Essays on Economics of Entrepreneurship

by

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Abstract

This dissertation examines three important issues. The first issue is about the human capital investment and entrepreneurship as a career choice. The standard human capital theory shows that firms (employees) never invest in general (firm-specific) human capital of the employee as they do not extract any return from it. However, when entrepreneurship is introduced as a career option for an innovative employee, both firm’s and employee’s human capital investments change. Employee starts investing in his firm-specific human capital to increase the probability to innovate (and to become an entrepreneur). However, the firm uses general human capital investment to reduce the risk of employee’s departure. The second issue is regarding the factors motivating entry regulations reforms and the possible nonlinear effects of entry regulation reforms. The current literature and the policy recommendations assume that these reforms have linear effects on entrepreneurship. Nevertheless, the anecdotal evidence shows that the outcomes of such reforms vary greatly from country to country. To investigate this issue, I collect a sample data on entry regulations and firm creation from World Bank. The empirical analysis indicates that the effect of entry regulation reforms depends on the pre-reform level of bureaucracy in the country. More specifically, while low-bureaucracy countries benefit from entry regulation reforms, high-bureaucracy countries do not benefit. Moreover, the probability of making a reform increases if the country has reformist neighbors, cumbersome entry regulations, high unemployment rate, or low corruption level. The last issue is related to the individual and joint effects of bureaucracy and corruption on different types of entrepreneurs. The current literature investigates these effects only on unified measures of entrepreneurship. However, entrepreneurs are very different in many senses. To address this issue, I collect the necessity-based and opportunity-based entrepreneurship data from Global Entrepreneurship Monitor. The empirical analysis yield two important results: First, bureaucracy has a direct negative (positive) effect on necessity-based
(opportunity-based) entrepreneurs. Second, corruption mitigates the effect of bureaucracy for both groups of entrepreneurs. All three chapters offer useful insights and important implications to academics and policymakers.
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Statement of Originality

(Required only for Division IV Ph.D.)

I hereby certify that all of the work described within this thesis is the original work of the author. Any published (or unpublished) ideas and/or techniques from the work of others are fully acknowledged in accordance with the standard referencing practices.

(Koray Sayili)

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Chapter 1

Introduction

“Change is the only constant in life.” These are the famous words of Heraclitus (of Ephesus). Even though he used these words millennia ago, it explains the world we have been living in at any period.

As anything else in life, economies are in the process of continuous change. Joseph Schumpeter, one of the most-influential economists of all times, argues that entrepreneurs are at the core of this economic change. In Capitalism, Socialism and Democracy (1942), he defines the function of entrepreneurs as: “The function of entrepreneurs is to reform or revolutionize the pattern of production by exploiting an invention or, more generally, an untried technological possibility for producing a new commodity or producing an old one in a new way…”\(^1\)

Despite Schumpeter’s influential works on entrepreneurship, large corporations continued to be the main subjects of economic analysis and research during the first three decades of post-World War II period (van Stel, 2005). However, entrepreneurship (and small businesses) moved to the center stage starting from mid-1970s thanks to the arrival of new production and communication technologies. These technologies simplified the production of, access to, and dissemination of new and valuable information which eventually gave rise to “knowledge-based economies” period.

In this new period, more and more economists (and social scientists) started to pay attention to entrepreneurship as a research topic. Some of these studies concentrated on entrepreneurship at individual level. What factors motivate people to start new ventures? What

lies behind the entrepreneurial success? Do first-time and serial entrepreneurs face similar challenges? These are some of the questions investigated by this strand of economics of entrepreneurship literature. Another group of studies focused on the relationship between new firm creation and industrial competition. What are the possible effects of new firm entry on industrial profits/market values? What strategies incumbent firms use when there is a new entry into their market? How do government regulations (such as the ones regarding labor mobility and patenting) affect specific industries? These types of questions are examined by this strand of economics of entrepreneurship literature. The third group of studies used more macro perspectives in their approach. Is entrepreneurship the cause or the consequence of unemployment? How do we define the relationship between entrepreneurship and economic growth? Why some countries are more entrepreneurship-oriented than others? These are typical questions studied in this strand of economics of entrepreneurship literature.

Despite the growing interest in entrepreneurship (as a research topic) in the last three decades, the literature does not offer a clear, robust, or systematic answer to many empirical and theoretical questions. This dissertation aims to provide answers to some of the unanswered questions with the following three chapters.

In Chapter 2, Preventing Employee Departure: A Human Capital Model with Innovation, I study how the optimal human capital investments by firms and employees are affected when an innovative employee can choose to become an entrepreneur (rather than staying as an employee and sharing the innovative idea with the management). In standard human capital model developed by Becker (1962), employees can only choose between working for their current firm and working for another firm. Because the employee’s firm-specific skills are not valuable (or useful) in another firm, they do not get any financial benefit for these skills. As a result of this, only firms pay for firm-specific human capital investments. On the other hand,
because their general skills are equally valuable in any firm, employee’s current firm cannot extract any return from these skills. That is why firms do not pay for general human capital investments in Becker’s model. However, when we look at the empirical evidence, we see that employees invest in their firm-specific human capital and firms invest in general human capital of their employees. In this chapter, I shed light on this puzzle by developing a principal-agent model where both firm and employee can invest in the employee’s human capital. The novel feature of this model is that firm-specific human capital increases not only employee’s productivity but also his probability to come up with an innovative idea. From the employee’s perspective, the innovation brings the opportunity of entrepreneurship. From the firm’s perspective, entrepreneurship represents the departure of a skilled employee. The first main result of this model shows that when the entrepreneurial return is sufficiently high, the employee becomes too motivated to innovate. Therefore, he invests in his firm-specific human capital in equilibrium. The second main result of this model is that when the employee invests more than a certain threshold in his firm-specific human capital, the firm uses general human capital investment to reduce the risk of departure.

In Chapter 3, *Entry Regulation Reforms: Who Gains From Them and Why We Make Them?*, I investigate the possible non-linear effects of entry regulation reforms on new firm creation rate and the factors motivating countries to make such reforms. Many countries have simplified their entry regulations in the last decade. Yet, the outcomes of these reforms vary significantly. This raises the question of whether the effects of such reforms are linear or nonlinear. In addition to that, there is a possibility that entry regulation reforms and firm creation rates are determined simultaneously which raises concerns about endogeneity. I address these issues in this chapter by using a sample of 34 countries and eight years of entry regulations (i.e., the number of procedures to start a business) and entrepreneurship (new business density) data
available in World Bank databases. This chapter has three important empirical findings: First, entry regulation reforms positively affect the firm creation rate in a linear setting. This result is robust to different bureaucracy measures and econometric models including the treatment effect model. More interestingly, this effect is instantaneous and it dies out in the long-run. Second, while low-bureaucracy countries benefit from these reforms, high-bureaucracy countries do not. Even though this result sounds surprising, one possible explanation comes from the kinship of bureaucracy and corruption. In other words, high-bureaucracy countries are generally high-corruption countries and potential entrepreneurs can circumvent the bureaucratic process through corruption. Last but not least, countries with reformist neighbors, cumbersome entry regulations, high unemployment rate, and low corruption level are more likely to make entry regulation reforms.

In Chapter 4, Red Tape, Corruption, and Entrepreneurship: Who Benefits and Who Dislikes What?, I examine the individual and joint effects of bureaucracy and corruption on different types of entrepreneurs. The current literature argues that cumbersome entry regulations and corruption are major obstacles for potential entrepreneurs. Even though this conclusion is in line with conventional wisdom, it fails to account for different types of entrepreneurs. Furthermore, despite the policy recommendations of previous literature, some countries (including the developed countries like Germany, Finland, Switzerland, and the United States) preferred not to reform their entry regulations. I address these issues by employing the necessity-based and the opportunity-based entrepreneurship rate data of Global Entrepreneurship Monitor (GEM). The empirical analysis yields two important results: First, entry regulations have a direct negative (positive) effect on necessity-based (opportunity-based) entrepreneurship rate. Second, corruption mitigates the effect of entry regulations for both groups of entrepreneurs. In other words, corruption greases the wheels for necessity-based entrepreneurs and it sands the wheels
for opportunity-based entrepreneurs. One possible explanation of these empirical results is the competition between these two groups of entrepreneurs. Cumbersome entry regulations discourage necessity-based entrepreneurs as expected. However, this reduces the potential competition for opportunity-based entrepreneurs. If this positive effect (i.e., reduced competition) outweighs the negative effect (i.e., cost) of bureaucracy, then opportunity-based entrepreneurs benefit from bureaucracy.

In Chapter 5, I provide the concluding remarks on the subjects covered in Chapter 2 to Chapter 4 and some suggestions for future research.
Chapter 2

Preventing Employee Departure: A Human Capital Model with Innovation

2.1 Introduction

In his seminal paper, Becker (1962) categorizes human capital into two groups, general human capital and firm-specific human capital, based on which employers value them. While general human capital is equally valuable in any firm, firm-specific human capital is only valuable to the current employer. Because all firms value the employee's general human capital equally, the employee realizes all the returns to general human capital investment. Consequently, firms never invest in general human capital. On the other hand, because no other firm values the employee's firm-specific human capital, the current firm captures all the returns to specific human capital investment. Hence, employees never invest in firm-specific human capital. Yet, empirical evidence (e.g. Capelli, 2004; Flaherty, 2007) shows that many firms invest in general human capital of their employees and many employees invest in firm-specific human capital. This paper aims to shed light on this puzzle by analyzing the optimal human capital investments in a principal-agent framework. The key departure from Becker's work is that I introduce "generating an innovative idea" as the new effect of human capital investment.

I develop a two-period principal-agent model in which first the principal (she) and then the agent (he) can invest in the agent's human capital during the first period. The human capital investment can be in the form of general or specific human capital. While general human capital only increases the agent's second period output, specific human capital increases both the agent's second period output and his probability to innovate.² At the end of the first period, the agent

² The positive effect of human capital accumulation on innovation is well-documented in the literature. There is both theoretical (e.g. Nelson & Phelps, 1966; Aghion & Howitt, 1998) and empirical evidence (e.g. Ballot, Fakhfakh & Taymaz, 2001; Pauline-Gallié & Legros, 2012) supporting this argument.
realizes whether he has an innovative idea or not. If he has no innovative idea, he can work for the principal or another firm in the second period. In such case, his second period wage is the full return to his general human capital. If, however, the agent has an innovative idea, he implements the innovation outside the firm as an entrepreneur. In this case, the agent earns $R$, which is his return from entrepreneurship.

The first important result of this model is that the agent invests in his specific human capital in equilibrium. The intuition behind this result can be explained as follows: Because the return from entrepreneurship is higher than the employment wage, the agent is interested in becoming an entrepreneur. However, in order to become an entrepreneur, he needs to generate an innovative idea. Therefore, the agent invests in his specific human capital because it increases his probability to innovate and thus, to become an entrepreneur.

From the principal's perspective, innovation represents the departure of a skilled agent. If the agent leaves, the principal benefits from neither his output nor his innovative idea so she invests in the agent's human capital strategically to reduce the risk of departure. Because the principal invests in the agent's human capital before the agent does, she captures the first-mover advantage in the game. This advantage allows her to alter the agent's human capital investments. This brings us the second important result which explains how the principal's and the agent's human capital investments interact. If the principal invests in specific human capital, the agent's probability to innovate increases. This reduces the agent's willingness to stay so the agent reduces his general human capital investment. At the same time, because the agent is less willing to stay and more willing to become an entrepreneur, he increases his specific human capital investment. If the principal invests in general human capital of the agent, the agent's willingness

\[R\]

3 Empirical evidence supports the notion that some employees choose entrepreneurship as a career path if they identify an opportunity or generate an innovative idea (e.g. Cooper, 1985; Bhide, 1994; Gompers, Lerner & Scharfstein; 2005; Ganco, 2013).
to and return from staying increases. This reduces the agent's motivation to innovate. As a result, the agent reduces his specific human capital investment and increases his general human capital investment.

The third important result of the paper pertains to the principal's human capital investments. The principal knows that the agent's specific human capital investment increases as the entrepreneurial income (i.e., $R$) rises. This reduces the marginal benefit (henceforth MB) of investing in the agent's specific human capital for the principal because the agent's probability to stay in the firm reduces with higher specific human capital investment. When $R$ reaches a certain threshold, the MB of investing in the agent's specific human capital reduces to zero for the principal so she stops the investment. If $R$ exceeds this threshold, this time the MB of investing in the agent's general human capital becomes positive. This is because the agent's probability to stay in the firm reduces below the optimal level and the principal needs to make staying more attractive. By investing in the agent's general human capital, the principal raises his second period wage in the firm so the agent's probability to stay increases.

This paper relates to several strands of the economics literature. First and foremost, this paper is a part of the human capital literature which examines why firms (employees) invest in general (specific) human capital. The papers focusing on why firms invest in general human capital offer three alternative explanations. First, the information asymmetry between the principal and other firms allows the principal to capture some return to general human capital investment (Katz & Ziderman, 1990; Chang & Wang, 1996). Second, the principal can enjoy some return to general human capital investment thanks to labor market frictions as suggested by Acemoglu & Pischke (1998, 1999). Third, the principal can benefit from the strategic complementarity between general and specific human capital which incentivizes her to invest in general human capital (Balmaceda, 2005; Kessler & Lülfesmann, 2006). The papers focusing on
why employees invest in specific human capital also offer several explanations. Some of these explanations are promotion based on seniority (Carmichael, 1983), up-or-out contracts (Kahn & Huberman, 1988), promotion to another job (Prendergast, 1993), sales-based incentives (Zabojnik, 1998), and reduction in the probability of being laid off (Bernhardt & Mongrain, 2010).

Within this strand of literature, Sevilir's (2010) work is closest to this study in terms of its context. Sevilir's paper investigates the effect of firm-sponsored general human capital investment on the agent's ability to innovate and start a new venture. It shows that firm's investment in general human capital motivates the agent to exert more effort. Higher effort increases the agent's probability to generate a firm-specific innovation which boosts the principal's profit. This study differs in the following aspects: First, Sevilir (2010) assumes that firm can only invest in general human capital. In this paper, firm can invest in general and/or specific human capitals. Second, Sevilir (2010) uses the innovation as the only outcome of human capital investment. This paper simultaneously studies the effect of human capital investment on both the agent's production and his probability to innovate. Finally, Sevilir (2010)'s result on general human capital stems from the principal's probability to capture the rent from firm-specific innovation. In this paper, the principal never captures any returns from innovation and she invests in general human capital just to increase the probability of retention. In other words, this study offers a novel explanation of why the principal invests in the agent's general human capital.

The second related strand of literature studies the effects of innovation, allocation of IP rights, and labor mobility on corporate strategies. Kim & Marschke (2005) study the R&D investment of a firm under the risk of employee departure. They find that higher patenting rate and/or reduction in R&D spending are the optimal responses against this risk. Hellmann (2007)
investigates the corporate strategies in a multi-tasking environment where employees allocate effort between the innovation opportunities and the core task. He shows that the agent's decision on following innovative opportunities and becoming an entrepreneur depends on the incentive scheme for the core task, allocation of IP rights, and the availability of venture capital. Hellmann & Thiele (2011) derive the optimal incentive contract for the standard task when the innovation is unplanned and its rent can only be shared through ex-post bargaining. Their results show that the firm-specificity of the innovation plays a crucial role in the optimal incentive contract: The higher the firm-specificity of the innovation, the lower the incentives for the standard task.

Bettignies & Chemla (2008) investigate why corporate venturing emerges. They show that corporate venturing helps firms retain their star employees who have innovative ideas. Campbell et al. (2012) compare the effect of employee mobility and employee entrepreneurship on the parent firm. Their results indicate that employee entrepreneurship has a larger negative effect on the parent firm even after controlling for observable employee quality.

The contribution of this paper to the literature is three-fold. First, this paper introduces innovation and entrepreneurship into the human capital theory and provides a new explanation for why firms (employees) invest in general (specific) human capital. Second, this paper highlights the difference between sequential and simultaneous human capital investments. Third, this paper provides a theoretical explanation for the empirical observation of firm-provided general human capital's positive effect on employee retention (see e.g. Capelli, 2004; Flaherty, 2007; Gicheva, 2012).4

The rest of the paper is organized as follows: Section 2 presents the basic setup for the principal-agent framework. Section 3 analyzes the human capital model without innovation as

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4 Capelli (2004) and Flaherty (2007) show that employer provided general training - in the form of tuition reimbursement - increases the employee retention rate. Moreover, the results in Gicheva (2012) support the same argument by indicating employer-sponsored MBA reduces the turnover probability.
the benchmark case. Section 4 introduces innovation into the human capital model and derives
the equilibrium human capital investments. Section 5 considers some extensions to the model.
Section 6 discusses empirical implications of the model. Section 7 concludes.

All derivations and proofs are in the appendix.

2.2 Basic Setup
Consider an employment relationship between a risk-neutral principal (she) and a risk-neutral
and wealth-constrained agent (he). There are two periods: In the first period, the agent
accumulates human capital, which is required for production. In the second period, the agent
uses his human capital to produce output.

Human capital investment can be in the form of general training or specific training.
After the training, the agent's human capital levels are \( g \in [0, \bar{g}] \) and \( s \in [0, \bar{s}] \). There are
two ways to invest in the agent's human capital: Contractible training (e.g. education) which is
financed by the principal and non-contractible training (e.g. on-the-job training) level of which
is determined by the agent. The cost of training is \( C(z) = \frac{z^2}{2} \) with \( z = g_A, g_P, s_A, s_P \) where
the subscripts P and A stand for the principal and the agent, respectively.

Investments in human capital have two effects: First, it increases the agent's second
period output if he stays with the firm. The agent's production is represented by the following
function:

\[
F(g, s) = f(g) + h(s)
\]

where \( f(g) = g_A + g_P \) and \( h(s) = s_A + s_P \).\(^5\)

\(^5\) When combined with the convex cost functions, linear production functions guarantee an interior solution. Moreover, they are used by several papers (e.g. Hashimoto, 1981; Benhardt & Mongrain, 2010) in the human capital literature.
The second effect is that specific human capital increases the agent's probability to innovate. This is a key and novel feature of this model. The agent's probability to innovate depends on the agent's specific human capital and is given by:

\[ p(s) = \gamma(s_A + s_P) \]

where \( \gamma \) defines the marginal contribution of specific human capital and \( \gamma \in (0, \frac{1}{\bar{s}}] \).\(^6\)

This probability of innovation function captures the notion that the agent gets a better understanding of the production process with human capital investment. This allows him to determine possible inefficiencies in the production. As a result, the agent can generate an innovative idea which is also an entrepreneurial opportunity for him. The empirical findings of Corbett (2007) also support this assumption, by showing that investment in specific human capital increases the entrepreneurial opportunities identified by employees.

Figure 2.1 illustrates the timing of this game:

[Insert Figure 2.1 around here]

At date 0, the principal offers the agent a contract which specifies the firm-sponsored training level. If the agent accepts the offer, the training stage starts.

At date 1/2, the firm-sponsored training ends and the agent decides how much non-contractible training effort to exert.

An important feature of this game is that the training is in sequential form. Sequential investment is consistent with the idea that many firms offer training and orientation to new employees before they start working.

\(^6\) I assume a linear probability of innovation for the sake of simplicity.
At date 1, the agent becomes aware of the possible innovative idea which is employee-specific. If the agent has an innovative idea, he implements it outside the firm as an entrepreneur and earns the entrepreneurial income of $R$. In this case, the principal hires a new unskilled agent. However, if the agent has no innovative idea, he can work for the principal or another firm in the second period and earn the employment wage ($w$). To ensure that the agent chooses entrepreneurship over employment, I assume that the return from entrepreneurship is higher than the maximum employment wage he can earn in any firm (i.e., $R > w$).

At date 2, the agent gets the income of $R$ and the principal gets nothing if the agent innovated at date 1. Otherwise, the agent gets the wage ($w$) and the principal claims the residual amount.

### 2.3 Benchmark: No-innovation Case

First, I consider the benchmark case which is in the spirit of Becker (1962).

#### 2.3.1 First-Best Outcome

In the first-best scenario, the principal and the agent invest in the agent's human capital to maximize the total surplus:

$$\max (g_A + g_P + s_A + s_P) - \frac{(g_A)^2}{2} - \frac{(g_P)^2}{2} - \frac{(s_A)^2}{2} - \frac{(s_P)^2}{2}$$

The socially optimal human capital investments are then as follows:

$$g_A^{FB} = 1 \quad \text{and} \quad s_A^{FB} = 1$$

---

7 The agent does not share the innovative idea with the principal due to the risk of appropriation. Put differently, once the principal learns about the innovative idea, she can benefit from it without compensating the agent. This story also fits well to the real world. As mentioned in Hellmann & Thiele (2011), overwhelming majority of innovative employees get no or very small reward after sharing their innovative ideas with their employers in the real world.

8 The residual amount is the difference between the agent's total production and his wage.
These investments will be used to assess whether the equilibrium outcome is socially efficient.

2.3.2 Second-Best Outcome
In order to find the equilibrium human capital investments, I proceed by backward induction.

At date 2, the principal pays the wage \( w \) to the agent.

At date 1, the agent receives wage offers from the principal and another firm (henceforth competitor). While his general human capital is equally valuable in both firms, his specific human capital has no value for the competitor. For that reason, the competitor offers \( f(g^*) \), the returns to general human capital, to the agent. In order to retain the agent, the principal's wage offer must be at least as high as the competitor's offer. Thus, the principal also offers \( f(g^*) \) as the second period wage and her payoff becomes \( h(s^*) \), the returns to specific human capital.

At date 1/2, the agent chooses \( g_A \) and \( s_A \) to maximize his net payoff:

\[
\max (g_A + g_p) - \frac{(g_A)^2}{2} - \frac{(s_A)^2}{2}
\]

The agent's equilibrium human capital investments become:

\[
g_A^* = g_A^{FB} = 1
\]

At date 0, the principal chooses \( g_p \) and \( s_p \) to maximize her net payoff:

\[
\max (s_A + s_p) - \frac{(g_p)^2}{2} - \frac{(s_p)^2}{2}
\]

The principal's equilibrium human capital investments become:

\[
s_p^* = s_p^{FB} = 1
\]
**Proposition 1**: In the human capital model without innovation, the agent (principal) invests in general (specific) human capital at the first-best level. On the other hand, the agent (principal) does not invest in specific (general) human capital in equilibrium.

This proposition shows that without the innovation, the human capital model in this paper generates the same insights as Becker (1962).

### 2.4 Human Capital Model with Innovation

The novel feature of this model is that the agent can generate an innovative idea as a result of specific human capital investment. Having an innovative idea matters to the agent because he can become an entrepreneur and earn a higher income. On the other hand, because it leads to the departure of a skilled agent, the principal's payoff reduces.

I proceed by backward induction in order to find the equilibrium human capital investments:

At date 2, both parties receive their payoffs and the game ends.

At date 1, the agent realizes whether he has the (employee-specific) innovative idea. If he has an innovative idea, he implements it outside the firm as an entrepreneur. The agent's payoff is then given by $R$. If he has no innovative idea, the game goes back to the standard human capital model where the agent gets $f(g^*)$ as his payoff and the principal gets $h(s^*)$ as her payoff.

At date 1/2, the agent decides on his human capital investment. This investment affects his second period payoff in two ways: Investing in general human capital increases his second period wage if he stays in the firm and investing in specific human capital increases his probability to innovate and earn the entrepreneurial income. Therefore, the agent chooses $g_A$ and $s_A$ to maximize his utility:
\[ \text{Max } \gamma(s_A + s_P)R + [1 - \gamma(s_A + s_P)](g_A + g_P) - \frac{(g_A)^2}{2} - \frac{(s_A)^2}{2} \]

At the optimal choice of \( s_A \) and \( g_A \), the marginal benefits are equal to the marginal costs of these investments:

\[ s_A^* = \gamma[R - (g_A + g_P)] \quad (1) \]

\[ g_A^* = 1 - \gamma(s_A + s_P) \quad (2) \]

As shown in the appendix, the agent's equilibrium human capital investments are as follows:

\[ g_A^* = \frac{1 - \gamma^2R - \gamma s_P + \gamma^2 g_P}{1 - \gamma^2} \quad (3) \]

\[ s_A^* = \frac{\gamma(R - 1) + \gamma^2 s_P - \gamma g_P}{1 - \gamma^2} \quad (4) \]

**Proposition 2:** In the innovation environment, the agent invests in his specific human capital in equilibrium as long as \( \gamma > 0 \). Moreover, the agent's investment in specific human capital (general human capital) is increasing (decreasing) in the entrepreneurial income (i.e., \( R \)).

The logic behind this proposition is straightforward: Because the entrepreneurial income is higher than the employment wage (i.e., \( R > w = g_A + g_P \)), the agent prefers to become an entrepreneur. However, in order to become an entrepreneur, the agent must innovate. Because his probability to innovate is increasing in specific human capital, the agent invests in this human capital in equilibrium. The explanation of the second part of this proposition is as follows: Because the entrepreneurial income is the agent's reward for innovating, any increase in this income also increases the agent's willingness to innovate. In such case, in order to increase his probability to innovate, the agent increases his specific human capital investment. On the other
hand, the agent's general human capital increases neither his entrepreneurial income nor his probability to innovate. Therefore, the agent reduces his general human capital investment. Even though the agent reduces his general human capital investment, he continues to invest in it as long as his probability to innovate is less than one. This is because he may still be an employee in the second period and if so, his income comes from his general human capital.

**Proposition 3:** In the innovation environment,

(i) The principal's general human capital investment positively affects the agent's general human capital investment (i.e., \( \partial g_A / \partial g_P > 0 \)) and it negatively affects the agent's specific human capital investment (i.e., \( \partial s_A / \partial g_P < 0 \)).

(ii) The principal's specific human capital investment positively affects the agent's specific human capital investment (i.e., \( \partial s_A / \partial s_P > 0 \)) and it negatively affects the agent's general human capital investment (i.e., \( \partial g_A / \partial s_P < 0 \)).

The rationale behind these interactions is as follows: When the principal invests in the agent's general human capital, the agent's reward for staying with the principal increases. As a result, the agent reduces his specific human capital investment. As he reduces his specific human capital investment, his probability to stay with the principal increases. This means he is more likely to earn the return to his general human capital in the second period. For that reason, the agent increases his general human capital investment.

When the principal invests in the agent's specific human capital, the agent's probability to stay with the principal decreases. This means the agent is less likely to earn the return to his general human capital so he decreases his general human capital investment. As he reduces his general human capital investment, the relative reward of innovation increases. For that reason, the agent increases his specific human capital investment.
The human capital interactions arise in this game because the principal and agent invest in the agent's human capital sequentially. This brings an important strategic advantage to the principal: Even though the agent's human capital investments are not contractible, the principal can alter the agent's investments thanks to these interactions.

At date 0, the principal chooses $g_p$ and $s_p$ to maximize her utility:

$$\max V_0 = \left[1 - \gamma s_A(g_p, s_p) - \gamma s_P\right] \left[s_A(g_p, s_p) + s_p\right] - \frac{(g_p)^2}{2} - \frac{(s_p)^2}{2}$$

At the optimal choice of $g_p$, the marginal benefit is equal to the marginal cost of investment:

$$\frac{\partial s_A}{\partial g_p} \left[1 - \gamma s_A - \gamma s_P\right] - \gamma \frac{\partial s_A}{\partial g_p} (s_A + s_p) = g_p$$

(5)

What this equality shows can be interpreted in the following way: As discussed in Proposition 3, the principal's general human capital investment reduces the agent's specific human capital investment (i.e., $\frac{\partial s_A}{\partial g_p} < 0$). This interaction has two consequences for the principal. First, if the agent does not generate an innovative idea, the principal’s payoff becomes the full return to specific human capital. Thus, the principal’s payoff decreases as the agent reduces his specific human capital investment. The first term on the LHS of this equality shows this negative effect. Second, the agent's specific human capital investment increases his probability to innovate. If the agent innovates, the principal's payoff becomes zero because the agent becomes an entrepreneur. Thus, the agent's probability to stay with the principal increases as he reduces his specific human capital investment. The second term on the LHS of this equality shows this positive effect. This means $g_p^*$ becomes positive if and only if the positive effect (i.e., increasing the agent's probability to stay) dominates the negative effect (i.e., reducing the agent's specific human capital output) of general human capital investment.
At the optimal choice of $s_p$, the marginal benefit is also equal to the MC of investment:

$$\left[1 + \frac{\partial s_A}{\partial s_p}\right][1 - \gamma s_A - \gamma s_p] - \gamma \left[1 + \frac{\partial s_A}{\partial s_p}\right](s_A + s_p) = s_p \tag{6}$$

The interpretation of this equality is similar to the principal’s general human capital investment: The principal’s specific human capital investment has one positive and one negative effect. If the agent does not innovate, the principal’s second period payoff increases both directly and indirectly (through increasing $s_A$) as a result of this investment. The first term on the LHS of this equality shows this positive effect. On the negative side, the principal’s specific human capital investment reduces the agent’s probability to stay with her both directly and indirectly. The second term on the LHS of this equality shows this negative effect. This means $s_p^*$ becomes positive if and only if the positive effect (i.e., increasing the agent’s specific human capital output) dominates the negative effect (i.e., reducing the agent’s probability to stay).

