** [0.026]	0.847*** [0.010]
	Reform*pre-reform ESB_PC	0.106** [0.027]	0.204*** [0.003]	0.215* [0.062]	0.457** [0.045]	1.186*** [0.006]
50%	Reform	0.335** [0.016]	0.544*** [0.000]	0.689*** [0.004]	0.323 [0.123]	1.008** [0.016]
	Reform*pre-reform ESB_PC	0.173*** [0.008]	0.422** [0.010]	0.666** [0.014]	0.486*** [0.004]	1.173*** [0.003]
60%	Reform	0.396** [0.018]	0.561*** [0.002]	0.813*** [0.001]	0.400** [0.023]	0.468*** [0.000]
	Reform*pre-reform ESB_PC	0.216** [0.045]	0.37 [0.180]	1.053 [0.282]	0.268 [0.131]	0.089 [0.371]

Appendix 1. Numerical Example of Misclassification Errors

Suppose, a true reform is a reduction in the cost of registration of 40%. In other words, this reduction leads to the largest number of new business registration on average, across all countries in our sample. But without knowing what the correct cutoff is, we could erroneously misclassify a reform. Suppose we set a cutoff to 30% and all countries that experienced a change of 30% or more cost reduction are classified as reformers (i.e. treated sample) and all others are not-reformers (controls). However, a change between 30% and 40% is not a true reform in a sense that a significant number of new businesses will not register under new regime, relative to the old regime. This is similar to making a Type II error – we classify a country as a reformer when indeed it is not. This is represented by a shaded portion of the distribution in Figure A1, left panel. Thus, our treated sample is contaminated by a number of countries that have no observable increase in registrations. Therefore, our statistical results will be biased downward, and unlikely to register a significant impact of this change on the outcome.

The opposite situation can happen when we set the cutoff at a 50% reduction, when in reality 40% is sufficient for a reform (i.e. sufficient to induce a significant number of new business registrations). In this case we classify all countries with less than 50% reduction on costs as non-reformers. Therefore, our sample of “non-reformers” (i.e. controls) contains a number of true reformers incorrectly classified (i.e. all countries with reforms in between 40% and 50% reduction are incorrectly classified as non-reformers). This is similar to a Type I error – the true reformers are misclassified as non-reformers. This is represented by the shaded portion of the distribution in Figure A1, right panel. Similarly, this will also bias results downward (because the control sample contains some of the treated firms).

The closer our chosen cutoff point is to the true reform point, the more significant the regression results should be. Thus, we can use the significance and magnitude of the coefficients to point out the true definition of reform as a specific percent change in the underlying variable.

Figure A1. Classification Errors in Reform Definition

