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New Firm Registration and the Business Cycle

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Abstract

This paper uses new panel data on the number of new firm registrations in 109 countries during 2002–2012 to study the relationship between entrepreneurship and economic growth. The data show strong evidence of a pro-cyclical pattern in entrepreneurship. An examination of heterogeneous relationships between new firm registration and the business cycle finds that higher levels of financial development and better business environments are associated with stronger pro-cyclicality of entrepreneurship both across countries and within countries over time. The results are robust to various measures of business regulation, such as the cost and time of starting a new firm and closing an insolvent firm. These findings suggest that fostering an efficient regulatory environment for the financial and private sector is important for encouraging a speedier recovery in the formation of new firms during economic expansions and aiding the efficient wind-down of insolvent firms during economic slowdowns.

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New Firm Registration and the Business Cycle

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1. Introduction

The entrance of new firms into an economy creates jobs, fosters competition and innovation, and contributes to economic growth (Schumpeter, 1912; Ciccone and Papaioannou, 2007; Aghion, et al., 2009; Haltiwanger, 2010). Policy makers are especially interested in the job creation aspects of new business formation and devise a variety of mechanisms to support new and small businesses. Yet macroeconomic fluctuations cannot be ignored. Indeed, there is significant scope to deepen our understanding of how entrepreneurship reacts to the business cycle so that effective policies can be put in place to stimulate new job growth and mitigate the negative impacts of recessions.

Economic theory does not offer a clear prediction on the relationship between the business cycle and entrepreneurship. Some theories suggest that during recessions limited demand and reduced access to capital will inhibit new firm creation, leading to the pro-cyclical nature of entrepreneurship (Bernanke and Gertler, 1989, Rampini, 2004). Others point out that higher unemployment and lower wages might lead many to start their own businesses out of necessity, i.e. the "recession push" toward entrepreneurship (see Parker, 2009 and Thurik et al., 2008). In addition, the costs of production, including wages, rents and the cost of capital, as well as the opportunity costs of potential entrepreneurs are all lower in recessions, which may also suggest a countercyclical relationship (Fairlie, 2011).

The empirical evidence also appears mixed. For example, Audretsch et al. (1994) and Audretsch (1995) find that unemployment reduces the amount of entrepreneurial activity, suggesting a pro-cyclical relationship, while Fairlie (2011) and Evans and Leighton (1990) find that unemployment leads to higher entry into self-employment, suggesting a countercyclical relationship. Using data from 22 OECD countries for the period from 1972 to 2007, Koellinger and Thurik (2012) offer more nuanced evidence. They find that on the aggregate level of the

world economy, entrepreneurship is pro-cyclical and granger-causes aggregate GDP. However, on the level of the national economy, entrepreneurship appears to be countercyclical and is granger caused by unemployment.

The recent 2008-09 global financial crisis presents a new and important opportunity to study the relationship between entrepreneurship and economic growth. Many countries around the world experienced a collapse in available financing, precipitous drops in trade and consumer demand, and a future outlook that was uncertain at best. The magnitude of the recession that followed was unprecedented in many countries and has been compared to the Great Depression of the 1930s. However, the global economy has changed over the last century, in particular, the deepening of local financial markets and the growth of the private sector, especially in middle-income countries. The recent financial crisis can therefore help shed new light on the evolving relationship between entrepreneurship and the business cycle. Yet the degree to which new firm creation was affected by the macroeconomic trends of the past decade has not been fully documented. This paper offers new evidence on the relationship between economic growth and entrepreneurship using new data covering over 100 countries over the last decade.

Specifically, this paper explores the magnitude of changes in new firm registrations over the period 2002-2012, which includes pre-crisis, crisis, and recovery periods related to the global financial crisis as well as myriad other region- and country-level economic fluctuations. We collect the data on the number of newly registered limited liability companies per year directly from business registries in 109 countries. Our main focus is on the extent to which business cycle fluctuations, captured by the GDP growth, are associated with new firm creation. We use country fixed effects to capture time-invariant country characteristics and time dummies to capture global

macroeconomic shocks. Our main regressions use contemporaneous or lagged GDP growth to explain new firm registration.

We find strongly pro-cyclical results: country-specific GDP growth leads to higher new firm registrations even controlling for the global macroeconomic shocks captured by time dummies. These results are robust to a number of alternative specifications.

Furthermore, we explore how this relationship differs in countries with varying characteristics. Specifically, we examine how country-level differences in financial development and the business environment influence the strength of the relationship between the business cycle and new firm registrations. We hypothesize that in countries with better developed financial markets new firm registration is more responsive to the business cycle. In such countries entrepreneurs are more accustomed to borrowing from formal financial institutions and are more dependent on the availability of external finance (Chavis, Klapper, and Love, 2010). Therefore, tighter credit during recessions should result in fewer new business startups. To the contrary, in countries where new business owners are not reliant on external finance, the credit contraction should not have a significant impact and thus the pro-cyclical relationship will be muted. In addition, in countries with good business environments and low regulatory burdens, such as quick and inexpensive processes to open a new firm, register property, and liquidate or restructure the business, current and potential business owners can quickly respond to changes in demand and start a new business when demand conditions are good, or close a failing one when the demand falters. Again, this will lead to a stronger pro-cyclical relationship between the business cycle and entrepreneurship in countries with better business environments. To test this hypothesis we interact GDP growth with country-specific characteristics using two approaches: first, we use time invariant country characteristics measured over our whole sample period and

second, we use time-varying country characteristics. Our findings support our hypotheses. Specifically, in countries with greater financial development and better business environments, entrepreneurship exhibits stronger pro-cyclical behavior.

This work contributes to the literature on business cycles and entrepreneurship in three important ways. First, to our knowledge, this is the first paper that explores the heterogeneous relationships between entrepreneurship and growth, conditional on variations in the quality of local institutions across countries. Second, we focus on the relationship between economic growth and entrepreneurship during the period surrounding a global financial crisis. This period is characterized by more pronounced cyclical swings, which allows for stronger identification of the key relationships. Third, we provide a novel data set on formal firm creation across a large sample of economies over an eleven year period. Most previous work has been limited to data in developed countries, or for a smaller subset of countries. It is also distinct from most other work on entrepreneurship in that we use data on new registrations of companies with limited liability as the unit of measurement, rather than self-employment rates, which are more likely to include subsistence and own-account entrepreneurs. The use of actual registration data on limited liability companies makes the analysis more relevant for high-growth entrepreneurship. We are also able to avoid the inconsistencies in sampling methodology and survey response errors that can bias analysis of self-reported self-employment data.