As shown in the appendix, the principal’s equilibrium human capital investments are:

$$s_p^* = \max\left\{0, \frac{-[2\gamma^2 R - \gamma^2 - 1]}{1 + 2\gamma - 2\gamma^2 + 2\gamma^3 + \gamma^4}\right\} \tag{7}$$

$$g_p^* = \max\left\{0, \frac{\gamma[2\gamma^2 R - \gamma^2 - 1]}{1 + 2\gamma - 2\gamma^2 + 2\gamma^3 + \gamma^4}\right\} \tag{8}$$

**Proposition 4:** In the innovation environment, there exists a threshold for the entrepreneurial income, $\bar{R} = (1 + \gamma^2)/2\gamma^2$, such that

(i) The principal does not invest in general human capital and her specific human capital investment reduces as $R$ increases (i.e., $\partial s_p^*/\partial R < 0$) when $R < \bar{R}$,

(ii) The principal invests in neither general nor specific human capital when $R = \bar{R}$, and

(iii) The principal does not invest in specific human capital and her general human capital investment increases as $R$ increases (i.e., $\partial g_p^*/\partial R > 0$) when $R > \bar{R}$. 

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Figure 2.2 illustrates the relationship between the entrepreneurial income and the principal's human capital investments (as discussed in Proposition 4).

[Insert Figure 2.2 around here]

The intuition behind this proposition is as follows: First of all, if the entrepreneurial income is below a certain threshold (i.e., \( R \))\(^9\), the agent does not consider becoming an entrepreneur and he invests in his human capital exactly as in no-innovation case. For that reason, the horizontal axis in Figure 2.2 starts from this threshold value, not zero. If the entrepreneurial income is above this threshold, entrepreneurship becomes a viable career option in the second period so the agent starts investing in his specific human capital. We know from Proposition 2 that the agent increases his specific human capital investment as the entrepreneurial income rises.

As the agent increases \( s_A^*(g_P, s_P) \), the marginal benefit of investing in \( s_P^* \) decreases for the principal. This is because when \( s_A^* \) increases, the agent's probability to stay with the principal decreases. When the entrepreneurial income reaches the threshold \( \bar{R} \), the agent's specific human capital investment becomes \( s_A^* = 1/2\gamma \). This reduces the marginal benefit of investing in \( s_P^* \) to zero so the principal chooses not to invest (i.e., \( s_P^* = 0 \))\(^{10}\).

When the entrepreneurial income exceeds the threshold \( \bar{R} \), the agent's specific human capital investment increases above \((1/2\gamma)\) which makes the marginal benefit of investing in \( s_P^* \) negative. Because the principal cannot reduce specific human capital investment below zero, her equilibrium investment stays at \( s_P^* = 0 \). At the same time, the marginal benefit of investing in

\(^9\) This minimum threshold for the entrepreneurial income is equal to the wage obtained in no-innovation case: \( R = w^* = g_A^* + g_P^* = 1 \).

\(^{10}\) The principal's payoff is maximized when the agent's probability to innovate reaches 0.5 and this probability level is reached when \( s_A^* = 1/2\gamma \). Thus, investing in \( s_P^* \) only reduces the principal's payoff after this point.
$g_P^*$ becomes positive as $s_A > 1/2\gamma$). This is because the agent's probability to innovate is above the optimal level for the principal and reducing this probability will increase the principal's payoff. Due to the negative interaction between $g_P^*$ and $s_A^*$, the principal can achieve this goal with general human capital investment. Thus, the principal starts investing in the agent's general human capital when $R > \bar{R}$.

The first part of Proposition 4 (i.e., when $R < \bar{R}$) is consistent with the findings of Kim & Marschke (2005). They show that when a scientist's departure risk rises, the firm reduces its innovation budget. This helps the firm reduce the probability of the scientist walking away with the innovation. In this model, when the entrepreneurial income rises, the agent's departure risk increases. In order to reduce this risk, the principal reduces specific human capital investment.

The second part of Proposition 4 (i.e., when $R > \bar{R}$) presents a novel result. According to Becker (1962), the principal never invests in general human capital of the agent because the agent captures all the return to general human capital investment. However, this paper shows that the principal can invest in general human capital even if the agent gets the full return to this investment. The principal makes such an investment because the bigger threat for her (in terms of labor mobility) comes from entrepreneurship, not other firms. According to the model, the principal can match the wage offers from other firms so the agent stays with her in the second period. However, the principal cannot match the entrepreneurial income in the model (i.e., $R > w$). As mentioned in Bettignies & Chemla (2008), a firm's concern to retain its skilled employees is stronger when those employees have access to better compensation outside the firm. This situation forces the principal to increase the attractiveness of staying. In this model, the principal makes staying more attractive by investing in general human capital of the agent which raises his second period wage within the firm.
2.5 Extensions

2.5.1 Simultaneous Human Capital Investments

In the previous sections, I assumed that the principal invests in the agent’s human capital first. As the first-mover, she could invest strategically to alter the agent's human capital investments. In this section, I analyze the scenario in which both parties simultaneously invest in the agent's human capital.

At date 2, both parties receive their payoffs and the game ends.

At date 1, the agent potentially observes an innovation opportunity. If he has an innovative idea, he implements it as an entrepreneur and earns the payoff of $R$. If he has no innovative idea, he stays with the principal in return for the payment of $f(g^*)$.

At date 0, the agent chooses $g_A$ and $s_A$ to maximize his expected utility:

$$\text{Max } U_i = \gamma (s_A + s_P)R + [1 - \gamma (s_A + s_P)](g_A + g_P) - \frac{(g_A)^2}{2} - \frac{(s_A)^2}{2}$$

As shown in the appendix, the agent’s equilibrium investments are given by:

$$g_A^* = \frac{1 - \gamma^2 R - \gamma s_P + \gamma^2 g_P}{1 - \gamma^2} \quad (9)$$

$$s_A^* = \frac{\gamma (R - 1) + \gamma^2 s_P - \gamma g_P}{1 - \gamma^2} \quad (10)$$

Again at date 0, the principal chooses $g_P$ and $s_P$ to maximize her expected utility:

$$\text{Max } V_i = [1 - \gamma s_A - \gamma s_P][s_A + s_P] - \frac{(g_P)^2}{2} - \frac{(s_P)^2}{2}$$

As shown in the appendix, the principal’s equilibrium human capital investments are:

$$g_P^* = 0 \quad (11)$$
\[ s^*_p = \text{Max} \left\{ 0, \frac{-2\gamma^2 R - \gamma^2 - 1}{1 + 2\gamma - \gamma^2} \right\} \tag{12} \]

**Proposition 5:** In the innovation environment with simultaneous human capital investments, there exists a threshold for the entrepreneurial income, \( \bar{R} = (1 + \gamma^2)/2\gamma^2 \), such that

(i) The principal invests in the agent's specific human capital when \( R < \bar{R} \), where \( s^*_p \) is decreasing in \( R \) (i.e., \( \partial s^*_p / \partial R < 0 \)),

(ii) The principal does not invest in the agent's specific human capital when \( R \geq \bar{R} \), and

(iii) The principal never invests in the agent's general human capital.

Figure 2.3 illustrates the relationship between the entrepreneurial income and the principal's human capital investments in simultaneous investment game:

[Insert Figure 2.3 around here]

The rationale behind this proposition is as follows: When investments are made simultaneously, the principal's first-mover advantage disappears. In other words, the principal cannot influence the agent's human capital investments. For that reason, the principal never invests in the agent's general human capital. On the other hand, both parties' expected payoffs are affected by their specific human capital investments. That is why the principal and the agent take each other's specific human capital investment into account when they make their investment decisions. The agent's specific human capital investment increases as the entrepreneurial income increases (i.e., \( \partial s^*_A / \partial R > 0 \)). This reduces the principal's probability to retain the agent. Therefore, the principal reduces the specific human capital investment as the agent's return from entrepreneurship increases. If the return from entrepreneurship exceeds the threshold value, the agent's probability to innovate becomes sufficiently high so any investment...
by the principal only reduces her expected payoff. For that reason, the principal does not invest in the agent's specific human capital when $R \geq \bar{R}$.

### 2.5.2 General Human Capital and Probability of Innovation

The human capital model in Section 4 assumed that the agent's probability to innovate is only a function of his specific human capital. In this section, I relax this assumption and use a probability function which increases in both general and specific human capital$^{11}$:

$$p(g, s) = \gamma s + \alpha g = \gamma (s_A + s_P) + \alpha (g_A + g_P)$$

where $\alpha > 0$ is a parameter that measures the importance of general human capital for the agent's innovation probability.

I focus on the case where $\gamma > \alpha$ because the principal may still use general human capital investment as a strategic tool to retain the agent in the second period.$^{12}$

At date 2, both parties receive their payoffs and the game ends.

At date 1, the agent observes the potential innovative idea. If he has an innovative idea, he chooses to become an entrepreneur and his payoff becomes $R$. If he does not have an innovative idea, he stays with the principal and his payoff becomes $f(g^*)$.

At date 1/2, the agent chooses $g_A$ and $s_A$ to maximize his expected utility:

$$\text{Max } U_t = [\gamma (s_A + s_P) + \alpha (g_A + g_P)]R + [1 - \gamma (s_A + s_P) - \alpha (g_A + g_P)](g_A + g_P) - \frac{(g_A)^2}{2} - \frac{(s_A)^2}{2}$$

As I show in the appendix, the agent’s equilibrium human capital investments are:

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$^{11}$ This type of probability function is also in line with the evidence presented in Hermann & Peine (2011).

$^{12}$ If $\alpha > \gamma > 0$, the principal would never invest in the agent's general human capital. Furthermore, the agent's willingness to invest in firm-specific human capital would also reduce. This stems from the fact that general human capital investment increases both his employment wage and his probability to innovate.
\[
g_A^* = \frac{1 + R(\alpha - \gamma^2) - \gamma s_P + (\gamma^2 - 2\alpha) g_P}{1 + 2\alpha - \gamma^2}
\]

\[
s_A^* = \frac{R(\gamma - \gamma \alpha) - \gamma + \gamma^2 s_P - \gamma g_P}{1 + 2\alpha - \gamma^2}
\]

**Proposition 6**: Consider the innovation environment,

(i) There exists a threshold for \(\alpha\), \(\bar{\alpha} = \gamma^2\), such that the agent's general human capital investment is increasing in \(R\) when \(\alpha > \bar{\alpha}\) (i.e., \(\partial g_A / \partial R > 0\)), and decreasing otherwise.

(ii) There exists another threshold for this marginal contribution, \(\hat{\alpha} = \gamma^2 / 2\), such that the agent's general human capital investment is increasing in \(g_P^*\) for \(\alpha < \hat{\alpha}\) (i.e., \(\partial g_A / \partial g_P > 0\)), and decreasing otherwise.

The first part of this proposition can intuitively be explained as follows: The agent's willingness to innovate increases with the rise in return from entrepreneurship (i.e., \(R\)). Even though investing in general human capital increases the agent's probability to innovate directly, this investment negatively affects his specific human capital investment. This means general human capital investment reduces the agent's probability to innovate indirectly (through reducing \(s_A^*\)). If the positive effect of general human capital investment on innovation dominates the negative effect (i.e., \(\alpha > \gamma^2\)), the agent's probability to innovate increases in equilibrium so the agent invests more in his general human capital as \(R\) rises.

The intuition behind the second part of this proposition is also similar to the first part: The principal's general human capital investment increases the agent's probability to innovate. This means the agent's probability to stay in the firm reduces. For that reason, the agent reduces his general human capital investment. On the other hand, the principal's general human capital investment increases the employment wage so it reduces the relative attractiveness of entrepreneurship. As a result, the agent reduces his specific human capital investment. This
makes it more likely that the agent stays in the firm, so his best response is to increase his general human capital investment. Therefore, the overall effect of $g_p^*$ on $g_A^*$ depends on $\alpha$: If $\alpha > \hat{\alpha}$, the first effect dominates so the agent reduces $g_A^*$. If $\alpha < \hat{\alpha}$, the second effect dominates so the agent increases $g_A^*$.

At date 0, the principal chooses $g_p^*$ and $s_p^*$ to maximize her expected utility:

$$\max V_l = \left[1 - \gamma s_A(g_p, s_p) - \gamma s_p - \alpha g_A(g_p, s_p) - \alpha g_p \right] \left[ s_A(g_p, s_p) + s_p \right] - \frac{(g_p)^2}{2} - \frac{(s_p)^2}{2}$$

At this point, I focus on the more interesting scenario where $g_p^*$ becomes positive.

The only purpose of the principal's general human capital investment is to make the job more attractive for the agent so he is more likely to stay. However, as discussed in Section 4, the principal uses general human capital investment as a last resort. In other words, the principal invests in the agent's general human capital only after her specific human capital investment reduces to zero.

Therefore, the principal chooses only $g_p$ to maximize her expected utility:

$$\max V_l = \left[1 - \gamma s_A(g_p) - \alpha g_A(g_p) - \alpha g_p \right] \frac{(g_p)^2}{2}$$

In this case, the principal's equilibrium general human capital investment is:

$$g_p^* = \max \left\{ 0, \gamma R(2\gamma^2 + \gamma^2 \alpha - \alpha) - (\gamma^2 + 1) \right\} \frac{1 + 2\alpha - \gamma^2}{(1 + 2\alpha - \gamma^2)^2 + 2\gamma(\gamma^2 - \alpha)}$$

**Proposition 7**: Consider the innovation environment where both general and specific human capital investments positively affect the probability of innovation,

(i) There exists a threshold for the entrepreneurial income, $\hat{R} = (\gamma^2 + 1)/(2\gamma^2 + \gamma^2 \alpha - \alpha)$, such that the principal does not invest in the agent's general human capital.
capital when \( R < \hat{R} \). Otherwise, the principal invests in \( g^*_P \) and it is increasing in \( R \) (i.e., \( \partial g_P / \partial R > 0 \)).

What this proposition shows can be explained as follows: The entrepreneurial income is the agent's reward for innovation. When this reward increases, the agent becomes more motivated to innovate. When the return from entrepreneurship exceeds \( \hat{R} \), the agent's probability to stay becomes very low so the principal invests in the agent's general human capital to distract him from innovation.

**Corollary 1**: As the marginal contribution of general human capital to the probability of innovation (i.e., \( \alpha \)) increases, the threshold value for the entrepreneurial income (i.e., \( \hat{R} \)) increases and the equilibrium value of \( g^*_P \) decreases.

This corollary is easy to explain and it is self-evident: The principal's only benefit from general human capital investment is the decrease in the agent's probability to innovate (through reducing \( s^*_A \)). At the same time, general human capital investment increases the agent's probability to innovate directly. As \( \alpha \) increases, the direct positive effect increases. This means the principal benefits less from general human capital investment. For that reason, the principal's willingness to invest in the agent's general human capital decreases as \( \alpha \) increases.

**2.6 Empirical Implications**

This model yields several empirical predictions that provide interesting insights to human capital investments, wage structures, and employee mobility.

One of the main contributions of the model is that it explains why firms invest in their employees' general human capital. The model predicts that there is a positive relationship between firms' investment in general human capital and the employees' likelihood of staying
with the firm. This prediction is in contrast with the standard human capital theory because it assumes that firms never capture any return to general human capital investment. This model argues that even though firms do not capture any return directly from general human capital investment, such investment increases the probability of retention and hence the probability of capturing the return to specific human capital. The prediction of higher retention rate is also supported by some recent empirical evidence. For example, Capelli (2004), Flaherty (2007), and Gicheva (2012) show that employer-financed general training (i.e., education) increases the employee retention rate.

Another empirical prediction of the model that is along the same line is that even though firms may reduce employee turnover by general human capital investment, the employees who leave such firms are more likely to become entrepreneurs. When the firm invests in the employee's general human capital, it increases the employee's (future) wage in the firm because other firms also value this type of human capital. By offering a higher wage, the firm matches other firms' wage offers so the employee's probability to stay with the firm increases (see Coff, 1997; Benson, Finegold & Mohrman, 2004). However, if the employee starts a new venture, his entrepreneurial income can be higher than the firm's wage offer. For that reason, when the skilled (and better paid) employee leaves the firm, his probability to become an entrepreneur is higher than his probability to join another firm. In fact, the empirical evidence presented in Carnahan, Agarwal & Campbell (2012) support this prediction by showing that employee entrepreneurship is more plausible than employee departure if the employee is better paid in his current firm.

The third empirical prediction concerns the enforcement of non-compete clauses (henceforth NCC) as an alternative means to prevent employee departure. While NCCs are not enforceable in certain states (e.g. California), they are enforceable in others (e.g. Massachusetts and New York). Because the employee can become an entrepreneur with the innovative idea he
generated during his employment in this paper, the findings are more applicable to the states where NCCs are not enforceable. If, however, the firm is located in a state where NCCs are enforceable, employee entrepreneurship can be prevented with a contract so the firm can restructure its human capital investments. Firms in such states are expected to increase specific human capital investment and not to invest in general human capital. At the same time, employees in such states do not invest in specific human capital and they invest only in general human capital. The empirical evidence presented in Garmaise (2011) and Marx et al. (2009) support the prediction of higher (lower) specific human capital investment by firms (employees) in states where NCCs are enforceable.

The fourth empirical prediction of the model is about how the industry in which the firm competes affects human capital investments. Certain industries such as high tech and biotech are more innovation oriented than others. In those industries, losing a skilled employee with an innovative idea can be more detrimental to firms. Thus, the importance of employee retention is arguably higher in innovation-oriented industries. For that reason, the model predicts higher general human capital investment by firms in those industries.

2.7 Conclusion

In this paper I develop a theoretical model that combines human capital investment, innovation, and entrepreneurship. The positive effect of human capital investment on employee productivity is widely-discussed and well-understood in the human capital literature since the seminal work of Becker (1962). However, the positive effect of human capital investment on employee innovativeness has not yet been studied. This paper investigates how firm's and employee's human capital investments change when employee can generate an innovative idea as a result of his acquired human capital and choose entrepreneurship over employment.
The cardinal factor that determines equilibrium human capital investments in this paper is the employee's return from entrepreneurship. Because specific human capital investment increases the employee's probability to innovate, any increase in return from entrepreneurship motivates the employee to invest more in his specific human capital. In contrast to that, the firm cuts down its own specific human capital investment in order to reduce the risk of employee departure. However, if the return from entrepreneurship exceeds a certain threshold, the employee invests even more in his specific human capital and his probability to innovate becomes substantially high. In such case, the firm chooses not to invest in the employee's specific human capital. In addition to that, the firm starts investing in the employee's general human capital. The purpose of this strategy is to decrease the relative attractiveness of entrepreneurship by increasing the employment wage. As a result, the employee reduces his specific human capital investment in equilibrium and the firm's probability to retain the employee increases. This is a novel finding which explains why firms may invest in their employees' general human capital.

Several important questions remained unanswered. For example, does empirical evidence support general human capital investment by firms competing in highly innovative industries or firms located in areas with high new firm creation rates? How do firm's human capital investments change in a multi-agent environment especially when employees are heterogeneous in terms of productivity and ability to innovate? These are promising areas for future research which can provide additional insights on human capital investment.
Figure 2.1: Time Chart of the Game
Figure 2.2: Human Capital Investments by the Principal in Sequential Game

Figure 2.3: Human Capital Investments by the Principal in Simultaneous Game
Chapter 3

Entry Regulation Reforms: Who Gains From Them & Why We Make Them?

3.1 Introduction
Entrepreneurship has emerged as a hot topic of interest both for economists and policymakers after the influential works of Schumpeter (1934, 1942). Following Schumpeter’s works, many studies have investigated the factors that may hinder/incentivize new firm creation. The number of factors analyzed grew significantly in the last two decades as new datasets became available.

One of the factors that recently became popular among academics is the regulation of entry (of start-up firms). Starting with the seminal work of Djankov et al. (2002), many studies in the last decade (e.g. Klapper, Laeven & Rajan, 2006; Ciccone & Papaioannou, 2007; Branstetter et al., 2014) show that new firm creation rate is negatively affected by cumbersome entry regulations as they allow for greater corruption or cause delayed entry. This finding is generally followed by a suggestion of making a policy reform (i.e., simplifying the bureaucratic procedures) so countries can increase their firm creation rates.

Interestingly, actions of several countries do not follow this generalized suggestion. For instance, countries like Spain and Argentina had quite cumbersome entry regulations during the 2005-2012 period, but they preferred not to make any policy reforms between those years. On the contrary, countries like Belgium, Singapore, and Canada simplified their entry regulations during the same period even though their entry regulations were uncomplicated and easy to complete. Another example can be given for the outcome of reforms. Both Italy and Hungary made entry regulation reforms in 2008. However, as shown in Figure 3.1, while Hungary experienced a sharp increase in firm creation rate at/after the reform years, firm creation rate of Italy did not change much during the post-reform period.
These real world examples raise the following questions: Do entry regulations truly have a negative impact on entrepreneurship? If there is a relationship between entrepreneurship and entry regulations, is this a linear or nonlinear relationship? More specifically, does the effect of an entry regulation reform depend on country specific factors (such as the pre-reform level of bureaucracy)? And finally, what factors motivate countries to make entry regulation reforms? This paper addresses these questions by using a panel of 34 countries and eight years of entry regulations (i.e., number of procedures to start a business) and entrepreneurship (i.e., firm creation rate) data available in World Bank databases.

The answers to these questions are important for academics and policymakers as they improve our understanding of the relationship between entry regulation reforms and entrepreneurship. The current literature argues that entry regulations have a negative (linear) effect on entrepreneurship. However, this effect can be nonlinear as reformist countries have several country specific factors (such as the pre-reform level of bureaucracy in the country). If the effect of a policy reform is nonlinear, this means certain countries may not benefit from these reforms while others benefit extensively. This information (if valid) is also useful to policymakers as it can help them shape their reform agenda and focus on policies that will stimulate entrepreneurship.

My empirical strategy to address these questions is simple. First, I investigate the effects of entry regulations and policy reforms on firm creation rate by using a fixed-effects (within estimator) model and a dynamic panel model. In the second part, I examine whether the effects of entry regulations (and reforms) are linear or nonlinear. To achieve this goal, I use two different

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13 In this chapter, benefit is used to explain the increase in firm creation (entrepreneurship) rate.
methods: First, I introduce the squared term of my entry regulations measure (i.e., number of procedures to start a firm) in the fixed-effects model. Second, I categorize my sample countries as low and high-bureaucracy countries based on their entry regulations levels. Following that, I introduce a high-bureaucracy country dummy and an interaction term between this dummy and my entry regulations measure to see if entry regulations (and policy reforms) have different effects in low and high-bureaucracy countries.

The empirical analysis yields three important results: First, entry regulations (policy reforms) have a negative (positive) effect on entrepreneurship if we ignore the pre-reform level of bureaucracy in those countries. Second, the effect of entry regulations (and changes in entry regulations) is more likely to be instantaneous, so the increase in firm creation rate (resulting from the reform) is generally seen at the reform year only. Third, the effect of an entry regulation reform differs significantly once we categorize countries based on their bureaucracy levels. To be more specific, while entry regulations have a negative impact on firm creation rates in low-bureaucracy countries, this effect is insignificant in high-bureaucracy countries. In other words, these results tell us that low-bureaucracy countries are more likely to benefit from entry regulation reforms. Thus, my results confirm that the effect of entry regulation reforms is nonlinear and “one size fits all” approach does not work well for such reforms.

Despite the fact that these results are robust to different bureaucracy and reform measures and econometric models, one potential concern (i.e., endogeneity) still remains. The relationship between entry regulation reforms and firm creation rate may be more complicated than it looks as they are possibly simultaneously determined. If this is the case, our results may be tainted by the endogeneity problem. To address this issue, I employ a treatment effect model (i.e., two-step model). In the first stage, each country’s reform probability is estimated with a

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14 This result may sound unexpected but a couple of potential explanations are provided in later sections.
probit model where reformist neighbors dummy\textsuperscript{15} serve as instrumental variable (IV). In the second stage, the predicted reform (probability) values are used to estimate the firm creation rate. The results are qualitatively similar to the fixed-effects model’s results so even though it is important to control for selection bias (which is indicated by the statistically significant lambda), our empirical results remain the same.

This paper relates to the economics and public policy literatures which study the relationship between policy reforms and entrepreneurship. This is a large body of literature as there are several ways a government can affect the firm creation rate. For instance, governments can affect the firm creation rate by changing the bankruptcy laws. As explained in Armour & Cumming (2008) and Lee et al. (2011), lenient bankruptcy laws positively affect firm creation rate by encouraging potential entrepreneurs to take more risk. Another government policy which can affect the firm creation rate is the tax policy. This branch of literature exhibits opposing results. For example, while Cullen & Gordon (2007) show that higher personal income tax is associated with higher entrepreneurial activity, Bruce & Deskins (2012) find that a higher income tax reduces entrepreneurial activity. Regulations on labor relations can also affect the decision to become an entrepreneur. For instance, Kanniainen & Vesela (2005) show that stricter employment protection legislations reduce firm creation rate.

The branch of this literature to which my paper contributes mostly examines the relationship between entry regulations and entrepreneurship. This fast growing strand of literature starts with the seminal work of Djankov et al. (2002). In their paper, the authors investigate the effect of regulation of entry on 85 countries and they find that cumbersome entry regulations reduce firm creation rate by allowing greater corruption. Following Djankov et al.

\textsuperscript{15} Although it is explained in the later sections, reformist neighbor dummy takes the value of one if at least one neighbor of our country made a policy reform last year or current year. Why this variable is a good IV candidate is explained in later sections.
(2002), many papers study this relationship as well. While some of these studies use firm or industry level data (e.g. Klapper, Laeven & Rajan, 2006; Ciccone & Papaioannou, 2007; Branstetter et al., 2014), the others use country level data (e.g. van Stel, Storey & Thurik, 2007; Klapper, Amit & Guillén, 2010; Levie & Autio, 2011). Despite this difference, overwhelming majority of these studies reach the same conclusion: Cumbersome entry regulations have a negative impact on potential entrepreneurs. One exception (in terms of its findings) in this strand of literature is the study by van Stel, Storey & Thurik (2007). In their paper, the authors show that entry regulations are not significant determinants of entrepreneurship because skilled entrepreneurs can always find ways to overcome these regulatory burdens (except the minimum capital requirements).

Within this strand of literature, Klapper & Love (forthcoming) is the closest work to this study. In their paper, the authors use the same World Bank data\textsuperscript{16} in the empirical analysis. Furthermore, they analyze the effects of both entry regulations and policy reforms on entrepreneurship. However, this study differs from their work in two aspects: First, while they investigate whether the size of the reform package is an important factor, this paper investigates whether the pre-reform level of bureaucracy matters for the effect of entry regulation reforms. Second, unlike Klapper & Love (forthcoming), this paper addresses the endogeneity concern arising from possible simultaneity bias between reforms and firm creation rates. While doing that, it also attempts to understand the factors that affect the reform probability (such as having reformist neighbor countries, being a highly corrupt country, experiencing high unemployment rate or negative economic growth rate).

\textsuperscript{16} Both entrepreneurship and entry regulations measures used in Klapper & Love (forthcoming) are identical to the measures used in this paper.
The contribution of this paper to the literature is three-fold. First, this paper confirms the negative effect of entry regulations on firm creation rate. This finding is robust to different empirical models and different bureaucracy measures. More interestingly, it shows that the effect is mostly instantaneous. Second, this paper shows that the effect of entry regulation reforms is nonlinear and it depends on the pre-reform bureaucracy level of the country. This contribution (or finding) provides us an alternative explanation for why some high-bureaucracy countries do not prefer to make reforms in the real world. Last but not least, this paper recognizes and deals with the potential endogeneity problem in the relationship between entrepreneurship and entry regulation reforms with a two-stage model. Addressing this problem allows us to test what factors facilitate policy reforms while the current literature provides only anecdotal evidence on this matter. Other than being a novel attempt, the results of this model also provide us useful insights on when to expect regulatory reforms.

The rest of the paper is structured as follows: Section 2 develops the hypotheses to-be-tested. Section 3 explains the data and descriptive statistics. Section 4 presents the empirical models and their results. Section 5 controls for the robustness of main results. Section 6 discusses the important policy implications. Finally, Section 7 concludes.

3.2 Theory and Hypotheses

Entrepreneurship is a popular research subject for many social scientists. This popularity mainly stems from the fact that entrepreneurship has many facets and it can be analyzed from many different perspectives. For example, the risk appetite of entrepreneurs can be an interesting subject for psychologists and behavioral economists while the start-up financing options/choices may attract the attention of finance scholars.

As the popularity of entrepreneurship rises, more and more papers become dedicated to understanding what factors encourage potential entrepreneurs. In early 2000s, a new branch of
entrepreneurship literature has emerged as data on entry regulations (of start-ups) became available.

3.2.1 Entry Regulations and Entrepreneurship

When a potential entrepreneur decides to start her firm, she has to complete a set of bureaucratic procedures (such as registering the firm to tax authorities) before she starts operating her firm officially. In many countries, a potential entrepreneur has to dedicate a considerable amount of time, effort, and money to complete these procedures. For some potential entrepreneurs, these procedures can be discouraging as they create a misallocation of limited resources to unproductive purposes. Moreover, if these procedures take long time to complete, it can delay the entry and cause the potential entrepreneur to miss a time-sensitive business opportunity. Thus, cumbersome entry regulations can be considered as an obstacle for some (if not all) entrepreneurs. In other words, an entry regulation reform may encourage potential entrepreneurs by reducing the obstacles ahead of them. This brings us the first hypothesis to-be-tested:

\[ H1: \text{There is a negative relationship between the firm creation rate and the number of procedures to start a business. In other words, a policy reform (i.e., a reduction in the number of procedures) creates a positive effect on firm creation rate.} \]

Mathematically, the effect of bureaucracy on entrepreneurship is also easy to show: Let’s assume that firm creation rate (FCR) is a function of bureaucracy (B) alongside other factors. Then, the first hypothesis suggests that \( \frac{\partial FCR}{\partial B} < 0 \).

3.2.2 Potential Nonlinearity in the Effect of Entry Regulation Reforms

Despite the fact that the above argument is logical and it has been confirmed multiple times by previous studies, the current literature does not pay attention to a potential pitfall. This argument
implicitly assumes that the effect of policy reforms on entrepreneurship is linear. Put differently, findings in the current literature support “one size fits all” approach. However, it is quite possible that the effect of entry regulation reforms is nonlinear and it depends on several country specific factors such as the pre-reform level of bureaucracy in the country.

Not every procedure is equally challenging or time consuming for potential entrepreneurs. This means governments may receive different levels of complaints for these bureaucratic procedures. Rationally, it is more likely that they will simplify/eliminate the procedure which receives the most complaints first. Thus, the negative effect of the most burdensome procedure can be different for high-bureaucracy and low-bureaucracy countries.

Another possibility for a high-bureaucracy country is that it can introduce a larger reform package which eliminates several procedures simultaneously. Therefore, if a policy reform is made by a high-bureaucracy country, it is more likely to create a larger (marginal) benefit to entrepreneurs than a reform made by a low-bureaucracy country.

Both of these arguments simply suggest that there is diminishing marginal returns to entry regulation reform(s). In other words, the effect of entry regulations (i.e., number of procedures) is nonlinear. Mathematically, this can be shown as \( \frac{\partial^2 FCR}{\partial B^2} < 0 \).

On the other hand, high bureaucracy countries are likely to have high corruption as well. The corruption provides an opportunity to make private gains to officials in return for expedited service. In other words, corruption can be an effective tool to circumvent bureaucratic process. This possibility, which is known as the “greasing the wheels” hypothesis, has been empirically tested and supported by Dreher & Gassebner (2013) and Méon & Weill (2010). From our potential entrepreneurs’ perspective, if corruption reduces/eliminates the negative effect of cumbersome entry regulations, then policy reforms may not create a large positive effect.
To sum up, if entrepreneurs in high-bureaucracy countries can circumvent bureaucratic procedures with corruption but their counterparts in low bureaucracy countries cannot, then bureaucracy is more detrimental in low-bureaucracy countries. Thus, if a policy reform is made in a low-bureaucracy country, it can create a larger benefit and this suggests that there is increasing marginal returns to entry regulation reform(s). Mathematically, this can be demonstrated as $\frac{\partial^2 FCR}{\partial B^2} > 0$.

In light of all these arguments, I build Hypothesis 2 which recognizes the possible impact of pre-existing bureaucracy level on the effectiveness of entry regulation reforms:

**H2a**: If an entry regulation reform is made by a high-bureaucracy country, it has a significantly larger positive effect on firm creation rate than a reform made by a low-bureaucracy country.

**H2b**: If an entry regulation reform is made by a low-bureaucracy country, it has a significantly larger positive effect on firm creation rate than a reform made by a high-bureaucracy country.

### 3.2.3 Endogeneity and Motivations to Make Policy Reforms

These two hypotheses approach the relationship between entrepreneurship and entry regulation reforms with the (implicit) assumption that the relationship is unidirectional. In other words, changes in entry regulations (i.e., reforms) can affect the firm creation rate but not vice versa. However, there is a possibility that the relationship between entry regulation reforms and firm creation rate is bidirectional. In other words, while entry regulation reforms may positively affect the firm creation rate, countries with high firm creation rates (or countries which aim to increase their firm creation rates) are more likely to make such reforms. This means entry regulation reforms and firm creation rate may be simultaneously determined. If this is the case, the relationship should be estimated in two stages as in treatment effect model where the first-stage (probit) regression predicts the probability of making reforms for each country. In order to
predict the reform probabilities, I benefit from both economic (such as GDP growth rate and unemployment rate) and political factors (such as bureaucracy level and corruption level in the country). On top of that, the first stage regressions should include an instrumental variable that can explain (some) variation in probability of making reforms but is not a significant determinant of firm creation rate. This is a challenging task as it is hard to find a variable that is only associated with the reform probability of the country. The variable I choose to serve as the instrumental variable in this paper is reformist neighbor(s) dummy. The reforms made by neighbor countries can affect the reform probability of a country as it is likely to trigger a “race to the bottom” in entry regulations. On the other hand, the effect of having reformist neighbors on firm creation rate is expected to be much weaker and limited. There are three reasons for this weaker (if not insignificant) effect: First, as mentioned in the introduction, there is no guarantee that every policy reform incentivizes potential entrepreneurs so it may not affect the firm creation rate of neither the reformist country nor its neighbors. Second, it is highly unlikely that domestic entrepreneurs consider/compare international and home country locations. Thus, a reformist country may not attract the attention of neighbor country entrepreneurs just because it made a policy reform(s). Last but not least, major political changes (generally followed by reforms) may happen at the regional level rather than the country level (e.g. fall of communism or political protests in South American countries). Therefore, such political changes and reforms possibly attract the attention of international entrepreneurs to a geographical region rather than a specific country. In addition to these reasons, we can say that the reverse causality (i.e., increasing in firm creation rate motivating a neighbor to make a reform) is not a major concern as there is no evidence or explanation in the literature indicating such a relationship.

Despite the abovementioned reasons, there may be other (unknown/unconsidered) ways through which reformist neighbors can affect the firm creation rate in a country. To control for these
other ways, I include the reformist neighbor dummy as an additional explanatory variable to my regressions which estimate the firm creation rate. The coefficient of this variable is consistently insignificant so we can assume that having reformist neighbors is not a statistically important factor for firm creation rate.17

Once the first stage regression is estimated with a probit model, the predicted values for entry regulation reforms can be calculated and these predicted values can be used in lieu of the policy reforms variable(s) in the second stage regressions. Finally, it is noteworthy to mention that these two regressions will be estimated together (rather than separately) so the possible correlation between error terms in these two stages is controlled for.

3.3 Data

3.3.1 Sample
The data used in this study covers 2005-2012 period for 34 countries.18 All variables are collected from World Bank and its affiliates’ databases. Even though some of the variables used in this study have 2014 data available, I use 2012 as the final year because the dependent variable (i.e., the firm creation rate) data is mostly missing for 2013. It is also noteworthy to mention that certain countries (such as the United States, Brazil, and China) are not included in the final sample as data of one or more variables (mostly the dependent variable or the variables of interest) are not available for the sample period.

3.3.2 Dependent Variables
Our hypotheses investigate the effects of entry regulations (and policy reforms) on entrepreneurship. Therefore, the dependent variable should be a measure of entrepreneurship.

17 The fixed-effects regression results including the reformist neighbor dummy as an explanatory variable in estimating the firm creation rate are not reported in this paper but they are available upon request.
18 The list of all countries and years covered in this study can be found in the Appendix.
There are different definitions and measures of entrepreneurship available in the literature. While some scholars (e.g. Robinson & Sexton, 1994) consider all self-employed people as entrepreneurs, others (e.g. Carland et al., 1984) prefer to use the Schumpeterian view of entrepreneurship by stressing on the innovative side of entrepreneurs. In this paper, I use the business entry density rate (henceforth firm creation rate) as the proxy for entrepreneurship. Firm creation rate of a country is calculated as the number of newly registered limited liability corporations (henceforth LLCs) per 1,000 working-age population in that country. This variable fits well to my goal as LLCs are generally a standardized form of doing business across the globe so they are appropriate for cross-country comparison.\(^\text{19}\) Moreover, even though this data is available only for a short period of time, several studies in entrepreneurship literature (e.g. Klapper, Amit & Guillén, 2010; Cumming, Johan & Zhang, 2014) have already benefited from this data.

### 3.3.3 Variables of Interest

In this paper, there are three variables of interest: Number of procedures (to start a business), entry regulation reform dummy, and change in number of procedures (henceforth ∆Procedures).

The first variable of interest is the number of procedures to start a business (henceforth procedures). The “procedures” variable is measured as the number of steps to be completed (such as obtaining necessary permits and completing all inscriptions, verifications, and notifications) to start operating a business. In order to define the number of procedures, World Bank (in collaboration with government officials and local corporate lawyers) studies the national laws and regulations regarding the business registration process in each country. There are two

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\(^{19}\) There are also two weaknesses of this measure: First, this measure does not include firms created in other legal forms such as sole proprietorships and partnerships. Second weakness is that this variable measures the new firms created only in the formal sector. Therefore, the data does not reflect any unofficial economic activity changes.
reasons why I choose this variable as a proxy for bureaucracy: First, “procedures” variable is
standardized and it is available for many country-years. Thus, it fits well to my goal of cross-
country comparison. Second, there are many studies in the related literature (e.g. Klapper,
Laeven, & Rajan, 2006; van Stel, Storey, & Thurik, 2007; Klapper, Amit & Guillén, 2010;
Dreher & Gassebner, 2013) which use “procedures” as a proxy for entry regulations.

The second variable of interest is the reform dummy which is created by using the
procedures variable. If a country reduces its number of procedures in a given year, I consider
that country as a reformist country and the dummy variable takes the value of one for that year.
The main advantage of using this variable is that it gives us a chance to determine the
effectiveness of a policy change. The drawback of using this variable is that because it is a
dummy variable, it can only take the value of one or zero so some potentially valuable variation
in the procedures data is going to be lost. Yet, I prefer to use this variable for two reasons: First,
when one wants to control for endogeneity, the reform dummy (i.e., whether a country is
planning to make a reform or not) is easier to predict than the size of the reform. Second, even
though potentially important variation is lost, the reform dummy is used in several recent
entrepreneurship studies such as Bruhn (2011), Bruhn (2013), and Klapper & Love
(forthcoming).

One way to overcome the drawback of the reform dummy variable is to use the
∆Procedures variable. The common characteristic of these two variables is that both are
providing us the information on which countries reduced their entry regulations. Yet,
∆Procedures has two advantages over reform dummy. The first advantage is that it allows us to

20 ∆Procedures variable is defined as \( (\text{Procedures}_t - \text{Procedures}_{t-1}) \). If a country reduces its number
of procedures, then we see a negative value for this variable. Alternatively, I use the percentage change in number
of procedures (i.e., %∆Procedures) in testing H1. The results are qualitatively similar and they are available in
the Appendix Section.
take the magnitude of reforms into account so it does not suffer from the loss of potentially valuable variation. The second advantage is that it also controls for the effect of increases in number of procedures while this is not recognized in reform dummy.

Finally, it is also worthwhile to mention that I use both current year and last year values of these three variables in my regressions. Using the first lag of these variables allow me to control whether there is a delayed effect. Furthermore, comparing the coefficients of current year variables and last year variables gives us a clue on whether the effect of a reform is instantaneous or it dies out in the future.

3.3.4 Control Variables

The empirical models in this paper include several control variables. These control variables are last year’s GDP growth rate, last year’s unemployment rate, credit access rate, GDP per capita, (logarithm of) population, and year fixed effects.

The first control variable is the last year’s GDP growth rate which is collected from World Bank database. GDP growth rate is an important factor for entrepreneurship as it represents the changes in aggregate demand. Moreover, it provides useful information about people’s expectations on labor markets and probability of survival for start-ups. The first lag of GDP growth rate is preferred to be used to mitigate the possible endogeneity concern which stems from a potential bidirectional relationship between entrepreneurship and growth rate. The first lag of GDP growth rate is also used as a control variable by the closest study, Klapper & Love (forthcoming).

The second control variable is the last year’s unemployment rate which is also collected from World Bank database. The relationship between unemployment rate and entrepreneurship is believed to be bidirectional: Unemployment may direct some people to start their own firms (i.e., refugee effect) and the opening of new firms create new employment opportunities (i.e.,
entrepreneurial effect). However, this bidirectionality raises some endogeneity concerns and for that reason I use the first lag of unemployment rate in my empirical models. It is also important to note that several studies in the related literature (e.g. Faria, Cuestas & Mourelle, 2010; Berglann et al., 2011) use the unemployment rate as a factor influencing entrepreneurship decision.

The third control variable is the credit access rate. As shown by previous literature (e.g. Black & Strahan, 2002; Kerr & Nanda, 2009), credit access is crucial for the survival and success of a (new) business and it is one of the most important challenges faced by many entrepreneurs. In this paper, I use the domestic credit to private sector (as % of GDP) as a proxy of credit access rate. This variable is also available in World Bank database and it is used in several related papers in entrepreneurship literature (e.g. Aghion, Fally, & Scarpetta, 2007; Aidis, Estrin, & Mickiewicz, 2012).

The fourth control variable is the GDP per capita (henceforth income). Similar to the credit access rate, income level can be an important factor in starting a new firm decision as it is closely related to the financial constraints faced by the potential entrepreneur. In other words, a high income can alleviate the financial constraints and encourage entrepreneurship. If we look at the current literature, we can see that the effect of income on entrepreneurship is previously investigated by Hurst & Lusardi (2004), Acs & Amaros (2008), and Thurik (2008).

The fifth control variable used in the empirical models is the (logarithm of) population. On one hand, a large population represents a larger aggregate demand which can positively affect the decision to become an entrepreneur. On the other hand, a large population can be considered as a signal of higher competition among potential entrepreneurs for the scarce resources.

\[ \text{To further reduce the endogeneity concerns, I have repeated the empirical models with the second lags of unemployment rate and growth rate. The results were qualitatively same and they are available upon request.} \]
Therefore, the overall effect of population depends on which effect is dominant. The population (and its density) is also used by numerous studies in the entrepreneurship literature such as Sato, Tabuchi & Yamamoto (2012), Anokhin & Schulze (2008), and Shaffer, Hasan & Zhou (2014).

I also include year fixed effects in my empirical models. The sample used in this study covers the period of 2005 to 2012 which includes the Great Recession years. As shown in Fairlie (2013) and Shane (2011), this recession had significant impacts on firm creation rate in many countries. Therefore, the effect of this recession must be teased out, which can be achieved with the year fixed effects, while estimating the effect of policy reforms on entrepreneurship. Moreover, this vector (of fixed effects) can capture other year specific factors that may affect the firm creation rates during this period.

3.3.5 Descriptive Statistics
Table 3.1 shows the descriptive statistics of the main variables:

[Insert Table 3.1 around here]

According to Table 3.1, the firm creation rate in our sample ranges between 0.47 firms (Argentina) to 17.57 firms (Iceland) with the median of 3.2 firms (per 1,000 working-age population). A potential entrepreneur has to complete between two (in Canada) and 15 (in Greece) procedures to start a new firm while the median level is six procedures. Approximately 12.5% of our data is indicating policy reforms which correspond to 29 reforms in seven-year period. The change in number of procedures (∆Procedures) variable ranges between -6 (i.e., elimination of six procedures) and one (i.e., increase in number of procedures) while the average

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22 This number may seem small but it is due to the fact that many countries (i.e., 27 countries in our sample with 56 reforms) chose to reduce the time these procedures take rather than eliminating a procedure directly.
is -0.20. The GDP growth rate fluctuates between -17.96% (in Latvia) and 14.78% (Singapore) with an average of 2.23%. Although the median unemployment rate is 7.2%, there are several countries with lower than 4% unemployment rate (such as Iceland, Singapore, and the Netherlands) and countries with higher than 18% unemployment rate (such as Spain, Hungary, and Latvia). When we look at the credit access rate, we see that this ratio is lowest in Argentina with 11.67% (in 2005) and it is highest in Iceland with 319.46% (in 2006) while the median is pretty close to 100%. The median GDP per capita is around $33,000 while our sample ranges from upper-middle income countries (such as Romania with $4,572) to high-income countries (such as Switzerland with $83,087). The smallest country in the sample is Iceland (with a population below 300,000 people) while the largest country is Russia (with a population above 140-million people).

Table 3.1 gives us only limited information about the policy reforms. However, it is important to know who made these reforms and how many procedures they eliminated with each reform package. Table 3.2 provides us such details on policy reforms:

As can be seen in Table 3.2, there are 29 reforms made during the 2005-2012 period. In addition to that, four countries preferred to increase the number of procedures. The largest reform, which reduced the number of procedures from 11 to five, was made by Uruguay in 2011. Majority of the reforms (18 of 29) reduced the number of procedures by one. Finally, all countries which reduced the number of procedures by three or more at once had at least nine procedures before the reform year.

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23 The average of -0.20 means the sum of ∆Procedures is -46. Despite being unreported in Table 3.1, this number comes from a total reduction of 50 procedures and a total increase of four procedures during the sample period.
3.3.6 Preliminary Analyses

As mentioned in earlier sections, the majority of the previous literature finds a negative relationship between the entry regulations and the firm creation rate. It would be useful to check whether we can see a negative relationship between the firm creation rate and the procedures visually before making the statistical analysis. Figure 3.2 illustrates the scatter plot of these two variables:

[Insert Figure 3.2 around here]

As shown in Figure 3.2, there is a negative relationship between the firm creation rate and the number of procedures. The downward sloped best-fitting line also confirms this negative relationship. Even though the introduction of other related factors can affect the relationship between these two variables, this finding is not surprising considering the similar results presented in previous literature.

3.4 Empirical Models and Results

3.4.1 The Linear Effect of Bureaucracy and Reforms on Firm Creation Rate

In order to test Hypothesis 1, I use two different regression models.

The first regression model is a fixed-effects model which investigates the within-country variation in the dependent variable. The main advantage of the fixed-effects model is that it alleviates the endogeneity concerns resulting from omitted variable bias because it includes time-invariant country-specific variables in the model. During the estimation, the standard errors are clustered at country level to account for potential within-country error term correlations.²⁴

The fixed-effects models used in testing H1 are as follows:

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²⁴ As mentioned in Stock & Watson (2008), clustered error terms at panel ID level are identical to the robustly estimated error terms in fixed-effects models.
\[ FCR_{i,t} = \beta V_{i,t} + \phi X_{i,t-1} + \gamma Z_{i,t} + \theta T_{t} + c_{i} + u_{i,t} \]  

(1)

\[ FCR_{i,t} = \alpha V_{i,t-1} + \phi X_{i,t-1} + \gamma Z_{i,t} + \theta T_{t} + c_{i} + u_{i,t} \]  

(2)

where

\( FCR_{i,t} \) represents the firm creation rate in country \( i \) at year \( t \),

\( V_{i,t} \) represents the variables of interest (procedures, policy reform dummy variable, and \( \Delta \text{Procedures} \)) for country \( i \) at year \( t \),

\( X_{i,t-1} \) represents the lagged control variables (i.e., GDP growth rate and unemployment rate),

\( Z_{i,t} \) represents the other control variables (credit access rate, income, and the logarithm of population)

\( T_{t} \) represents the year fixed effects,

\( c_{i} \) represents the time-invariant country specific effects, and

\( u_{i,t} \) represents the error terms.

The coefficients of \( \beta \) in Equation (1) and \( \alpha \) in Equation (2) measure the effects of entry regulations and policy reforms on firm creation rate. If these coefficients are negative and significant for Procedures and \( \Delta \text{Procedures} \), but positive and significant for reform dummy, we can say that potential entrepreneurs are discouraged by high bureaucracy. In other words, our results support \( H1 \).

One potential pitfall of the first two equations is that they do not take the past firm creation rate into account. Past firm creation rate can be an important factor in determining the current firm creation rate as it is a good proxy for culture. As discussed in several previous studies (e.g. Scheinberg & MacMillan, 1988; Davidsson & Wiklund, 1997; Thomas & Mueller, 2000), culture is an important determinant of entrepreneurship and controlling for it can improve the predictive power of our models.
The introduction of lagged firm creation rate variable makes our model a dynamic panel. Dynamic panels cannot be estimated by fixed-effects regressions because as Nickell (1981) shows, the coefficients will be biased. For this reason, I use Blundell & Bond (1998) regressions to estimate the effects of our variables of interest on firm creation rate in a dynamic setting.\textsuperscript{25} The Blundell & Bond models used in testing \textit{H1} take the following forms:

\[
F_{CR_{it}} = \delta_1 F_{CR_{i,t-1}} + \beta V_{i,t} + \phi X_{i,t-1} + \gamma Z_{i,t} + \theta T_t + c_i + u_{i,t} \tag{3}
\]

\[
F_{CR_{i,t}} = \delta_1 F_{CR_{i,t-1}} + \alpha V_{i,t-1} + \phi X_{i,t-1} + \gamma Z_{i,t} + \theta T_t + c_i + u_{i,t} \tag{4}
\]

where

\(F_{CR_{i,t-1}}\) represents the firm creation rate in country \(i\) at year \(t-1\).

Again the coefficients of \(\beta\) in Equation (3) and \(\alpha\) in Equation (4) determine whether our empirical results support \textit{H1} or not. In addition to that, the coefficient \(\delta_1\) determines whether countries with high firm creation rates can sustain their high FCR level thanks to entrepreneurship-friendly culture.

Table 3.3 reports the results of Equation (1) and (2) while Table 3.4 reports the results of Equation (3) and (4) defined above:

[Insert Table 3.3 around here]

[Insert Table 3.4 around here]

Majority of the results presented in Table 3.3 and Table 3.4 show that procedures have a negative and significant effect on firm creation rate while policy reforms have a positive and

\textsuperscript{25} The reason for this choice stems from the fact that Blundell & Bond (1998) estimator is generally more efficient than Arellano & Bond (1991) estimator as mentioned in Roodman (2009). Furthermore, the unreported results of Arellano & Bond (1991) model are qualitatively similar to the reported Blundell & Bond (1998) model results and they are available upon request.
significant effect. On the other hand, despite having the expected sign, the coefficient of ∆Procedures are mostly insignificant in these two tables. According to Column (1) of both tables, every additional procedure reduces the firm creation rate by approximately 0.23 units which corresponds to a 7.3% decrease in firm creation rate for a country with median level of firm creation rate. According to Column (3) of both tables, every policy reform increases the firm creation rate by 0.46 to 0.51 units. These results indicate that potential entrepreneurs are negatively affected by entry regulations so most of our empirical results support H1.

Interestingly, all variables of interest coefficients (except Column 3 and 4 of Table 3.3) indicate an instantaneous effect of entry regulations and reforms. Once the lagged variables of interests are used in estimation, the magnitudes of their coefficients move towards zero and their statistical significance reduce/disappear. Therefore, we can say that potential entrepreneurs are more responsive to policy changes in the short-run (i.e., the reform year) than in the long-run.

When it comes to the control variables, the only control variable which is consistently positive and significant in both tables is the credit access rate. According to Column (1) of both tables, a 10-percentage point increase in the credit access rate corresponds to 0.13 to 0.16-unit increase in firm creation rate which corresponds to 5% increase for a median firm creation rate country. Thus, financial constraints are important obstacles for entrepreneurs as expected.

If we look at the coefficient of (lag of) unemployment rate, we can see that it is positive and significant in all regressions at Table 3.4, but insignificant in all regressions at Table 3.3. Therefore, which empirical model we use makes a difference on the effect of unemployment rate. According to Column (2) of Table 3.4, one-percentage point rise in last year’s unemployment rate increases firm creation rate by 0.10 units (per 1,000 working-age

26 This type of increase corresponds to a large number of new LLCs being created. For instance, Canada has approximately 24 million people in the working age group as of 2012. 0.23 units increase in firm creation rate (resulting from policy reform) corresponds to more than 5,600 new LLCs being created in Canada.
population). This result is also expected since unemployment can lead some people into entrepreneurship as career choice.

A similar situation (to unemployment rate) can be observed for the income variable. While its coefficient is positive and significant in all regressions at Table 3.3, it is insignificant in all regressions at Table 3.4. Again, this means which empirical model we use makes a difference on the effect of income level. According to Column (1) of Table 3.3, a $1,000-increase in income level corresponds to 0.11-unit increase in the firm creation rate. This can be interpreted as people in richer countries face less financial constraints on average and this encourages them to create more firms.

The other two control variables (i.e., last year’s GDP growth rate and logarithm of population) are statistically insignificant in both tables, so neither of them affects the firm creation rate.

Finally, previous year’s firm creation rate positively affects the current firm creation rate in all regressions at Table 3.4. According to Column (6), one-unit increase in last year’s firm creation rate increases the current year firm creation rate by 0.86 units. Therefore, countries with high firm creation rates are expected to have high firm creation rates in the future as well.

3.4.2 The Nonlinear Effect of Entry Regulation Reforms on Firm Creation Rate
The common characteristic of the models in the previous section is that they do not recognize the possible effect of which country makes the reform. As discussed in Stiglitz (2008) and Acs, Desai & Hessels (2008), “one size fits all” approach to policy reforms may lead to different (and sometimes unexpected) results as country specific factors may change the impact of a reform.

One of the country specific factors that can change the effect of the policy reform is the pre-reform level of bureaucracy in the country. If the pre-reform level of bureaucracy is (statistically) important, this tells us that entry regulations (and policy reforms) have a nonlinear
effect on firm creation rate. As defined in $H2$, high-bureaucracy countries may benefit more (or
less) from policy reforms compared to low-bureaucracy countries.

In order to test $H2$, I use two different models. In the first model, I introduce the squared
term of procedures (i.e., proxy for entry regulations) to Equation (1) and (2). This means the first
model testing $H2$ looks the following way:

\[
FCR_{i,t} = \beta_1 \text{Proc}_{i,t} + \beta_2 \left( \text{Proc}_{i,t} \right)^2 + \phi X_{i,t-1} + \gamma Z_{i,t} + \theta T_t + c_t + u_{i,t} 
\] (5)

\[
FCR_{i,t} = \alpha_1 \text{Proc}_{i,t-1} + \alpha_2 \left( \text{Proc}_{i,t-1} \right)^2 + \phi X_{i,t-1} + \gamma Z_{i,t} + \theta T_t + c_t + u_{i,t} 
\] (6)

where

$Proc_{i,t}$ represents the number of procedures to start a business in country i at year t.

If $H2a$ (i.e., high-bureaucracy countries benefiting more from policy reforms) is correct, we need to find negative and significant $\beta_1$ and $\beta_2$ ($\alpha_1$ and $\alpha_2$) in Equation 5 (6). If $H2b$ (i.e.,
low-bureaucracy countries benefiting more from policy reforms) is correct, we should see
negative and significant $\beta_1$ ($\alpha_1$) and positive and significant $\beta_2$ ($\alpha_2$) in these equations. If $\beta_1$
($\alpha_1$) is negative and significant but $\beta_2$ ($\alpha_2$) is insignificant, this means all countries benefit from
policy reforms in a linear fashion so the empirical models in previous literature are not
misspecified.

In the second model, I first categorize countries as high-bureaucracy and low-
bureaucracy countries based on the following criterion: If a country has more than six procedures
to start a business in a specific year, this country is considered as a high-bureaucracy country in
that year.\footnote{If a country with more six procedures makes a policy reform and reduces its number of procedures to a level six or below, this country will be considered as a low-bureaucracy country the following year. For example, Slovenia had nine procedures in 2007, so it was considered a high-bureaucracy country. However, Slovenia made a policy reform in 2008 which reduced its number of procedures to five so it became a low-bureaucracy country in 2008.} This threshold (i.e., six procedures) is chosen intentionally as it represents the median
value of the procedures variable. After defining high-bureaucracy (and low-bureaucracy) countries, I create the high-bureaucracy country dummy. In the second step, I create the interaction term between procedures variable and high-bureaucracy country dummy. With the introduction of high-bureaucracy country dummy and the interaction variable, the second model which tests H2 looks the following way:

\[
FCR_{it} = \beta_1 Proc_{it} + \beta_2 HBD_{it-1} + \beta_3 (Proc_{it} \times HBD_{it-1}) + \phi X_{it-1} + \gamma Z_{it} + \theta T_t + c_i + u_{it} \tag{7}
\]

\[
FCR_{it} = \alpha_1 Proc_{it-1} + \alpha_2 HBD_{it-1} + \alpha_3 (Proc \times HBD)_{it-1} + \phi X_{it-1} + \gamma Z_{it} + \theta T_t + c_i + u_{it} \tag{8}
\]

where

\(HBD_{it-1}\) represents the high-bureaucracy country dummy which takes the value of one if country i has more than six procedures to start a business at year t-1.

If high-bureaucracy countries benefit more from policy reforms (as defined in H2a), we should see negative and significant \(\beta_1\) and \(\beta_3\) (\(\alpha_1\) and \(\alpha_3\)) coefficients in Equation 7 (8). If, however, \(\beta_1\) (\(\alpha_1\)) is negative and significant but \(\beta_3\) (\(\alpha_3\)) is positive and significant, this means low-bureaucracy countries benefit more from policy reforms which supports H2b. Finally, if \(\beta_1\) (\(\alpha_1\)) is negative and significant but \(\beta_3\) (\(\alpha_3\)) is insignificant, this means every (additional) procedure has the same effect on high and low-bureaucracy countries so a nonlinear model is no better than a linear one.