The paper proceeds as follows. Section 2 briefly discussed related literature on the topic of entrepreneurship and business cycle. Section 3 presents the data and methodology, including summary statistics. Section 4 discusses our regression models and empirical results. Section 5 concludes.

2. Related Literature

Our paper is related to Klapper and Love (2011) yet differs substantially in its focus as well as in its range of data. Klapper and Love (2011) used a similar data set to document that entrepreneurship dropped during the global financial crisis and that this drop was more pronounced in countries with deeper financial development and in those more severely affected by the crisis. Their regression methodology focused on the crisis time dummies and the interaction of these crisis dummies with country characteristics. In this paper, however, we focus on the relationship between entrepreneurship and economic growth, captured by GDP growth, and the heterogeneities there within. This shifts our attention to the business cycle dynamics of entrepreneurship more broadly. We explore how various country characteristics affect the relationship between entrepreneurship and economic growth both across countries and within countries over time. To our knowledge, this has not previously been investigated. As compared to Klapper and Love (2011), we also exploit a significantly larger data set which includes 16 additional countries and five additional years. Their data began in 2004 and ended in 2009, at the height of the crisis, while our data begin in 2002 and extends to 2012, which includes the important recovery years of 2010-2012.

Earlier studies have identified significant relationships between entrepreneurship and economic growth, competitiveness, job creation and growth of cities (Wennekers et al. 1999; Thurik et al. 2004; van Stel et al. 2005, Glaeser 2007; Anyadike-Danes et al. 2010). For instance, previous literature has shown that macroeconomic variables, such as GDP and theh business cycle, play an important role in the decision to become an entrepreneur. Yet evidence as to whether the relationship is pro- or countercyclical is mixed. Koellinger and Thurik (2012) examine the causal nature of this relationship using OECD data from 1972 to 2007 and find that

entrepreneurship trends are an early indicator of the recovery from economic recessions, while entrepreneurship at the national level reacts to unemployment fluctuations instead of causing them. On the country-level, Baptista and Preto (2007) study firm entry in Portugal and conclude that the relationship between unemployment and entrepreneurship is ambiguous. Fritsch and Schroeter (2011) argue that the level of start-up activity and change in employment exhibit an inverse U-shaped relationship, supporting the finding by Fritsch and Mueller (2004) that new firms can have both positive and negative effects on employment.

A study by Fairlie (2011) of U.S. firms suggests that higher unemployment rates tend to increase the probability that individuals start businesses ("necessity entrepreneurs"). This study also finds that entrepreneurship is more likely during recessionary times, even though there is decreased access to financial capital. In other words, the lack of better opportunities outweighs the negative effects of limited demand and access to capital. This reinforces the findings of Evans and Leighton (1990) that unemployment is positively associated with a greater propensity to start a new firm.

Yet other studies, such as Audretsch et al. (1994) and Audretsch (1995), find that unemployment reduces the amount of entrepreneurial activity, suggesting a pro-cyclical relationship. Grant (1996) and Carrasco (1999) also find a pro-cyclical relationship.

Furthermore, many studies show that the relationship between firm formation and economic growth—as well as its causality— can only be understood by taking into account regional differences (Plummer and Acs 2005; Fritsch and Mueller 2004; van Stel and Storey 2004). For instance, a study of Ireland by Anyadike-Danes et al. (2010) shows that the national economic growth can stimulate the birth of new businesses at the sub-national level, which in

turn may generate economic growth. However, due to lack of spatial time series data sets, it is hard to establish this causality.

Other work has also explored the long-run linkages between entrepreneurship and outcomes such as unemployment and venture growth (Fritsch and Mueller, 2008; Carree and Thurik, 2008). Congregado, Golpe, and Parker (2012) find evidence that cyclical fluctuations have persistent effects on the natural rate of entrepreneurship (i.e. hysteresis) in Spain, but not in the United States.

On the individual level, previous literature has shown that becoming an entrepreneur is related to individual characteristics such as education, gender, wealth, marital status, age, family background, and risk attitudes (e.g. Parker, 2004 and Berglann, 2009). For example, Glaeser (2007) finds that skilled, older adults are significantly more likely to be entrepreneurs. Surveys of individuals in Brazil, China, and Russia find that entrepreneurs are more likely to have entrepreneurs among their relatives and friends, place a higher value on work, are happier, and perceive themselves as more successful (Djankov, et al, 2006). Cultural factors such as religion and gender gap may also affect the relationship between entrepreneurship and unemployment (Audretsch et al. 2007; Startiene and Rememikiene 2008; Rememikiene and Startiene 2009). Institutional factors such as the level of economic freedom and corruption are likewise found to significantly contribute to differences in entrepreneurship levels (Gohmann, 2012; Hall and Sobel, 2008). Entrepreneurs are also most likely to live in areas where there is an abundant labor supply, either because they are attracted to the area by the available workers or because these workers provide the pool of potential entrepreneurs (Dumais, Ellison and Glaeser 1997). According to Glaeser (2007), the labor supply is one of the most powerful predictors of entrepreneurship.

3. Data and Methodology

3.1 Definitions and Data Collection

To facilitate a cross-country analysis of trends in entrepreneurship, we employ a methodology that can be consistently applied across heterogeneous legal regimes and economic systems. We define entrepreneurship as "the activities of an individual or a group aimed at initiating economic enterprise in the formal sector under a legal form of business". For our unit of measurement, we use formal, private companies with limited liability. This choice accounts for data availability and its consistency across economies, as well as its relevance to high-growth entrepreneurship. Companies with limited liability are separate legal entities, and the financial liability of shareholders is limited to the value of their investment in the company. Notably, this is the most prevalent business form in most economies around the world (Doing Business, 2010).

Our definition excludes informal sector firms, based on the difficulties of quantifying the number of firms in the informal sector, rather than on its relevance for developing economies. The only way to enumerate firms in the informal sector is through economic censuses, which, because of their high costs, are infrequently conducted. Partnerships and sole proprietorships are also not considered in our analysis as these types of entities differ substantially with respect to their definition and regulation worldwide. In many economies, sole proprietorships are not required to register with a centralized agency and are able to operate formally with a tax license from municipal authorities.

Data were collected via electronic surveys. These were sent to official government sources in 139 economies, with 122 responses. The survey solicited data on the number of newly registered limited liability companies per year, as well as information on the registration process. In the vast majority of economies, data were provided directly by the registrar of companies, the government entity responsible for recording and maintaining information on new and existing

firms. In other countries, data were collected from national statistical offices and chambers of commerce.[1]

We exclude from our analysis countries classified as offshore financial centers as identified by the IMF (Zoromé, 2007). The information provided by these countries likely reflects a nontrivial number of shell companies, defined as companies that are registered for tax purposes, but are not active businesses.[2]

Our final data set consists of 996 country-year observations from 109 countries over the period 2002-2012. Of the 109 economies in our sample, 34 are high-income, 56 are middle-income, and 19 are low-income, according to World Bank classifications. The database is unbalanced, with 58 economies providing complete data over the time period.

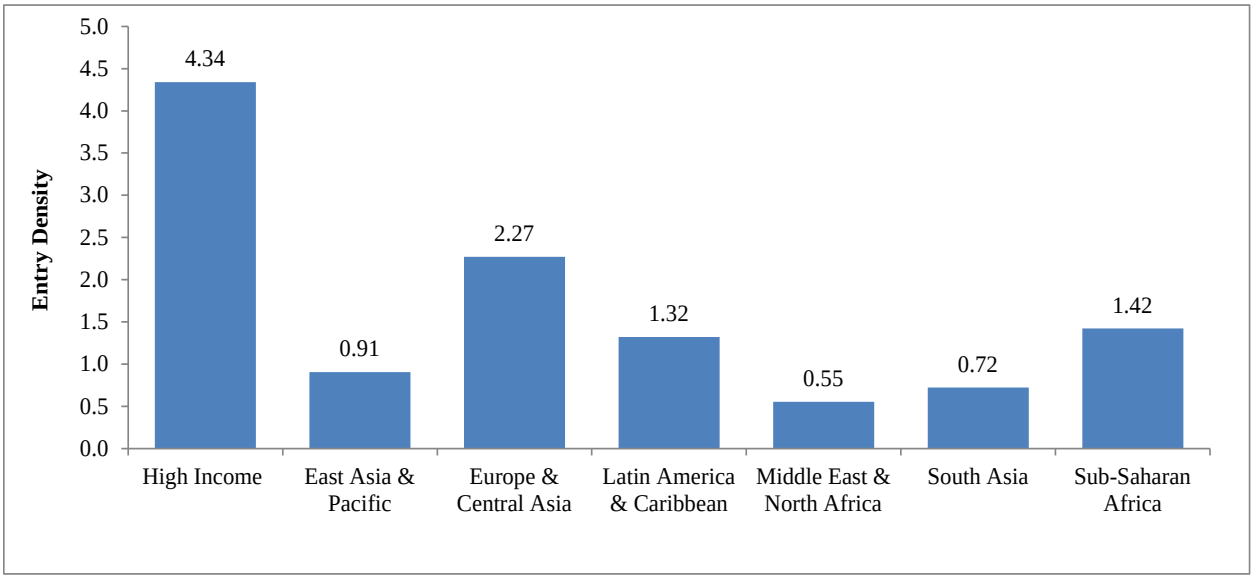
Our main variable of interest is entry density, defined as the number of newly registered companies per 1,000 working-age people (ages 15–64) per year. We complement the Entrepreneurship Database with data from the World Development Indicators (WDI) and Doing Business (DB) databases. We merge in two variables from WDI: annual GDP growth and Domestic Credit to Private Sector (% GDP). We merge in 17 indicators from DB from the following subtopics: *Starting a Business, Resolving Insolvency, Registering Property, Enforcing Contracts*, and *Getting Credit*. While other subtopics are included in the DB database, they were added more recently and generally cover only about half of the time period under study. We construct principle component scores for each of the subtopics and an overall DB score. The scores are based on standardized indicators with higher scores corresponding to a better business environment.

[1] The complete database on new firm registration is available at: www.doingbusiness.org/entrepreneurship.
[2] Data collected from economies categorized by the International Monetary Fund and the Financial Stability Forum as offshore financial centers are excluded from the analysis. See http://www.imf.org/external/np/mae/oshore/2000/eng/back.htm#table1 and http://www.imf.org/external/np/pp/eng/2008/050808.pdf

3.2 Data and Summary Statistics

Entry density varies enormously across economies and regions. This variation likely stems from differences in macroeconomic conditions, the ease of formal business registration, the range of legal enterprise forms, and other regulatory factors that affect the entrepreneurial environment.

Figure 1 Entry density by region, 2002–12
Newly registered firms per 1,000 working-age adults (average per year)



Note: Entry densities are based on economy-level averages over the period 2002–12.
Source: World Bank Entrepreneurship Database, 2013 edition.

On average, 4.34 new formal companies with limited liability (referred to as "firms" hereafter) are registered each year per 1,000 working-age adults in high-income economies (figure 1). In the developing world the average is 1.47. Among developing regions, Europe and Central Asia has the highest average entry density (2.27) and Middle East & Northern Africa the lowest (0.55).[3] Put another way, about 20,000 new firms register each year in Belgium—which

[3] The relatively high score for Sub-Saharan African economies (1.42) is driven by South Africa (6.74), which has a popular simplified LLC form for sole proprietors.