Table 3.5 presents the results of Equation (5) to Equation (8):

[Insert Table 3.5 around here]

The results in Column (1) to Column (4) show that low(er) bureaucracy countries face a larger negative effect of entry regulations. In other words, they benefit more from policy reforms than high(er) bureaucracy countries. To be more specific, according to Column (2), if a country
has nine or more procedures, this country does not suffer from additional procedures. This means a policy reform made by a country with nine or more procedures may create no positive effect on firm creation rate.

A similar comment can be made on the results presented in Column (5) and (6). A high-bureaucracy country benefits less from a policy reform than a low-bureaucracy country. In fact, the unreported Wald Test shows that the effect of a reform made by a high-bureaucracy country is no different than zero, so high-bureaucracy countries do not benefit from reforms, at least statistically.

Both of these empirical results support H2b but it is still worth investigating whether corruption explanation makes sense. The correlation between our bureaucracy variable (i.e., procedures) and the (inverse) corruption score announced by Transparency International for our sample countries is 0.50 and it is significant at 1% level. Thus, bureaucracy and corruption are highly related. Yet, this coefficient does not show whether corruption neutralize the effect of bureaucracy. To determine this effect, I first add the (inverse) corruption score as an additional control variable to Equation (1) and (3). Despite being individually insignificant, the F Test indicates that the joint effect of procedures and corruption is not statistically different from zero. Thus, corruption reduces (if not eliminates) the negative effect of bureaucracy for potential entrepreneurs. In addition to that, I also add the squared (inverse) corruption term to see if the corruption’s positive effect kicks in after a country’s corruption score falls below a certain threshold. The results indicate that corruption has a negative effect on low-corruption countries but the effect becomes positive for countries with higher corruption level. This result is also

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28 The negative effect of each additional procedure continues until the eighth procedure. Starting from the ninth procedure, every procedure reduces the total negative effect of bureaucracy. This tipping point can be calculated from $\frac{\partial FCR}{\partial Proc} = -1.135 + 0.132 \times Proc$ which reaches the value of zero at $Proc = 8.6$.

29 You can see these regression results in the Appendix section.

30 The effect becomes positive for countries with the score of 6.7 or less in Corruption Perception Index.
logical and supportive of our hypothesis (H2b) as only high level of corruption creates a positive effect which may alleviate/eliminate the negative effect of additional procedures in high-bureaucracy countries.

Despite this evidence, there is another potential explanation of why high-bureaucracy countries do not suffer from additional procedures which is visible in Column (5) and (6). The high bureaucracy country dummies in both columns are negative and significant, so these countries actually suffer from being a high-bureaucracy country in addition to higher number of procedures to start a business. This may stem from the possibility that high bureaucracy can be the signal (or outcome) of political instability and/or inefficient judicial system in the country. This relationship is also well-documented in the previous literature. For instance, according to Mauro (1995), bureaucracy and political instability (or judicial system inefficiency) are highly (positively) correlated. Therefore, potential entrepreneurs in high-bureaucracy countries may be discouraged by a more serious problem where entry regulations are not the cause of lower firm creation rate but a symptom of a systemic problem.

When it comes to the control variables, the coefficients of credit access rate and the income level are mostly positive and significant. This means an increase in either variable positively affects the firm creation rate which is consistent with our financial constraints explanation. For instance, according to Column (2), a ten-percentage point increase in credit access rate or a $1,000 increase in income level in the country correspond to 0.13-unit and 0.11-unit increase in firm creation rate, respectively.

On the other hand, the effect of GDP growth rate depends on which model we prefer. While the GDP growth rate has a positive effect on firm creation rate in Equation (5) and (6), it is not significant in Equation (7) and (8). If we want to be more specific, according to Column
(2), a two-percentage point increase in GDP growth rate corresponds to a 0.10-unit increase in firm creation rate.

If we look at the effect of (lag of) unemployment rate and the logarithm of population, they are mostly insignificant in Table 3.5, so neither factor is an important determinant of firm creation.

3.4.3 Endogeneity and Two-Stage Models
As mentioned in the introduction, one possible concern regarding the previous models (and results) is that they do not recognize possible simultaneity of policy reforms and firm creation rate. In order to alleviate this concern, I use a treatment effect model (i.e., two-stage model). In the first stage, each country’s reform probability is estimated with a probit model. There are five factors (variables) I employ at the first stage regressions all of which are expected to affect policy reforms.\(^{31}\)

The first variable, which also serves as the IV, is the (lag of) reformist neighbor(s) dummy variable. This variable takes the value of one if at least one neighbor of our country made a policy reform in the previous or current year. This variable is built by using the number of procedures to start a business data and it aims to understand whether countries have “race to the bottom” in entry regulations. If there is “race to the bottom”, we should find a positive coefficient for this variable.

The second variable is the (lag of) number of procedures to start a firm, which is the proxy for the bureaucracy level in that country. As discussed in previous sections, high-bureaucracy countries can simplify the entry regulations in many different ways. Furthermore,

\(^{31}\) The first and second stages of the treatment effect model are estimated jointly with the code of \textit{treatreg} in Stata 12. To show that I use the best-fitting model, I provide a separate panel probit regressions table in the Appendix.
our sample shows that majority of the policy reforms (i.e., 22 out of 29) are made by countries with more than six procedures to start a business. Thus, I expect to find a positive coefficient for this control variable.

The third variable is the (lag of) GDP growth rate. The lower the GDP growth rate, the higher the possibility that the country will try to stimulate the economic growth. One way to achieve this goal is to encourage entrepreneurship. Thus, it is more likely that this country makes a policy reform. As an alternative to the (lag of) GDP growth rate, I also employ a dummy variable which takes the value of one if a country experiences negative economic growth the year before the reform.

The fourth variable is the (lag of) high unemployment dummy which takes the value of one if the country has an unemployment rate of 11% or more.\(^{32}\) One of the potential benefits of entrepreneurship is the creation of new jobs which can reduce the unemployment rate. As policy reforms can incentivize potential entrepreneurs, we can assume that countries with higher unemployment rates are more likely to make policy reforms. Thus, I expect to find a positive coefficient for this variable as well.

The last variable is about the corruption level in the country. It is believed that bureaucracy and corruption are two intertwined concepts (Aidt, 2003). As cumbersome bureaucracy creates room for private gains to officials, high level of corruption can also be an obstacle to reforms as officials can be reluctant to lose their private gains. To determine the effect of corruption, I build a high corruption dummy variable which takes the value of one if the Corruption Perception Index (henceforth CPI) score of a country (which is announced by Transparency International) is five or less in that year.\(^{33}\)

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\(^{32}\) This 11% threshold corresponds to 90\(^{th}\) percentile of our sample and the unreported results are qualitatively similar if the threshold of 8.4% (75\(^{th}\) percentile of the sample) is used in lieu of 11% threshold.

\(^{33}\) This threshold is the midpoint of the CPI scale and it also defines the bottom third of our sample.
Taking all these factors into account, the first stage regressions are as follows:

\[
RD_{i,t} = \beta_1 RND_{i,t-1} + \beta_2 Proc_{i,t-1} + \beta_3 Growth_{i,t-1} + \beta_4 HUD_{i,t-1} + \beta_5 HCD_{i,t-1} + e_{i,t} \tag{9}
\]

\[
RD_{i,t} = \beta_1 RND_{i,t-1} + \beta_2 Proc_{i,t-1} + \beta_3 NGD_{i,t-1} + \beta_4 HUD_{i,t-1} + \beta_5 HCD_{i,t-1} + u_{i,t} \tag{10}
\]

where

- \(RD_{i,t}\) represents the reform dummy, which takes the value of one if country \(i\) reduces the number of procedures to start a firm at year \(t\),
- \(RND_{i,t-1}\) represents the reformist neighbor dummy for country \(i\) at year \(t-1\),
- \(Proc_{i,t-1}\) represents the number of procedures to start a business in country \(i\) at year \(t-1\),
- \(Growth_{i,t-1}\) represents the GDP growth rate of country \(i\) at year \(t-1\),
- \(NGD_{i,t-1}\) represents the negative growth dummy for country \(i\) at year \(t-1\),
- \(HUD_{i,t-1}\) represents the high unemployment dummy for country \(i\) at year \(t-1\), and
- \(HCD_{i,t-1}\) represents the high corruption dummy for country \(i\) at year \(t-1\).

In the second-stage regressions, the estimated reform probabilities become the main variable of interest. To be consistent with the previous models testing \(H1\), I use the same control variables in the second stage regressions. Furthermore, I introduce the country fixed effects into the second-stage regressions as it cannot be estimated as a fixed-effects model automatically. With these variables, the second-stage regressions look the following way:

\[
FCR_{i,t} = \beta \tilde{PR}_{i,t} + \phi X_{i,t-1} + \gamma Z_{i,t} + \theta T_t + c_i + u_{i,t} \tag{11}
\]

\[
FCR_{i,t} = \beta_1 \tilde{PR}_{i,t} + \beta_2 HBCD_{i,t-1} + \phi X_{i,t-1} + \gamma Z_{i,t} + \theta T_t + c_i + u_{i,t} \tag{12}
\]

where

\(\tilde{PR}_{i,t}\) represents the estimated probability of reform for country \(i\) at year \(t\).
If we find a positive and significant $\beta$ coefficient in Equation (11), then the treatment effect model indicates the same finding as our fixed-effects model testing $H1$. In addition to that, I also control for the pre-existing level of bureaucracy in Equation (12) while trying to determine the effect of policy reforms. If we find a negative and significant $\beta_2$ coefficient, it means that high-bureaucracy countries have lower level of firm creation rates and this result is in line with our previous findings.

Table 3.6 reports the results of Equation (9) to Equation (12):

[Insert Table 3.6 around here]

All first-stage regressions (i.e., odd numbered columns) in Table 3.6 show that all factors except the economic growth (regardless of how it is measured) have significant effects on the probability of making policy reforms. To be more specific, countries experiencing high unemployment rate before the reform year, having reformist neighbor(s), and with higher level of bureaucracy (measured by the number of procedures before the reform year) are more likely to make policy reforms. The positive effects of these factors are in line with our expectations. On the other hand, countries which have poor corruption record (i.e., scoring five or less out of 10 in the Corruption Perception Index announced by Transparency International) are less likely to make policy reforms. This result is also expected because government officials enjoy private gains in high corruption environment and they may be less inclined to reduce the bureaucracy level so they continue to have private gains.

When we look at the second-stage regressions (i.e., even numbered columns), we see that reform (dummy) has a positive and significant effect on firm creation rate. To elaborate on this effect, according to Column (2), if a country makes an entry regulation reform, its firm creation rate increases by 1.62 units, which corresponds to 51% increase for a country with median-level of firm creation, on average. When it comes to high-bureaucracy countries (i.e.,
countries with more than six procedures to start a firm), their firm creation rate is significantly lower than low-bureaucracy countries. According to Column (4), the firm creation rate of a high-bureaucracy country is 1.18 units (per 1,000 working-age population) lower than the firm creation rate of a low-bureaucracy country.

The majority of the control variables in the second-stage regressions are also significant factors for firm creation rates in our sample. To be more specific, while last year’s GDP growth rate, credit access rate, and income level have positive and significant effects on firm creation rate, (logarithm of) population has a negative and significant effect. According to Column (6), one-percentage point increase in GDP growth rate or a three-percentage point increase in credit access rate correspond to 0.05 units increase in firm creation rate. On the other hand, one-percent increase in population reduces the firm creation rate by 0.14 units (per 1,000 working-age population). The only control variable which is insignificant in all second-stage regressions is the (lag of) unemployment rate. Thus, it is safe to assume that unemployment rate does not have any significant effect on the firm creation rate in the treatment effect models.

The final and the most important thing to discuss regarding our treatment effect models is the importance of controlling for selection bias. The lambda coefficients (i.e., inverse Mills ratios) reported at the bottom of Table 3.6 provide valuable information on this issue. All four treatment effect models have lambda coefficients which are statistically different from zero. These coefficients suggest that it is appropriate to apply the treatment effect model to our data despite the fact that the results are qualitatively similar to our fixed-effects model results.

### 3.5 Robustness

All regression models discussed in Section 4 investigate the effect of policy reforms made in the current or previous year to determine whether the effect is instantaneous or not. However, once
the reform is made, the country’s firm creation rate in the coming years can also be affected by this reform.

In order to test this possibility, I compare the firm creation rates of reformist countries before and after the (major) reform year. As one can guess, the determination of the major reform year is the critical step in this setting. In order to determine the major reform year, I use the following strategy: If a country made only one reform during the sample years, that year is the reform year. If a country made more than one reform during the sample period, the year in which our country reduced the number of procedures most (i.e., the largest \( \Delta \text{Procedure} \)) is the major reform year. If all reforms have the same \( \Delta \text{Procedure} \), then I choose the first reform year as the major reform year.

As mentioned several times previously, we may be losing valuable variation in our data by using a dummy variable for reforms. To alleviate that concern, I also use an interaction variable between this post-reform dummy and \( \Delta \text{Procedure} \) variable. Finally, to test whether low and high-bureaucracy countries experience similar changes in their firm creation rates, I use an interaction variable between the post-reform dummy and high-bureaucracy dummy which I previously used in testing \( H2 \) related regressions in this paper.

With the introduction of these new variables, our fixed-effects models look the following way:

\[
F_{CR,i,t} = \beta_{\text{PostRef}_i,t} + \phi X_{i,t-1} + \gamma Z_{i,t} + \theta T_t + c_i + u_{i,t} 
\]

(13)

\[
F_{CR,i,t} = \beta \left( \text{PostRef}_i,t \ast \Delta \text{Proc}_{i,t} \right) + \phi X_{i,t-1} + \gamma Z_{i,t} + \theta T_t + c_i + u_{i,t} 
\]

(14)

\[
F_{CR,i,t} = \beta_1 \text{PostRef}_i,t + \beta_2 \text{HBD}_{i,t-1} + \beta_3 \left( \text{PostRef}_i,t \ast \text{HBD}_{i,t-1} \right) + \phi X_{i,t-1} + \gamma Z_{i,t} + \theta T_t + c_i + u_{i,t} 
\]

(15)

where

\( \text{PostRef}_i,t \) represents the post-reform year dummy, which takes the value of one starting from the major reform year (which is year \( t \)) for country \( i \), and
$HBD_{i,t-1}$ represents the high-bureaucracy country dummy for country i at year t-1.

If the policy reform stimulates entrepreneurship as expected, we should find a positive and significant $\beta$ coefficient in Equation (13) and a negative and significant $\beta$ coefficient in Equation (14). Moreover, if the high-bureaucracy countries benefit less from policy reforms as shown in previous regressions, we should find a negative and significant $\beta_3$ coefficient in Equation (15).

The results of Equation (13) to (15) are presented in Table 3.7:

[Insert Table 3.7 around here]

The first two columns of Table 3.7 show that reformist countries experience a significant increase in firm creation rate. Moreover, as Column (2) shows, the effect is weaker in magnitude when we measure the impact only after the reform year (but not at the reform year). The results in Column (3) and Column (4) are also supportive of our findings in the first two columns. The reformist countries experience a significant increase in firm creation rate starting from the reform year. However, the effect becomes insignificant once it is measured only after the reform years. These two findings confirm that the effect of policy reforms is more instantaneous which is in line with our main regression results.

If we look at the changes in firm creation rate for low-bureaucracy countries during the post-reform years, we see that they experience a large and significant increase. On the other hand, high-bureaucracy countries experience a smaller yet significant increase in firm creation rate during the post-reform period. Even though the effect (of reforms) is significant for high-bureaucracy countries, it is smaller so this finding can also be considered consistent with our main regression results.
When it comes to the control variables, the only two control variables which are consistently significant in all regressions at Table 3.7 are the income level and credit access rate. The coefficients of both of these variables are positive and significant so our theory on financial constraints finds support from our empirical results. The other control variables are insignificant in majority of the regressions, so they do not affect the firm creation rate in this empirical setting.

3.6 Policy Implications

Our empirical results have important policy implications which can help policymakers build a more effective agenda on entrepreneurship.

First and foremost, high-bureaucracy countries do not benefit from policy reforms as much as expected. For example, Argentina can be considered as a high-bureaucracy country in our sample. During the sample years, Argentina did not make a policy reform. Even though this may sound surprising, our results show that the lack of willingness for entry regulation reforms in Argentina may stem from the possibility that potential entrepreneurs do not suffer from these procedures. One potential explanation for this outcome is the high corruption level in Argentina. If corruption circumvents these procedures for potential entrepreneurs, they are not negatively affected by them. Thus, if Argentina wants to increase its firm creation rate, it may try to improve the governance and political stability in the country before making such reforms.

What if our country is a low-bureaucracy country? The effect of policy reforms for such countries is (positive and) significant. This finding explains why low-bureaucracy countries like Canada, Singapore, or Belgium made policy reforms during the sample period. It is also noteworthy to mention that these three countries are also low corruption countries. When corruption level is low, the start-up (entry) procedures cannot be eliminated through bribery, so a potential entrepreneur has to dedicate certain amount of effort, time, and money for these procedures which can create the negative effect.
Another useful insight this paper provides to policymakers is related to the size of the reform package. A larger reform package (which eliminates several procedures simultaneously) is more likely to create the desired effect than small reform packages. This can also explain why high-bureaucracy countries like Uruguay and Slovenia made larger reforms during the sample period.

There are also policy implications regarding the timing of policy reforms.

First of all, potential entrepreneurs in currently high-bureaucracy countries are more likely to see a policy reform in the near future. In addition to that, these reforms are more likely to be larger reforms, which confirm the value of our previous suggestion. This prediction is also confirmed by several recent examples: Greece had 15 procedures to start a firm until 2010. However, Greece made a policy reform in 2011 and in 2013 which reduced the number of procedures to 11 and then to five.34

Another group of countries from which we are more likely to see policy reforms are the ones with high unemployment rate. In our sample, there are a few examples of high unemployment countries making a policy reform such as Croatia in 2006 (where the unemployment rate was 12.60% in 2005) and Latvia in 2011 (where the unemployment rate was 18.70% in 2010). Even though our sample ends in 2012, the more recent data on unemployment rate and entry regulations also confirm this relationship. For example, the unemployment rate of Italy rose above the 11% threshold (i.e., rose from 10.70% to 12.20%) in 2013 and Italy made a policy reform in 2014.

Several countries in our sample (e.g. Croatia, Romania, and Turkey) have high level of corruption. As the results in Table 3.6 confirm, high corruption is an impediment to making

34 Spain can be given as a similar example to Greece as they reduced their entry regulations level from 11 procedures to seven procedures in 2014.
policy reforms. Therefore, if these countries fight corruption more effectively, their probability to make entry regulation reforms increases significantly. Let’s take Turkey. Turkey had a CPI score of 4.9 in 2012 which is right below our threshold. After 2012, Turkey’s CPI score gradually reduced to 4.2 in 2015. Not surprisingly, we did not see a policy reform by Turkey during post-2012 period.

Finally, the results show that having reformist neighbors increases the reform probability of a country as well. This finding is very useful in predicting from which countries we can expect entry regulation reforms in the coming years. More importantly, this finding provides us valuable information on how to convince some governments to reduce the bureaucracy level in their countries.

3.7 Conclusion
The majority of the entrepreneurship literature argues that cumbersome entry regulations are obstacles for potential entrepreneurs. With the influence of these studies, several countries which aim to foster new firm creation rate added entry regulation reforms into their political agenda. Even though this argument makes sense and the empirical evidence supports it, the approach used by the current literature has an important shortcoming: It disregards the fact that the effect of an entry regulation reform depends on country specific factors. This paper extends the current literature by investigating whether the effect of a policy reform depends on the pre-reform level of bureaucracy in the country. In addition to that, this paper fills another gap in the literature by addressing the potential simultaneity bias between firm creation rate and policy reforms. While addressing this concern, it also explains why countries make entry regulation reforms.

There are three important findings in this paper: The first empirical result indicates that entry regulation reforms increase the firm creation rate. This result is valid even if we take the past firm creation rates into account or address the potential simultaneity bias between firm
creation rate and policy reforms. The second empirical result shows that the effect of a policy reform is generally instantaneous so it is more likely to create an increase in firm creation rate in the reform year but not the following years. The last empirical result shows that while low-bureaucracy countries benefit from policy reforms, high-bureaucracy countries are less likely to experience such an effect. This smaller (or insignificant) response to policy reforms by high-bureaucracy countries can potentially be explained by the high(er) corruption circumventing cumbersome entry regulations.

Even though these findings are helpful to policymakers and they improve our understanding of the relationship between entrepreneurship and entry regulation reforms, there is a clear limitation of this study. The entrepreneurship variable used in this study measures the firms created only in formal sector. Thus, the effect of entry regulation reforms on informal sector cannot be determined. If cumbersome entry regulations direct some people to start their firms informally, we can say that the effects of regulatory reforms are overestimated. Unfortunately, this is not something we can test and determine at this stage due to lack of such detailed data. Yet, it can be a fruitful and interesting research topic in the future and it can help us make more insightful comments.
Table 3.1: Descriptive Statistics

<table>
<thead>
<tr>
<th>(1) Firm Creation Rate</th>
<th>(2) Procedures</th>
<th>(3) Reform Dummy</th>
<th>(4) ΔProcedures</th>
<th>(5) GDP Growth</th>
<th>(6) Unemployment</th>
<th>(7) Credit Access</th>
<th>(8) Income</th>
<th>(9) Ln(Population)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Obs.</td>
<td>266</td>
<td>266</td>
<td>232</td>
<td>232</td>
<td>266</td>
<td>266</td>
<td>261</td>
<td>265</td>
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<tr>
<td>Mean</td>
<td>3.90</td>
<td>6.45</td>
<td>0.125</td>
<td>-0.20</td>
<td>2.23</td>
<td>7.42</td>
<td>107.57</td>
<td>30.834</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>2.98</td>
<td>2.95</td>
<td>0.33</td>
<td>0.73</td>
<td>3.94</td>
<td>3.48</td>
<td>59.25</td>
<td>17.470</td>
</tr>
<tr>
<td>Median</td>
<td>3.2</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>2.42</td>
<td>7.2</td>
<td>99.23</td>
<td>33.072</td>
</tr>
<tr>
<td>Min</td>
<td>0.47</td>
<td>2</td>
<td>0</td>
<td>-6</td>
<td>-17.96</td>
<td>2.3</td>
<td>11.67</td>
<td>4.572</td>
</tr>
<tr>
<td>Max</td>
<td>17.57</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>14.78</td>
<td>25</td>
<td>319.46</td>
<td>83.087</td>
</tr>
</tbody>
</table>

Note: The descriptive statistics are for 34 countries. While GDP growth, unemployment, and credit access are measured in percentages, income (GDP per capita) is measured in 1000 dollars.
Table 3.2: Entry Regulation Reforms Table

<table>
<thead>
<tr>
<th>Change in No. of Procedures</th>
<th>Count</th>
<th>No. of Times Happened During the Sample Years</th>
<th>Example Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0 (Reduction)</td>
<td>29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>= 0 (No Change)</td>
<td>199</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 0 (Increase)</td>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Change in No. of Procedures</th>
<th>No. of Times Happened During the Sample Years</th>
<th>Example Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>-6</td>
<td>1</td>
<td>Uruguay</td>
</tr>
<tr>
<td>-4</td>
<td>2</td>
<td>Slovenia and Portugal</td>
</tr>
<tr>
<td>-3</td>
<td>2</td>
<td>Italy and Korea</td>
</tr>
<tr>
<td>-2</td>
<td>6</td>
<td>5 Countries (such as Croatia and Hungary)</td>
</tr>
<tr>
<td>-1</td>
<td>18</td>
<td>12 Countries (such as Singapore and Netherlands)</td>
</tr>
<tr>
<td>+1</td>
<td>4</td>
<td>Argentina, Mexico, Romania, and Uruguay</td>
</tr>
</tbody>
</table>

Note: The sample includes 29 entry regulation reforms (i.e., reduction in number of procedures).
Table 3.3: Fixed-Effects Regressions Testing Hypothesis 1

<table>
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<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
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<tbody>
<tr>
<td></td>
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<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>Procedures</td>
<td>-0.2338**</td>
<td>(-2.29)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procedures (t-1)</td>
<td>-0.1388*</td>
<td>(-1.97)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reform Dummy</td>
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<td></td>
<td>0.5118***</td>
<td>(2.78)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reform Dummy (t-1)</td>
<td></td>
<td></td>
<td>0.5892***</td>
<td>(3.27)</td>
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<td></td>
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<tr>
<td>ΔProcedures</td>
<td></td>
<td></td>
<td></td>
<td>-0.1350*</td>
<td>(-1.73)</td>
<td></td>
</tr>
<tr>
<td>ΔProcedures (t-1)</td>
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<td></td>
<td></td>
<td>-0.1122</td>
<td>(-1.38)</td>
<td></td>
</tr>
<tr>
<td>GDP Growth (t-1)</td>
<td>0.0402</td>
<td>0.0405</td>
<td>0.0419</td>
<td>0.0395</td>
<td>0.0358</td>
<td>0.0576*</td>
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<tr>
<td></td>
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<td>(1.34)</td>
<td>(1.46)</td>
<td>(1.40)</td>
<td>(1.20)</td>
<td>(1.90)</td>
</tr>
<tr>
<td>Unemployment (t-1)</td>
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<td>0.0045</td>
<td>-0.0056</td>
<td>-0.0026</td>
<td>-0.0029</td>
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<tr>
<td></td>
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<td>(-0.02)</td>
<td>(-0.003)</td>
<td>(0.37)</td>
</tr>
<tr>
<td>Credit Access</td>
<td>0.0132**</td>
<td>0.0131*</td>
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<td>0.0145**</td>
<td>0.0145**</td>
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<tr>
<td></td>
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<td>(1.96)</td>
<td>(2.38)</td>
<td>(2.39)</td>
<td>(2.30)</td>
<td>(1.65)</td>
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<td>0.1119***</td>
<td>0.1072***</td>
<td>0.1068***</td>
<td>0.1074***</td>
<td>0.1178***</td>
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<tr>
<td></td>
<td>(3.50)</td>
<td>(3.38)</td>
<td>(3.29)</td>
<td>(3.33)</td>
<td>(3.30)</td>
<td>(3.73)</td>
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<td>(-1.29)</td>
<td>(-1.29)</td>
<td>(-1.33)</td>
<td>(-1.28)</td>
<td>(-1.67)</td>
</tr>
<tr>
<td>Year Fixed Effects</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>(1.33)</td>
<td>(1.28)</td>
<td>(1.67)</td>
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<td>0.3941</td>
<td>0.3768</td>
<td>0.4007</td>
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</table>

Note: The numbers in parentheses are the t-statistics for the corresponding variables.

*, **, *** represent the significance at 10%, 5%, and 1% level.

The error terms are clustered at country level in all regressions.
Table 3.4: Dynamic Panel Regressions Testing Hypothesis 1

<table>
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<th>Dependent Variable: Firm Creation Rate</th>
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<th>Blundell-Bond</th>
<th>Blundell-Bond</th>
<th>Blundell-Bond</th>
<th>Blundell-Bond</th>
<th>Blundell-Bond</th>
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<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
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<td>0.8754***</td>
<td>0.8701***</td>
<td>0.8878***</td>
<td>0.8759***</td>
<td>0.8678***</td>
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<td></td>
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<td>(10.89)</td>
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<td>(12.47)</td>
<td>(12.49)</td>
<td>(11.31)</td>
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</tr>
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<td></td>
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<td>Procedures (t-1)</td>
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<td></td>
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<td></td>
</tr>
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</tr>
<tr>
<td>Reform Dummy (t-1)</td>
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<td>Reform Dummy (t-1)</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>ΔProcedures</td>
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<td>ΔProcedures (t-1)</td>
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<td></td>
</tr>
<tr>
<td>GDP Growth (t-1)</td>
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<td>-0.0510</td>
<td>-0.0502</td>
<td>-0.0552</td>
<td>-0.0550</td>
<td>-0.0512</td>
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<td></td>
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<td>(-1.44)</td>
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<td>(-1.59)</td>
<td>(-1.60)</td>
<td>(-1.34)</td>
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<tr>
<td>Unemployment (t-1)</td>
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<td>0.1032**</td>
<td>0.0979**</td>
<td>0.1006**</td>
<td>0.1025**</td>
<td>0.1000**</td>
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<td>(2.28)</td>
<td>(2.31)</td>
<td>(2.37)</td>
<td>(2.19)</td>
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</tr>
<tr>
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<td>0.0160***</td>
<td>0.0163***</td>
<td>0.0166***</td>
<td>0.0163***</td>
<td>0.0165***</td>
<td>0.0210***</td>
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<td></td>
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<td>(3.77)</td>
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<td>(3.77)</td>
<td>(3.86)</td>
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<td>(-0.03)</td>
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<tr>
<td>Ln (Population)</td>
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<td>0.2159</td>
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<td>(0.35)</td>
<td>(0.65)</td>
<td>(0.48)</td>
<td>(0.51)</td>
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</tr>
<tr>
<td>Year Fixed Effects</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
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</tr>
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<td>227</td>
<td>227</td>
<td>193</td>
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</tr>
<tr>
<td>Chi-Square</td>
<td>766.82***</td>
<td>714.16***</td>
<td>738.94***</td>
<td>712.19***</td>
<td>723.16***</td>
<td>643.42***</td>
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</tr>
</tbody>
</table>

Note: The numbers in parentheses are the t-statistics for the corresponding variables. *, **, *** represent the significance at 10%, 5%, and 1% level.
Table 3.5: Fixed-Effects Regressions Testing Hypothesis 2

<table>
<thead>
<tr>
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<th>Fixed-Effects</th>
<th>Fixed-Effects</th>
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<tbody>
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<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Procedures</td>
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<td>-1.1349*</td>
<td>-0.2858**</td>
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<tr>
<td></td>
<td>(-1.92)</td>
<td>(-1.97)</td>
<td>(-2.08)</td>
</tr>
<tr>
<td>Procedures$^2$</td>
<td>0.0581*</td>
<td>0.0660*</td>
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</tr>
<tr>
<td></td>
<td>(1.74)</td>
<td>(1.74)</td>
<td></td>
</tr>
<tr>
<td>Procedures$_{(t-1)}$</td>
<td></td>
<td>-0.7949**</td>
<td>-0.8131**</td>
</tr>
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<td>(-2.14)</td>
</tr>
<tr>
<td>Procedures$^2$_{(t-1)}</td>
<td>0.0482*</td>
<td>0.0479*</td>
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</tr>
<tr>
<td></td>
<td>(2.02)</td>
<td>(1.94)</td>
<td></td>
</tr>
<tr>
<td>High Bureaucracy Dummy$_{(t-1)}$</td>
<td></td>
<td>-2.1610*</td>
<td>-3.3625**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-1.92)</td>
<td>(-2.28)</td>
</tr>
<tr>
<td>(High Bur. Dummy * Procedures)$_{(t-1)}$</td>
<td>0.2528*</td>
<td>0.5215*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.88)</td>
<td>(2.00)</td>
</tr>
<tr>
<td>GDP Growth$_{(t-1)}$</td>
<td>0.0494**</td>
<td>0.0501*</td>
<td>0.0437**</td>
</tr>
<tr>
<td></td>
<td>(2.53)</td>
<td>(1.97)</td>
<td>(2.11)</td>
</tr>
<tr>
<td>Unemployment$_{(t-1)}$</td>
<td>0.0314</td>
<td>0.0203</td>
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</tr>
<tr>
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<td>(0.22)</td>
<td>(0.29)</td>
</tr>
<tr>
<td>Credit Access</td>
<td>0.0135</td>
<td>0.0128**</td>
<td>0.0133</td>
</tr>
<tr>
<td></td>
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<td>(2.11)</td>
<td>(1.62)</td>
</tr>
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<td>Income</td>
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<td>0.1130***</td>
<td>0.1024***</td>
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<tr>
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<td>(4.19)</td>
<td>(3.83)</td>
<td>(3.93)</td>
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<td>-18.630**</td>
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<td>(-2.15)</td>
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<tr>
<td>Year Fixed Effects</td>
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<td>No</td>
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Note: The numbers in parentheses are the t-statistics for the corresponding variables.

*, **, *** represent the significance at 10%, 5%, and 1% level.

The error terms are clustered at country level in all regressions.
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Note: The results of both stages come from Stata 12 code of “treatreg”. The numbers in parentheses are the t-statistics for the corresponding variables. *, **, *** represent the significance at 10%, 5%, and 1% level.
Table 3.7: Robustness (Post-Reform) Regressions

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Note: The numbers in parentheses are the t-statistics for the corresponding variables.
*, **, *** represent the significance at 10%, 5%, and 1% level.
The error terms are clustered at country level in all regressions.
Figure 3.1: Firm Creation Rate of Italy and Hungary

![Figure 3.1: Firm Creation Rate of Italy and Hungary](image)

Figure 3.2: Scatter Plot of Firm Creation Rate and Number of Procedures

![Figure 3.2: Scatter Plot of Firm Creation Rate and Number of Procedures](image)

Note: The best-fitting (blue) line is determined with a simple OLS regression in which firm creation rate is the dependent variable and the number of procedures is the independent variable.
Chapter 4

Red Tape, Corruption, and Entrepreneurship: Who Benefits and Who Dislikes What?

4.1 Introduction
In their seminal paper, Djankov et al. (2002) investigate the effect of regulation of entry on 85 countries and they find that cumbersome entry regulations negatively affect entrepreneurs by allowing greater corruption. Following this paper, many studies examine the relationship among entry regulations, corruption, and entrepreneurship and majority of them reach the same conclusion. With the influence of these studies, many countries reformed their entry regulations in the first decade of the 2000s.

Even though this finding (i.e., entry regulations negatively affect entrepreneurship) sounds logical, two important concerns about its validity still remain. First, despite the encouragement for a policy reform, several countries (including developed countries like Finland, Switzerland, and Canada) either kept their business registration time, which is a standard measure of entry regulations, same or even increased in the first decade of 2000s.35 Second, no papers in this branch of literature distinguish between different types of entrepreneurs while investigating the effect of bureaucracy and/or corruption.36 However, it is a well-known fact that many entrepreneurs are different in their motivations, determination level, and growth aspirations. Thus, it is possible that different types of entrepreneurs can respond differently to bureaucracy and/or corruption. These concerns raise the following two questions: Why do some countries still have cumbersome entry regulations? And do bureaucracy and/or corruption affect

35 If we use the number of business registration procedures, the list of countries which did not reform their entry regulations gets even longer and it includes countries like Germany, Japan, and the United States.
36 In this paper, I use the terms entry regulations and bureaucracy interchangeably.
all entrepreneurs in the same way? This paper aims to shed light on these issues by analyzing the individual and joint effects of bureaucracy and corruption on two different types of entrepreneurs, namely necessity-based and opportunity-based entrepreneurs.

As can be understood from the discussion above, distinguishing between necessity-based and opportunity-based entrepreneurship is a novel and crucial feature of this paper. But what is the difference between these two types of entrepreneurs? As defined in Reynolds et al. (2005), necessity-based entrepreneurs are formerly unemployed people who became entrepreneurs due to having no other job options. On the other hand, opportunity-based entrepreneurs are people who became entrepreneurs because they discovered a business opportunity which is more profitable than their current employment. Moreover, previous literature reveals that these two types of entrepreneurs are different in many other attributes such as growth aspirations (Acs & Varga, 2005), human capital endowments (Block & Sandner, 2009), job satisfaction (Block & Koellinger, 2009), and duration of entrepreneurship (Block & Sandner, 2009). Considering these differences, it would not be surprising to see different responses to regulatory changes from these two types of entrepreneurs. In fact, the case of Spain can be considered as a great example for the relationship between bureaucracy and necessity-based/opportunity-based entrepreneurship rates. As can be seen in Figure 4.1, Spain gradually reduced the number of days spent to complete bureaucratic procedures (from 70 days to 30 days) between 2005 and 2012. During the same period, the necessity-based entrepreneurship rate increased from 14% to 26% and opportunity-based entrepreneurship rate reduced from 55% to 33% gradually. Even though the case of Spain may be an exception, it is still worth investigating for a panel of countries.

[Insert Figure 4.1 around here]

One may wonder why different responses to entry regulations and/or corruption by these two types of entrepreneurs matter. If necessity-based entrepreneurs and opportunity-based
entrepreneurs are affected differently by bureaucracy and/or corruption, this must be taken into account during policy development. For instance, it may be more important to incentivize the potential necessity-based entrepreneurs in a country with persistently high unemployment rate. However, following general policy recommendations (i.e., reducing the entry regulations and corruption level simultaneously) may turn out to be ineffective or even counter-effective. Thus, knowing the (potentially different) effects of entry regulations and/or corruption can help policymakers design better and more effective policies.

One possible channel through which bureaucracy and corruption affect the necessity-based and opportunity-based entrepreneurs differently is the competition among new entrants. Imagine a model where a necessity-based and an opportunity-based entrepreneur evaluate the decision of entry. Any entrepreneur who decides to start a firm has to complete a set of bureaucratic procedures. This process (i.e., bureaucracy) is costly to the potential entrepreneur(s) and she has to take this cost into account when she decides to start a venture or not. Moreover, her entrepreneurial payoff depends on the entry decision of the other potential entrepreneur. In this model, bureaucracy has two effects: First, it discourages potential entrepreneurs by reducing their payoff. Second, if bureaucracy discourages one potential entrepreneur, the other type potential entrepreneur gets a larger payoff due to reduced competition. This means a potential entrepreneur (namely the opportunity-based entrepreneur) may enjoy bureaucracy if its benefit (i.e., reduced competition) outweighs the cost. Let’s also assume that bureaucracy can be eliminated with bribery. In that case, corruption has two effects: First, corruption creates a positive effect by eliminating the bureaucracy (and its cost) on our potential entrepreneur(s). Second, it creates a negative effect because bribe is a payment to the government official and it reduces the entrepreneurial payoff. As corruption creates these two effects on both types of entrepreneurs, its overall effect also depends on two things: First, it depends on which of the two
effects dominate the other. Second, it depends on if a potential entrepreneur enjoys or dislikes bureaucracy. In this new setting, a potential entrepreneur (namely the necessity-based entrepreneur) is more likely to enjoy corruption when high-bureaucracy reduces her probability to start a new venture.

I empirically test these theoretical predictions by employing a panel data drawn from several online sources. I collect the necessity-based and opportunity-based entrepreneurship data from Global Entrepreneurship Monitor (GEM) database. The entry regulations data (i.e., the number of days spent for bureaucratic procedures and the number of procedures to be completed to start a business) is gathered from the World Bank Doing Business (WBDB) database. The corruption data (i.e., Corruption Perception Index) comes from Transparency International database. Finally, all control variables come from the World Bank database. Using these data, I build two empirical models: The first model is a fixed-effects model in which the individual and joint effects of bureaucracy and corruption are estimated. The results are striking and supportive of the theoretical predictions: While bureaucracy has negative and significant effect on necessity-based entrepreneurs, it has a positive and significant effect on opportunity-based entrepreneurs. On the other hand, corruption mitigates the effect of bureaucracy on both types of entrepreneurs in high-bureaucracy environment. Thus, corruption helps necessity-based entrepreneurs circumvent time-consuming bureaucratic processes. As a result of it, opportunity-based entrepreneurs face increased competition which reduces their willingness to start new ventures. The second model is a simultaneous equations model which aims to separate the direct effect of bureaucracy from its indirect effect (through affecting potential competitor). This model also allows us to see whether these two types of entrepreneurs are interdependent or not. The results are also supportive of the theoretical predictions: Necessity-based and opportunity-based entrepreneurship rates are inversely related which can be interpreted as a signal of competition.
between these two groups of entrepreneurs. Moreover, the (direct) effect of bureaucracy becomes insignificant for both types of entrepreneurs after controlling for their interdependence. This finding is surprising as the direct effect of bureaucracy is expected to be negative. One potential explanation of this finding (i.e., insignificance of bureaucracy coefficient) can be the competition among same type entrepreneurs. If bureaucracy has a positive (or negative) effect on opportunity-based (necessity-based) entrepreneurship rate, this means it encourages (discourages) all opportunity-based (necessity-based) entrepreneurs. If there is also competition among same type of entrepreneurs, the overall effect of bureaucracy can be insignificant.

This paper relates to two strands of economics and entrepreneurship literature. The first strand of literature studies the differences between necessity-based and opportunity-based entrepreneurs. The main difference between these two types of entrepreneurs is their motivation to start their firms, which is first defined in Reynolds et al. (2002). Following this study, several others investigate in what perspectives these two types of entrepreneurs differ. For instance, according to Acs & Varga (2005), opportunity-based entrepreneurs are more dedicated and motivated for high growth. According to Block, Sandner, & Spiegel (2015), necessity-based entrepreneurs have significantly lower risk tolerance. According to Block & Koellinger (2009), opportunity-based entrepreneurs are more satisfied with their career choice and this comes from both monetary and nonpecuniary reasons. In another related study, McMullen, Bagby & Palich (2008) investigate the effects of different economic freedom factors on necessity-based and opportunity-based entrepreneurs. The authors’ results indicate that only opportunity-based entrepreneurship is positively associated with property rights. In other words, their results show that regulatory environment may affect these types of entrepreneurs differently.

The second strand of literature examines the relationship among entry regulations, corruption, and firm entry. Almost all studies in this strand of literature (e.g. Ciccone &
Papaioannou, 2007; Klapper, Laeven & Rajan, 2006; Klapper, Amit & Guillén, 2010; Levie & Autio, 2011) find a negative relationship between the entry regulations and firm entry rates. However, two studies separate from the rest of the literature in terms of their findings. According to van Stel, Storey, & Thurik (2007), entry regulations are not significant determinants of entrepreneurship because skilled entrepreneurs can find a way to overcome these regulatory burdens. A more interesting conclusion is reached by Desai, Gompers & Lerner (2003). In their paper, the authors study the effect of institutional environment on entrepreneurship in Europe. Their results show that high entry regulations positively affect the entrepreneurship rate in Western Europe but not in Eastern Europe. Yet, their paper does not explain through what mechanism this can happen. Within this strand of literature, Dreher & Gassebner (2013) is the closest work to this study. The authors also investigate the effects of bureaucracy and corruption on entrepreneurship and they find that while bureaucracy negatively affects entrepreneurship, corruption mitigates this negative effect. This study differs from Dreher & Gassebner (2013) in a key aspect: I investigate the individual and joint effects of bureaucracy and corruption on different types of entrepreneurs rather than a unified measure of entrepreneurship.

The contribution of this paper to the literature is three-fold. First, this paper studies the (individual and joint) effects of bureaucracy and corruption on necessity-based and opportunity-based entrepreneurship rather than total entrepreneurship. The empirical findings not only improve our understanding of necessity-based and opportunity-based entrepreneurs, but also provide useful insights to policymakers. Second, the positive effect of entry regulations on opportunity-based entrepreneurs offers a potential explanation for why some countries did not reform their entry regulations. Finally, this paper provides empirical support to public interest theory of regulation developed by Pigou (1938). As mentioned but not tested in Djankov (2009), public interest theory of regulation argues that entry regulations can be a measure to control high
business failures and to improve the overall quality of goods and services in the market. Because necessity-based entrepreneurs have lower levels of motivation and dedication, they are more likely to fail compared to opportunity-based entrepreneurs. Furthermore, opportunity-based entrepreneurs are more likely to offer higher quality goods thanks to their innovative ideas. Thus, cumbersome entry regulations may reduce the business failure rate and increase the quality of goods by encouraging opportunity-based and discouraging necessity-based entrepreneurs.

The rest of the paper is organized as follows: Section 2 builds the theoretical model to explain the effects of bureaucracy and corruption on different types of entrepreneurs. Section 3 develops the hypotheses to-be-tested based on the theoretical model. Section 4 defines the data and the descriptive statistics. Section 5 presents the main empirical models and results. Section 6 analyzes the robustness of our results. Section 7 concludes.

4.2 Theoretical Background

4.2.1 Bureaucracy Game

As discussed in the introduction, bureaucracy can play a crucial role in the entry decision of both types of entrepreneurs. More importantly, bureaucracy may positively affect the entry decision of some entrepreneurs while negatively affecting the others. To explain under what circumstances we can see this opposing effect, I build the following model:

Consider a model with two potential entrepreneurs, a necessity-based (henceforth NBE) and an opportunity-based (henceforth OBE) one. Each entrepreneur must decide whether to start a new venture in a given industry. Entrepreneur type \( i \) (where \( i = NBE, OBE \)) has a reservation wage of \( W_i \) which is a random variable uniformly distributed over \([0, 1]\). Entrepreneur \( i \) knows the realized value of \( W_i \) before making any decision, however, he/she only knows the distribution of \( W_j \) where \( j \neq i \).
If entrepreneur $i$ starts a new venture, she receives a payoff of 1 regardless of the state of the world. In addition to that, she receives a bonus of $B_i$ if her potential competitor (i.e., type $j$) does not start a new venture. This bonus payment can be thought as the benefit from reduced competition for our potential entrepreneurs. While the NBE does not have an initial investment cost, the OBE has to invest $F$ to start her venture. As shown in previous literature, NBEs were unemployed before starting the firm which restricts their capability to make higher initial investments. In addition to that, they are more risk-averse and have no innovative idea so they are more likely to start smaller (and simpler) firms which reduce their need for initial investment. When it comes to the OBEs, they have higher growth aspirations, their firms are larger, and they stay in business longer than NBEs all of which generally requires more capital investment. In addition to that, the OBE has an innovative idea to protect so it is more likely for him to have higher starting capital (investment).  

Let us define $P_i$ as the probability of entrepreneur $i$ starting her venture. Entrepreneur $i$ will choose to start the venture if and only if her net return from doing so, $R_i$, is positive. Mathematically, the net entrepreneurial return for entrepreneur $i$ is equal to the following:

$$R_i = 1 + (1 - P_j) B_i - K - F - W_i \geq 0$$

Hence there exists a threshold reservation wage, $\bar{W}_i$, for entrepreneur $i$ such that she starts the venture if and only if $W_i \leq \bar{W}_i$ where:

$$\bar{W}_i = 1 + (1 - P_j) B_i - K - F$$

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37 The introduction of $F$ also serves to another purpose: Without $F$, we reach the corner solution in equilibrium which prevents us to see the effect(s) of bureaucracy on both types of entrepreneurs.
Because the reservation wages are uniformly distributed over $[0,1]$, entrepreneur $i$ can assume $P_j = \bar{W}_j$ while making the starting a venture decision.

Finally, let’s introduce a key difference between NBE and OBE. As discussed in the literature, OBEs are more dedicated and growth-oriented than NBEs. This difference should be taken into account while determining the reservation wages of our potential entrepreneurs. To capture this key difference in a simple way, we posit that $B_{OBE}$ and $B_{NBE}$ with $B_{OBE} > 1 > B_{NBE}$. This simply means that OBE has a better bonus structure than NBE in a reduced competition environment.\(^{38}\)

Considering all the information and assumptions explained above, we can now re-define the reservation wage functions for OBE and NBE:

$$\bar{W}_{OBE} = 1 + (1 - \bar{W}_{NBE}) B_{OBE} - K - F$$

$$\bar{W}_{NBE} = 1 + (1 - \bar{W}_{OBE}) B_{NBE} - K$$

As can be seen in these equations, the reservation wages of both potential entrepreneurs are functions of each other so we can find the equilibrium values by plugging them into the other.

**Proposition 1:** The potential opportunity-based entrepreneur (OBE) is more likely to start a venture in a higher bureaucracy environment than the potential necessity-based entrepreneur (NBE). In other words, OBE’s (NBE’s) threshold reservation wage increases (decreases) in bureaucracy.

Proof: First, we need to calculate the equilibrium reservation wages for OBE and NBE:

$$\bar{W}_{OBE} = 1 + (1 - \bar{W}_{NBE}) B_{OBE} - K - F = 1 + (1 - [1 + (1 - \bar{W}_{OBE}) B_{NBE} - K]) B_{OBE} - K - F$$

\(^{38}\) This assumption is also consistent with the previous literature as OBEs are more dedicated and financially successful than NBEs.
\[ \bar{W}_{OBE} = 1 - (1 - \bar{W}_{OBE})B_{OBE}B_{NBE} + KB_{OBE} - K - F \]

\[ \bar{W}^*_{OBE} = 1 - \frac{F}{1 - B_{OBE}B_{NBE}} + \frac{K(B_{OBE} - 1)}{1 - B_{OBE}B_{NBE}} \]

\[ \bar{W}_{NBE} = 1 + (1 - \bar{W}_{OBE})B_{NBE} - K = 1[1 - [1 + (1 - \bar{W}_{NBE})B_{OBE} - K - F]]B_{NBE} - K \]

\[ \bar{W}_{NBE} = 1 - (1 - \bar{W}_{NBE})B_{OBE}B_{NBE} + KB_{NBE} + FB_{NBE} - K \]

\[ \bar{W}^*_{NBE} = 1 + \frac{FB_{NBE}}{1 - B_{OBE}B_{NBE}} - \frac{K(1 - B_{NBE})}{1 - B_{OBE}B_{NBE}} \]

Since we find the equilibrium threshold reservation wages, we can also determine the effect of bureaucracy on both potential entrepreneurs:

\[ \frac{\partial \bar{W}^*_{OBE}}{\partial K} = \frac{(B_{OBE} - 1)}{1 - B_{OBE}B_{NBE}} > 0 \quad \text{and} \quad \frac{\partial \bar{W}^*_{NBE}}{\partial K} = -\frac{(1 - B_{NBE})}{1 - B_{OBE}B_{NBE}} < 0 \]

This result is also easy to explain intuitively: Bureaucracy has two effects on our potential entrepreneurs: The first effect is the direct effect of bureaucracy (i.e., cost of bureaucracy) which is negative. The second effect is the indirect effect of bureaucracy. This indirect effect is positive for both potential entrepreneurs as it represents the negative effect of bureaucracy on the potential competitor. Put differently, this indirect effect can be defined as the “reduced competition effect”. Because the reduced competition effect outweighs the cost (i.e., direct effect) of bureaucracy for OBE, the overall effect is positive. However, the direct effect outweighs the reduced competition effect for NBE, so she becomes less likely to start a venture in high bureaucracy environment.

The effect of bureaucracy on potential entrepreneurs can also be explained with graphical illustration. The threshold reservation wages (i.e., \( \bar{W}_{OBE} \) and \( \bar{W}_{NBE} \)) in this simple theoretical model are strategic substitutes. Thus, they are going to be downward sloping reaction curves and their intersection gives us the equilibrium reservation wages. When the level of
bureaucracy increases, both reaction curves shift inwards. Because the reaction curve of OBE is much steeper than the reaction curve of NBE, OBE benefits and NBE suffers from an increase in bureaucracy. To illustrate this opposing effect of bureaucracy, I define and sketch the figure of two scenarios. In both scenarios, I assume that \( B_{OBE} = 1.2 \), \( B_{NBE} = 0.5 \), and \( F = 0.2 \). The difference is that bureaucracy cost \( K \) is 0.5 in scenario 1 while it is 0.8 in scenario 2.\(^{39}\) Figure 4.2 depicts the reaction curves and the equilibrium threshold reservation wages in both scenarios:

[Insert Figure 4.2 around here]

### 4.2.2 Corruption Game

In the previous model, both potential entrepreneurs have to endure the cost of bureaucracy in order to start operating their ventures. However, the existence of bureaucracy may create an opportunity of private benefits to some government officials. In return for the private benefit (i.e., bribe in the form of money, gifts, etc.), bureaucrats may circumvent the bureaucratic process so a potential entrepreneur can start her venture immediately.

The introduction of corruption brings the necessity to adjust the reservation wage functions for our potential entrepreneurs. In order to keep it simple, there will be two effects of corruption in the reservation wage functions: First, if NBE or OBE decides to bribe the official(s), they have to make a one-time payment of \( M \). At the same time, this payment allows them to reduce the level of bureaucracy (such as completing the process faster or not being audited strictly, etc.). Let’s call \( c \) the level of corruption. If the corruption level is high, the officials have no accountability and they can eliminate as much bureaucracy as they want. However, if there is low corruption, the officials have limited ability to speed up the process. In

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\(^{39}\) In these scenarios, the corner solutions are still possible. If \( K \leq 0.2 \) or \( K \geq 1 \), we reach to corner solutions.
other words, the second effect of bureaucracy is positive for our potential entrepreneurs because it represents the reduction in cost of bureaucracy.

After the corruption is introduced into the previous model, the reservation wage functions look the following way\(^\text{40}\):

\[
\bar{W}_{OBE} = 1 + (1 - \bar{W}_{NBE})B_{OBE} - K(1 - c) - F - M
\]

\[
\bar{W}_{NBE} = 1 + (1 - \bar{W}_{OBE})B_{NBE} - K(1 - c) - M
\]

Even though corruption enters into the reservation wage (or reaction) functions in two places, it actually creates four effects on each entrepreneur. The abovementioned two effects are the direct effects of corruption. In addition to that, corruption has two indirect effects on each entrepreneur through the potential competitor.\(^\text{41}\)

**Proposition 2:** In equilibrium, corruption mitigates the negative effect of bureaucracy on NBE and it mitigates the positive effect of bureaucracy on OBE.

Proof: In order to determine the effect of corruption in equilibrium, all we have to do is to plug in the reservation wage functions into each other.

\[
\bar{W}_{OBE} = 1 + \left(1 - 1 - (1 - \bar{W}_{OBE})B_{NBE} + K(1 - c) + M\right)B_{OBE} - K(1 - c) - F - M
\]

\[
\bar{W}_{OBE} = 1 - (1 - \bar{W}_{OBE})B_{OBE}B_{NBE} + K(1 - c)(B_{OBE} - 1) + M(B_{OBE} - 1) - F
\]

\[
\bar{W}_{OBE} = 1 - \frac{F}{1 - B_{OBE}B_{NBE}} + \frac{K(1 - c)(B_{OBE} - 1)}{1 - B_{OBE}B_{NBE}} + \frac{M(B_{OBE} - 1)}{1 - B_{OBE}B_{NBE}}
\]

\[
\bar{W}_{NBE} = 1 + \left(1 - 1 - (1 - \bar{W}_{NBE})B_{OBE} + K(1 - c) + F + M\right)B_{NBE} - K(1 - c) - M
\]

\[
\bar{W}_{NBE} = 1 - (1 - \bar{W}_{NBE})B_{OBE}B_{NBE} - K(1 - c)(1 - B_{NBE}) - M(1 - B_{NBE}) + FB_{NBE}
\]

\(^{40}\) Ignoring the competition between our potential entrepreneurs, the higher the corruption level (i.e., c), the higher the direct benefit of corruption.

\(^{41}\) These indirect effects appear in the system once we plug the reservation wage functions into each other.
\[
\bar{W}_{NBE}^* = 1 - \frac{K(1 - c)(1 - B_{NBE})}{1 - B_{OBE} B_{NBE}} - \frac{M(1 - B_{NBE})}{1 - B_{OBE} B_{NBE}} + \frac{F}{1 - B_{OBE} B_{NBE}}
\]

Since we know the equilibrium threshold reservation wages, we can calculate and explain the joint effect of corruption and bureaucracy\^42:

\[
\frac{\partial^2 \bar{W}_{OBE}^*}{\partial K \partial c} = \frac{-(B_{OBE} - 1)}{1 - B_{OBE} B_{NBE}} < 0 \quad \text{and} \quad \frac{\partial^2 \bar{W}_{NBE}^*}{\partial K \partial c} = \frac{(1 - B_{NBE})}{1 - B_{OBE} B_{NBE}} > 0
\]

As can be seen in the above equations, OBE’s threshold reservation wage reduces in \(c\) while NBE’s threshold reservation wage increases in \(c\). There is a simple intuitive explanation for this result: Because OBE was enjoying bureaucracy (thanks to dominant reduced competition effect), its reduction (or elimination) is not something that benefits OBE. On the other hand, NBE was suffering from bureaucracy so its reduction (or elimination) is welcomed by NBE.

4.3 Brief Literature Review and Hypotheses

As an interdisciplinary subject, entrepreneurship and its variation across countries have attracted the attention of scholars from various fields. In addition, empirical evidence showing entrepreneurship as a source of innovations, job creation, and economic growth (e.g. Acs & Audretsch, 2005; Carree & Thurik, 2003; Wennekers & Thurik, 1999; Thurik et al., 2008) increased its attractiveness as a research subject. Considering its positive effects, many scholars showed particular interest in the factors that can stimulate entrepreneurship. For example, sociological factors such as status of entrepreneurs in a society (e.g. Kelley, Singer, & Herrington, 2011; Klyver & Thornton, 2010), psychological factors such as fear of failure (e.g. Ardagna & Lusardi, 2010), financial factors such as access to credit (e.g. Black & Strahan, 2002; Kerr & Nanda, 2009) and personal wealth level (e.g. Evans & Jovanovic, 1989; Lofstrom, Bates,

\^42 The first derivation is positive as \(B_{OBE} > 1\) and the second derivation is negative as \(B_{NBE} < 1\).
& Parker; 2014), and economic factors such as economic growth (e.g. van Stel, Storey, & Thurik, 2007) and employment status (e.g. Faria, Cuestas & Mourelle, 2010; Ritsilä & Tervo, 2002) are believed to be important for people who consider starting up a firm. In recent years, some scholars shifted their focus to another important factor, government bureaucracy, thanks to the availability of new datasets.

4.3.1 The Effect of Bureaucracy on Entrepreneurship

Bureaucracy can be defined as the set of rules and regulations that specify what should be done when interacting with government. From a firm’s perspective, bureaucracy shapes its way of doing business in many ways. For example, regulations regarding firm registration (e.g. Klapper, Amit & Guillén, 2010), taxation (e.g. Bruce & Mohsin, 2006), labor relations (e.g. Kanniainen & Vesela, 2005), and bankruptcy (e.g. Armour & Cumming, 2008) can affect the creation, growth, and profitability of firms. Therefore, regulations play an important role in the entry decision of potential entrepreneurs.

In this paper, I focus on a specific type of regulation potential entrepreneurs have to deal with: Entry regulations. In order to start a firm, an entrepreneur has to complete several bureaucratic procedures which require money, time, and effort. According to conventional wisdom, cumbersome entry regulations can discourage potential entrepreneurs because not only they cause a misallocation of limited resources to nonproductive purposes but also they can create a delay in entry. In fact, several studies (e.g. Klapper, Laeven & Rajan, 2006; Ciccone & Papaioannou, 2007; Klapper, Amit & Guillén, 2010) show that cumbersome entry regulations are perceived as obstacles by potential entrepreneurs and they reduce the firm creation rate.

Interestingly, the current literature did not investigate the effect of entry regulations on different types of entrepreneurs. As mentioned in the introduction, necessity-based and opportunity-based entrepreneurs are quite different in terms of their motivations to start new
firms and many other attributes. Thus, it is possible that they can respond differently to entry regulations. Moreover, as the theoretical model explains, these two types of entrepreneurs are potential competitors and entry regulations may have an indirect effect through potential competitor’s entry decision.

As explained in the theoretical model, opportunity-based entrepreneur may benefit from (high) bureaucracy while necessity-based one dislikes it. In light of these theoretical predictions, I build the following two hypotheses:

**H1**: Entry regulations have a negative direct effect on necessity-based entrepreneurship rate.

**H2**: Entry regulations have a positive direct effect on opportunity-based entrepreneurship rate.

### 4.3.2 The Effect of Corruption on Entrepreneurship

The completion of all procedures to start a firm requires an interaction between the entrepreneur and several government officials. Sometimes these officials are ready to speed up the process in return for personal benefits. For that reason, when the effect of bureaucracy is investigated, one should pay close attention to the possible effects of corruption as well.

Corruption is believed to be a major impediment to economic growth. For instance, Mauro (1995) finds that corruption has a negative effect on both private investment and economic growth. Similarly, Mo (2001) shows that corruption negatively affects the economic growth rate by creating political instability. Recently, some papers (e.g. Broadman, 2000; Djankov et al., 2002; Campos, Estrin, & Proto, 2010) investigate the direct effect of corruption on entrepreneurship and all of them conclude that corruption has a negative direct effect.

Despite the almost unanimous agreement on the negative direct effect of corruption, scholars are divided on the indirect effect of corruption. On one hand, some scholars believe that corruption can be used to circumvent cumbersome procedures. This hypothesis is known as
“greasing the wheels” and the papers by Méon & Weill (2010) and Dreher & Gassebner (2013) provide the empirical evidence supporting this hypothesis. On the other hand, some scholars believe that corruption continues to have a negative effect even in high bureaucracy environments. This hypothesis is known as “sanding the wheels” and the papers by Méon & Sekkat (2005) and Aidt (2009) provide the empirical evidence supporting this hypothesis. As discussed in the theoretical model, corruption may grease the wheels for the bureaucracy discouraged entrepreneur by facilitating her entry. At the same time, it can sand the wheels for the bureaucracy benefiting entrepreneur by increasing the other potential entrepreneur’s probability of entry. Therefore, the effect of corruption depends on how entrepreneurs respond to bureaucracy. This brings us the third and fourth hypotheses:

**H3**: Corruption mitigates the effect of bureaucracy on the necessity-based entrepreneurship rate. Hence, corruption “greases the wheels” if bureaucracy has a negative effect or it “sands the wheels” if bureaucracy has a positive effect on necessity-based entrepreneurs.

**H4**: Corruption mitigates the effect of bureaucracy on the opportunity-based entrepreneurship rate. Hence, corruption “greases the wheels” if bureaucracy has a negative effect or it “sands the wheels” if bureaucracy has a positive effect on opportunity-based entrepreneurs.

### 4.4 Data

#### 4.4.1 Sample

The data used in this study covers 2005-2012 period for 25 countries and they are collected from several databases (see below). I chose these countries by using the following strategy: A country is included in the sample whenever the data is available for a minimum of six years and at least four of them are for consecutive years. Even though determining the final sample with

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43 The list of all countries and years covered can be found in the Appendix.
these selection criteria reduces the sample size, using a longer time dimension may improve the precision of the results. Furthermore, using a stricter rule regarding data selection gives us the opportunity to build a panel which is close to be balanced. To be more specific, we have only 12 data points missing in our dependent variables with the abovementioned selection criteria.\textsuperscript{44} This corresponds to only 6% of the potentially balanced panel. Moreover, there is no clear trend in missing data (in terms of years and/or countries) so we do not have to further investigate the possibility of non-random missing data.

### 4.4.2 Dependent Variables

As mentioned in previous sections, this study explores two different groups of entrepreneurs: Necessity-based entrepreneurs and opportunity-based entrepreneurs.

The necessity-based entrepreneurship rate measures the percentage of adult population who are involved in early stage entrepreneurship due to having no other job options (Reynolds et al., 2005). On the other hand, the opportunity-based entrepreneurship rate measures the percentage of adult population who are involved in early stage entrepreneurship due to finding a business opportunity or an innovative idea (Reynolds et al., 2005).

Both of these variables are collected with Global Entrepreneurship Monitor Adult Survey and they are available in the online database of Global Entrepreneurship Monitor (henceforth GEM). The GEM Adult Survey is executed by national teams who conduct face-to-face and/or phone interviews with a sample of individuals (including entrepreneurs). In these interviews, people are asked whether they set up a new firm recently or not. If the respondent’s answer is positive, then he/she is asked the motivation behind this decision – whether they recognized a business opportunity or they decided to start a firm due to having no other job

\textsuperscript{44} Relaxing one of (or both of) these selection criteria can increase the number of countries in the analysis. However, the final sample will be more unbalanced and that is why I use these selection criteria.
opportunities. The answer to this question determines the type of the entrepreneurs and the GEM national teams calculate and report the average necessity-based and opportunity-based entrepreneurship rates.

Even though the GEM Adult Survey data goes back to 2001, the earliest opportunity-based entrepreneurship rate data can be found in 2005 (for 35 countries). Over the years, the number of countries in the GEM Adult Survey increased significantly (e.g. 67 countries in 2012). However, the survey results are not available for all previously surveyed countries during the entire sample period and this makes it hard to build a strongly balanced panel for more accurate analysis.

Although the necessity-based and opportunity-based entrepreneurship data are available for limited number of countries and short period of time, several recent papers (e.g. Koellinger & Minniti, 2009; Wong, Ho, & Autio, 2005; Baptista, Karaöz, & Mendonça, 2014; Cullen, Johnson, & Parboteeah, 2014) have benefited from them in their empirical analyses.

### 4.4.3 Variables of Interest

There are three variables of interest used in this study: The time spent to start a business (henceforth *Time*), the corruption distance, and the interaction term of these two variables.

The *Time* variable, which is the proxy for bureaucracy, measures the median number of calendar days spent to complete all business registration procedures.\(^{45}\) This variable is collected by World Bank and it is currently available in World Bank Doing Business (henceforth WBDB) database. During the data collection process, national laws, regulations, and publicly available information on business entry is carefully studied. After creating a detailed list of registration procedures, World Bank collects information on how many days it takes to complete each of

\(^{45}\) The time spent to start a business data can be found at [http://data.worldbank.org/indicator/IC.REG.DURS](http://data.worldbank.org/indicator/IC.REG.DURS)
these procedures. If a procedure can be completed in an expedited way (even if it creates additional cost to the applicant), the fastest completion data is chosen and reported by World Bank. The earliest available data on time spent to start a business is for 133 countries in 2003 and the number of countries in the dataset increased slightly over time (i.e., 178 countries as of 2012). The Time variable is commonly used in the entrepreneurship literature which investigates the effect of entry regulations on entrepreneurship (e.g. Ciccone & Papaioannou, 2007; Dreher & Gassebner, 2013; Klapper & Love, forthcoming). The popularity of this variable comes from its availability for many countries and its standardized structure which allows for cross-country comparisons.

The second variable of interest, the corruption distance, measures the distance of a country’s corruption index score to the highest corruption index score (i.e., to the cleanest country) achieved in that year. The corruption data originally comes from the Corruption Perceptions Index (henceforth CPI) announced by Transparency International. The data reflects the views of several analysts, business people, and experts in each country and it is collected via phone and face-to-face surveys. The index ranges between 0 (fully corrupt) and 10 (corruption-free) and the interviewees express their opinion on where their country stands in this Likert scale. Later, the average score of each national interview is calculated. Finally, the reported scores (i.e., CPI scores) are calculated by averaging all national interview scores in that year. The index data goes back to 1995 (for 41 countries) and the number of countries in the dataset increased significantly over time (i.e., 183 countries as of 2012).

In this study, I prefer to use the corruption distance variable for two reasons: First, a higher CPI score represents a cleaner country and it is quite commonly inversed or rescaled (e.g.

\[ Alteratively, I have used the inverse corruption index score (i.e., the distance to a corruption-free country score). The results are qualitatively similar and they are available in the Robustness section.\]

\[ The data must come from at least three separate set of interviews completed in that specific year.\]

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Sandholtz & Gray, 2003; Tavits, 2007; Potrafke, 2012; Dreher & Gassebner, 2013) so a higher score represents a more corrupt country. Second, an inverse CPI score represents the distance to a corruption-free country. However, even highest CPI scoring countries could not reach to that level in any year. Moreover, our entrepreneurship data does not differentiate between domestic and international entrepreneurs and most of the international entrepreneurs look at the relative corruption level during the entry decision (Wu, 2006; Duanmu, 2011). Considering these two reasons, I use the corruption distance variable which may allow for a better and more realistic comparison.

The last variable of interest is the interaction term between the corruption distance and the Time variables. The main reason I am interested in this variable is that it allows us to see the joint effect of bureaucracy and corruption. Together with the corruption distance variable, this interaction term helps us determine whether corruption “greases” or “sands” the wheels. It is also noteworthy to mention that some previous studies (e.g., Aidt, 2009; Dreher & Gassebner, 2013) benefited from this type of interaction term when testing the mitigating (or aggravating) effect of corruption.

4.4.4 Control Variables

Other than the variables of interest, the main empirical models include five control variables: last year’s GDP growth rate, last year’s unemployment rate, GDP per capita (henceforth income), credit access rate, and year fixed effects.

The first control variable is the lag of GDP growth rate which represents the macroeconomic outlook of a country and it is available in World Bank database. GDP growth rate can be an important determinant of entrepreneurship because it affects people’s expectations about the economy regarding the labor market, consumer demand, and interest rates. In addition to that, several studies stress the importance of GDP growth rate on entry decision and the
survival of a start-up (e.g., van Stel, Storey, & Thurik, 2007; Geroski, Mata, & Portugal, 2010; Klapper & Love, forthcoming). I prefer to use the last year’s GDP growth rate so I alleviate the possible endogeneity concern stemming from a potential bidirectional relationship between entrepreneurship and growth rate.

The second control variable used in the empirical models is the last year’s unemployment rate which is also available in World Bank database. Previous literature (e.g. Thurik et al., 2008; Faria, Cuestas & Mourelle, 2010) show that there is a bidirectional relationship between entrepreneurship and unemployment rate. Unemployment may direct some people to start their own firms and higher rate of firm creation may reduce the unemployment rate through job creation. Because this bidirectional relationship creates endogeneity concerns, I use the first lag of unemployment rate in my models.48

GDP per capita is the third control variable which also comes from the World Bank database. I control for the income effect because starting a business is a costly process and a high GDP per capita may indicate how well-developed the markets are. From one perspective, if a country has a higher income level, the financial constraints faced by potential entrepreneurs are expected to be smaller. From the other perspective, the higher the income level, the more developed and saturated the markets are, so the competition is higher for potential entrepreneurs. The overall effect of income level on both types of entrepreneurship hinges upon which of the two effects is dominant. It is also important to mention that the income level is a widely-used variable in many entrepreneurship studies (e.g. Noorderhaven et al. 2004; Klapper, Amit, & Guillén, 2010; Acs & Amorós, 2008).

Credit access is believed to be one of the most important challenges faced by many entrepreneurs in the literature (e.g. Black & Strahan, 2002; Kerr & Nanda, 2009). If an

48 In the appendix, I also show the regression results with second lags of unemployment and GDP growth rates.
entrepreneur can borrow loans faster and at reasonable cost from the financial markets/institutions, he/she is more likely to survive and succeed. Thus, I expect credit access to have a positive effect on both types of entrepreneurs. As a proxy for credit access, I use the domestic credit to private sector (as % of GDP) ratio. This variable is available in World Bank database and it is used by many papers in entrepreneurship literature (e.g. Aidis, Estrin, & Mickiewicz, 2012; Aghion, Fally, & Scarpetta, 2007; Baliamoune-Lutz & Garello, 2014).

Finally, I use year fixed effects as control variables in my empirical models. The sample used in this study covers the period of 2005 to 2012 which includes the Great Recession years. As mentioned in Fairlie (2013), this recession has affected both firm closure and firm creation rates in many countries. Although other control variables may explain some part of this recession effect, it is still important to include year fixed effects because this vector (of fixed effects) can capture other year specific factors that may affect the entrepreneurship decisions during the sample period.

### 4.4.5 Descriptive Statistics and Preliminary Analyses

Table 4.1 shows the descriptive statistics of the abovementioned variables.

[Insert Table 4.1 around here]

Table 4.1 indicates that while the average necessity-based entrepreneurship rate is 22.64%, the average opportunity-based entrepreneurship rate is 50.29% during the sample period. Furthermore, only in very few cases (16 country years) the opportunity-based entrepreneurship rate is below the necessity-based entrepreneurship rate. A potential entrepreneur has to spend four weeks on average for bureaucratic procedures before starting his/her company. Even though the median corruption distance (to the least corrupt country) is 3.5 (out of 10), this distance becomes as large as 7.3 (for Russia) during the sample years. The
annual GDP growth rate fluctuates between -17.96% (for Latvia) and 12.23% (for Latvia) while its average is 2.36% during the sample period. Although the average unemployment rate is 8.71%, some countries have unemployment rate even below 4% (such as Iceland, Denmark, and the Netherlands) while others have unemployment rate above 24% (such as Greece, Spain, and South Africa) during this period. The average and median GDP per capita were both around $26,000. Still, the countries in our sample are diverse in terms of income level: We have early upper-middle-income countries such as Peru (with $2,670 GDP per capita) and high-income countries such as Denmark (with $62,600 GDP per capita). Finally, while the average credit access rate is slightly above 100%, sample includes countries with extremely low credit access rate (such as Argentina) and extremely high credit access rate (such as Iceland).

4.4.6 The Relationship between Bureaucracy and Corruption

As mentioned earlier, the two main variables of interest in this paper are the Time (spent to start a business) and the corruption distance. Because our goal is to determine the individual and joint effects of these two variables on our entrepreneurs, it is important to start with their relationship.

It is long-believed that cumbersome regulations in a country create room for corruption (Mauro, 1995; Djankov et al., 2002). The positive relationship between regulations and corruption can be explained by the possible rent-seeking behavior of bureaucrats and people’s willingness to speed-up the bureaucratic processes. If this story is true, the world should be divided into two groups: “Low bureaucracy with low corruption” countries and “high bureaucracy with high corruption” countries.

In order to determine whether the data support this story or not, I make a visual and statistical analysis on the relationship between the Time (spent to start a business) and the corruption distance. Figure 4.3 illustrates the scatter plot of these two variables:
As shown in Figure 4.3a, there is a positive and statistically significant relationship between the corruption distance and the Time variables.\(^9\) However, the R-square is approximately 14% which means the majority of variation in our bureaucracy variable (time spent to start a business) is explained by factors other than corruption (or vice versa).

Even though there is a positive and significant relationship between corruption (distance) and bureaucracy, there may be “high bureaucracy with low corruption” countries and “low bureaucracy with high corruption” countries. I analyze this possibility in Figure 4.3b by dividing the sample data into four quadrants as above/below the mean values of Time and corruption distance. Figure 4.3b shows that more than one-third of the sample falls into “high bureaucracy with low corruption” and “low bureaucracy with high corruption” categories. Table 4.2 provides further details on these quadrants:

According to Table 4.2, there are five countries which can be considered as “high bureaucracy with low corruption” countries and there are 11 countries which can be considered as “low bureaucracy with high corruption” countries. Table 4.2 provides interesting information on geographical location too: Scandinavian (and many developed) countries are “low bureaucracy with low corruption” countries. Most of the South American countries fall into the “high bureaucracy with high corruption” category. Finally, many former communist (and currently EU member) countries are in the “low bureaucracy with high corruption” category.

To sum up, there is a positive relationship between bureaucracy and corruption but our sample also includes several countries which do not fall into the expected quadrants.

\(^9\) The relationship is determined with a simple OLS regression and the results are available upon request.
4.5 Empirical Analysis and Results

In order to test these hypotheses (and propositions) discussed in previous sections, I use two regression models. The first model is a fixed-effects model. The main advantage of the fixed-effects model is that it alleviates the omitted variable bias concerns by including time-invariant country-specific factors in the regression. Moreover, the estimated standard errors are clustered at country level to account for potential within-country error term correlations.\(^{50}\) The following equation describes the fixed-effects model used in this paper:

\[
Y_{i,t} = \alpha_1 Time_{i,t} + \alpha_2 CorrDist_{i,t} + \alpha_3 (Time \ast CorrDist)_{i,t} + \beta X_{i,t-1} + \theta Z_{i,t} + \gamma T_t + c_i + u_{i,t} \quad (1)
\]

where

- \(Y_{i,t}\) represents the NBE or OBE rates in country \(i\) at year \(t\),
- \(Time_{i,t}\) represents the time spent to start a business in country \(i\) at year \(t\),
- \(CorrDist_{i,t}\) represents the corruption distance of country \(i\) to the least corrupt country at year \(t\),
- \(X_{i,t-1}\) represents the lagged control variables (i.e., GDP growth rate and unemployment rate),
- \(Z_{i,t}\) represents the other control variables (i.e., GDP per capita and credit access rate),
- \(T_t\) represents the year fixed effects,
- \(c_i\) represents the time-invariant country specific effects, and
- \(u_{i,t}\) represents the error terms.

The coefficient on the time variable (i.e., \(\alpha_1\)) measures the direct effect of entry regulations on the necessity-based and opportunity-based entrepreneurship rates. If this coefficient is positive and significant for a group of entrepreneurs (i.e., OBE according to \(H2\)),

---

\(^{50}\) As mentioned in Stock & Watson (2008), fixed-effects regressions where error terms are clustered at panel ID level are equivalent to fixed-effects regressions where the error terms are estimated robustly.
bureaucracy increases the likelihood of entry for that group. If this coefficient is negative and significant for a group of entrepreneurs (i.e., NBE according to H1), bureaucracy decreases the likelihood of entry for that group.\(^{51}\)

The coefficient on the interaction term (i.e., \(\alpha_3\)) determines whether corruption greases or sands the wheels for our entrepreneurs. If \(\alpha_1\) is negative and \(\alpha_3\) is positive and significant, this means corruption greases the wheels for that group of entrepreneurs. If, however, \(\alpha_1\) is positive and \(\alpha_3\) is negative and significant, this means corruption sands the wheels for that group of entrepreneurs.\(^{52}\)

Table 4.3 reports the results of the fixed-effects regressions defined above:

[Insert Table 4.3 around here]

The results show that while the direct effect of bureaucracy (measured by \(\alpha_1\)) is negative and significant for necessity-based entrepreneurs, it is positive and significant for opportunity-based entrepreneurs. If we elaborate on the direct effect of bureaucracy (i.e., \(Time_{i,t}\)), Column (2) and Column (4) show that every additional day spent for bureaucratic procedures reduces the necessity-based entrepreneurship rate by 0.20 percentage points and increases the opportunity-based entrepreneurship rate by 0.28 percentage points on average. Thus, our results support H1 and H2. Moreover, this result is in line with the finding of Branstetter et al. (2014). The authors show that policy reforms (i.e., reduction in bureaucracy) increased entrepreneurship rate in Portugal but the majority of post-policy reform entrants were smaller, less innovative, and less-

\(^{51}\) The direct effect of bureaucracy is different from the overall effect of bureaucracy. The overall effect of bureaucracy is measured by \(\frac{\partial Y_{i,t}}{\partial Time_{i,t}} = (\alpha_1 + \alpha_3 CorrDist_{i,t})\). In accordance with our H1 & H2, I look at the direct effect of bureaucracy in this paper.

\(^{52}\) As in the case of bureaucracy, greasing/sanding wheels effect of corruption is different from the overall effect of corruption. The overall effect of corruption is measured by \(\frac{\partial Y_{i,t}}{\partial CorrDist_{i,t}} = (\alpha_1 + \alpha_3 Time_{i,t})\). In accordance with our H3 & H4, I discuss the greasing/sanding the wheels effect in this paper.
likely to survive which fit better to the definition and characteristics of necessity-based entrepreneurs.

Table 4.3 also indicates that the direct effect of corruption is negative but not significant on both types of entrepreneurs. When it comes to the interaction term in Table 4.3, we see that the joint effect of bureaucracy and corruption is positive and significant for necessity-based entrepreneurs, while it is negative and significant for opportunity-based entrepreneurs. More specifically, Column (2) and Column (4) show that an increase in corruption distance (for a given number of days spent for bureaucratic procedures) by one unit increases the necessity-based entrepreneurship rate by 0.06 percentage points and decreases the opportunity-based entrepreneurship rate by 0.06 units. These empirical results are also in line with our theoretical predictions and they support $H3$ and $H4$.

Even though they are not hypothesized, we can also determine the overall effects of bureaucracy and corruption for our potential entrepreneurs. Because the direct effect of bureaucracy is negative (positive) and the indirect effect is positive (negative) for necessity-based (opportunity-based) entrepreneurs, the overall effect of bureaucracy depends on the corruption (distance) of the country. If the corruption distance is less than 3.14 units, the overall effect of bureaucracy is negative on necessity-based entrepreneurs. If we look at the overall effect of bureaucracy on opportunity-based entrepreneurs, the threshold value becomes 4.49 units. In other words, when the corruption distance is less than 4.49 units, the overall effect of bureaucracy is positive on opportunity-based entrepreneurs. When it comes to the overall effect of corruption, we see that it is also opposing for our two types of entrepreneurs. Because the direct effect of corruption is insignificant for both entrepreneurs, the overall effect is determined by the indirect effect of corruption. Thus, our results show that the overall effect of corruption is positive (negative) for necessity-based (opportunity-based) entrepreneurs.
According to Table 4.3, last year’s GDP growth rate has a negative effect on the necessity-based entrepreneurship rate. Column (2) shows that one percentage point increase in (last year’s) GDP growth rate reduces the necessity-based entrepreneurship rate by 0.38 percentage points. This is an intuitive finding, because a higher growth rate can be perceived as a better job market signal and a higher probability of finding a job by potential necessity-based entrepreneurs. Table 4.3 also indicate that the (lag of) GDP growth rate is not a significant determinant of opportunity-based entrepreneurship rate.

Table 4.3 also shows that previous year’s unemployment rate positively (negatively) affects the necessity-based (opportunity-based) entrepreneurship rate. According to Column (2) and Column (4), a one-percentage point increase in previous year’s unemployment rate increases the necessity-based entrepreneurship rate by 0.91 percentage points and it reduces the opportunity-based entrepreneurship rate by 0.63 percentage points. These opposing effects also fit well to the competition story: Increasing unemployment rate reduces the probability of finding a job for potential necessity-based entrepreneurs so they become more likely to start their own firms. On the other hand, their entry represents a higher competition for potential opportunity-based entrepreneurs so they are less likely to start their firms.

The income level and the credit access rate have no significant effect on necessity-based entrepreneurs. On the other hand, while the income level has a positive (and significant) effect, the credit access rate has a negative (and significant) effect on opportunity-based entrepreneurs. According to Column (4), a $1,000-increase in income level increases the opportunity-based entrepreneurship rate by 0.48 percentage points. Moreover, a one-percentage point increase in credit access rate reduces the opportunity-based entrepreneurship rate by 0.07 percentage points on average. The unexpected result here is the negative effect of credit access rate. This unexpected result may be explained with the following story: Even though a higher credit access
rate is the signal of a better-developed financial system, established firms are more likely to be
given access to credit before new firms. This type of lending can create a larger negative effect
on opportunity-based entrepreneurs (than necessity-based entrepreneurs) as access to credit may
be more crucial for their ability to exploit the business opportunity they discovered (which will
affect their growth and success rate).

Although these results make sense, one might argue that the inclusion of other potentially
important variables may change these results. For that reason, I expand the list of control
variables with the following factors: Financial development level proxied by market
capitalization to GDP ratio, capital controls level proxied by an index developed by Fernandez
et al. (2015), and country-specific time trends. The results show that these additional variables
are statistically insignificant (both individually and jointly) and our variables of interest have
very similar coefficients to the ones in Table 4.3.\textsuperscript{53}

The second model I employ to test our hypotheses is the simultaneous equations model
(with fixed effects). The simultaneous equations model investigates the interdependence of the
necessity-based and opportunity-based entrepreneurship rates. Both the theoretical model and
the first empirical (fixed-effects) model show that these two groups of entrepreneurs give
opposing responses to high bureaucracy and high corruption which we try to explain with the
competition among new entrants hypothesis. If this competition hypothesis is valid, we should
find an inverse and interdependent relationship between our two entrepreneurship variables.

The simultaneous equations model is implemented in two-stages: In the first stage, one
type of entrepreneurship rate is estimated with Equation (1). In the second stage, I estimate the
other type of entrepreneurship rate where the first-stage estimates of the first type of
entrepreneurship rate is now included as an explanatory variable.

\textsuperscript{53} The results of the regressions with additional control variables can be found in the Appendix.
There are two important things to explain before reporting and explaining the empirical results: First, there should be at least one variable for each type of entrepreneurship that will be used in the first-stage as the instrumental variable (henceforth IV). This variable is expected to have a significant effect on one type of entrepreneurship rate but not on the other one. Finding a good IV is a challenging task as our two types of entrepreneurs are going to compete in the same economic environment. Yet, there are some variables which we can potentially use as our IVs as they are more likely to be (statistically and economically) associated to one type of entrepreneurship than the other type. The variable I choose as the IV for necessity-based entrepreneurship rate is the previous year’s growth rate. As discussed previously, growth rate is expected to affect potential necessity-based entrepreneurs because they are more likely to find a job (in the labor market) in a fast growing economy. In other words, if a potential necessity-based entrepreneur is expecting to find a job, he/she is less likely to start his own venture. On the other hand, the effect of growth rate on opportunity-based entrepreneurship is expected to be much weaker (if exists at all). This is because potential opportunity-based entrepreneurs are currently employed people and they start new ventures to exploit business opportunities. Thus, a better labor market is less likely to affect their decision to become entrepreneurs. Having said that, it is possible for economic growth to affect their decision to become entrepreneurs through other channels such as affecting the (aggregate) demand and the industry. Despite this possibility, I believe that GDP growth rate is a reasonable IV and the results presented in Table 4.3 support this notion. When it comes to the IV for opportunity-based entrepreneurship rate, I choose the income level and the credit access rate. The common characteristic of these variables is that they are related to the financial condition/constraints of our entrepreneurs. For potential opportunity-based entrepreneurs, the wealth level and their ability to borrow are crucial factors as they have high growth aspirations. Moreover, as the current literature shows, they stay in
business for longer period which means they are/will be in need of external funding for a longer period. On the contrary, necessity-based entrepreneurs generally start smaller and less competitive ventures which stay in business for shorter periods. Therefore, finding external funding may not be an urgent or crucial matter for necessity-based entrepreneurs. Despite these arguments, there may be other channels through which income level and credit access can affect the entry decision of necessity-based entrepreneurs. The results presented in Table 4.3 indicate that the unobserved channels are not significant factors, at least statistically. For the reasons discussed above, using the income level and the credit access rate as the IV for opportunity-based entrepreneurship rate is an acceptable choice. Finally, I add the interaction term (and corruption distance variable) only in the first-stage as these variables are not significant (neither individually nor jointly) in the second-stage results.\(^{54}\) Second, if these two stages are estimated separately, the standard errors will not be correct due to ignorance of potential correlation between these two stages. In order to solve this problem, I estimate these two stages jointly by using the “xtivreg” code in Stata.\(^{55}\) Taking all these factors into account, Equation (2) and (3) represent the second-stage regressions for our entrepreneurship rates:

\[
OBE_{i,t} = \alpha_1 \overline{NBE}_{i,t} + \alpha_2 Time_{i,t} + \alpha_3 CorrDist_{i,t} + \beta Unemp_{i,t-1} + \theta Z_{i,t} + \gamma T_t + c_i + u_{i,t} \tag{2}
\]

\[
NBE_{i,t} = \alpha_1 \overline{OBE}_{i,t} + \alpha_2 Time_{i,t} + \alpha_3 CorrDist_{i,t} + \beta X_{i,t-1} + \gamma T_t + c_i + e_{i,t} \tag{3}
\]

where

\(OBE_{i,t}\) represents the opportunity-based entrepreneurship rate for country \(i\) at year \(t\),

\(NBE_{i,t}\) represents the necessity-based entrepreneurship rate for country \(i\) at year \(t\),

\(Unemp_{i,t-1}\) represents the unemployment rate in country \(i\) at year \(t-1\),

\(^{54}\) The results which include all three variables of interest in both stages can be found in the Appendix section.

\(^{55}\) Alternatively, I use “xtivreg2” and the results are qualitatively very similar to the ones reported in Table 4.4.
$Z_{i,t}$ represents the other control variables (i.e., credit access rate and income), and $X_{i,t-1}$ represents the lagged control variables (i.e., GDP growth rate and unemployment rate).

Table 4.4 reports the results for Equation (2) and (3):

[Insert Table 4.4 around here]

First of all, Table 4.4 shows that the first-stage regressions are qualitatively very similar to our results in Table 4.3. While the direct effect of bureaucracy is positive (negative) for opportunity-based (necessity-based) entrepreneurs, the indirect effect (through the interaction term) is negative (positive) for opportunity-based (necessity-based) entrepreneurs. Thus, the overall effect of bureaucracy is positive for opportunity-based entrepreneurs if and only if the corruption distance is greater than 4.5 units. On the other hand, the overall effect of bureaucracy is negative for necessity-based entrepreneurs if the corruption distance is less than 3.14 units. These results are consistent with what we have found with our fixed-effects models (in Table 4.3) and they will help us in the second-stage regressions.

When it comes to the second-stage regressions, we see that necessity-based and opportunity-based entrepreneurship rates are interdependent and inversely related as predicted. For instance, according to Column (3), a one-percentage point increase in opportunity-based entrepreneurship rate reduces the necessity-based entrepreneurship rate by 0.74 percentage points. On the opposite side, according to Column (6), a one-percentage point increase in necessity-based entrepreneurship rate reduces the opportunity-based entrepreneurship rate by 0.65 percentage points. These results provide further evidence that our entrepreneurs’ entry decisions are interdependent and they are likely to see each other as potential competitors.

If we look at the effect of bureaucracy on our entrepreneurs (after taking the competition effect into consideration), we see that bureaucracy does not have a significant effect on either
type of entrepreneurship rate except Column (3) which is positive but only marginally significant. On the contrary, corruption (distance) has a negative and significant effect on both types of entrepreneurship rates now. According to Column (3), one-unit increase in the corruption distance reduces the necessity-based entrepreneurship rate by 3.80 percentage points on average. According to Column (6), one-unit increase in the corruption distance reduces the opportunity-based entrepreneurship rate by 4.08 percentage points. Thus, after competition between these two groups is taken into account, we see that corruption has a negative (direct) effect on both groups of entrepreneurs.

When it comes to the control variables, the only control variable that has a significant effect on either type of entrepreneurs is the (lag of) GDP growth rate. According to Column (2), one-percentage point increase in last year’s GDP growth rate reduces the necessity-based entrepreneurship rate by 0.46 percentage points. Thus, potential necessity-based entrepreneurs are more inclined to search for a job in a fast growing economy. All other control variables (i.e., lag of unemployment rate, credit access rate, and the income level) are insignificant in the second-stage regressions despite the fact that they have the same signs with Table 4.3 results.

Before having the robustness checks, it is important to explain why our bureaucracy variable’s coefficient became insignificant in the simultaneous equations models. To be more specific, we need to answer whether this result is data-related or there exists a logical explanation for it. It is hard to give a definitive answer to this question but one potential explanation lies in the way our data is defined. Our dependent (entrepreneurship) variables, necessity-based and opportunity-based entrepreneurship rates, represent a group of entrepreneurs rather than individual entrepreneurs. It is also quite likely that there is competition among same type of entrepreneurs alongside across group competition. Thus, even though bureaucracy may affect an individual entrepreneur negatively, it creates a similar effect on another entrepreneur of same
type. Because the elimination of potential competition (from the same type of entrepreneur) has an indirect positive effect on our entrepreneur, the overall effect of bureaucracy may become insignificant as our empirical results show. Unfortunately, this potential explanation cannot be tested empirically at this stage due to the fact that our data is defined and reported at country-level (but not at individual entrepreneur-level).

4.6 Robustness

In order to reinforce the accuracy of these empirical findings, I employ alternative bureaucracy and/or corruption variables as the robustness check.

As an alternative to the Time variable, I use the number of (bureaucratic) procedures to start a business (henceforth Procedures). The number of procedures to start a business, which is collected by World Bank, is measured as the number of steps to be completed (such as obtaining necessary permits and licenses and completing all inscriptions, verifications, and notifications) in order for a business to start its operations.\(^{56}\) The earliest available data on number of procedures is for 134 countries in 2003 and the number of countries in the dataset increased slightly over time (i.e., 178 countries as of 2012). Furthermore, Procedures is also very-widely used as a measure of bureaucracy in entrepreneurship literature (e.g. Fonseca, Lopez-Garcia, & Pissarides, 2001; Klapper, Laeven, & Rajan, 2006; van Stel, Storey, & Thurik, 2007; Dreher & Gassebner, 2013).

As an alternative to the corruption distance (to the least corrupt country) variable, I use the inverse CPI scores, which is simply the distance to a corruption-free country. Inverse CPI score is also used by the closest study, Dreher & Gassebner (2013), to this paper.

\(^{56}\) The number of procedures data can be found at http://data.worldbank.org/indicator/IC.REG.PROC/countries
To be consistent with the main empirical model, I use the following fixed-effects regressions:

\[ Y_{i,t} = \alpha_1 \text{Proc}_{i,t} + \alpha_2 \text{CorrDist}_{i,t} + \alpha_3(\text{Proc}_{i,t} \times \text{CorrDist}_{i,t}) + \beta X_{i,t-1} + \theta Z_{i,t} + \gamma T_t + c_i + u_{i,t} \]  

\[ Y_{i,t} = \alpha_1 \text{Time}_{i,t} + \alpha_2 \text{InvCorr}_{i,t} + \alpha_3(\text{Time}_{i,t} \times \text{InvCorr}_{i,t}) + \beta X_{i,t-1} + \theta Z_{i,t} + \gamma T_t + c_i + u_{i,t} \]

where

\( \text{Proc}_{i,t} \) represents the number of procedures to start a firm in country \( i \) at year \( t \), and

\( \text{InvCorr}_{i,t} \) represents the inverse CPI score (i.e., \( 10 - \text{CPI}_{i,t} \)) of country \( i \) at year \( t \).

Table 4.5 presents the results for Equation (4) and Equation (5):

Table 4.5 shows that while procedures have a direct negative (and significant) effect on necessity-based entrepreneurs, they have a direct positive (and significant) effect on opportunity-based entrepreneurs. According to Column (1) and (3), every additional procedure reduces (increases) the necessity-based (opportunity-based) entrepreneurship rate by 1.94 (3.29) percentage points. These results are consistent with our previous empirical findings.

When it comes to the corruption, the direct effect of corruption is negative and significant on necessity-based entrepreneurs, while it is insignificant for opportunity-based entrepreneurs. The coefficient of the interaction term (i.e., \( \alpha_3 \)) is positive and significant for the necessity-based entrepreneurship rate, while it is negative and significant for opportunity-based entrepreneurship rate. As Column (1) and (3) show, a one-unit increase in corruption distance (for a given level of bureaucracy) increases (reduces) the necessity-based (opportunity-based) entrepreneurship

\[ \text{Proc}_{i,t} \]

\[ \text{InvCorr}_{i,t} \]

Table 4.5

The definitions of all variables are identical to the empirical results section models.
rate by 0.72 (0.66) percentage points. These results also confirm our previous finding on the mitigating effect of corruption on bureaucracy.\textsuperscript{58}

If we look at Column (2) and Column (4), we can say that bureaucracy (proxied by Time) has a negative (positive) direct effect on necessity-based (opportunity-based) entrepreneurs. A one-day increase in time spent for bureaucratic process reduces (increases) the necessity-based (opportunity-based) entrepreneurship rate by 0.21 (0.24) percentage points. When it comes to the corruption (distance), the direct effect of corruption is significant for neither necessity-based nor opportunity-based entrepreneurs. On the other hand, the joint effect of bureaucracy and corruption is positive and significant for necessity-based entrepreneurs while it is negative and significant for opportunity-based entrepreneurs. A one-unit increase in corruption distance increases (reduces) the necessity-based (opportunity-based) entrepreneurship rate by 0.06 (0.05) percentage points. These results are also consistent with our previous findings.

The only control variable which affects both types of entrepreneurs is the unemployment rate. To be more specific, according to Column (2) and (4), if the previous year’s unemployment rate increases by one-percentage point, necessity-based (opportunity-based) entrepreneurship rate increases (decreases) by 0.92 (0.70) percentage points.

The only other control variable which has significant effect on necessity-based entrepreneurs is the GDP growth rate. According to Column (1), a one-percentage point increase in GDP growth rate reduces the necessity-based entrepreneurship rate by 0.43 percentage points.

One the contrary, the factors which affect the opportunity-based entrepreneurship rate are the income level and the credit access. If we elaborate on their effects, according to Column

\textsuperscript{58} If we calculate the overall effects of bureaucracy and corruption, we see that both of them have certain threshold values for necessity-based entrepreneurs. On the other hand, while the overall effect of bureaucracy has a certain threshold for opportunity-based entrepreneurs, corruption always negatively affects opportunity-based entrepreneurs.
(3), while a $1,000-increase in income level increases the opportunity-based entrepreneurship rate by 0.46 percentage points, a one-percentage point increase in the credit access rate reduces the opportunity-based entrepreneurship rate by 0.07 percentage points.

4.7 Conclusion

Even though majority of the prior literature suggests that high bureaucracy has a negative effect on entrepreneurship, several countries continue to have cumbersome entry regulations. This paper offers an alternative explanation to this interesting phenomenon by investigating the effects of bureaucracy and corruption on different types of entrepreneurs.

The empirical analysis in this paper yields two important results: The first result indicates that while entry regulations have a negative effect on necessity-based entrepreneurs, they have a positive effect on opportunity-based entrepreneurs in low corruption environment. The striking result here is the positive effect of entry regulations on opportunity-based entrepreneurs. At first glance, this result may sound counter-intuitive as entry regulations are supposed to be obstacles for opportunity-based entrepreneurs as well. However, one possible explanation of this result is the “reduced competition effect”. Because potential necessity-based entrepreneurs are discouraged by cumbersome entry regulations, potential opportunity-based entrepreneurs face a reduced competition which improves their probability of success and profitability. If this positive effect outweighs the negative effect, then bureaucracy can be beneficial for opportunity-based entrepreneurs as our results indicate.

The second important result is that high corruption when combined with high bureaucracy mitigates the effect of bureaucracy for both types of entrepreneurs. Put differently, while corruption “greases the wheels” for necessity-based entrepreneurs, it “sands the wheels” for opportunity-based entrepreneurs. This mitigating effect of corruption may be explained as follows: High corruption offers potential necessity-based entrepreneurs an expedited way of
starting firms in a high-bureaucracy environment. Thus, the necessity-based entrepreneurship rate increases with corruption. However, the increase in the necessity-based entrepreneurship rate represents a higher competition for potential opportunity-based entrepreneurs so some of them get discouraged from entry.

Other than being significant and surprising, these results also provide important insights to policymakers. Depending on the distribution of entrepreneurial types within the country, demographic characteristics of the society, and macroeconomic factors, the empirical findings of this paper can help policymakers make better decisions on when to eliminate entry regulations or when to fight corruption. For instance, a country experiencing chronically high unemployment rate may be better-off by making a business registration reform so potential necessity-based entrepreneurs are encouraged to become self-employed. On the other hand, countries hoping to incentivize opportunity-based entrepreneurs should put “fighting corruption” on top of their agenda rather than reforming the business registration process.

Despite the fact that this paper sheds light on the individual and joint effects of bureaucracy and corruption, several questions remain unanswered. First, are there any other possible explanations of the opposing responses to bureaucracy by necessity-based and opportunity-based entrepreneurs? If so, how can we test/verify them? Second, do these factors affect all industries in the same way? If not, why do some industries react differently to bureaucracy and corruption? Finally, do international and domestic entrepreneurs respond to the policy changes in a similar manner? These are fruitful areas for future research and they can further improve our understanding of different types of entrepreneurs and how to motivate each type to increase the new firm creation rate.
Table 4.1: Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>(1) Necessity Entrepreneurship</th>
<th>(2) Opportunity Entrepreneurship</th>
<th>(3) Time</th>
<th>(4) Corruption Distance</th>
<th>(5) GDP Growth</th>
<th>(6) Unemployment</th>
<th>(7) Income (in 1000s)</th>
<th>(8) Credit Access Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>22.64</td>
<td>50.29</td>
<td>28.32</td>
<td>3.49</td>
<td>2.36</td>
<td>8.71</td>
<td>26.15</td>
<td>103.24</td>
</tr>
<tr>
<td><strong>Std. Deviation</strong></td>
<td>10.86</td>
<td>12.35</td>
<td>31.79</td>
<td>2.19</td>
<td>4.16</td>
<td>4.73</td>
<td>17.51</td>
<td>64.51</td>
</tr>
<tr>
<td><strong>Min</strong></td>
<td>3</td>
<td>10</td>
<td>4</td>
<td>0</td>
<td>-17.96</td>
<td>2.3</td>
<td>2.40</td>
<td>8.77</td>
</tr>
<tr>
<td><strong>25th Percentile</strong></td>
<td>14</td>
<td>41</td>
<td>9</td>
<td>1.6</td>
<td>0.35</td>
<td>5.9</td>
<td>9.06</td>
<td>47.02</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>22</td>
<td>49</td>
<td>16</td>
<td>3.5</td>
<td>2.67</td>
<td>7.7</td>
<td>25.90</td>
<td>91.76</td>
</tr>
<tr>
<td><strong>75th Percentile</strong></td>
<td>31</td>
<td>59.5</td>
<td>33</td>
<td>5.5</td>
<td>4.96</td>
<td>9.8</td>
<td>41.46</td>
<td>163.27</td>
</tr>
<tr>
<td><strong>Max</strong></td>
<td>50</td>
<td>80</td>
<td>156</td>
<td>7.3</td>
<td>12.23</td>
<td>25.2</td>
<td>65.57</td>
<td>311.06</td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th><strong>Opportunity &gt; Necessity</strong></th>
<th><strong>Opportunity = Necessity</strong></th>
<th><strong>Opportunity &lt; Necessity</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Cases</td>
<td>170</td>
<td>2</td>
<td>16</td>
</tr>
</tbody>
</table>

Note: Necessity-based entrepreneurship rate, opportunity-based entrepreneurship rate, GDP growth, and unemployment rate are in percentages. Corruption distance of a country is calculated as the difference of the least corrupted country’s index score and the country’s corruption index score. Income represents the GDP per capita and it is measured in 1,000 dollars.
Table 4.2: Entry Regulations and Corruption Quadrants

<table>
<thead>
<tr>
<th>Group</th>
<th>Time</th>
<th>Corr. Distance</th>
<th>No. of Observations</th>
<th>No. of Countries</th>
<th>Example Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Low, Low)</td>
<td>&lt; 28.32</td>
<td>&lt; 3.49</td>
<td>90</td>
<td>12</td>
<td>Denmark, Finland, UK, USA</td>
</tr>
<tr>
<td>(Low, High)</td>
<td>&lt; 28.32</td>
<td>&gt; 3.49</td>
<td>58</td>
<td>11</td>
<td>Italy, Latvia, Romania</td>
</tr>
<tr>
<td>(High, Low)</td>
<td>&gt; 28.32</td>
<td>&lt; 3.49</td>
<td>22</td>
<td>5</td>
<td>Uruguay, Spain, Japan</td>
</tr>
<tr>
<td>(High, High)</td>
<td>&gt; 28.32</td>
<td>&gt; 3.49</td>
<td>54</td>
<td>11</td>
<td>Argentina, Brazil, Greece, Russia</td>
</tr>
</tbody>
</table>

Note: The threshold level for the time spent to start a business (i.e., 28.32 days) and the corruption distance (i.e., 3.49) are the mean values for these two variables in the sample. The countries mentioned in the last Column represent the countries which stayed in the same quadrant either most of the sample period or the entire sample period.
Table 4.3: Fixed-Effects Regressions

<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>Necessity-Based Entrepreneurship Rate</th>
<th>Opportunity-Based Entrepreneurship Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Time</td>
<td>-0.1970***</td>
<td>-0.1992***</td>
</tr>
<tr>
<td></td>
<td>(-3.63)</td>
<td>(-3.62)</td>
</tr>
<tr>
<td>Corruption Dist.</td>
<td>-2.1110</td>
<td>-2.8264</td>
</tr>
<tr>
<td></td>
<td>(-1.04)</td>
<td>(-1.13)</td>
</tr>
<tr>
<td>Time x Corruption Dist.</td>
<td>0.0653***</td>
<td>0.0635***</td>
</tr>
<tr>
<td></td>
<td>(4.08)</td>
<td>(3.63)</td>
</tr>
<tr>
<td>(GDP Growth)$_{t-1}$</td>
<td>-0.3731***</td>
<td>-0.3821**</td>
</tr>
<tr>
<td></td>
<td>(-2.81)</td>
<td>(-2.12)</td>
</tr>
<tr>
<td>(Unemployment)$_{t-1}$</td>
<td>0.6752***</td>
<td>0.9075**</td>
</tr>
<tr>
<td></td>
<td>(2.86)</td>
<td>(2.62)</td>
</tr>
<tr>
<td>Income</td>
<td>-0.2230</td>
<td>-0.1244</td>
</tr>
<tr>
<td></td>
<td>(-1.09)</td>
<td>(-0.55)</td>
</tr>
<tr>
<td>Credit Access</td>
<td>0.0255</td>
<td>0.01769</td>
</tr>
<tr>
<td></td>
<td>(1.66)</td>
<td>(1.02)</td>
</tr>
<tr>
<td>Year Fixed Effects</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Constant</td>
<td>25.9382**</td>
<td>24.1090</td>
</tr>
<tr>
<td></td>
<td>(2.41)</td>
<td>(1.69)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Constant</td>
<td>63.8029***</td>
<td>53.1868***</td>
</tr>
<tr>
<td></td>
<td>(5.04)</td>
<td>(4.62)</td>
</tr>
<tr>
<td></td>
<td>No. of Obs.</td>
<td>187</td>
</tr>
<tr>
<td></td>
<td>187</td>
<td>187</td>
</tr>
<tr>
<td></td>
<td>R-square</td>
<td>0.2652</td>
</tr>
<tr>
<td></td>
<td>0.2942</td>
<td>0.3085</td>
</tr>
<tr>
<td></td>
<td>0.4321</td>
<td></td>
</tr>
</tbody>
</table>

Note: The numbers in parentheses are the t-statistics for the corresponding variables.

*, **, *** represent the significance at 10%, 5%, and 1% level.

The error terms are clustered at country level in all regressions.
Table 4.4: Simultaneous Equations Model Regressions

<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>OBE (1) First-Stage</th>
<th>Necessity-Based Entrepreneurship Rate (2) Second-Stage</th>
<th>NBE (3) Second-Stage</th>
<th>Opportunity-Based Entrepreneurship Rate (4) First-Stage</th>
<th>NBE (5) Second-Stage</th>
<th>Opportunity-Based Entrepreneurship Rate (6) Second-Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunity Ent.</td>
<td>-0.4928**</td>
<td>-0.7440***</td>
<td>-0.6058**</td>
<td>-0.6546**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-2.51)</td>
<td>(-2.88)</td>
<td>(-2.05)</td>
<td>(-2.22)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Necessity Ent.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>0.2829***</td>
<td>0.0684</td>
<td>-0.1992**</td>
<td>0.0679</td>
<td>0.0689</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.79)</td>
<td>(1.60)</td>
<td>(-2.52)</td>
<td>(1.27)</td>
<td>(1.29)</td>
<td></td>
</tr>
<tr>
<td>Corruption Dist.</td>
<td>-1.6714</td>
<td>-3.8015*</td>
<td>-2.8264*</td>
<td>-4.0832**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-0.76)</td>
<td>(-1.86)</td>
<td>(-1.65)</td>
<td>(-2.07)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time x Corruption Dist.</td>
<td>-0.0631***</td>
<td>0.0635***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-2.81)</td>
<td>(3.62)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(GDP Growth)_t-1</td>
<td>-0.2207</td>
<td>-0.4617**</td>
<td>-0.3821*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-0.82)</td>
<td>(-2.25)</td>
<td>(-1.82)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Unemployment)_t-1</td>
<td>-0.6303*</td>
<td>0.5157</td>
<td>0.9075***</td>
<td>-0.1039</td>
<td>0.0718</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-1.76)</td>
<td>(1.54)</td>
<td>(3.25)</td>
<td>(-0.21)</td>
<td>(0.15)</td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>0.4794*</td>
<td>-0.1244</td>
<td>0.4000</td>
<td>0.2935</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.80)</td>
<td>(-0.60)</td>
<td>(1.62)</td>
<td>(1.17)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Credit Access</td>
<td>-0.0711*</td>
<td>0.0177</td>
<td>-0.0550</td>
<td>-0.0522</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-1.93)</td>
<td>(0.61)</td>
<td>(-1.55)</td>
<td>(-1.48)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Constant</td>
<td>53.9683***</td>
<td>40.5185***</td>
<td>65.5316***</td>
<td>23.0465***</td>
<td>56.3469***</td>
<td>70.7317***</td>
</tr>
<tr>
<td></td>
<td>(4.66)</td>
<td>(3.38)</td>
<td>(3.45)</td>
<td>(2.55)</td>
<td>(6.72)</td>
<td>(6.52)</td>
</tr>
<tr>
<td>No. of Obs.</td>
<td>187</td>
<td>187</td>
<td>187</td>
<td>187</td>
<td>187</td>
<td>187</td>
</tr>
<tr>
<td>R-square</td>
<td>0.4321</td>
<td>0.2942</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chi Square</td>
<td>2956.90</td>
<td>2349.54</td>
<td>9348.43</td>
<td>9453.31</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The numbers in parentheses are the t-statistics for the corresponding variables.

*, **, *** represent the significance at 10%, 5%, and 1% level.
Table 4.5: Robustness Checks

<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>Necessity-Based Entrepreneurship Rate</th>
<th>Opportunity-Based Entrepreneurship Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Procedures</td>
<td>-1.9370*</td>
<td>3.2940***</td>
</tr>
<tr>
<td></td>
<td>(-1.87)</td>
<td>(3.18)</td>
</tr>
<tr>
<td>Time</td>
<td></td>
<td>-0.2060**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-2.37)</td>
</tr>
<tr>
<td>Corruption Dist.</td>
<td>-6.9128**</td>
<td>1.7793</td>
</tr>
<tr>
<td></td>
<td>(-2.32)</td>
<td>(0.47)</td>
</tr>
<tr>
<td>Inverse Corruption</td>
<td>-2.3917</td>
<td>-1.3523</td>
</tr>
<tr>
<td></td>
<td>(-0.87)</td>
<td>(-0.55)</td>
</tr>
<tr>
<td>(Procedures x Corruption Dist)</td>
<td>0.7193***</td>
<td>-0.6621**</td>
</tr>
<tr>
<td></td>
<td>(3.37)</td>
<td>(-2.77)</td>
</tr>
<tr>
<td>(Time x Inverse Corr)</td>
<td>0.0574**</td>
<td>-0.0467*</td>
</tr>
<tr>
<td></td>
<td>(2.42)</td>
<td>(-1.89)</td>
</tr>
<tr>
<td>(GDP Growth)$_{t-1}$</td>
<td>-0.4331**</td>
<td>-0.4391**</td>
</tr>
<tr>
<td></td>
<td>(-2.40)</td>
<td>(-2.22)</td>
</tr>
<tr>
<td>(Unemployment)$_{t-1}$</td>
<td>0.9163***</td>
<td>0.9176**</td>
</tr>
<tr>
<td></td>
<td>(2.84)</td>
<td>(2.58)</td>
</tr>
<tr>
<td>Income</td>
<td>-0.1387</td>
<td>-0.1108</td>
</tr>
<tr>
<td></td>
<td>(-0.67)</td>
<td>(-0.47)</td>
</tr>
<tr>
<td>Credit Access</td>
<td>0.0151</td>
<td>0.0147</td>
</tr>
<tr>
<td></td>
<td>(0.81)</td>
<td>(0.78)</td>
</tr>
<tr>
<td>Year Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Constant</td>
<td>33.5095**</td>
<td>23.6371</td>
</tr>
<tr>
<td></td>
<td>(2.12)</td>
<td>(1.38)</td>
</tr>
<tr>
<td>No. of Obs.</td>
<td>187</td>
<td>187</td>
</tr>
<tr>
<td>R-square</td>
<td>0.3108</td>
<td>0.2674</td>
</tr>
</tbody>
</table>

Note: The numbers in parentheses are the t-statistics for the corresponding variables.

*, **, *** represent the significance at 10%, 5%, and 1% level.

The error terms are clustered at country level in all regression.
Figure 4.1: The Case of Spain

![Graph showing Spain - Bureaucracy and Entrepreneurship Rates](image-url)
Figure 4.2: Reaction Functions of Potential Entrepreneurs

Case 1: $K = 0.5$

- Blue Line: $\bar{\omega}_{OBE} = 1.5 - 1.2\bar{\omega}_{NBE}$
- Red Line: $\bar{\omega}_{NBE} = 1 - 0.5\bar{\omega}_{OBE}$

Case 2: $K = 0.8$

- Green Line: $\bar{\omega}_{OBE} = 1.2 - 1.2\bar{\omega}_{NBE}$
- Yellow Line: $\bar{\omega}_{NBE} = 0.7 - 0.5\bar{\omega}_{OBE}$
Figure 4.3a: Entry Regulations and Corruption Regression

Figure 4.3b: Scatter Plot of Entry Regulations and Corruption

Note: In Figure 4.3a, the best-fitting line is determined with a simple OLS regression in which time is the dependent variable and the corruption distance is the independent variable.

In Figure 4.3b, the red lines are the threshold (mean) values for the corruption distance and the time spent to start a business. They are used to divide the scatter plot into four quadrants.
Chapter 5

General Discussion and Conclusions

This dissertation investigates three important issues in economics of entrepreneurship.

Chapter 2 deals with how the optimal human capital investments (of both firms and employees) change when an innovative employee can choose to become entrepreneur. Different from standard human capital model of Becker (1962), this chapter assumes that firm-specific human capital investment increases the employee’s probability to innovate. An innovative employee can exploit this idea himself by becoming an entrepreneur. However, this means the firm loses not only the innovative idea but also a trained employee. This chapter provides us three important findings: First, an employee invests in his firm-specific human capital because it increases his probability to innovate and to earn the entrepreneurial payoff. Second, if the firm invests in the employee’s human capital before the employee does, the firm gets the first-mover advantage and it can change the employee’s human capital investment. Third, if the entrepreneurial payoff is sufficiently high, this motivates the employee to over-invest in his firm-specific human capital. In order not to lose a skilled employee, the firm chooses to invest in the employee’s general human capital so entrepreneurship becomes relatively less lucrative.

Chapter 3 studies the factors motivating entry regulation reforms and whether the effects of such reforms depend on the pre-reform level of bureaucracy. By using a sample of entrepreneurship and entry regulations data from World Bank, I make a thorough empirical analysis. The empirical models yield three important findings: First, entry regulation reforms increase the firm creation rate in a linear setting. In addition to that, this effect is more likely to be instantaneous rather than enduring. Second, the effects of entry regulation reforms are nonlinear once we control for the pre-reform level of bureaucracy. To be more specific, while
low-bureaucracy countries benefit from such reforms, high-bureaucracy countries do not benefit. The potential explanation of this no benefit for high-bureaucracy countries is the circumventing effect of corruption in high-bureaucracy countries. Third, countries with cumbersome entry regulations, reformist neighbors, high unemployment rate, and low corruption level are more likely to make entry regulation reforms.

Chapter 4 analyzes the individual and joint effects of bureaucracy and corruption on different types of entrepreneurs. By using a sample which includes data from Global Entrepreneurship Monitor, World Bank, and Transparency International, I run both fixed-effects and simultaneous equations model regressions. These models offer two important findings: First, while the direct effect of bureaucracy is negative on necessity-based entrepreneurs, it is positive on opportunity-based entrepreneurs. Second, when corruption is also taken into account, corruption mitigates both the negative effect of bureaucracy on necessity-based and the positive effect of bureaucracy on opportunity-based entrepreneurs. The potential explanation of these opposing effects comes from the competition between these two groups of entrepreneurs. The discouragement of necessity-based entrepreneurs by bureaucracy improves the profitability of opportunity-based entrepreneurs due to reduced competition. As a result, they become more likely to start their ventures. However, when corruption reduces the cost of bureaucracy for necessity-based entrepreneurs, their encouragement for starting new ventures increases the potential competition for opportunity-based entrepreneurs. Thus, opportunity-based entrepreneurs become less likely to start their ventures due to corruption.

These three chapters also signal some direction for future research on these subjects. If there is a dataset (employer-employee matched) offering the employee entrepreneurship data, the theoretical findings in Chapter 2 can be empirically tested. If there is a good instrumental variable for firm creation rate (which does not affect the reform probability), one can test the
simultaneous effects of firm creation rate and entry regulation reforms. If one finds individual level data on necessity-based and opportunity-based entrepreneurs, he/she can control the within group competition (alongside between groups competition) as well.
References


Appendix A
Main Human Capital Model from Chapter 2

Date 1/2:

\[
Max \gamma(s_A + s_P)R + [1 - \gamma(s_A + s_P)](g_A + g_P) - \frac{(g_A)^2}{2} - \frac{(s_A)^2}{2}
\]

First-order condition for \(s_A\) and \(g_A\) yield:

\[
s_A^* = \gamma[R - (g_A + g_P)] \quad (1)
\]

\[
g_A^* = 1 - \gamma(s_A + s_P) \quad (2)
\]

Substituting \(s_A^*\) and \(g_A^*\) into each other yield:

\[
g_A^* = \frac{1 - \gamma^2 R - \gamma s_P + \gamma^2 g_P}{1 - \gamma^2} \quad (3)
\]

\[
s_A^* = \frac{\gamma(R - 1) + \gamma^2 s_P - \gamma g_P}{1 - \gamma^2} \quad (4)
\]

Date 0:

\[
Max V_t = [1 - \gamma s_A(g_P, s_P) - \gamma s_P][s_A(g_P, s_P) + s_p] - \frac{(g_P)^2}{2} - \frac{(s_P)^2}{2}
\]

The first-order condition for \(g_P\) yields:

\[
\frac{\partial s_A}{\partial g_P}[1 - \gamma s_A - \gamma s_P] - \gamma \frac{\partial s_A}{\partial g_P}(s_A + s_P) = \frac{\partial s_A}{\partial g_P}[1 - 2\gamma s_A - 2\gamma s_P] = g_P \quad (5)
\]

where \(\frac{\partial s_A}{\partial g_P} = (-\gamma/1 - \gamma^2)\)

\[
\frac{2\gamma^2(s_A + s_P) - \gamma}{1 - \gamma^2} = g_P
\]
Plugging Equation (4) into the equation above, we get:

\[
2\gamma^2 s_p + 2\gamma^2 \left[ \frac{\gamma(R - 1) + \gamma^2 s_p - \gamma g_p}{1 - \gamma^2} - \gamma \right] = g_p
\]

\[
(2\gamma^2 s_p + 2\gamma^3 R - \gamma^3) = g_p[(1 - \gamma^2)^2 + 2\gamma^3]
\]

Thus,

\[
g_p^*(s_p) = \max \left\{ 0, \frac{\gamma[2\gamma^2 R - \gamma^2 - 1] + 2\gamma^2 s_p}{1 + 2\gamma - 2\gamma^2 + 2\gamma^3 + \gamma^4} \right\}
\]

The first-order condition for \( s_p \) yields:

\[
\left[ 1 + \frac{\partial s_A}{\partial s_p} \right] [1 - \gamma s_A - \gamma s_p] - \gamma \left[ 1 + \frac{\partial s_A}{\partial s_p} \right] (s_A + s_p) = \left[ 1 + \frac{\partial s_A}{\partial s_p} \right] [1 - 2\gamma s_A - 2\gamma s_p] = s_p
\]

where \( \frac{\partial s_A}{\partial s_p} = [1 + (\gamma^2 / 1 - \gamma^2)] \).

\[
1 - 2\gamma s_A = s_p(1 - \gamma^2 + 2\gamma)
\]

Plugging Equation (4) into the equation above, we get:

\[
1 - 2\gamma \left[ \frac{\gamma(R - 1) + \gamma^2 s_p - \gamma g_p}{1 - \gamma^2} \right] = s_p(1 - \gamma^2 + 2\gamma)
\]

\[
s_p^* = \max \left\{ 0, \frac{\gamma[2\gamma^2 R - \gamma^2 - 1] + 2\gamma^2 s_p}{1 + 2\gamma - 2\gamma^2 + \gamma^4} \right\}
\]

Because \( s_p^* \) and \( g_p^* \) are functions of each other, we plug them into each other:

\[
s_p^* = \frac{-[2\gamma^2 R - \gamma^2 - 1] + 2\gamma^2 \left( \frac{\gamma[2\gamma^2 R - \gamma^2 - 1] + 2\gamma^2 s_p}{1 + 2\gamma - 2\gamma^2 + \gamma^3 + \gamma^4} \right)}{1 + 2\gamma - 2\gamma^2 + \gamma^4}
\]

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Because $s_P^* \geq 0$, we find:

$$s_P^* = \max \left\{ 0, \frac{-[2\gamma^2 R - \gamma^2 - 1]}{1 + 2\gamma - 2\gamma^2 + 2\gamma^3 + \gamma^4} \right\}$$

(7)

$$g_P^* = \frac{\gamma[2\gamma^2 R - \gamma^2 - 1] + 2\gamma^2 \left\{ \frac{-[2\gamma^2 R - \gamma^2 - 1]}{1 + 2\gamma - 2\gamma^2 + 2\gamma^3 + \gamma^4} \right\}}{1 + 2\gamma - 2\gamma^2 + 2\gamma^3 + \gamma^4}$$

Because $g_P^* \geq 0$, we find:

$$g_P^* = \max \left\{ 0, \frac{\gamma[2\gamma^2 R - \gamma^2 - 1]}{1 + 2\gamma - 2\gamma^2 + 2\gamma^3 + \gamma^4} \right\}$$

(8)

Proof of Proposition 4: The denominator of both $g_P^*$ and $s_P^*$ are positive for $\forall \gamma > 0$. Thus, the positivity of $g_P^*$ and $s_P^*$ hinges upon the numerator in both human capital investments. As one can easily see from Equation (5) and (6), what determines the value of both $g_P^*$ and $s_P^*$ is the term in the square bracket.

$$[2\gamma^2 R - \gamma^2 - 1] \leq 0$$

$$R \leq \frac{1 + \gamma^2}{2\gamma^2} = \bar{R}$$

If $R < \bar{R}$, then $g_P^* = 0$ and $s_P^* > 0$ in equilibrium.

If $R = \bar{R}$, then $g_P^* = 0$ and $s_P^* = 0$ in equilibrium.

If $R > \bar{R}$, then $g_P^* > 0$ and $s_P^* = 0$ in equilibrium.
Appendix B
Model of Extension 1 from Chapter 2

Date 0 (Agent’s utility):

\[ \text{Max } U_i = \gamma (s_A + s_P) R + [1 - \gamma (s_A + s_P)] (g_A + g_P) - \frac{(g_A)^2}{2} - \frac{(s_A)^2}{2} \]

The first-order condition for \( s_A \) and \( g_A \) yield:

\[ g_A^* = 1 - \gamma (s_A + s_P) \]

\[ s_A^* = \gamma [R - (g_A + g_P)] \]

Substituting \( s_A^* \) and \( g_A^* \) into each other yield:

\[ g_A^* = \frac{1 - \gamma^2 R - \gamma s_P + \gamma^2 g_P}{1 - \gamma^2} \quad (9) \]

\[ s_A^* = \frac{\gamma (R - 1) + \gamma^2 s_P - \gamma g_P}{1 - \gamma^2} \quad (10) \]

Date 0 (Principal’s utility):

\[ \text{Max } V_I = [1 - \gamma s_A - \gamma s_P][s_A + s_P] - \frac{(g_P)^2}{2} - \frac{(s_P)^2}{2} \]

The first-order condition for \( g_P \) yields:

\[ \frac{\partial V_I}{\partial g_P} \rightarrow g_P^* = 0 \quad (11) \]

The first-order condition for \( s_P \) yields:

\[ s_P = \frac{1 - 2\gamma s_A}{1 + 2\gamma} \]
Plugging Equation (10) into the equation above, we get:

\[
s_P(s_A) = \frac{1 - 2\gamma \left[ \frac{\gamma(R - 1) + \gamma^2 s_P - \gamma g_P}{1 - \gamma^2} \right]}{1 + 2\gamma}
\]

\[
s_P^* = \text{Max} \left\{ 0, \frac{-[2\gamma^2 R - \gamma^2 - 1]}{1 + 2\gamma - \gamma^2} \right\}
\]

Proof of Proposition 5: Since the denominator of \( s_P^* \) is positive for \( \forall \gamma \in (0, 2.414] \), what determines the positivity of \( s_P^* \) is the numerator of Equation (10). If the square bracket term is negative, then \( s_P^* \) will be positive in equilibrium. Otherwise, \( s_P^* \) will be zero in equilibrium.

\[
s_P^* = 0 \quad \text{if} \quad [2\gamma^2 R - \gamma^2 - 1] \geq 0
\]

\[
R \geq \frac{1 + \gamma^2}{2\gamma^2} = \bar{R}
\]

Thus, when \( R > \bar{R} \), then both \( s_P^* = 0 \) and \( g_P^* = 0 \) in equilibrium.
Appendix C

Model of Extension 2 from Chapter 2

Date 1/2:

\[ \text{Max } U = [\gamma(s_A + s_p) + \alpha(g_A + g_P)]R + [1 - \gamma(s_A + s_p) - \alpha(g_A + g_P)](g_A + g_P) - \frac{(g_A)^2}{2} - \frac{(s_A)^2}{2} \]

The first-order condition for \( s_A \) and \( g_A \) yield:

\[ g_A = \frac{\alpha R + 1 - \gamma(s_A + s_p) - 2\alpha g_P}{1 + 2\alpha} \]

\[ s_A = \gamma R - \gamma(g_A + g_P) \]

Substituting \( s_A^* \) and \( g_A^* \) into each other yield:

\[ g_A^* = \frac{\alpha R + 1 - \gamma s_p - \gamma[\gamma R - \gamma(g_A + g_P)] - 2\alpha g_P}{1 + 2\alpha} \]

\[ g_A^* = \frac{1 + R(\alpha - \gamma^2) - \gamma s_p + (\gamma^2 - 2\alpha)g_P}{1 + 2\alpha - \gamma^2} \tag{13} \]

\[ s_A^* = \gamma R - \gamma g_P - \gamma \left[ \frac{1 + R(\alpha - \gamma^2) - \gamma s_p + (\gamma^2 - 2\alpha)g_P}{1 + 2\alpha - \gamma^2} \right] \]

\[ s_A^* = \frac{R(\gamma - \gamma\alpha) - \gamma + \gamma^2 s_p - \gamma g_P}{1 + 2\alpha - \gamma^2} \tag{14} \]

Proof of Proposition 6: The denominator of both \( s_A^* \) and \( g_A^* \) are positive for \( \forall \gamma \leq 1 \) and \( \forall \alpha > 0 \).

Thus, the positivity or negativity of the derivations depends on the numerator.

\[ \frac{\partial g_A^*}{\partial R} = \frac{\alpha - \gamma^2}{1 + 2\alpha - \gamma^2} \]
If $\alpha > \gamma^2$, $g_A^*$ increases as $R$ increases.

If $\alpha < \gamma^2$, $g_A^*$ decreases as $R$ increases.

\[
\frac{\partial g_A^*}{\partial g_P^*} = \frac{\gamma^2 - 2\alpha}{1 + 2\alpha - \gamma^2}
\]

If $\alpha < \gamma^2/2$, $g_A^*$ increases as $g_P^*$ increases.

If $\alpha > \gamma^2/2$, $g_A^*$ decreases as $g_P^*$ increases.

**Date 0:**

Since the focus is on when the principal finances general human capital investment, we assume that $s_P^* = 0$ in this section. This assumption stems from the finding in Section 4: The principal reduces specific human capital investment first and then she starts investing in general human capital as further distraction if needed.

\[
Max V_I = [1 - \gamma s_A(g_P, s_P) - \gamma s_P - \alpha g_A(g_P, s_P) - \alpha g_P][s_A(g_P, s_P) + s_P] - \frac{(g_P)^2}{2} - \frac{(s_P)^2}{2}
\]

The first-order condition for $g_P$ yields:

\[
\frac{\partial s_A}{\partial g_P} [1 - \gamma s_A - \alpha g_A - \alpha g_P] - s_A \left[ \gamma \frac{\partial s_A}{\partial g_P} + \alpha \frac{\partial g_A}{\partial g_P} + \alpha \right] = g_P
\]

where

\[
\frac{\partial s_A}{\partial g_P} = \left( \frac{-\gamma}{1 + 2\alpha - \gamma^2} \right) \quad \text{and} \quad \frac{\partial g_A}{\partial g_P} = \left( \frac{\gamma^2 - 2\alpha}{1 + 2\alpha - \gamma^2} \right)
\]

\[
\left( \frac{-\gamma}{1 + 2\alpha - \gamma^2} \right) [1 - \gamma s_A - \alpha g_A - \alpha g_P] + s_A \left( \frac{\gamma^2 - \alpha}{1 + 2\alpha - \gamma^2} \right) = g_P \left[ 1 - \frac{\gamma \alpha}{1 + 2\alpha - \gamma^2} \right]
\]

\[
(2\gamma^2 - \alpha)s_A + \gamma \alpha g_A - \gamma = g_P(1 + 2\alpha - \gamma^2 - \gamma \alpha)
\]
In this stage, when we plug Equation (13) and (14) into the equation above, we get:

\[
(2\gamma^2 - \alpha) \left[ \frac{R(\gamma - \gamma \alpha) - \gamma - \gamma g_p}{1 + 2\alpha - \gamma^2} \right] + \gamma \alpha \left[ \frac{1 + R(\alpha - \gamma^2) + (\gamma^2 - 2\alpha)g_p}{1 + 2\alpha - \gamma^2} \right] - \gamma \\
= g_p(1 + 2\alpha - \gamma^2 - \gamma \alpha)
\]

\[
R[2\gamma^3 + \gamma^3 \alpha - \gamma \alpha] - \gamma^3 - \gamma = g_p[(1 + 2\alpha - \gamma^2)^2 + 2\gamma(\gamma^2 - \alpha)]
\]

\[
g_p^* = \text{Max} \left\{ 0, \frac{\gamma[R(2\gamma^2 + \gamma^2 \alpha - \alpha) - (\gamma^2 + 1)]}{(1 + 2\alpha - \gamma^2)^2 + 2\gamma(\gamma^2 - \alpha)} \right\}
\] (15)

Proof of Proposition 7: As long as the numerator is positive, general human capital investment by the principal will be positive in equilibrium as well. This means the square bracket in the numerator must be positive for \(g_p^*\) to be positive in equilibrium.

\[
R(2\gamma^2 + \gamma^2 \alpha - \alpha) > (\gamma^2 + 1)
\]

\[
R > \frac{(\gamma^2 + 1)}{(2\gamma^2 + \gamma^2 \alpha - \alpha)} = \bar{R}
\]

If \(\alpha = 0\), the positivity condition becomes identical to the main model’s condition (i.e., \(\bar{R} = \bar{R}\)).
Appendix D
List of Countries in the Sample Table for Chapter 3

<table>
<thead>
<tr>
<th>Countries</th>
<th>Years</th>
<th>Missing Years *</th>
</tr>
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<td>2005-12</td>
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</tr>
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<td>2005-12</td>
<td></td>
</tr>
<tr>
<td>Czech Republic</td>
<td>2005-12</td>
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<td>Finland</td>
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<td>France</td>
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<tr>
<td>Germany</td>
<td>2005-12</td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td>2005-10</td>
<td>2011-2012</td>
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<td>Hungary</td>
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<td></td>
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<td>2005-12</td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>2005-12</td>
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<td>Israel</td>
<td>2005-12</td>
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<td>Italy</td>
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<td>Japan</td>
<td>2005-12</td>
<td>2005</td>
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<tr>
<td>Republic of Korea</td>
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<td>Latvia</td>
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<td>The Netherlands</td>
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</tr>
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<td>2005-12</td>
<td>2011-2012</td>
</tr>
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<td>Russian Federation</td>
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<td>2005-12</td>
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</tr>
<tr>
<td>Uruguay</td>
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<td></td>
</tr>
</tbody>
</table>

* Missing years are for firm creation rate data
## Appendix E

### Additional Variable of Interest Regressions for Chapter 3

<table>
<thead>
<tr>
<th>Dependent Variable: Firm Creation Rate</th>
<th>Fixed-Effects</th>
<th>Blundell-Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Firm Creation Rate ((t-1))</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.8701***</td>
<td>0.8682***</td>
</tr>
<tr>
<td></td>
<td>(12.44)</td>
<td>(11.23)</td>
</tr>
<tr>
<td>%ΔProcedures</td>
<td>-1.5130**</td>
<td>-1.4250*</td>
</tr>
<tr>
<td></td>
<td>(-2.25)</td>
<td>(-1.78)</td>
</tr>
<tr>
<td>%ΔProcedures ((t-1))</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP Growth ((t-1))</td>
<td>0.0375</td>
<td>0.0589*</td>
</tr>
<tr>
<td></td>
<td>(1.29)</td>
<td>(1.96)</td>
</tr>
<tr>
<td>Unemployment ((t-1))</td>
<td>-0.0024</td>
<td>0.0377</td>
</tr>
<tr>
<td></td>
<td>(-0.02)</td>
<td>(0.37)</td>
</tr>
<tr>
<td>Credit Access</td>
<td>0.0147**</td>
<td>0.0185</td>
</tr>
<tr>
<td></td>
<td>(2.40)</td>
<td>(1.69)</td>
</tr>
<tr>
<td>Income</td>
<td>0.1069***</td>
<td>0.1170***</td>
</tr>
<tr>
<td></td>
<td>(3.31)</td>
<td>(3.70)</td>
</tr>
<tr>
<td>Ln (Population)</td>
<td>-14.7419</td>
<td>-20.1852*</td>
</tr>
<tr>
<td></td>
<td>(-1.28)</td>
<td>(-1.69)</td>
</tr>
<tr>
<td>Year Fixed Effects</td>
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<td>Yes</td>
</tr>
<tr>
<td>Constant</td>
<td>242.3823</td>
<td>331.0565</td>
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<tr>
<td></td>
<td>(1.29)</td>
<td>(1.69)</td>
</tr>
<tr>
<td>No. of Obs.</td>
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<td>193</td>
</tr>
<tr>
<td>R-square</td>
<td>0.3830</td>
<td>0.4047</td>
</tr>
<tr>
<td>Chi-Square</td>
<td>731.64***</td>
<td>643.73***</td>
</tr>
</tbody>
</table>

**Note:** The numbers in parentheses are the t-statistics for the corresponding variables.

*, **, *** represent the significance at 10%, 5%, and 1% level.

The error terms are clustered at country level in all regressions.

The second lag of %ΔProcedure variable is insignificant so the effect dies out in the long-run.
Appendix F
Second Lags of Unemployment and GDP Growth Regressions for Chapter 3

Dependent Variable: *Firm Creation Rate*

<table>
<thead>
<tr>
<th></th>
<th>Fixed-Effects</th>
<th>Fixed-Effects</th>
<th>Fixed-Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Procedures</td>
<td>-0.2240**</td>
<td>(-2.33)</td>
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</tr>
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<td>Procedures (t-1)</td>
<td>-0.1531**</td>
<td>(-2.04)</td>
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</tr>
<tr>
<td>Reform Dummy</td>
<td>0.3112**</td>
<td>(2.59)</td>
<td></td>
</tr>
<tr>
<td>Reform Dummy (t-1)</td>
<td></td>
<td></td>
<td>0.4525**</td>
</tr>
<tr>
<td>∆Procedures</td>
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<td></td>
<td>-0.0962**</td>
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<td>∆Procedures (t-1)</td>
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<td></td>
<td>-0.1209</td>
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<tr>
<td>GDP Growth (t-2)</td>
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<td>-0.0546</td>
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<td>Unemployment (t-2)</td>
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<td>(1.00)</td>
<td>0.072</td>
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<td>Credit Access</td>
<td>0.0184*</td>
<td>(1.75)</td>
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<td>Income</td>
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<td>(4.66)</td>
<td>0.1373***</td>
</tr>
<tr>
<td>Ln (Population)</td>
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<td>(-1.61)</td>
<td>-15.2993*</td>
</tr>
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<td>Yes</td>
</tr>
<tr>
<td>Constant</td>
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<td>(1.61)</td>
<td>250.7735*</td>
</tr>
</tbody>
</table>

| No. of Obs.          | 193           | 193           | 193           | 193           | 193           | 193           |
| R-square             | 0.4400        | 0.4243        | 0.4166        | 0.4258        | 0.4134        | 0.4163        |

Note: The numbers in parentheses are the t-statistics for the corresponding variables.
*, **, *** represent the significance at 10%, 5%, and 1% level.
The error terms are clustered at country level in all regressions.
The second lag of Procedures variable is insignificant so the effect dies out in the long-run.
## Appendix G

### Corruption Regressions for Chapter 3

**Dependent Variable:** Firm Creation Rate

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<thead>
<tr>
<th></th>
<th>Fixed-Effects (1)</th>
<th>Fixed-Effects (2)</th>
<th>Fixed-Effects (3)</th>
<th>Fixed-Effects (4)</th>
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<td>-0.1975***</td>
<td>-0.1772*</td>
<td>-0.1432*</td>
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<td></td>
<td>(-2.35)</td>
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<td><strong>High Bureaucracy Dummy</strong> (t-1)</td>
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<td>-0.4934</td>
<td>-0.4813</td>
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<tr>
<td></td>
<td></td>
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<td>(-1.17)</td>
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<tr>
<td><strong>Inverse Corruption</strong></td>
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<td>-1.0225*</td>
<td>0.2098</td>
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<td>(0.90)</td>
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<td>(Inverse Corruption)^2</td>
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<td>0.1589**</td>
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<td><strong>GDP Growth</strong> (t-1)</td>
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<td>0.0431</td>
<td>0.0452</td>
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<tr>
<td></td>
<td>(1.57)</td>
<td>(1.52)</td>
<td>(1.63)</td>
<td>(1.59)</td>
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<td><strong>Unemployment</strong> (t-1)</td>
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<td></td>
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<td>(0.25)</td>
<td>(0.16)</td>
<td>(0.43)</td>
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<tr>
<td><strong>Credit Access</strong></td>
<td>0.0136**</td>
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<td>0.0133*</td>
<td>0.0106***</td>
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<td>(2.06)</td>
<td>(2.82)</td>
<td>(2.01)</td>
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<td><strong>Income</strong></td>
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<td>0.1103***</td>
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<td>(5.70)</td>
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</table>

**Note:** The numbers in parentheses are the t-statistics for the corresponding variables.

*, **, *** represent the significance at 10%, 5%, and 1% level.

The error terms are clustered at country level in all regressions.
## Appendix H
### Panel Probit Regressions for Chapter 3

**Dependent Variable:** *Reform Dummy*

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<th>(4)</th>
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<th>(6)</th>
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<td>-0.0128</td>
<td>-0.0253</td>
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<td>(-0.59)</td>
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<td>-0.1086</td>
<td>-0.0312</td>
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<td>(-0.40)</td>
<td>(-0.11)</td>
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<tr>
<td>High Unemployment Dummy <em>(t-1)</em></td>
<td></td>
<td>0.7970**</td>
<td>0.7433**</td>
<td>0.8160**</td>
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<td>(2.29)</td>
<td>(2.21)</td>
<td>(2.34)</td>
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<td>Corruption <em>(t-1)</em></td>
<td>-0.0026</td>
<td>-0.0039</td>
<td>-0.0448</td>
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<td>(-0.05)</td>
<td>(-0.60)</td>
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<tr>
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<td>-0.5708*</td>
<td>-0.7231**</td>
<td>-0.7265**</td>
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<td>(-2.05)</td>
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<tr>
<td>Reformist Neighbor Dummy <em>(t-1)</em></td>
<td>0.3962*</td>
<td>0.3997*</td>
<td>0.4009*</td>
<td>0.4898**</td>
<td>0.4832**</td>
<td>0.4929**</td>
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<td>(1.68)</td>
<td>(2.02)</td>
<td>(2.01)</td>
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<td>-1.891***</td>
<td>-1.733***</td>
<td>-2.097***</td>
<td>-1.927***</td>
<td>-2.084***</td>
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<td>Chi-Square</td>
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<td>10.05*</td>
<td>7.27</td>
<td>14.34**</td>
<td>11.02*</td>
<td>13.95**</td>
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</table>

**Note:** The reported results come from population averaged panel probit regressions. The numbers in parentheses are the t-statistics for the corresponding variables.

*, **, *** represent the significance at 10%, 5%, and 1% level.
## Appendix I

List of Countries in the Sample Table for Chapter 4

<table>
<thead>
<tr>
<th>Countries</th>
<th>Years</th>
<th>Missing Years *</th>
</tr>
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<tbody>
<tr>
<td>Argentina</td>
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<td></td>
</tr>
<tr>
<td>Brazil</td>
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<td></td>
</tr>
<tr>
<td>Colombia</td>
<td>2005-12</td>
<td>2005</td>
</tr>
<tr>
<td>Croatia</td>
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<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>2005-12</td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>2005-12</td>
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<td></td>
</tr>
<tr>
<td>Germany</td>
<td>2005-12</td>
<td>2007</td>
</tr>
<tr>
<td>Greece</td>
<td>2005-12</td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td>2005-12</td>
<td></td>
</tr>
<tr>
<td>Iceland</td>
<td>2005-12</td>
<td>2011, 2012</td>
</tr>
<tr>
<td>Ireland</td>
<td>2005-12</td>
<td>2009</td>
</tr>
<tr>
<td>Italy</td>
<td>2005-12</td>
<td>2011</td>
</tr>
<tr>
<td>Japan</td>
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<td></td>
</tr>
<tr>
<td>Latvia</td>
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<tr>
<td>The Netherlands</td>
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<td>Peru</td>
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<td>Romania</td>
<td>2005-12</td>
<td>2005, 2006</td>
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<td>Russia</td>
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<td>2005-12</td>
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</tr>
<tr>
<td>Uruguay</td>
<td>2005-12</td>
<td>2005</td>
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</table>

* Missing years are for necessity-based and opportunity-based entrepreneurship data
Appendix J
Fixed-Effects Regressions with Second Lags for Chapter 4

<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>Necessity-Based Entrepreneurship Rate</th>
<th>Opportunity-Based Entrepreneurship Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Time</td>
<td>-0.2330***</td>
<td>-0.2360***</td>
</tr>
<tr>
<td></td>
<td>(-3.04)</td>
<td>(-3.71)</td>
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<tr>
<td>Corruption Dist.</td>
<td>-2.1465</td>
<td>-3.2238</td>
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<tr>
<td></td>
<td>(-1.03)</td>
<td>(-1.40)</td>
</tr>
<tr>
<td>Time x Corruption Dist.</td>
<td>0.0609***</td>
<td>0.0664***</td>
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<tr>
<td></td>
<td>(3.95)</td>
<td>(4.28)</td>
</tr>
<tr>
<td>(GDP Growth)$_{t-2}$</td>
<td>-0.2157**</td>
<td>-0.1498</td>
</tr>
<tr>
<td></td>
<td>(-2.09)</td>
<td>(-1.30)</td>
</tr>
<tr>
<td>(Unemployment)$_{t-2}$</td>
<td>0.3745</td>
<td>0.8571***</td>
</tr>
<tr>
<td></td>
<td>(1.44)</td>
<td>(2.88)</td>
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<tr>
<td>Income</td>
<td>-0.5618***</td>
<td>-0.4576*</td>
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<td>Credit Access</td>
<td>0.0603**</td>
<td>0.0537**</td>
</tr>
<tr>
<td></td>
<td>(2.59)</td>
<td>(2.53)</td>
</tr>
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<td>Year Fixed Effects</td>
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<tr>
<td>Constant</td>
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Note: The numbers in parentheses are the t-statistics for the corresponding variables.

*, **, *** represent the significance at 10%, 5%, and 1% level.

The error terms are clustered at country level in all regressions.
## Appendix K

Fixed-Effects Regressions with Additional Control Variables for Chapter 4

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<tr>
<th>Dependent Variable:</th>
<th>Necessity-Based Entrepreneurship Rate</th>
<th>Opportunity-Based Entrepreneurship Rate</th>
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<tbody>
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<td></td>
<td>(1)</td>
<td>(2)</td>
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<td>Corruption Dist.</td>
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<td>-4.8910**</td>
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<tr>
<td>Time x Corruption Dist.</td>
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<td>0.0643***</td>
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<tr>
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<td>(3.20)</td>
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<td>(-2.45)</td>
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<td>0.0553**</td>
<td>0.0443*</td>
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<td>(0.18)</td>
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<td>Market Cap to GDP</td>
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</table>

Note: The numbers in parentheses are the t-statistics for the corresponding variables.

*, **, *** represent the significance at 10%, 5%, and 1% level.

The error terms are clustered at country level in all regressions.
Appendix L

Additional Simultaneous Equations Model Regressions for Chapter 4

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<th>Dependent Variable:</th>
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<th>Opportunity-Based Entrepreneurship Rate</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>(1) Second-Stage</td>
<td>(2) Second-Stage</td>
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<tr>
<td>Opportunity Ent.</td>
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<td>(-0.75)</td>
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<td>Necessity Ent.</td>
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<td>Time</td>
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<td>(-0.52)</td>
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<tr>
<td>Time x Corruption Dist.</td>
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<td>0.0354</td>
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<tr>
<td></td>
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<td>(1.47)</td>
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<td>(GDP Growth)_{t-1}</td>
<td>-0.2760*</td>
<td>-0.3815**</td>
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<td>(-1.70)</td>
<td>(-2.01)</td>
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<td>(Unemployment)_{t-1}</td>
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</table>

Note: The reported results are the second stage regression results.

The numbers in parentheses are the t-statistics for the corresponding variables.

*, **, *** represent the significance at 10%, 5%, and 1% level.

The unreported F-Test results show that Corruption Dist. and the interaction term are jointly insignificant at Column (2) and (4).