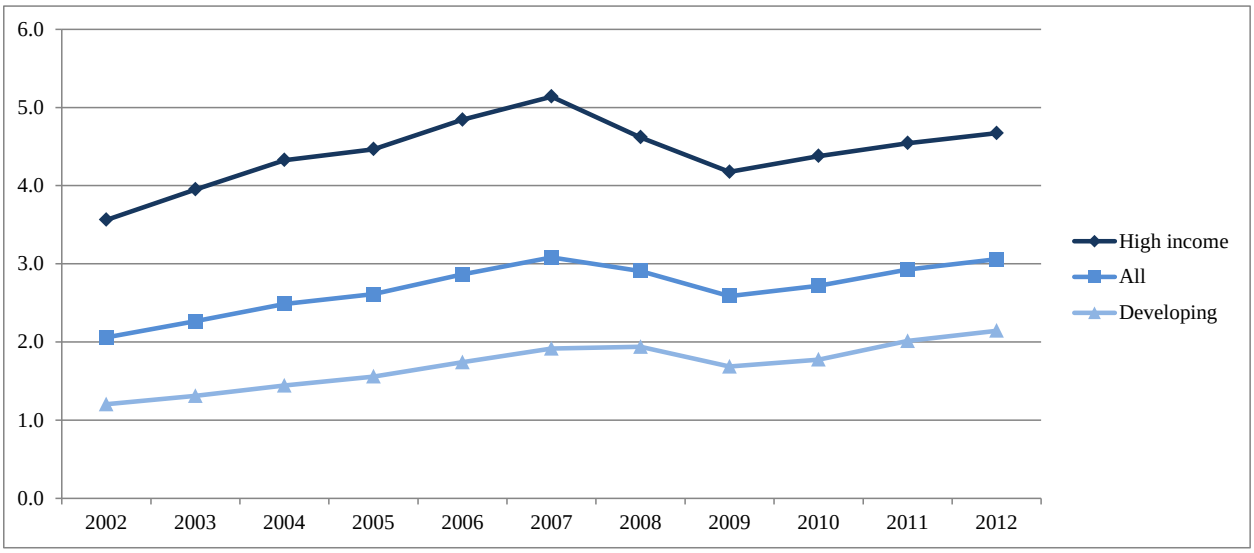
has an average entry density for high-income economies in the 2012 sample. By contrast, only about 4,000–5,000 new firms register each year in Belarus, Guatemala, and Zambia—each of which falls in the middle of the distribution of entry density for developing economies and has a working-age population similar in size to that in Belgium.

3.2.1 Entrepreneurship and the Business Cycle

The link between new firm registration and the business cycle can be easily seen through the lens of the 2008-09 global financial crisis. New firm registrations closely tracked the boom, bust, and recovery cycle of the global economy over this period (figure 2). In the pre-crisis period from 2002 to 2007, a majority of countries experienced robust positive growth in new firm registrations. On average, new firm registrations grew at a median annual rate of 10 percent among the 58 economies with complete 2002-2012 data (figure 2) with approximately 75 percent of economies experiencing positive annual growth in entry density each year. Indeed, in 52 of the 58 economies with complete 2002-2012 data, new firm entry density in 2007 exceeded that of 2002.

However, with tight lending practices, depressed aggregate demand, and widespread uncertainty, an economic recession is a difficult time to start a business—and the data bear this out. Beginning in 2008, new firm creation stalled and even dropped sharply in many economies (figure 2). While 72 percent of economies experienced positive annual growth in entry density in 2007, just 53 percent of economies did so in 2008. Among high-income economies, just 29 percent had positive year-on-year growth between 2007 and 2008.

Figure 2 Entry density in 58 economies, 2002–12
Newly registered firms per 1,000 working-age adults



Note: Entry densities are based on 58 economies with data available over the entire period.
Source: World Bank Entrepreneurship Database, 2013 edition.

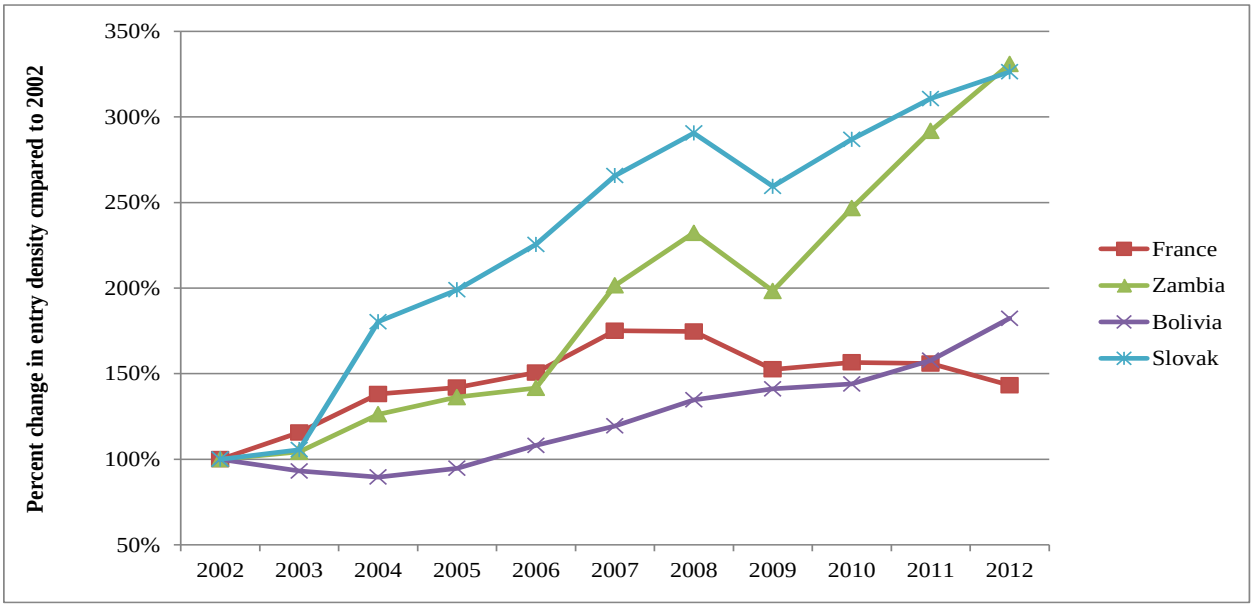
By 2009, new firm registrations had dropped in nearly two-thirds of economies in the sample with new firm registrations contracting by a median annual rate of 4 percent, and 11 percent in high-income economies. 17 out of 21 high income countries with complete 2002-2012 data experienced a drop in new firm registrations between 2008 and 2009. In some economies, the drop was quite dramatic: new firm registrations in Spain fell between 25 and 30 percent each year in 2008 and 2009. Fewer developing countries appear to have been affected, with 40 percent of countries maintaining even or positive growth in entry density between 2008 and 2009.

Although data from 2010 to 2012 show clear signs of a recovery, fewer countries experienced positive annual growth in new firm registrations and the pace of growth was considerably slower as compared to the pre-crisis period. By 2012, the median annual rate of growth had rebounded to 7 percent, though the level of new firm registrations remained below the 2007 level in half of the economies in our sample. The slower rates of growth in new firm registration following the crisis raises the possibility of hysteresis, in which the financial crisis

may have affected the natural rate of new firm registrations in some countries. Future rounds of data will shed light on this issue.

As always, aggregate trends mask considerable heterogeneity. While the patterns of new firm registrations do reflect the impact of the crisis in the majority of economies, figure 3 demonstrates the diversity of paths that this effect took. France experienced steady growth in new firm registrations before the crisis, no growth in 2008, a steep drop in 2009, and anemic or slightly negative growth from 2009 to 2012. In the Slovak Republic, new firm registrations grew at a steady pace of around 13 percent from 2002 to 2008, then dropped sharply in 2009 before resuming growth around 10 percent in 2010, 2011 and 2012.

Figure 3 Country examples of entry density over 2002-2012 period
Percent change in entry density as compared to 2002



Source: World Bank Entrepreneurship Database, 2012 edition.

In Bolivia, as in many other developing economies, the crisis manifested itself as a slow-down, rather than a drop, in new firm registrations. Bolivia averaged 9 percent annual growth in new firm registrations between 2004 and 2008. In 2009 and 2010, however, this rate slowed to 5

percent, on average, before rising to 14 percent in 2011 and 2012. It is also possible that the effect of the crisis in some economies may have been mitigated by simultaneous reforms that simplified business registration (Klapper and Love, 2011a).

4. Regression Results

4.1 New Firm Registration and Economic Growth

In this section, first we empirically investigate the relationship between the business cycle and new firm registration among our sample of 109 economies. Next, we explore the heterogeneity of this relationship, focusing on the effects of financial development and the business environment.

In our first empirical exercise, we employ a simple model using the log of entry density as our dependent variable and economic growth (as a proxy for the business cycle) as our main independent variable of interest. We also include country and year fixed effects to account for the panel structure of the data as well as global macroeconomic trends:

$$\text{Log Entry Density}_{it} = \text{growth}_{it-1} + X_{it} + \delta_t + \eta_i + \varepsilon_{it} \qquad (1)$$

where X_{it} matrix of time-variant county characteristics, δ_t is a matrix of year fixed effects and η_i is a matrix of country fixed effects. We explore the relationship of new entry density with contemporaneous economic growth, as well as using lagged economic growth. The year 2007, which is the latest pre-crisis year, is the excluded variable in the matrix of year fixed effects. We estimate the model with errors clustered on the country level to capture any serial correlation of errors within a country. The log of entry density, economic growth and other country-level variables are trimmed at the 1st and 99th percentiles to diminish the influence of outliers.

Table 1 formally investigates the relationship between the business cycle and new firm registration from 2002 to 2012. We first test this relationship is a simple bivariate regression model with country fixed effects and find a significant and positive relationship between economic growth and new firm registrations (column 1). We then add in year fixed effects to absorb macroeconomic trends over our sample period and find that the variable-of-interest remains significant (column 2). Further, the values of binary year coefficients clearly illustrate the impact of the global economic crisis on new firm registration: new firm registration rose steadily in the pre-crisis period, from 2002 to 2007. In 2008 and 2009, however, the upward trend stalls, as confirmed by the insignificant 2008 and 2009 binary variables. This progression closely maps the informal description of the time trend of entry density in Figure 1. Despite controlling for global trends, the country-specific GDP growth remains significant.

Column 3 of Table 1 demonstrates that the GDP growth result is robust to the inclusion of a trend variable which further controls for global macroeconomic trends. The trend variable takes on value of 1 for the year 2002, 2 for the year 2003, and so on. In column 4 we add in controls for domestic credit as a percentage of GDP as well as a principle component score measuring the business environment as derived from Doing Business indicators to control for other factors that may influence new firm registration and be picked up on by economic growth. Columns 5-8 replicates columns 1-4 using instead economic growth and other country variables lagged at one year. The main result remains: there exists a positive and significant relationship between economic growth and new firm registration.

4.2 Heterogeneous Effects of the Business Cycle

Next, we formally investigate heterogeneity in the relationship between the business cycle and new firm registration. We employ two approaches: first examining time-invariant country characteristics, i.e. in what *type* of countries is the relationship between the business cycle and new firm registration particularly strong, and second by examining time-variant country characteristics, i.e. *within countries*, what factors strengthen the positive relationship between the business cycle and new firm registration. We build on the previous model by adding an interaction term between economic growth and a country-level, time-invariant variables, X_i :

$$\text{Log Entry Density}_{it} = \text{growth}_{it} + \text{growth}_{it*} X_{i+} \delta_t + \eta_i + \varepsilon_{it} \qquad (2)$$

Table 4 examines whether broad country-level differences in financial development (as proxied by domestic credit as a percentage of GDP) or the business environment influence the relationship between the business cycle and new firm registrations. We hypothesize that in these types of countries, barriers to starting a business, such as access to credit and regulatory hurdles, are lower thus making new firm registration more responsive to the business cycle.

As suggested by Figure 3 in the previous section, the magnitude and timing of drops (or slow-downs) varied significantly across economies. One important channel through which economic booms or slow-downs likely affected new firm registrations is access to external finance. Previous work by Rajan and Zingales (1999) demonstrated that access to external finance and financial development is particularly important to the growth of firms that are more dependent on external finance. The same is likely to hold for new firms: in countries where financial markets are well-developed, new firm registrations may be particularly responsive to

the business cycle. Thus, we test our hypothesis that the business cycle in countries with high levels of financial development is more strongly associated with new firm registrations.

We define financial development as a country-level, time-invariant characteristic by taking the average of domestic credit to GDP over the time period 2002 to 2012 and interacting this value with lagged GDP growth. Because country fixed-effects are included, we do not include the domestic credit to GDP value separately.[4] We find this interaction to be positive and significant at the 1% level, suggesting that countries with highly developed financial systems have stronger relationship between new firm registration and the business cycle.

We next examine whether the quality of the business environment affects the relationship between the business cycle and new firm registration. Djankov, et al. (2006), show that countries with better regulations grow faster, but do not examine changes in this relationship over time. Again, we hypothesize that a robust business environment enables entrepreneurs to be nimble, react quickly and take advantages of opportunities presented by fluctuations in the business cycle. As proxies for the business environment, we use indicators from the Doing Business database, specifically from each of the following subtopics: Starting a Business, Resolving Insolvency, Registering Property, Enforcing Contracts, and Getting Credit. Indicators in these subtopics have been tracked since 2003 or 2004, i.e. the first two years of the Doing Business project. Although other indicators have been added (i.e. Getting Electricity), we do not include them in our analysis because they have limited coverage. We calculate a principal component score based for each subtopic using the three to four indicators within each subtopic. Using the same methodology, we also calculate an overall Doing Business score based on all 17 indicators.

[4] These results are also robust to using either starting values of our financial development and business environment measures (using 2003 for financial development and 2004 for business environment), or averages taken over the pre-crisis years, i.e. 2003-2007 or 2004-2007.

As before, we define components of the business environment as country-level, time-invariant characteristics by taking the average of the overall score and subtopic scores over the time period 2003 (or 2004, depending on coverage) to 2012 and interacting this value with lagged GDP growth. Our results confirm our hypothesis that the relationship between the business cycle and new firm registration in stronger in countries with better business environments. The coefficients are positive for the main score and all five subtopic scores and significant for the main score and three of the five subtopic scores. Intuitively, the coefficient is largest for the Starting a Business score which is most directly related to our independent variable, new firm registrations.

In Table 5, we again explore heterogeneity in the relationship between the business environment and new firm registration, but this time through the lens of time-variant indicators of financial development and the business environment *within* countries. Having established that countries with better-developed financial systems and better business environments display a particularly strong relationship between the business environment and new firm registration, we explore whether variation in these measures within countries over time can also explain heterogeneity in the relationship. We hypothesize that variations over time in financial development and the business environment in a given country will indeed impact the relationship between the business environment and new firm registration in much the same way that these factors affect heterogeneity in the relationship across countries. Thus our model is identical to that in table 4, except that financial development and business environment variables, captured by $X_{it,}$ now vary over time, and because of this we can also include them separately in the model.

$$\text{Log Entry Density}_{it} = \text{growth}_{it} + \text{growth}_{it*} X_{it} + X_{it} + \delta_t + \eta_i + \varepsilon_{it} \qquad (3)$$

Column 1 confirms that the relationship between the business cycle and new firm registration is stronger in years where the percentage of domestic credit to GDP is higher. Columns 2-7 also mirror the results in table 4, illustrating that improvements in the business environment can strengthen the relationship between the business cycle and new firm registration. The interaction of the main Doing Business score with GDP growth is positive and significant, as are three of the five interactions of the subtopic scores with GDP growth. Interestingly, while results in table 4 indicate that the ease of getting credit does not affect the relationship between the business environment and new firm registrations *across* countries, changes in these measures within countries can indeed impact the relationship.

5. Conclusion

This paper studies the relationship between entrepreneurship and economic growth using panel data on the number of new firm registrations in 109 countries for the period 2002-2012. We find strong evidence of a pro-cyclical pattern in entrepreneurship. In addition, we show significant heterogeneous relationships between new firm registration and the business cycle. We find that higher levels of financial development and better business environments are associated with a stronger pro-cyclicality of entrepreneurship both across countries and within countries over time. Our results are robust to various measures of business regulation, such as the cost and time of starting a new firm and closing an insolvent firm.

An explanation for our results might be that in countries with deeper credit markets, entrepreneurs are more accustomed to borrowing from formal financial institutions and are more dependent on the availability of external finance to use as start-up capital. Therefore, tighter credit during recessions should result in fewer new business startups. In comparison, in countries where new business owners are not reliant on external finance, but depend more on other sources

of start-up capital, such as savings, personal credit cards, and loans from family and friends, the credit contraction should not have a significant impact and thus the pro-cyclical relationship will be muted.

In addition, in countries with good business environments and low regulatory burdens, current and potential business owners should be able to quickly respond to changes in demand and start a new business when demand conditions are good, or close a failing one when the demand falters. Again, this will lead to a stronger pro-cyclical relationship between the business cycle and entrepreneurship in countries with better business environments.

Taken together, our results suggest a crucial role for policy makers and regulators in fostering economic growth. First, an important way for the government to promote financial sector development is to ensure that the banking sector is competitive and efficient, but also stable (World Bank, 2012). It is also critical that regulations simplify private sector entry, exit, and other government relations to promote private sector growth and competitiveness (Klapper, et al., 2006). Fostering an efficient regulatory environment for the financial and private sector can promote economic growth by aiding the efficient wind-down of insolvent firms during economic slowdowns and encouraging a speedier recovery in the formation of new firms during economic expansions.

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Table 1: Variable Definitions

Variable	Description	Source
Entry Density	Entry density, defined as new firms registered per working age population (normalized by1,000) (*World Bank Entrepreneurship Database, 2013*)	World Bank Entrepreneurship Database, 2013
GDP growth	Real GDP growth (%) (*WB-WDI*, 2013)	World Bank World Development Indicators, 2013
Credit/GDP	Domestic Credit to Private Sector as % GDP	World Bank World Development Indicators, 2013
Doing Business	Principle Component Score of 17 standardized *Doing Business* indicators covering 5 subtopics (*Starting a Business*, *Resolving Insolvency*, *Registering Property*, *Enforcing Contracts*, *Getting Credit*). Higher values indicate a more favorable busines environment.	Doing Business, 2013
Starting a Business	Principle Component Score of 4 standardized *Starting a Business* subtopic indicators (procedures, time, cost, minimum capital). Higher values indicate a more favorable busines environment.	Doing Business, 2013
Resolving Insolvency	Principle Component Score of 3 standardized *Resolving Insolvency* subtopic indicators (cost, time, recovery rate). Higher values indicate a more favorable busines environment.	Doing Business, 2013
Registering Property	Principle Component Score of 3 standardized *Registering Property* subtopic indicators (procedures, time, cost). Higher values indicate a more favorable busines environment.	Doing Business, 2013
Enforcing Contracts	Principle Component Score of 3 standardized *Enforcing Contracts* subtopic indicators (procedures, time, cost). Higher values indicate a more favorable busines environment.	Doing Business, 2013
Getting Credit	Principle Component Score of 4 standardized *Getting Credit* subtopic indicators (legal rights, credit information, public registry coverage, private bureau coverage). Higher values indicate a more favorable busines environment.	Doing Business, 2013

Table 2: Summary Statistics

Variable	N	mean	sd	min	max	p1	p5	p50	p95	p99
Entry Density	996	2.49	3.32	0.00	25.07	0.01	0.03	1.10	8.74	16.82
GDP growth	996	4.40	4.77	-41.30	46.50	-8.01	-2.77	4.28	10.78	18.80
Credit/GDP	954	58.00	52.19	0.92	319.46	4.01	7.67	37.72	170.02	214.39
Doing Business	694	0.03	2.21	-7.00	4.31	-6.51	-3.43	0.10	3.60	4.17
Starting a Business	809	0.02	1.20	-7.16	1.79	-5.10	-1.83	0.22	1.40	1.59
Resolving Insolvency	771	0.02	1.47	-3.83	2.81	-3.61	-2.51	-0.13	2.53	2.78
Registering Property	724	-0.01	1.21	-5.34	2.20	-3.45	-2.10	0.14	1.67	1.98
Enforcing Contracts	809	0.05	1.19	-5.83	2.66	-2.78	-2.21	0.24	1.70	2.46
Getting Credit	735	0.01	1.38	-2.36	3.76	-2.36	-2.01	0.11	2.22	2.71

Table 3: The Business Cycle and New Firm Creation

This table uses an unbalanced panel dataset from 109 countries for the 11-year period 2002 to 2012. All variables are defined in Table 1. The dependent variable is annual entry density (logged). All variables have been trimmed at the 1st and 99th percentiles (with the exception of the trend variable and binary year variables). All columns include country and year fixed effects and standard errors clustered at the country-level. Variables marked as lagged are lagged one year. Standard errors are in squared brackets.

	Entry Density							
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
GDP growth	0.010**	0.018**	0.018**	0.028***				
	(0.005)	*(0.007)*	*(0.007)*	*(0.006)*				
GDP growth (lagged)					0.011***	0.012*	0.012*	0.022***
					(0.004)	*(0.006)*	*(0.006)*	*(0.006)*
Trend (2002=1; 2012=13)			0.087***	-0.001			0.033***	0.012
			(0.013)	*(0.016)*			*(0.013)*	*(0.016)*
Credit/GDP				0.000				
				(0.001)				
Credit/GDP (lagged)								-0.002
								(0.002)
Doing Business				0.166***				
				(0.063)				
Doing Business (lagged)								0.111*
								(0.061)
Year = 2002		-0.435***				-0.425***	-0.261***	
		(0.066)				*(0.059)*	*(0.092)*	
Year = 2003		-0.369***	-0.020			-0.379***	-0.247***	
		(0.048)	*(0.040)*			*(0.050)*	*(0.077)*	
Year = 2004		-0.293***	-0.032	-0.200***		-0.276***	-0.178***	
		(0.039)	*(0.039)*	*(0.073)*		*(0.042)*	*(0.063)*	
Year = 2005		-0.178***	-0.004	-0.133**		-0.201***	-0.136***	-0.158***
		(0.038)	*(0.036)*	*(0.060)*		*(0.036)*	*(0.049)*	*(0.058)*
Year = 2006		-0.103***	-0.016	-0.083**		-0.094***	-0.061	-0.061
		(0.029)	*(0.026)*	*(0.041)*		*(0.032)*	*(0.037)*	*(0.045)*
Year = 2008		0.052	-0.035	0.054***		0.015	-0.018	0.006
		(0.032)	*(0.036)*	*(0.020)*		*(0.028)*	*(0.026)*	*(0.021)*
Year = 2009		0.101	-0.074	0.075		0.002	-0.063**	-0.050
		(0.068)	*(0.079)*	*(0.048)*		*(0.046)*	*(0.031)*	*(0.033)*
Year = 2010		0.083	-0.178**	-0.029		0.121*	0.023	0.071
		(0.055)	*(0.072)*	*(0.022)*		*(0.067)*	*(0.046)*	*(0.045)*
Year = 2011		0.121**	-0.227***			0.129**	-0.002	0.003
		(0.059)	*(0.085)*			*(0.055)*	*(0.027)*	*(0.028)*
Year = 2012						0.164***		
						(0.063)		
Constant	-1.795***	-1.771***	-2.293***	-1.347***	-1.891***	-1.864***	-2.061***	-1.590***
	(0.035)	*(0.068)*	*(0.081)*	*(0.275)*	*(0.030)*	*(0.061)*	*(0.121)*	*(0.285)*
Observations	870	870	870	631	960	960	960	641
Adjusted R2	0.951	0.966	0.966	0.978	0.950	0.965	0.965	0.975
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 4: Time-invariant Heterogeneous Effects of the Business Cycle and New Firm Entry

This table uses an unbalanced panel dataset from 109 countries for the 11-year period 2002 to 2012. All variables are defined in Table 1. The dependent variable is annual entry density (logged). All variables interacted with GDP growth are country average over the period 2002 to 2012 (coverage for Doing Business variables begins in 2003 or 2004). All variables have been trimmed at the 1st and 99th percentiles (with the exception of the binary year variables). All columns include country and year fixed effects and standard errors clustered at the country-level. Variables marked as lagged are lagged one year. Standard errors are in squared brackets.

	Entry Density						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP growth (lagged)	-0.002	0.010	0.010	0.012*	0.010	0.010*	0.013**
	(0.007)	*(0.006)*	*(0.006)*	*(0.007)*	*(0.006)*	*(0.006)*	*(0.006)*
GDP growth (lagged) X Credit/GDP ('02-'12)	0.000***						
	(0.000)						
GDP growth (lagged) X Doing Business ('04-'12)		0.007***					
		(0.002)					
GDP growth (lagged) X Starting a Business ('03-'12)			0.012**				
			(0.005)				
GDP growth (lagged) X Resolving Insolvency ('03-'12)				0.007**			
				(0.003)			
GDP growth (lagged) X Registering Property ('04-'12)					0.006		
					(0.005)		
GDP growth (lagged) X Enforcing Contracts ('03-'12)						0.009**	
						(0.004)	
GDP growth (lagged) X Getting Credit ('04-'12)							0.006
							(0.004)
Year = 2002	-0.410***	-0.412***	-0.430***	-0.422***	-0.427***	-0.423***	-0.412***
	(0.058)	*(0.058)*	*(0.059)*	*(0.058)*	*(0.059)*	*(0.058)*	*(0.059)*
Year = 2003	-0.370***	-0.389***	-0.387***	-0.389***	-0.383***	-0.384***	-0.361***
	(0.051)	*(0.051)*	*(0.052)*	*(0.051)*	*(0.051)*	*(0.051)*	*(0.049)*
Year = 2004	-0.265***	-0.260***	-0.270***	-0.277***	-0.271***	-0.272***	-0.273***
	(0.043)	*(0.043)*	*(0.043)*	*(0.043)*	*(0.042)*	*(0.042)*	*(0.042)*
Year = 2005	-0.200***	-0.202***	-0.207***	-0.206***	-0.196***	-0.203***	-0.192***
	(0.037)	*(0.036)*	*(0.037)*	*(0.037)*	*(0.036)*	*(0.036)*	*(0.036)*
Year = 2006	-0.094***	-0.095***	-0.093***	-0.104***	-0.090***	-0.093***	-0.086***
	(0.031)	*(0.032)*	*(0.032)*	*(0.032)*	*(0.032)*	*(0.032)*	*(0.032)*
Year = 2008	0.019	0.035	0.018	0.032	0.026	0.032	0.013
	(0.028)	*(0.022)*	*(0.028)*	*(0.022)*	*(0.024)*	*(0.025)*	*(0.028)*
Year = 2009	0.020	0.012	0.012	0.007	0.003	0.012	0.006
	(0.047)	*(0.049)*	*(0.047)*	*(0.050)*	*(0.046)*	*(0.047)*	*(0.048)*
Year = 2010	0.156**	0.133*	0.127*	0.129*	0.108	0.122*	0.125*
	(0.070)	*(0.071)*	*(0.069)*	*(0.071)*	*(0.066)*	*(0.065)*	*(0.071)*
Year = 2011	0.143**	0.113**	0.121**	0.119**	0.123**	0.131**	0.127**
	(0.056)	*(0.055)*	*(0.056)*	*(0.057)*	*(0.056)*	*(0.057)*	*(0.057)*
Year = 2012	0.180***	0.152**	0.170***	0.144**	0.162**	0.169***	0.170***
	(0.065)	*(0.061)*	*(0.065)*	*(0.062)*	*(0.065)*	*(0.064)*	*(0.066)*
Constant	-1.788***	-1.731***	-1.891***	-1.826***	-1.757***	-1.685***	-1.782***
	(0.061)	*(0.073)*	*(0.065)*	*(0.065)*	*(0.096)*	*(0.107)*	*(0.073)*
Observations	934	909	936	905	941	944	937
Adjusted R2	0.965	0.966	0.966	0.965	0.966	0.966	0.965
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: Time-variant Heterogeneous Effects of the Business Cycle and New Firm Entry

This table uses an unbalanced panel dataset from 109 countries for the 11-year period 2002 to 2012. All variables are defined in Table 1. The dependent variable is annual entry density (logged). All variables have been trimmed at the 1st and 99th percentiles (with the exception of the binary year variables). All columns include country and year fixed effects and standard errors clustered at the country-level. Variables marked as lagged are lagged one year. Standard errors are in squared brackets.

	Entry Density						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
GDP growth (lagged)	0.000	0.020***	0.018***	0.024***	0.015**	0.019***	0.021***
	(0.008)	*(0.007)*	*(0.006)*	*(0.007)*	*(0.006)*	*(0.006)*	*(0.006)*
Credit/GDP (lagged)	-0.001						
	(0.002)						
GDP growth (lagged) X Credit/GDP (lagged))	0.000**						
	(0.000)						
Doing Business (lagged)		0.107					
		(0.082)					
GDP growth (lagged) X Doing Business (lagged)		0.006**					
		(0.003)					
Starting a Business (lagged)			0.057				
			(0.058)				
GDP growth (lagged) X Starting a Business (lagged)			0.013**				
			(0.005)				
Resolving Insolvency (lagged)				0.044			
				(0.083)			
GDP growth (lagged) X Resolving Insolvency (lagged)				0.005			
				(0.004)			
Registering Property (lagged)					0.098		
					(0.092)		
GDP growth (lagged) X Registering Property (lagged)					0.012***		
					(0.004)		
Enforcing Contracts (lagged)						0.247*	
						(0.128)	
GDP growth (lagged) X Enforcing Contracts (lagged)						0.004	
						(0.005)	
Getting Credit (lagged)							-0.047
							(0.063)
GDP growth (lagged) X Getting Credit (lagged)							0.012***
							(0.003)
Constant	-1.754***	-1.390***	-1.938***	-1.828***	-1.444***	-1.136***	-1.815***
	(0.068)	*(0.231)*	*(0.068)*	*(0.123)*	*(0.220)*	*(0.347)*	*(0.150)*
Observations	908	666	770	735	694	770	704
Adjusted R2	0.970	0.970	0.970	0.969	0.972	0.970	0.969
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes