Summer 8-1-2019

Essays on Entrepreneurship and Public Policy

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ABSTRACT

ESSAYS ON ENTREPRENUERSHIP AND PUBLIC POLICY

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AUGUST 2019

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This dissertation consists of three chapters empirically analyzing how public policy affects firm behavior, with a particular emphasis on small, entrepreneurial firms.

The first chapter analyzes how occupational licensing affects firm entry and employment decisions. Occupational licensing is a government permission to work within a specific job classification. The costs to firms of paying to license employees can be a substantial consideration when firms are making location and hiring decisions. Using individual firm-level data I analyze how these costs affect firms by determining how differences in costs across state borders affect the likelihood of firms entering on a particular side of a state-pair. I find firms are less likely to enter in an expensive state if a substantially cheaper state is within a short distance. I also utilize a geographic regression discontinuity design and determine that firms on the more expensive side of a state border pair have approximately 2.3 employees fewer on average. Comparing similar licensed and unlicensed industries I find evidence of a persistent decrease in average employment for licensed firms in high cost states relative to unlicensed firms.

The second chapter investigates potential gender related bias in equity, debt, and philanthropic contribution financing decisions for early-stage African entrepreneurial ventures. Utilizing a series of individual estimations and a two-stage Heckman Selection Model on questionnaire results from 2,812 early-stage entrepreneurs in Ghana, Kenya, Nigeria, Tanzania,

Uganda, and South Africa, I find substantial evidence of a negative effect of having a female primary founder on the probability of being selected for equity funding but that this bias does not persist in the amount of equity funding the venture attracts. I find that in the case of debt and lending finance, female entrepreneurs are subject to a lower probability of being selected for funding and smaller total amounts of debt financing. Philanthropic contributions present an interesting alternative, and do not have any related gender bias in the initial selection or funding amount. This paper provides policy recommendations for encouraging female entrepreneurship, which has been shown to contribute to long-term sustainable economic growth.

The third chapter explores the unintended consequences of the Bankruptcy Abuse Prevention and Consumer Protection Act of 2005 (BAPCPA) on the entry and exit behaviors of small businesses. BAPCPA implemented significant changes to consumer bankruptcy law which had many unintended consequences for debtors, creditors, and consumers. Since small businesses are often unincorporated and therefore the financial assets and debts of the company cannot be separated from the owner, bankruptcy serves as a crucial form of partial wealth protection for self-employed and small business owners. This study focuses on how the implementation of BAPCPA affected small businesses entry and exit rates by utilizing a Difference-in-Difference methodology. A Triple-Differencing method is also incorporated to account for potential differences in small business entry and exit behaviors in low and high personal homestead exemption states. I find that BAPCPA decreased the entry rate of small businesses by approximately 4.91% and increased exit rates by 2.74%. These effects vary substantially across industries.

ESSAYS ON ENTREPRENEURSHIP AND PUBLIC POLICY

BY

ALICIA MORGAN PLEMMONS

A Dissertation Submitted in Partial Fulfillment
of the Requirements for the Degree
of
Doctor of Philosophy
in the
Andrew Young School of Policy Studies
of
Georgia State University

GEORGIA STATE UNIVERSITY
2019

ACCEPTANCE

This dissertation was prepared under the direction of Alicia Morgan Plemmons's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Economics in the Andrew Young School of Policy Studies of Georgia State University.

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August, 2019

DEDICATION

To all my cats- past, present, and future.

ACKNOWELDGEMENTS

I would like to offer my sincerest gratitude to my advisor, Dr. Sally Wallace, for her guidance and support during my journey at Georgia State University. She has been a wonderful mentor to me and has provided direction and insight at many crucial junctures. I also owe countless thanks to my other committee members, Dr. David Sjoquist, Dr. John Gibson, and Dr. Anne Tucker. My dissertation has been much improved through their thoughtful comments, suggestions, and encouragement.

I also would like to express my appreciation for the faculty of the Economics Department at Georgia State University. My research and teaching have greatly benefited through the comments and lectures of Dr. Pierre Nguimkeu, Dr. Garth Heutel, Dr. Dan Kreisman, Dr. Carlianne Patrick, Dr. Andrew Feltenstein, Dr. Spencer Banzhaf, Dr. Tom Mroz, Dr. Rusty Tchernis, Dr. Shelby Frost, and Dr. Grace O. A special thanks is also extended to the various members of the AYSPS staff who keep everything running smoothly, without them we would be lost.

My heartfelt gratitude also goes to my family, Carmen Plemmons, Mitch Plemmons, Kelly Plemmons, and Frieda Porter, who has been extremely patient and provided a wealth of moral support during this journey. Finally, I would like to thank my friends and partner, who have been outrageously supportive while I pursued my dreams. My sincerest gratitude goes to Katherine Key, Kalee Burns, and Walker Rhine who have spent countless hours reading drafts, providing feedback, and listening to presentations. Their friendships have been invaluable and have enriched my life both professionally and personally. I would also like to thank Joshua Madden, Bobby Grant, Mike Williams, Ryan Gwin, Nick Peay, David Bradley, Stuart Burnette, Michael Makovi, Jaketra Bryant, Erica Brice, the entirety of the 2014-2015 entering cohort, and many countless others.

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Introduction

Entrepreneurship and, more generally, business development play a crucial role in economic growth and prosperity. This dissertation contains a collection of three essays that seek to understand various aspects of business development, primarily behavior changes in response to new regulations, as well as the existence of differential credit constraints.

In Chapter 1, I analyze how occupational licensing affects firm entry and employment decisions in the United States. To empirically examine these entry and exit decisions, I focus on firms near state border because they would have the lowest cost to relocated their business and this methodology allows for the control of local and geographical heterogeneity. Using individual firm-level data I utilize a series of logistic regressions and determine that firms are less likely to enter expensive states when less expensive alternatives are located within a short distance. Then, to study employment behavior, I implement a geographic regression discontinuity design and find that the point estimate of expensive states have 2.3 fewer average employees compared to their low cost border counterparts. To provide additional insight into the causal effects of occupational licensing difference on firm employment behaviors, I use a non-temporal difference-in-difference framework to compare the employment patterns of similar unlicensed and licensed firms across low and high licensing cost border pairs. I find there is some evidence of an additional negative effect to average firm employment for licensed firms in high cost states that are not explained by the individual estimations.

Chapter 2, focuses on relationship of gender bias in entrepreneurial financing patterns in Africa, thereby affecting the credit constraints of male and female entrepreneurs heterogeneously. Access to capital is crucial to firm and development, and Africa has cultural and developmental barriers to credit access that need to be understood in order to design

effective policy. Gender bias in equity, debt, or philanthropic contribution financing can happen at two points: 1. in the initial decision to fund a project or not; and 2. in the amount of funding granted. In this chapter, I use data from a survey of early-stage entrepreneurs in six African nations to determine if there is evidence of gender bias in the two funding decisions. I first estimate these decisions individually, and then correct for possible selection bias in the initial financing decision that may influence the evidence of bias in the amount of funds by utilizing Heckman Selection methods. I find evidence of a gender bias in both decisions for equity and debt financing. Interestingly, this bias does not exist in philanthropic contribution finance.

Finally, Chapter 3 seeks to determine if the Bankruptcy Abuse Prevention and Consumer Protection Act of 2005 (BAPCPA) disproportionately harmed small businesses in the short-term after implementation. Small business ownership and self-employment can be inherently risky as often these businesses are unincorporated and therefore the assets and debts of the business cannot be separated from the owner. Therefore, in the case of unincorporated firms, bankruptcy serves as a means of partial wealth protection for these individuals. I use a difference-in-difference model, and find evidence of a significant decrease in small business entry and an increase in small business exits over the policy period that is not accounted for by the individual estimations. I then examine if there are additional policy effects in states with low personal homestead exemptions relative to states with high exemptions using a triple-differencing model. I find no evidence to suggest that the different level of exemptions interact with the policy to cause heterogenous entry and exit rates of small firms.

Chapter 1: Occupational Licensing Effects on Firm Entry and Employment

1. Introduction

Twenty-nine percent of the United States workforce required an occupational license in 2010, which is greater than the percentage of workers directly impacted by unions or the minimum wage (Kleiner & Krueger 2013). An occupational license is a government permission to work within a specific job classification, the requirements for which are often determined by each individual state. A person attempting to obtain an occupational license will incur costs in the form of monetary fees, examinations, and days required to complete education and experience mandates. Obtaining an occupational license for employees, or paying a wage premium for licensed workers, constitutes a significant cost consideration for firms. These costs may influence whether a business enters into a market or hires employees. Understanding the relationship between occupational licensing costs and firm decisions have important policy implications for how a state encourages business development and employment.

There is a growing body of literature focusing on the costs and benefits of occupational licensing. Proponents cite the benefits of occupational licensing as the protection of public health, consumer safety, and higher wages for employees (Kleiner & Krueger 2010). Opponents of the current form of regulations claim these benefits are outweighed by the harm caused from increased prices for consumers, failure to reduce the wage dispersion, and reduced aggregate economic mobility (Cox & Foster 1990, Carroll & Gaston 1981, Kleiner & Krueger 2010, Meehan et al. 2017). Wage premiums for license-holding employees in heavily regulated industries tend to be larger in states with steeper occupational licensing costs (Akerlof 1970, Sharpio 1986, Kleiner & Krueger 2013, Timmons & Thornton 2008). The effects of these wage premiums on firm location and hiring decisions, however has yet to be investigated.

The purpose of this study is to analyze how occupational licensing regulations influence entry and employment decisions of firms by analyzing the patterns exhibited by businesses that are located near state borders. In this study, I analyze the likelihood that a firm will enter the market from a specific side of a state border, given the differences in licensing costs, using a series of logistical functions. To observe differences in firm employment patterns over state borders I utilize a geographic regression discontinuity design to determine if there is a systematic difference in the average number of employees per firm, in bins of distance from the state border, between high- and low-cost states. Finally, to further substantiate claims of causal differences in average firm employment, I perform a non-temporal difference in difference analysis between a variety of firm-industry pairs that perform similar business functions. In each pair of firms, one firm generally employs workers that require occupational licensing in most states, while the other does not. The purpose of this approach is to confirm that changes in firm entry decisions are influenced by occupational licensing costs, and not other state or industry trends.

Previous studies focus on the effects of occupational licensing regulations on employees in the form of wage premiums, and on consumers in the form of price and quality changes for goods and services. To my knowledge, I develop one of the first spatial models for understanding the relationship between firm density and occupational licensing costs near state borders. My empirical methodology provides an analytical explanation of firm entry decisions and the causal effects of occupational licensing costs on firm employment near state borders. In doing so, I explain how these regulations affect decisions and preferences of firms, which can have widespread effects on local labor markets and state tax revenue.

I find an increased probability of firms entering on the cheaper side of a state border pair as occupational licensing cost differences increase. The magnitude of these correlations is larger

for businesses in labor-intensive industries. Using a geographic regression discontinuity framework, I find negative point estimations for differences in average firm employment in high-cost states relative to low-cost states. There are substantial discontinuities in employment around state borders which are persistent even after accounting for population and geographic attributes. Comparing pairs of industries that differ only in their occupational licensing requirements, I find that there is a substantial negative effect on average firm employment for licensed firms in high-cost states that are not present for unlicensed firms.

The paper will proceed as follows: Section 2 provides an overview of the relevant literature. Section 3 provides details on the data that will be used for analysis. Section 4 develops the empirical models that will be used to analyze the three different specifications of firm-levels. Section 5 presents the empirical results of the models. Section 6 concludes and discusses policy relevance.

2. Literature Review

According to the overview of occupational licensing history by Law & Kim (2005), governments introduced occupational licensing to help consumers understand and judge the quality of professional services. Technological advances and increased professional specialization had made it increasingly difficult for individuals to judge differences between service providers. The ideological benefit of occupational licensing is to decrease consumer uncertainty and increase demand for licensed services by signaling to the consumer, through the license, what the service provider does, and that the license holder is qualified to provide that service. Conversely, the lack of a license for a specific service subject to licensing regulations, informs the consumer that the service provider is not legally qualified to provide that good or service (Arrow 1971). For most industries, an individual state chooses whether an occupation is

subject to occupational licensing; likewise, states choose the fees, education, and experience requirements to meet the standards for that job. These requirements often differ drastically between states. Researchers have focused on occupational licensing, even though there are alternatives such as certifications and output monitoring, since these alternatives are far less prevalent in most industries (Cox & Foster 1990). Within the United States, the proportion of jobs that require some sort of occupational license has grown from approximately 4% of the workforce in the early 1950s, to 29% of the workforce in 2008 (Kleiner & Krueger 2013).

In recent decades, a substantial amount of literature has centered on analyzing the costs and benefits of occupational licensing. These studies typically focus on the effects of occupational licensing on either workers or consumers. Workers who are subject to occupational licensing often benefit from wage premiums; however, at the economy level, some studies find these licenses may have reduced aggregate economic mobility and failed their goal of wage dispersion (Kleiner & Krueger 2010, Kleiner & Krueger 2013, Kleiner & Krueger 2013, Meehan et al. 2017). Consumers are subject to substantial changes in cost through price effects. These price effects, in theory, represent payments for increased public health, safety, and quality of goods and services (Arrow 1971).

A variety of literature finds evidence of a wage premium for individual workers who hold an occupational license. The primary argument supporting this wage premium is that it incentivizes individuals to invest in occupational specific education, training, and examinations. The wage premium provides workers with the ability to recoup a return on investment costs, by making it more difficult for consumers to substitute the services of license holders with lower-quality versions of the same service (Akerlof 1970, Sharpio 1986). Gittleman et al. (2018) find that individuals who invested into human capital and obtained a license earn higher pay, are

more likely to be employed within their field, and also have a higher probability of access to employer sponsored health care. Survey data finds that having a government issued occupational license is associated with an approximate 18% differential in increased wages (Kleiner & Krueger 2013). Other research studies have focused on the wage premium associated with specific industries. Timmons & Thornton (2008) concluded that after controlling for various types of endogeneity, there is a licensing premium of up to 6.9% for radiological technologists in states that require licenses. Perloff (1980) focuses on the construction industry and finds that, though product market conditions have the largest effect on wage changes when a license has been established in the industry for some time, there is evidence that when there is an increase in a related but unlicensed industry there is often an increase in the licensed construction industry that continues to maintain a wage premium between the two. In contrast, a study by Guis (2016) finds a lack of evidence for this wage premium in many industries at the state level, but still finds statistically significant effects for child care workers, opticians, and veterinary technicians.

These wage premiums are designed to incentivize education and training, promote public health and safety, and to increase overall quality of goods and services. Yet, studies on the quality benefits of occupational licensing in the United States have had mixed results. Holen (1965) finds that increased stringency in the occupational licensing for dentists increased the quality of care, while decreasing the likelihood of adverse outcomes. Kleiner & Kudrle (2000), in an observational study of Air Force recruits' dental quality, find increased stringency on occupational licensing has no effect on the overall quality of dental work. While, even further, Carroll & Gaston (1981) find that licensing practitioners decreases the total stock of practitioners and lowers overall quality of dental services. The contradicting results of these three studies illustrates the inconclusive nature of research attempting to measure effects on quality outcomes

within occupational licensing literature. Within research on the quality effects about student outcomes of teacher licensing, Angrist & Guryan (2008) find that state-mandated testing of teachers had no effect on overall teacher quality. Kane et al. (2008) analyze licensed, unlicensed, and certified teachers in New York City and find little differences in student achievement. Maurizi (1974) finds that for contractors who are subject to higher standards when obtaining a license that there is enhanced quality for large and relatively well-off consumers, but the results were inconclusive when looking at smaller consumers.

Though the quality effects of occupational licensing restrictions are inconclusive, consumers are also affected by price changes. Conrad & Sheldon (1982) finds that restrictions on the number of firm branches and dental assistant's procedures led to a 4% increase in consumer prices. In the Kleiner & Kudrle (2000) study mentioned above, they find that when analyzing measures of restrictiveness, as determined by exam pass rates for dentists, states saw substantial increases in prices when restrictions were increased for dental services. In similar studies for optometry, Bond et al. (1980) and Haas-Wilson (1986) find that increases in the prices of eye exams and eye glasses in states with restrictions on optometrists' commercial practices were associated with no statistically significant effects on quality. These increased prices may also result in consumers eventually lowering their demand over time as they substitute away from the service. For example, a study on cosmetologists finds that additional regulations represent a statistically significant increase of the cost to consumers in the form of higher prices for cosmetology services; and faced with these increased prices, consumers reduced their number of visits per year by nearly 14% (Adams et al. 2002).

The wage premium for licensed employees can represent an additional cost for firms who wish to enter or remain in a market. The costs to firms cannot always be offset with increases in

prices because they may harm demand over time. To avoid these costs, firms may self-select into areas where they have the lowest cost to open and conduct business. Since occupational licensing costs are determined at the state level, there can be large differences in cost on either side of a state border, even if the local physical attributes of the location are the same. This study attempts to shift the focus away from consumers and employees, and instead investigates how occupational licensing affects business decisions, including where a firm operates and how many employees they hire.

Zapletal (2017) is the closest study to my own, as it focuses on the location decisions of businesses, though their study focuses specifically on personal care industries. They find that license restrictiveness affected business' decisions to enter and exit the market, but not their overall quality, services, or prices for cosmetology related services. Other studies find effects on the interstate migration of the labor force but have not specifically focused on firms, except for sole proprietorships. Kleiner & Vorotnikov (2017) use cross-sectional data of each state to analyze the qualitative differences between states. They find considerable variation in the percentage of the states' workforce that obtained licenses, and large variations in the effect of licensing between states. Johnson & Kleiner (2017) look at 22 occupations and find that state specific occupational licensing leads to a decline in interstate migration and job transitions. Pashigian (1979) looks at lawyers, many of whom operate as sole proprietorships, and finds that occupational licensing has a large effect in reducing the interstate mobility of these professionals after they have obtained a license in a state. In this study, I am interested in whether these effects influence the likelihood of where a business will enter the market, with the consideration that there are additional costs in the form of wage premiums or payments for workers to maintain

licenses. Firms also must consider, when choosing a location for their business, that the labor force in these regulated industries is less mobile between states.

Oftentimes self-employed individuals, sole-proprietors, or limited partnerships differ from incorporated firms in their size and hiring practices. Regardless of firm structure type, both small and large businesses are subject to the same occupational regulation requirement for their employees if they want to work in regulated industries. The influence of occupational licensing for smaller or younger firms is of crucial importance as we are transitioning from a manufacturing to a service-based economy (Kleiner & Krueger 2013). van Stel et al. (2007) looks at how business regulations affect nascent and young business entrepreneurship and finds that labor market regulations, in the form of increased capital requirements, decrease entrepreneurship rates. This could mean that the increased cost of conducting business, as a result of the fees to obtain occupational licenses, may be substantial overhead for a new firm that may cause them to choose to not open for business.

The selection into self-employment under the constraints of occupational licensing has different effects depending on if there are close complement or substitute industries that are not subject to the same rigorous standards. Kleiner & Park (2010) analyze the question of how occupational licensing and government regulation affects dentists and dental hygienists, which can be considered to be both complements and substitutes for each other. States vary in whether they allow for dental hygienists to operate as self-employed, or if they must work under the supervision of a dentist. Kleiner & Park (2010) find that hygienists in states that allow them to be self-employed maintained about 10% higher earnings, while dentists in those states have lower earnings and employment growth. States also differ in how they regulate self-employed individuals in the growing ‘gig-economy,’ which includes jobs in which independent workers

agree to work short-term engagements, such as ride-sharing and short-term single contract projects. Kleiner (2017) focuses on the self-employed individuals of the gig-economy through an analysis of the Uber market and finds that cities imposing more rigorous licensing standards have fewer Uber drivers per capita, as well as higher base fares. The self-employed and entrepreneurial business sectors have higher proportions of immigrant workers relative to their percentage of the population. Self-employment and entrepreneurship can often serve as an important means of employment for immigrant workers that may not have been subject to the same rigor of education requirements to maintain previous employment. Immigrants seeking to start a business face additional barriers to entry, in the form of complicated application processes and language requirements (Federman et al. 2006). Slivinski (2017) looks broadly at the burden of occupational licensing on immigrant entrepreneurs, and finds that states with higher than average occupational licensing requirements have lower rates of immigrant entrepreneurship.

3. Data

3.1 Occupational Licensing

State requirements for occupational licensing were acquired from the Institute for Justice License to Work (LTW) 2017 update. The LTW distinguishes between reported occupations that require an occupational license and those that require only a certification. An occupational license requirement is when government authorization is required to legally perform the services of that occupation. For example, an Emergency Medical Technician (EMT) requires an occupational license in all 50 states and the District of Columbia, this means that a license must be obtained to work as an EMT in any capacity. Consequently, a non-licensed individual may not be hired for an EMT position. Certifications differ in that, while they also signal competency in a field, they are not required to perform a specific service. For example, a bartender may

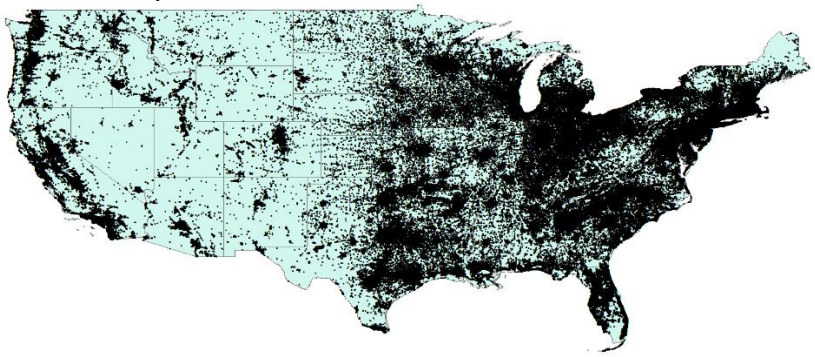
obtain a certification in 38 states but can still be a bartender without the certification. In this case the EMT data would be included in LTW report data for all states, but the bartender would not be considered under the burden of an occupational license in the certification-only states. This report measures the regulatory burden associated with 102 commonly regulated occupations within all 50 states and the District of Columbia. Information on each regulated occupation includes fees, examinations, and the calendar days necessary to complete mandatory education and experience requirements. Though this report does not cover every occupation subject to an occupational license, it is the largest currently available database of licenses, and these measures can serve to provide a foundation for determining a states' regulatory environment and stringency.

Tables 3 and 4 contain summary statistics for the state-level variables and cross-differenced state-level variables, respectively. To measure the regulatory environment of a state, simple averages are taken across occupations of the monetary fees and number of calendar days required to complete mandatory education and training for obtaining a license. These variables allow for the comparison of differences in regulatory environments between states. For the U.S., Nevada is the most expensive state in terms of monetary fees, with $704 being the average cost of an occupational license. The least expensive is Nebraska, where the average cost for a license is $76. Across the states the mean is $268.14, with a standard deviation of $113.77. In regards to calendar days required to complete mandatory education and training, Pennsylvania has the shortest number of average days required at 117.2 days. Hawaii, in comparison, has the largest average estimated days required to complete mandatory education and training at 988 days. For the U.S. the mean is 373.7 days, with a standard deviation of 199.5 days. Both variables are approximately standard normal in their distribution.

3.2 Firm-Level Characteristics

I obtained data on firm characteristics and locations through large-scale web scraping from a popular sales lead company, Reference USA, during April 2017. This data is collected at the firm level, as opposed to earlier studies that used establishment data aggregated to the zip-code or county level. Collected variables include the exact longitude and latitude of the firm location, SIC and NAICS codes at the six-digit level, employee and sales estimations, credit ratings, etc. Figure 1 contains a map of the exact locations for the 3,174,670 firms in my sample. The firms contained in this data set were established between 1994 and 2016 and are located within the continental United States. This study is limited to companies that were established from 1994 to present because the focus of the study is on companies from the internet age. The internet drastically changed the ability of companies to conduct sales and services at a distance, which affects business entry and location decisions.

Figure 1: Map of All Firm Locations
Map of business locations for 3,174,670 firms



The data used in this study contains information on the industry classification of each firm. Table 1 contains summary statistics for the number of firm observations within 9 major industry classifications. This information allows for the same interactions to be analyzed for subsets of data, to determine if occupational licensing burdens have a larger effect within specific industries. The smallest industry in the data set, with 19,188 firms representing

approximately 0.60% of the total firm data, is the Public Administration industry. The largest industry, representing 46.01% of the data with 1,460,624 firms, is the Services sector. These industries are defined at the 2-digit NAICS level, though future research may be determined at more specific 4- and 6-digit NAICS levels as well.

3.3 Similar Industry Matches

To address possible endogeneity concerns for the relationship between occupational licensing and average firm employment, I identify pairs of firms who perform similar economic functions that differ in whether they generally hire licensed employees. This is often difficult because in most cases similar business types fall under the same six-digit NAICS code. Since data is unavailable for the occupational licensing of every individual firm employee, generalizations must be made to attempt to compare industries. Though these matches are not perfect substitutes for each other, they provide insight into whether industries that are known to hire workers with occupational licenses have significant average employment differences, by comparing them to industries that should be unaffected. Table 2 shows the six business pairs that this study will compare in the empirical analysis.

Match Type (1) Transportation compares Taxi Services with Other Transit and Ground Passenger Transport. Taxi drivers are required to maintain special occupational licenses in sixteen states and most major cities. Since many states require occupational licenses for taxi drivers, this study identifies Taxi Services (NAICS 485310) as having generally licensed employees. Other Transit and Ground Passenger Transport (NAICS 485999) includes a wide variety of passenger transit, including shuttle services and van pools. Shuttle and van operators are often not required to have any additional occupational licensing, so this study defines these firms as having unlicensed employees.

Match Type (2) contains firms that both perform similar functions in Architecture and Design. Architecture Services (NAICS 541310) is an industry that is comprised of firms who are primarily engaged in the architectural design of residential, institutional, commercial, and industrial buildings and structures. Architect is a job classification that requires an occupational license in all 50 states, and Washington D.C. Therefore, Architecture Services is considered as having generally licensed employees. Other Specialized Design Services (NAICS 541490) is an industry comprised of firms that are primary engaged in professional design services, except for architectural, landscape architecture, engineering, and interior design. Because of the exclusions of the largest design subsections that require licenses, Other Specialized Design Services perform similar design projects but with unlicensed employees.

Match Type (3) contains overlapping industries that conduct Building Repair. Residential Remodelers (NAICS 236118) is comprised of establishments responsible for remodeling construction projects for residential single-family and multifamily buildings. Projects that are valued at over $1000 of home repair generally require modifications to be conducted by employees who hold occupational licenses in various fields- these include electrical, cement, drywall, cabinetry, HVAC, etc. Since residential remodeling typically works with high valued projects, most of their employees hold occupational licenses in a related field. In a related classification Other Personal and Household Goods Repair and Maintenance (NAICS 811490) also contains firms who work on repairing and maintaining residential buildings but are often associated as working with lower value projects. Since these projects tend to have lower monetary cost, they may not require having an employed workforce with a variety of occupational license to keep with state requirements for housing. Therefore, for the purpose of this study, these firms are defined as having generally unlicensed employees.

Match Type (4) focuses on firms that provide forms of Wellness. Offices of All Other Miscellaneous Health Care Practitioners (NAICS 621399) are establishments of private or group practices employing health care practitioners (except for physicians, dentists, chiropractors, optometrists, mental health specialists, physical therapists, audiologists, and podiatrists). This category includes health care professionals that are generally licensed employees such as dental hygienists, denturists, respiratory therapists, dietitians, and registered or licensed practical nurses. This industry classification has a close overlap in services with Other Personal Services (NAICS 812990). Other Personal Service includes many occupations including, but not limited to, personal fitness trainers, personal organizers, dating services, blood pressure testing machine operators, and comfort station operators that assist in generally unlicensed occupations that are related to general wellness.

Match Type (5) includes firms that are related to Landscaping. Landscaping Services (NAICS 561730) is the design and construction of landscaping plans. These landscaping services often require having generally licensed employees to design, construct, install, and maintain trees, gardens, walkways, decks, fences, and similar plants and structures. I compare this to the Nursery, Garden Center, and Firm Supply Store (NAICS 444220) because though the latter maintains and sells the plans and equipment used in landscaping, employees are generally unlicensed and do not require specialized occupational licenses to maintain or distribute these goods before they reach the customer.

Finally, Match Type (6) compares Lending Establishments. Commercial Banking (NAICS 522110) is subject to a wide variety of rules and regulations. These are firms that are primarily engaged in accepting demand and other deposits and making commercial and consumer loans. Since these loans are typically secured and subject to federal oversight,

commercial banking institutions hire many employees that are licensed in jobs such as accountants, bill collection, financial planning, title examiners, etc. This study defines the Consumer Banking industry as having licensed employees. Oppositely, Consumer Lending (NAICS 522291) is not subject to the same federal oversight since they are primarily engaged in making unsecured cash loans to consumers. These institutions do not offer the same range of financial services, and generally hire unlicensed employees to maintain their cash transactions. Commercial Banking and Consumer Lending industries are similar in that they both provide lending services to consumers.

4. Model Specifications

To identify the relationships between occupational licensing requirements, firm entry and employment decisions, I exploit variations in occupational licensing costs over state borders using multiple econometric techniques. First, I identify and analyze unusual clumping of firms in low cost states. I initially use a density manipulation test to determine if current firm locations could plausibly be randomly assigned or if there is evidence of manipulation of entry decisions across state borders. I then utilize a series of logit models to determine the probability that a new firm enters the market on a particular side of the border, given the differences in occupational licensing costs.

Second, I exploit differences in costs over these state borders to determine if licensing requirements affect the average number of workers a business chooses to employ. I determine the effect of being located in the more expensive state on the average number of employees per business within bins of physical distance from a state border using a geographic regression discontinuity design. To address possible endogeneity from other state attributes, I attempt to tease out the relationship between cost and employment by conducting a non-temporal

difference-in-difference assessment on six industry pairs. These industry pairs are particularly useful because they serve similar market functions within the economy, with the difference that one industry in each pair generally requires licensed employees, while the other does not.

4.1 Firm Entry

4.1.1 Density Manipulation Test

When analyzing firm entry patterns around state borders, it is necessary to determine if any observed patterns may be caused by arbitrary random assignment rather than purposeful manipulation. For each state border there are two adjacent states with different requirements for the days necessary to complete education and experience training as well as the average fees for people obtaining occupational licensing. The high-cost states are ones where workers on average will lose more calendar days of work to these requirements relative to the adjacent low-cost state, which is highly correlated with states with higher average fees relative to adjacent states. Figure 4 represents the density of firms located within 10-kilometers of a state border. Firms on the left are in 'low cost' states, while firms on the right are in 'high cost'. Visually observing Figure 4 it appears that there is a mass of firms slightly inside the low-cost state boundary. Though this may be visually convincing, I attempt to empirically determine if these densities are a product of arbitrary chance or if there is evidence of purposeful manipulation around the state border of firm entry.

I formally test for manipulation of the firm density around the state border using a procedure developed by Cattaneo et al. (2018), referred to as a Density Manipulation Test (DMT). Density manipulation testing around cutoffs are an extension of the local linear density estimator, first developed by Cheng (1997), and later introduced as a means of observing manipulation in regression discontinuities by McCrary (2008). Manipulation testing became a

feature for falsification testing around geographic borders with Cattaneo & Escanciano (2017). The DMT is conducted in two steps. First, I develop a finely gridded histogram, then it is smoothed using local linear regressions separately on either side of the cutoff. This method is useful in determining if discontinuities in the densities along the state border are determined by the treatment indicator of locating in a comparatively high-cost state. DMT results are discussed in Section 5.1.

4.1.2 Logit Model

Since there is evidence of manipulation of firm entry patterns around the state border, I conduct a series of logistical regressions to determine how differences in occupational licensing costs affect the probability that a firm will enter in a side of the border. I focus on firms that locate near state borders and exploit variation in occupational licensing requirements on firms that have relatively similar markets, geography, and other natural resources. I refer to businesses located near state boundaries as residing in a buffer zone. One of the cost measures of interest in this model is the calendar days required to complete education and experience training, which from here out will be referred to as 'days required'. I account for average monetary fees through a binary variable representing if a states average occupational licensing fees are greater than the border-pair states fees by at least $100, though this variable is not the primary focus on this study. There are 109 different state border pairs that I use within my analysis. The methodology for determining which firms are included within a buffer zone of a state border is included in Appendix A.

The firms that fall within these buffer zones constitute the subsamples by which I estimate the probability that a new firm enters the market on a particular side of the border. The logit model is as follows:

$$L_{is} = \theta_1(DR_2\text{-}DR_1)_s + \theta_2 Fees_s + X_i + \gamma_s + \varepsilon_{is} \quad (1)$$

L_i is a binary variable equal to 1 if a firm is located on Side 2 of a boarder pair, and 0 if the firm is located on Side 1. The selection of which side of a border pair was assigned Side 2 is determined arbitrarily by whichever state had the greater FIPS code. The interior term $(DR_2\text{-}DR_1)_s$ is the cross-border difference in days required for obtaining an occupational license between the two states, within the border pair that contains the firm. $Fees_s$ is a binary variable equal to 1 if the cross-border difference in average fees is greater than $100. X_i is a vector of individual firm characteristics, and γ_s contains a vector of cross-border controls including labor force participation rate, minimum wage, state sales tax rates, and average local tax rates.

Since the data is a cross-section of a collection of firms that existed in the United States in April of 2017, fixed effects to account for macroeconomic changes over time are unnecessary. Due to the nature of the data, the results of this model are meant to explore the correlation between policy differences and business entry decisions, rather than make claims of a causal nature.

4.2 Firm Employment

4.2.1 Geographic Regression Discontinuity Design

Since occupational license costs differ over geographic boundaries, I utilize a multi-dimensional discontinuity assessment in the longitude-latitude space. This means that I am implementing a regression discontinuity model design over physical space instead of time. Geographic Regression Discontinuity Design models (GRDD) are becoming more common within spatial literature to depict causal inferences from quasi-experimental policy structures. The most notable of these examples of exploiting geographic variation to estimate causality is the study by Card & Krueger (1994), who analyzed minimum wage law effects on the fast food

industry across the New Jersey and Pennsylvania space. Regression discontinuities based on geographic boundaries are an increasingly popular form of natural experiment in economics (Dell 2010, Keele et al. 2015, Cattaneo et al. forthcoming).

The purpose of this methodological approach is to determine if there are discontinuities in the average number of employees between high-cost and low-cost states. High-cost (treatment) states are ones where employees have higher days required than adjacent low-cost (control) states. These high- and low-cost state pairs share a common border. This model determines the relationship between occupational licensing costs and the average number of employees within bins of distance that are determined by minimizing the mean squared error (MSE). The basic GRDD model is structured as follows:

$$Y_{ib} = \alpha + T_i\tau + X_i\beta_{-h} + T_iX_i\beta_{+h} + Z_i + \lambda_b + \varepsilon_{ib} \quad (2)$$

Y_{ib} represents the outcome variable of interest for observation i on border segment b, which is the average number of employees in bins, whose sizes are determined by minimizing the MSE. T_i is a treatment variable equal to one if the firm is located on the High Side of the state pair, and zero otherwise. τ is a series of weights determined using a local linear regression with triangular kernel estimation. X_i is the geographic distance from the closest state border, which is contained in a vector between $X \in (-h, h)$, where $-h$ and $+h$ represent bandwidths of distance from the border. Z_i is a vector of cross-border control variables. λ_b represents border fixed effects for the 109 border pairs. Standard errors are clustered at the running variable.

The motivation for this model is to determine if occupational licensing costs have a significant effect on average firm employment in more expensive states. To alleviate potential concern of endogeneity, I conduct a non-temporal difference-in-difference analysis to determine

if there are additional influences of occupational licensing laws on average employment of licensed firms compared to unlicensed firms over state borders.

4.2.2 Difference-in-Difference

Following the work of Card & Krueger (1994), the structure of eliciting the effect of a program or regulation between two groups has become a widespread practice in labor economics. Occupational licensing restrictions may have an impact on regulated industries but should theoretically have little to no effect on non-regulated industries. To understand the additional effect of a state's occupational licensing restrictions relative to neighboring states, I compare the effects of being in a high-cost state versus a low-cost neighboring state for licensed versus unlicensed industries using a non-temporal Difference-in-Difference (DD) model. In this case I will compare a group who should be unaffected by changes in occupational licensing fees (control group) to a group that is subject to occupational licensing (treatment group). The non-temporal DD model is different from the standard approach because instead of comparing two locations over time, it compares two industries over two locations. The model setup is as follows:

$$Y_{isb} = \alpha + \eta OL_{is} + \zeta H_{ib} + \delta(OL*H)_{isb} + \varepsilon_{isb} \quad (3)$$

Y_{isb} is our outcome of interest, the number of employees in a firm. OL_{is} is a dummy variable equal to 1 if the business is part of the generally licensed industry, and 0 if not. The OL_{is} variable is meant to capture possible differences between the treatment and control groups before analyzing the effect of being in a high cost state. The industry pairs for licensed and unlicensed firms are described in Section 3.3. H_{ib} is also a dummy variable equal to 1 if the business is located on the border side with the more expensive, or "higher", occupational licensing fees. H_{ib} captures aggregate factors that cause changes in the outcome variable between these states, even

in the absence of the licensing fees differences. The coefficient of interest, δ, multiplies the interaction terms *(OL*H)* which is the same dummy variable equal to one for those observations in the industry subject to occupational licensing, in the high cost state.

The coefficients for the four possible combinations are as follows:

$$NOL_{Low} = \alpha \quad (4)$$

$$NOL_{High} = \alpha + \varsigma \quad (5)$$

$$OL_{Low} = \alpha + \eta \quad (6)$$

$$OL_{High} = \alpha + \eta + \varsigma + \delta \quad (7)$$

Where NO_{Low} represents the industry set that is not subject to occupational licensing in the low-cost state. $NOL_{High,}$ OL_{Low}, OL_{High}, are the industry set that is not subject to occupational licensing in the high-cost state, the industry set subject to occupational licensing in the low-cost state, and the industry set subject to occupational licensing in the high cost state, respectively. Which means, to elicit the coefficient of interest, the DD estimate must be structured as follows:

$$DD_{est} = (OL_{High} - OL_{Low}) - (NOL_{High} - NOL_{Low}) = \delta \quad (8)$$

The interpretation and inferencing based upon the moderate sample sizes for each of these four groups is straight forward and is easily testable for robustness to various group and state variances in the regression framework.

5. Empirical Results

5.1 Firm Entry

Figure 4 depicts a histogram showing the density of firms within 10 kilometers of all shared state borders, with the low-cost state on the left and high-cost state on the right. The cost represented is the number of calendar days required to complete education and experience

training. These days required are often translated as a cost to firms in terms of higher wages, payments for classes, and lost revenue. There appears to be a substantial increase in the density of firms within a few kilometers inside the border of the low-cost state.

I use a Density Manipulation Test (DMT) to formally test if the changes in the density of firms over the low- and high-cost states are not random in nature. Table 11 presents the manipulation test statistics for various buffer zone sizes. I find that we are able to reject the null hypothesis that no discontinuities exist in the density of firms at the state cutoff with significant confidence. For example, the robust bias-corrected test statistic, using a polynomial of degree 1, a triangular kernel, and jack-knifed standard errors for the 10-kilometer buffer zone is -7.0679 and the p-value is 0.0000. These selections of kernel shape and standard error clustering are default procedures in the literature. I also perform the DMT limited to firms within 5- and 2.5-kilometers of state boundaries and find no difference in significance or direction. The magnitude, direction, and significance for these results are consistent using a polynomial of order 2. Since it cannot be determined that these firm density patterns are arbitrarily assigned, I then analyze how differences in occupational licensing costs over state lines influences the probability of firm entry onto specific sides of the border.

Table 5 presents the results of the four logistical regression model specifications, which measures the marginal effects of independent variable changes on the probability of a firm entering on Side 2 of a pair of bordered states. The assignment of Side 1 and Side 2 is discussed in the methodology section. This table only considers firms located within 10-kilometers of state borders, since they have similar geographic, consumer, and natural resource features at this distance.

Column (1) represents the simplest estimation, containing only the marginal effects of the two main variables of interest on the probability of a new firm entering from Side 2 of the market. I find a negative and statistically significant coefficient of -0.0003 for the cross-differenced days required. This means that for every 33 additional days required for education and experience training on Side 2 of the border relative to Side 1, there is a 1% decrease in the probability that a new firm will enter into the state with the more expensive occupational licensing costs. Though a 1% decrease seems small in size, there are 20,993 firms located within 10-kilometers of a state border, so a 1 percentage point decrease in the probability of electing to start a business in a state relative to the adjacent state can potentially affect hundreds of businesses and millions of dollars of tax revenue. This could lead to substantial losses in state tax revenue. I also find a significant negative coefficient estimate of -0.6617 for the indicator if the average fees are greater than $100 from the border pair, which implies that if a state has substantially higher fees than the bordering states firms are less likely to enter on that side.

Since the firms are observed over a geographic longitude and latitude space Column (2) clusters the standard errors in bins of distance from the state border and finds almost identical trends in terms of magnitude and direction, though the marginal effect for the cross-differenced days required and average fees. Column (3) includes a variety of cross-border differenced control variables. Column (4) includes a variety of firm-specific variables regarding business structure. The direction, and significance of the marginal effect of the cross-difference days required on firm entry probability are consistent, though the magnitude of the coefficient estimate is smaller at -0.0001. When controlling for additional cross-border attributes, the magnitude of the coefficient estimate for cross-difference average fees becomes much smaller, ranging from -0.0154 to -0.0149. This shows that a border side having average monetary fees greater than their

adjacent state by over $100 is associated with a 1.49% decrease in the likelihood a firm will enter the market there.

Table 6 considers firms located with a 5-kilometer buffer zone of a state border, and Table 7 likewise conducts a similar analysis at a 2.5-kilometer buffer. Table 6 shows the marginal effects of an additional day in the cross-difference between the two sides of the border being correlated with a -0.0005 change in the probability of locating on Side 2 of the border in the basic model and -0.0001 in the most restrictive model with clustered errors, firm-specific variables, and cross-border controls. These effects are larger than at the 10-kilometer buffer zone, which supports the argument that these influences may be larger on the probability of entry for firms located closer to adjacent states. Within Table 7, I continue to find evidence of this negative and statistically significant trend of days required on the probability of firm location entry decisions. I also find significant negative coefficient estimates for average fees, ranging from -0.6037 in the base model and -0.0180 in the most restrictive model. It is important to note though that the magnitude of these probability changes is not consistent for all industries.

Table 8 explores potential differences in the correlation of occupational licensing costs and firm entry for various major industry classifications within a 10-kilometer buffer zone. These models are structured with the same control variable set at Model (3) in Tables 5-7. I find negative and significant marginal effects of additional days required on Side 2 relative to Side 1 for all industries. The correlations vary in magnitude from -0.0001 for most industries, to -0.0002 for Construction, Manufacturing, and Wholesale Distribution. These industries with the larger coefficient estimate tend to be labor intensive and are associated with more well-known occupational license requirements. The average fees variable is also significant and negative across all specifications, and ranges in magnitude from -0.0105 to -0.0267. Tables 9 and 10

repeat these industry specific models for the 5- and 2.5-kilometer border zones, respectively. These additional specifications maintain similar results in terms of magnitude, significance, and direction.

Since the data is cross-sectional the results presented are meant only to be correlative, rather than make any causal claims. I find, using the DMT, that these firm location patterns around state borders are not arbitrary, and instead manipulated by entrants. Using a series of logistic regressions, I determine that there are significant negative marginal effects for both extra days required and a cross-border difference in monetary fees of greater than $100 in the firm entry decision for Side 2. This means that when a state becomes more expensive relative to their adjacent state, firms are less likely to locate on the more expensive side of the border. These effects differ by industry and have larger magnitudes of marginal effects for firms in labor-intensive industries.

5.2 Firm Employment

In addition to firm entry decisions, I am also concerned with the employment practices of firms. For example, it would make little empirical difference if we had twice the number of firms, but those firms only had half the number of employees each. Therefore, both parts of the system must be analyzed. I use a Geographic Regression Discontinuity Design (GRDD) to determine if there is a systematic difference in average employment near state borders between high- and low-cost states. This model is conducted with the assumption that when considering areas within small buffer zones around state borders that both sides of the border have similar populations of potential workers regarding density, education, and output quality. I also make the assumption that since these firms near state borders often make up a very small fraction of the total firms within a state, that they are not endogenously driving current occupational cost

decisions at the state level. I believe these assumptions to be appropriate for considering the average number of workers per firm within small bins of distance on either side of the border, which abstracts away from the density of firms and employees.

Tables 12, 13, and 14 present the GRDD point estimates of the difference in employment trends at the border, when approaching over physical distance from the low-cost state on the left, and from the high-cost state on the right. Table 12 shows the estimates at the 10-kilometer buffer zone. Column (1) is the basic GRDD point estimation for linear functions using a triangular kernel structure, bin width determined by minimizing the mean squared error, and standard errors clustered along the running variable. The running variable in geographic regression discontinuity design framework is distance in the longitude and latitude space. Column (2) clusters the standard errors by the nearest neighbors along the running variable, by state. Column (3) allows for the non-linearity of the regressions on either side of the border by allowing polynomials of degree order 2. When analyzing changes in the average employee at 10-kilometers of distance, I find small and insignificant differences between the predicted border point estimates.

Table 13 limits the GRDD model to firms within a 5-kilometer buffer zone around the shared state borders. This specification may be more appropriate when analyzing border differences in average employment because occupational licensing cost effects may be larger for firms with less distance to an adjacent state. As with the 10-kilometer buffer, Column (1) presents the base specification, Column (2) clusters the standard errors by the nearest neighbor along the running variable by state, and Column (3) allows for non-linearity of the regressions by allowing for higher order polynomials. In this specification I find that all models for the 5-kilometer border have significant, and negative, point estimation differences at the state border.

The point estimation in the base model is -2.3421, indicating that there are approximately 2.3 fewer employees at a firm in the high-cost states relative to the low-cost states at the discontinuity. I likewise find a point estimation of -2.2896 in Column (2) and -2.4453 in Column (3). These results indicate that there are substantial firm average employment differences when considering firms within 5-kilometers of the state border.

The models are repeated for a 2.5-kilometer buffer zone in Table 14. I find similar negative regression discontinuity point estimations, though not significant in Column (3) when allowing for non-linearity of the regressions. Using this model and the limiting assumptions on the employee populations, there are potential concerns that these observations may be biased or influenced by other policies. To provide additional insight into the determinants of these employment differences, I conduct a comparative analysis on pairs of related industries who differ in their occupational licensing requirements. These industry pairs are described in Section 3.3. I conduct a series of Non-Temporal Difference-in-Difference (DD) models to compare licensed and unlicensed industries over state borders. The purpose of this analysis in conjunction with the GRDD is to determine if there are substantial differences in how licensed versus unlicensed firms differ in employment across high- and low-cost states.

Table 15 conducts the DD analysis for all firms found across the six matched industry pairs. The models for the six different match types are presented in Tables 16 – 21. These results present three model specifications at the 20-, 10-, 5-, and 2.5-kilometer buffer zones. High Side and Licensed Industry represent indicator variables equal to 1 if the firm is located on the costlier side of the border pair and if they are part of a generally licensed industry, respectively. These coefficients do not provide much analytical insight, as they just account for differences within the industry and firm pair subsets. The variable of interest is the interaction term (H*OL), which

is equal to 1 if the firm is both located on the costly side of the border and is a licensed industry, and 0 otherwise.

Model Specifications (1) in Table 15 represents the baseline specification where only the three variables of interest are regressed against the number of individuals a firm has employed. Within this specification 'high side' is determined by whichever side of the border has a longer amount of days required. Column (2) is the same specification but the standard errors are clustered over bins of distance, as is common practice with geographic models in the longitude-latitude space. Column (3) also includes additional cross-differenced control variables.

I find that for the total firm model in Table 15 that the interaction term (H*OL) is consistently negative for all specifications and buffer zone distances. This coefficient represents a negative effect on firm employment for licensed firms in high costs states that is not accounted for by differences in the border sides or differences between industries. Though the interaction term is not always significant, this may be due to an imprecise selection of controls. It is important to observe that the magnitude of this interaction effect in the total firms case is larger when considering firms in smaller buffer zones, in all specifications. For example, the most restrictive model presented in Column (3) has a negative interaction coefficient of -1.8648 when considering all firms within 20-kilometers of a state border. This means that licensed firms in high cost states typically have 1.9 fewer employees, even when accounting for industry and border differences. When considering only firms within 10-kilometers of the state border this interaction term increases in magnitude to -1.5785 and increases further to -3.9741 and -3.8537 for firms located within 5- and 2.5-kilometers of a state border, respectively.

The DD analysis is also conducted for the six match type pairs individually. These matches are pairs of industries that conduct similar functions within the economy but differ in

that one is often subject to occupational licensing for their workers while the other is not. Though these pairs of industries are similar, they are not perfect substitutes for one another and the analysis is meant to evaluate the validity of a possible interaction but not to make exhaustive causal claims. Table 16 compares the differences over borders for transportation industries, Match Type (1), with the licensed industry being Taxi Services (NAICS 485310) and the unlicensed industry being Other Transit and Ground Passenger Transit (NAICS 485999). When conducting the regression for this pair we find consistent, yet insignificant, interaction effects at 20-, 5-, and 2.5 kilometers. These effects become larger when analyzing subsets of firms closer to the border. These results, while they are not perfect specifications, support the possibility that there is an additional negative effect on employment for firms who are often subject to occupational licensing in high cost states. In Table 17 I find similar negative interaction terms for Match Type (2), Architecture and Design, that are also increasing in magnitude at smaller buffer sizes. Table 18, Match Type (3), comparing Building Repair industries has a negative coefficient at 20- and 10-kilometers, which becomes positive at 5 kilometers, and then negative again at the 2.5 kilometer buffer zone.

Table 19, Match Type (4), Healthcare Assistance, is the one subset group which does not exhibit these negative coefficients. Instead it finds a positive interaction term for typically licensed firms on the side of the border where employees lose more days of work to education and experience training. It is unknown if this feature is exclusive to the healthcare assistance industries, which may have greater benefits to continuing education requirements for employees than other industries, possibly due to fast pace changes in medical research. Table 20, Match Type (5), comparing Landscaping Industries and Table 21 Match Type (6), Lending, both exhibit

a negative coefficient on employment for being a licensed industry firm in a costlier state relative to the adjacent state.

The DD models provide support that, though it is not perfectly specified or significant, there exists a potential negative effect on employment for licensed industries in states with a high cost of days required of education and experience training relative to an adjacent state. This relationship persists, even when accounting for differences in the states and changes in employment for unlicensed industries. This result is reinforced by the GRDD point estimations of the average employee difference for the 10-, 5-, and 2.5-kilometer buffer zones. In summary, I find evidence of a negative impact on firm employment in high-cost states relative to adjacent low-cost states for firms near state borders.

6. Conclusion

In this study I analyze how occupational licensing costs impact firm entry and employment decisions near state borders. Although, there has been significant research on product quality and consumer behavior in response to occupational licensing costs, no studies to my knowledge have attempted to determine how these costs affect firms in the latitudinal and longitudinal space over adjacent states. My improved web scraped data set of specific firm location information allows regression models to be conducted at finer levels of geography. With this sample, I am able to predict both changes to probability of firm entry location as well as changes in average firm employment.

I find that increasing the days required for education and experience training relative to an adjacent state or having average monetary fees greater than the adjacent state by over $100 is correlated with a decrease in the probability of a firm entering the market on that side of the state

border. These changes in probability are larger for labor-intensive and heavily regulated industries such as Construction, Manufacturing, and Wholesale Distribution.

I find that when considering firms within a 5- or 2.5-kilometer buffer zone around a shared state boundary that there is a negative discontinuity point estimation between the low-cost and high-cost states in average firm employment. Meaning that there is a significant difference in the expected average number of employees at the state border between low- and high-cost state pairs, and that high cost states have less expected employees than low cost states. To substantiate the validity of these observations, I compare the average firm employment of pairs of similar licensed and unlicensed industries over state borders. I observe a negative effect in the interaction of being a licensed industry and residing in a high-cost state on the number of employees a firm has on their payroll, that is not accounted for through other channels.

These findings have several implications for policy makers. With a growing percentage of the U.S. workforce requiring an occupational license, understanding the implications of these policies on firm outcomes are crucial for fostering business and economic growth. My results suggest that states can attract new businesses and improve overall employment through small changes in cost requirements for occupational licenses relative to adjacent states, which can lead to increases in local and state tax revenue. While my findings have limitations due to the cross-sectional nature of the data, this study serves as an exploratory introduction into to the influence of occupational licensing costs on firms.

Chapter 2: Gender Bias within African Entrepreneurial Finance

1. Introduction

According to the 2015 World Bank Report, 10% of the world's population lives on less than $1.90 a day. Over half of these impoverished individuals live in Africa. To promote long-term economic growth, a crucial factor can be a society's propensity to incorporate new firms and jobs through entrepreneurship. The ability to succeed in entrepreneurial ventures is often dependent on the entrepreneur's access to initial financial capital, which is markedly difficult for women in countries throughout Africa. Women reported facing substantially higher barriers to entry, higher interest rates, and lack of local project support due to their gender. This paper seeks to analyze potential evidence of gender related biases in equity, debt, and philanthropic contribution financing practices and provide policy recommendations for improving female access to start-up funding for entrepreneurial ventures in Africa.

Entrepreneurship has been identified as a critical component for explaining wealth concentration and introducing social mobility into a society (Quadrini 2000). In developing countries, entrepreneurship often serves a means of job creation, reducing income inequality, and contributing to economic growth (Ayyagari et al. 2014; Desai et al. 2013; Acs and Szerb 2007; Kimhi 2010). Though entrepreneurship has predominantly been a male dominated activity, female entrepreneurship is becoming increasingly more prevalent and recognized for its important impact (De Vita et al. 2014). Unfortunately, research of female African entrepreneurship has not been forthcoming due to data constraints. Though there are studies that find evidence of a gender bias in lending practices and difficulties in the process of developing female-led businesses, these studies are often limited to late-stage or established firms, small sample sizes, case studies, or only one geographic region.

The purpose of this study is to investigate potential gender bias in access to financial sources for early-stage African entrepreneurs. Using data from 2,812 entrepreneurs collected through the Entrepreneur Database Program at Emory University, I estimate the effects of gender on the initial decision to fund a project and the magnitude of funding received once a decision has been made to fund a project through the use of equity, debt, or philanthropic contribution financing. First, I estimate gender bias in the probability of being approved for funding. I then estimate the effect of gender differences in the amount of funding an approved project receives utilizing ordinary least squares. There is concern about a potential bias in how entrepreneurial projects are chosen for funding which may result in the women selected for funding being higher in the performance distribution than their male counterparts. To account for this, I also estimate the effects of gender using a two-stage Heckman estimation to correct for potential selection bias. This empirical method allows for the effects of gender on the magnitude of project funding to be moderated by incorporating the estimated probability of getting funding to condition the amount of funding instead of conditioning on the biased selection, which extends the results to be represented of the full sample of entrepreneurs regardless of funding approval status.

This study utilizes new data, to overcome some limitations faced by previous researchers, provided through the Entrepreneurship Database Program at Emory University to develop one of the first cross-country analysis of the gender bias in financing trends for early-stage African entrepreneurs. This study provides crucial insight into the African financial environment which can guide public policy and financial aid initiatives encouraging economic growth and gender equality.

I find that early-stage African entrepreneurial firms with a female primary founder are less likely to receive equity and debt financing, even when utilizing a rich set of project and

industry controls. Not only are these female-led firms less likely to be funded but when approved, the amount of total finance provided tends to be smaller than similar male-led firms. Female-led entrepreneurial ventures also often face higher interest rates on loans and more restrictive loan repayment schedules. In contrast, I do not find evidence of a gender bias in the access or amount of philanthropic contribution funding for early-stage entrepreneurial businesses with a female primary founder. When utilizing the Heckman Selection Model, to correct for potential bias in the initial financing decision, I find that there is a negative effect of having a female primary founder on the selection for equity financing but not the amount the venture attracts. Within debt financing I find significant and large negative effects of female entrepreneurship in the selection and the total amount of debt funding a firm acquires which are larger than in the individual estimations. Finally, similar to the individual estimations, the Heckman Selection Model fails to find evidence of a significant gender bias in philanthropic contribution funding.

The paper proceeds as follows: Section 2 provides an overview of the relevant literature. Section 3 provides details on the data used. Section 4 develops the utilized empirical models. Section 5 discusses the results of the models. Section 6 concludes and provides public policy recommendations.

2. Literature Review

Entrepreneurship is often defined as the activity of setting up a business or businesses and taking on financial risk in the expectation of a future return. These returns are typically in the form of expected profits but can also be social returns as well, where the firm has little to no financial profit motives. Using various data sources, Quadrini (2000) finds that entrepreneurship is critical for explaining wealth concentration and introducing social mobility. In developing

countries, small entrepreneurial firms have the largest share of job creation, highest sales and employment growth, and can be desirable for quickly rehabilitating conflict areas (Ayyagari et al. 2014; Desai et al. 2013). Therefore, focusing on policies that can reform the ease of doing business and limiting entry regulations is an important determinant in forecasting future growth in developing nations and economies (Acs and Szerb 2007). In African countries, primarily Ethiopia, Kimhi (2010) finds a uniform increase in entrepreneurial income reduces per capita household income inequality. This ability to utilize entrepreneurial ventures to stimulate growth also can serve as an avenue for gender equality. The Female Entrepreneurship Index (2015) finds that women who own and operate businesses significantly improve their economic welfare outcomes, and tend to be innovative, market expanding, and export-oriented which leads to overall economic growth at the country levels.

This study presents a comparison of gender bias in entrepreneurial financial access across six African nations: Ghana, Kenya, Nigeria, South Africa, Tanzania, and Uganda. These countries represent various geographic and government features but share commonalities in their political and economic growth history. These six countries were all under British Rule during the colonization period. South Africa was the first to gain independence from Britain in 1931. The other five nations gained their independence as sovereign nations between March 6th, 1957 and April 26th, 1964. In the early 1960's these countries tended to be poor, pre-capitalist, and the production sector was primarily comprised of peasant agriculture using low-levels of technology (Ndulu and O'Connell 1999).

Since the British parliament pulled out of Africa abruptly after India declared independence, a well-defined government structure had not been established for the transition. By the mid-1970s nearly every country in Africa had abandoned pluralistic political structures

for authoritarian regimes (only five countries maintained multi-party systems, but none of these are examined within this study). Bratton and van de Walle (1997) categorize the African nations into four political authoritarian structures: military oligarchies, plebiscitary one-party systems, competitive one-party systems, and settler oligarchies. By 1975, within the six countries of interest Ghana, Uganda, and Nigeria developed into Military Oligarchies; Kenya and Tanzania had developed competitive one-party systems (open elections, but the primary authoritarian candidate won on average 93% of the vote); and South Africa had become a settler oligarchy (transition to black majority had not yet occurred). Despite the similar backgrounds of these countries, growth patterns began to diverge in the late 1980s to early 1990s along political subsets as these authoritarian governments shifted towards democracy. Important macroeconomic differences that emerged include wealth-inequality, ease of doing business, compliance to taxation law, and other factors that may have an impact of entrepreneurship that need to be explored further to understand how policies in these areas are affecting small-business ventures (Ali, Fjeldstad, Sjursen 2014).

Unfortunately, research on African entrepreneurship has been subject to data related constraints. Due to the high cost of developing novel data, most studies are often limited to a single country or a prohibitively small sample size. Though there is a significant body of literature on entrepreneurial choice and motivations, this literature has primarily been developed using data for OECD nations and therefore is not appropriate for explaining entrepreneurial choice and growth implications in post-authoritarian developing countries. Tomnic and Rebernik (2007) find when studying small entrepreneurial ventures in post-communist Eastern European countries that there are a variety of differences in the motivations and impact factors of businesses in alternative political cultures. Benzing and Chu (2009) used a Likert-style

questionnaire to elicit the start-up motivations of entrepreneurs in Kenya, Ghana, and Nigeria. They find that the strongest motivator across countries for entering entrepreneurship was the opportunity to increase income. They also found that entrepreneurs in Ghana have a strong motivation for providing stability for family, and female entrepreneurs are less motivated to create a business as a legacy or for external validation reasons. These results imply that there may be an important need for country and gender related policies in Africa when trying to develop environments that foster entrepreneurial access and growth. These target impact areas can be utilized to determine if a business may be growth- or independence-oriented, which is useful in policy research because this understanding can allow for policies to be directed towards ventures that sustain long-term economic growth and development and not the ventures that are created as a means of supplementing income (Douglas 2013).

Though entrepreneurship has predominantly been a male dominated activity, the contributions of female entrepreneurship are becoming increasingly more prevalent and recognized (De Vita et al. 2014). As of 2010, approximately 42% of entrepreneurs world-wide were women and that number is steadily increasing (Kelley et al. 2010). Despite this, female entrepreneurs in Africa are often subject to disadvantages and cultural bias due to gender differences. Witbooi and Ukpere (2011) find that in South Africa, though women represent 52% of the population, they still suffer from historical and cultural prejudice in accessing opportunities. This can have negative effects on female entrepreneurial aspirations in terms of employment growth, even if their entry into entrepreneurship and self-employment is not directly affected (Acs et al. 2008). Likewise, a decomposition by Bonte and Piegeler (2013) find women are less competitively inclined than men and are less willing to take risks, and that these

differences in risk preferences contribute significantly to the gender gap in latent and nascent entrepreneurship.

Bardasi et al. (2011) find that in sub-Saharan Africa there are significant gender gaps between male- and female-owned companies in terms of firm size and aspirations, but much smaller gaps in terms of firm efficiency and growth. Some researchers have attempted to explain this phenomenon through analysis of cultural norms. A study on female entrepreneurship in Kenya found that ethnic cultural influences play a large role in women's propensity towards entrepreneurship but found little evidence of localized community perception bias (Mungai & Ogot 2012).

Entrepreneurship serves as a source of economic empowerment for some African women. Female entrepreneurship participation is not only useful for personal development but has substantial impacts on the macroeconomic indices of their respective countries. Langevang and Gouch (2012) find that in sub-Saharan Africa shrinking public sectors and limited opportunity for formal employment in the private sector has led to an increase in youth selection into entrepreneurship. Similarly, Dzisi (2008) finds, through a survey of female entrepreneurs in Ghana, that through their entrepreneurial activity women were able to make substantial contributions to the economic growth of Ghana in terms of job creation, innovation, reduced poverty, and reduced unemployment rates. In a similar perspective, it can also be thought that growth-oriented firms are more likely to be invention based (Bettignies 2008). Robson et al. (2009) finds in a similar analysis of Ghana entrepreneurship, that the extent of the innovation improvements is related to firm size and education of the entrepreneur, which identifies the importance of providing access to capital and education resources for female entrepreneurs. Despite the measured improvements in macroeconomic factors, there is still a prevalent

productivity gap between firms with female versus male participation in ownership and decision making (Aterido and Hallward-Driemeier 2011).

One of the reasons why we see a gap in the productivity or firm size of female-led entrepreneurial ventures could be a lack of access to capital resources. Though there have been previous studies of external factors and their influence on business development in Africa, the external environment is considered to be necessary but not sufficient for understanding or sustaining changes in entrepreneurial competencies and performance (Kiggundu 2002; Shane et al. 2003). Witbooi and Ukpere (2011) find presence of a gender gap between men and women in the access to financial services in South Africa that is often related to cultural or historical prejudice. There is evidence of these gender biases in finance existing regardless of project quality or long-term profitability measures (Hanson 2009). Chamlou (2008) finds that there is little difference between male and female-owned firms in North Africa, even if the cultural commonly held perception is that female led businesses are small and informal. They find that female owned firms in North Africa are well-established, productive, and just as connected to global markets as male-owned firms in the same region.

Equity is one form of capital attainment for entrepreneurs. Equity can come from a variety of sources; including self-financing, angel investors, companies, government, venture capital, etc. Equity investment within the African continent is limited, and female founders often have a difficult time attracting outside investments. This trend seems counterintuitive because founding teams that include women are also more likely to hire employees within the first year, and to have earned prior revenues, which is a relationship that needs to be explored to understand gender diversity of African entrepreneurial ventures. Within the choice between equity investment, entrepreneurs must make decisions on types and amounts of equity investment they

need to start their ventures and to facilitate growth (Bettignies 2008). Other forms of financing utilized by some early-stage ventures include debt and philanthropic contributions. An interesting relationship for African firms that differs from many developed nations is there can be additional struggles to obtaining bank loans, and there are many non-government institutions that provide financial assistance to start-ups (Ali, Fjeldstad, Sjursen 2014). This study adds to the current literature by quantifying and understanding the relationship between early-stage African entrepreneurial venture finance and gender.

3. Data Description

3.1 Entrepreneurship Database Program at Emory University

Data on early-stage entrepreneurial ventures was acquired through the Entrepreneurship Database Program at Emory University (EDP). The EDP leverages relationships with accelerator programs around the globe and has collected application information on 13,496 early-stage entrepreneurs within 178 countries from 2013 to 2017. This unique dataset provides, to my knowledge, the largest currently available collection of cross-country observations of early-stage African entrepreneurial ventures, including information on financing, industry, firm performance, and firm founder characteristics.

These data were collected through a survey during the application process of an early-stage firm attempting to participate in an accelerator program, which often provides various types of business training. A second survey was conducted six months after the initial application process, regardless of whether the entrepreneurial firm was selected to work with an accelerator program. Though the firms applying for participation in programs within accelerator programs may not be representative of the entire population of entrepreneurs, they are an important focus for policy recommendations as these are often some of the highest performance and social

impact firms within communities; and understanding how to provide a hospitable environment for these types of firms is important for overall economic growth.

Within the EDP, there are firm-level observations for 2,812 firms operating in Ghana, Kenya, Nigeria, Tanzania, South Africa, and Uganda that I use within my analysis. Table 25 provides information on the number of observations and geographic location of each country. Table 28 provides founder gender statistics for the entrepreneurial businesses. 27.95% of the firms have a female primary founder, while 41.98% have at least one female founder. These firms are either a non-profit, for-profit, undecided, or other business classification. A breakdown of business classifications within my data set is provided in Table 23. Some of these firms have additional patents, copyrights, or trademarks which are shown in Table 24.

Entrepreneurs in these analyses can obtain funding from three different sources: equity, debt, or philanthropic contribution. Equity financing is a type of funding provided to a company with the expectation of some ownership or share in the future of the enterprise. Equity financing in my sample can be received from many different places including angel investors, other companies, government, venture capital, or other sources. Currently, 11.1% of the firms in my sample have some form of equity financing from sources other than the entrepreneur's personal funds. The mean amount of funds for a firm with equity financing is $20,852. Table 26 provides a breakdown of the equity sources utilized by firms within this survey.

The second type of financing that entrepreneurs can utilize is debt funding. These are funds which have an expectation of repayment in the future. These are provided through formal banking systems, non-bank institutions, governments, companies, family members, or other individuals. Table 27 provides a breakdown of the debt financing sources utilized by firms within this survey. Within this sample, 13.7% of the entrepreneurs have some form of debt

financing, with a mean of $25,340. The final type of funding option is philanthropic contribution financing. This is obtained from a charity, foundation, grant, gift, or some other form of social enterprise finance. Philanthropic contributions are the most heavily utilized source of start-up capital with 29.2% of the entrepreneurs in the sample using this form of financing. The mean amount of philanthropic contribution funding is $24,204.

3.2 Macroeconomic Indices

Early-stage venture environments are not only determined by demographic attributes; but can also be influenced by external macroeconomic factors such as policies, socioeconomic dynamics, or local cultural norms. These factors need to be accounted for when comparing entrepreneurial access to finances across countries. Table 29 provides summary statistics for many of the macroeconomic indices that will be considered in the analyses. These statistics were acquired through the World Bank and include information such as country, population, GDP per capita, the percentage of the population that lives in urban areas, GINI coefficients, Human Development Index (HDI), and the Ease of Doing Business (EDB).

As shown in Table 29, these countries are similar in their development scores but have a wide variety of levels of inequality. South Africa, considered by the World Bank to be the most developed of the African countries being considered, maintains the highest GINI coefficient at 0.631, while Ghana and Tanzania have much lower levels of income inequality. All the countries in my sample have over half of their population living in urban areas, except for Uganda and Tanzania (both of these countries do also have large nomadic groups of indigenous people). The GDP per capita is highest in South Africa and lowest in Uganda. The GDP per capita in all of the countries within this sample are less than $6,000 annual in 2015 USD.

4. Empirical Methodology

The financing process has two points where gender bias may be introduced: 1. at the initial decision to grant funding to an entrepreneur; and 2. within the decision of the amount of funding to provide. Since there are two points of potential gender bias in the finance decision, I first individually estimate the gender bias of these two points. I then utilize a two-stage Heckman Selection Model to account for selection bias to estimate the effects on the total funding amount. Finally, I compare the individual estimation and Heckman Selection Model to identify the range of possible funding bias.

4.1 Individual Estimations

To identify potential gender bias in African entrepreneurial finance I separately estimate the probability of an entrepreneur being approved for funding and the effect of characteristics on the amount of funding. To determine the probability of being approved for funding, I utilize a probit regression model for each of the three main categories of financing: equity, debt, and philanthropic contributions. This model determines if key characteristics affect the probability that an entrepreneurial venture gains access to funding. Using an Ordinary Least Squares (OLS) regression, I identify key characteristics determining the amount of funding a firm receives.

4.1.1 Approval

The following probit model is used to estimate the probability that a firm is approved for access to a funding source:

$$Approval_{ict} = \alpha_0 + \alpha_1 Gender_i + \alpha_2 Age_i + \alpha_3 Age_i^2 + \lambda X_i + \mu_c + \gamma_t + \varepsilon_{ict} \quad (1)$$

Where $Approval_{ict}$ is a binary variable equal to 1 if an entrepreneurial firm received funding from a given source, and 0 otherwise. $Gender_i$ is a binary variable equal to 1 if the firm's primary founder is female. Age_i and Age_i^2 represent age and age squared of the founder, respectively. X_i is a vector of additional characteristics of the firm and its primary founder such as education,

experience, industry, profit goals, profit margins, and presence of full-time and part-time employees. μ_c contains country fixed effects and macroeconomic indices. γ_t are application year fixed effects.

4.1.2 Funding Amount

The following regression estimates the relation between firm characteristics and the amount of funds granted to firms. It is important to note that the following regression is only for the sample of entrepreneurs who received funding and does not account for attributes of firms who were not selected. The following presents the structure of the OLS model:

$$Fund_{ict} = \beta_0 + \beta_1 Gender_i + \beta_2 Age_i + \beta_3 Age_i^2 + \lambda X_i + \upsilon_c + \gamma_t + \varepsilon_{ict} \quad (2)$$

Where $Funds_{ict}$ equals the log of the total amount of funds a firm received. All other variables are the same as the previous model.

The probit and OLS models in conjunction provide an analytical insight into the influences and gender bias in the access and magnitude of entrepreneurial finance. For the funding estimation to be true it requires the strong assumption that the selection of entrepreneurs across genders has similar performance distributions. Since I am concerned about possible gender bias in the selection process of entrepreneurial financial access it may not be the case that the funded female entrepreneurs are selected using similar criteria to their male entrepreneur counterparts. If only the top female entrepreneurs are selected the estimated results may not be applicable to all entrepreneurs. To address this concern is why I also utilize a Heckman Selection Model.

4.2 Heckman Selection Model

The Heckman Selection Model estimates the underlying relation of the firm characteristics and funding amount in the absence of a selection bias. The possible selection bias

is that due to harsher cutoffs for funding decisions for females there is a possibility that only the better performing females may be selected. This reduces the magnitude of the individual funding difference between genders that we observe within the total funding amount of all firms. The Heckman Selection Model considers the attributes of all entrepreneurs, regardless of if they are selected for funding, to determine how characteristics affect the total amount of funding awarded without the presence of bias.

The Heckman Selection Model is conducted by first determining the probability of being selected, and then using information provided from the first stage to predict how the characteristics affect the total amount of funding in the second stage. A key difference between estimating the two decisions individually as above and in this two-stage procedure is the inclusion of an additional variable that only predicts magnitude of funding through predicting selection probability, commonly called an exclusion variable. This exclusion variable will only be included in the first stage of the Heckman Selection Model. Each of the funding categories have different aspects of their market that are predictive of selection, but not funding. To make the exclusion variables I took the mean of the characteristics appearing in the pool of funding applicants to represent the level of competition faced by the applicant for receiving funding. Since each type of funding has different economic determinants, these mean characteristics differ by funding type. For equity the exclusion variable is the mean number of other applicants holding patents, for debt it is the mean number of other applicants holding trademarks, and finally for philanthropic contributions the exclusion variable is the mean age of the other applicants.

The first-stage of the Heckman Selection Model is visually similar to the probit model detailed above in equation (1). Unlike the above probit regression, I am estimating the latent propensity of being selected for funding, Approval*$_{ict}$.

$$Approval^*_{ict} = \alpha_0 + \alpha_1 Gender_i + \alpha_2 Age_i + \alpha_3 Age_i^2 + \eta + \lambda X_i + \mu_c + \gamma_t + \varepsilon_{ict} \quad (3)$$

Where most of the characteristics are defined the same as in equation (1), there is now the additional exclusion variable η, as discussed above. The observed realization of $Approval_{ict}^*$ is a binary variable representing that the applicant received funding and is observed with a positive amount of funding.

The second stage involves estimating the magnitude of funding conditional on being funded. $Approval = 1$ if $Approval^* \geq 0$, and 0 otherwise. Equation (3) is estimated using a probit regression and the inverse mills ratio is generated. The second stage includes the inverse mills ratio as an additional regressor within an OLS regression model. Equation (2) is then modified to the following:

$$Fund^*_{ict}|Approval =$$

$$\beta_0 + \beta_1 Gender_i + \beta_2 IMR_i + \beta_3 Age_i + \beta_4 Age_i^2 + \lambda X_i + \upsilon_c + \gamma_t + \varepsilon_{ict} \quad (4)$$

Where IMR_i is the inverse mills ratio, which accounts for the correlations of errors in equations (1) and (3). From this specification, we can determine if factors that make selection less likely, in this case having an entrepreneurial venture with a female primary founder, are associated with a difference in the magnitude of funds received from a financing source. If these results are identical to the previous method, then there is no selection differences present based on a gender bias. If the results are different, then they present a complimentary range of the effects of the gender of the primary founder on the amount of funding.

5. Empirical Results

5.1 Individual Estimations

Tables 30, 31, and 32 present the probit estimates for equity, debt, and philanthropic contribution financing, respectively. Each table represents the probability of a firm being selected for that type of funding. Column (1) presents the least restrictive specification which accounts for only founder gender and age. Column (2) also controls for founder education and experience. Column (3) is the most restrictive model and further includes founder profit goals and social motivations, as well as service or product information.

Across all equity and debt specifications there is a statistically significant negative effect on funding probability of having a female primary founder. This association ranges from a 28.90% to a 23.33% reduction in the probability for equity and a 14.34% to 16.15% decrease for debt funding. For equity, there is a negative association of an additional year of age, though this association is positive in the squared term which implies that this decrease happens at an increasing rate at higher ages within the range of ages present within the dataset. However, for debt, I find a positive effect of age on the probability of funding, which is expected since credit worthiness and history often increase with age. The squared term implies that this increase in the probability of receiving funding at older ages does decrease marginally over time within the range of ages in this dataset. In the third specification, I also find that the probability of receiving equity or debt funding increases if the firm has established profit goals or is holding a legal trademark. For equity the probability of funding also increases if the product is invention based, and the firm holds patents.

The most commonly utilized external source of funding by African entrepreneurial ventures are philanthropic contributions, which also ostensibly have a different selection

decision. They have the highest approval rates for applicants, and many contributors purposefully promote fairness in their funding choices. There is no significant effect of having a female primary founder of the entrepreneurial venture, but it is interesting that, unlike equity and debt financing, the estimated effect is positive. Age also has no significant effect, though the estimates imply that the funding probability may be lower for older entrepreneurs.

Bias may not only exist in the initial funding decision, but in the amount of funding that is provided to a firm. Tables 33, 34, and 35 present the results for the OLS regressions on the logged amount of equity, debt, and philanthropic contribution funding, respectively. This analysis only includes firms that were approved for and received a positive amount of funding. The three specifications control for firm and founder characteristics in the same way as the above probit models. For equity financing specifications (2) and (3), I find a large and negative effect of having a female primary founder on the magnitude of equity funding. This negative effect is present and significant for all debt specifications. In conjunction with the probit regression, this implies that there is some amount of negative effect of having a female founder on both the ability to gain funding and the amount of funding received even when accounting for differences in profit goals, experience, education, and attributes of the good or service. For both equity and debt, I find a positive effect of age on the magnitude of funding, though the squared term for equity implies that this increase is at a decreasing rate in higher ages. The equity results are counter to the selection estimation while both of the debt results are in line with each other in terms of the effect of age. For equity this implies that an older founder may decrease the probability of receiving funding, but older primary founders attract larger amounts if funding is received. There is also a significant and large increase in the magnitude of received funding for firms with established profit goals, and a large negative decrease in the magnitude of funds

received by firms with socially motivated projects. There are no other statistically significant predictors for debt funding magnitudes. However, the effect is negative for invention-based firms, and those with patents or copyrights. This may signal reluctance of debt financing sources to fund untested products. Which is different from equity financers who often prefer new products and services.

There does not appear to be a significant effect of founder gender on the philanthropic contribution magnitude. Even though the gender effects are not significant, they are positive implying there may be some active decision to give larger amounts of funding to female led companies. There exists a positive correlation between age and funding amount received, though the squared term implies that this positive effect lessens for older founders. There also appears to be a slight, yet significant, relation between the funding amounts and the founder having previous for-profit work experience. There also is a positive and significant effect of having trademarked brands, products, or services.

5.2 Heckman Selection Model

The potential issue with the two individual estimations is that selection bias in the initial financing decision may cause the pool of funded female applicants to be unrepresentative of the total pool of female applicants. Selection bias could cause the associations between founder characteristics with funding magnitude to be inaccurate or misleading. To address this concern, I utilize a two-stage Heckman Selection Model. This model allows for information regarding the entire pool of applicants and the selection decision to be considered when analyzing the amount of funding, rather than just those funded. In the models, the first stage representing the initial selection decision requires the inclusion of an additional variable that is not included in the magnitude estimation, this additional variable is referred to as an exclusion restriction. Since the

decision for each funding type is different, the exclusion restrictions are also different. For equity, the exclusion restriction is the percent of applicants within the same country, application year, and industry that hold a patent. For debt, it is the percent of applicants within the same country, application year, and industry that hold a trademark. Lastly, for philanthropy, it is the average age of the other applicants in the same country, application year, and industry.

The Heckman Selection model results are reported in Tables 36, 37, and 38. Columns (1), (2), and (3) are specified as above except that I remove patents, copyrights, and trademarks from specification (3). For all three funding sources, the exclusion restriction is a highly significant predictor of the selection decision, though occasionally is weaker in the third specification. I find that equity funding magnitudes are not significantly related with founder gender and that the effects are much smaller than they were in the prior estimations. For debt, a female founder still has a significant negative relation ranging from -0.833 to -0.9643 which is larger than the above results. Age has a significant, positive effect on the amount of equity and debt funding a firm receives, with estimates for equity ranging from 0.1753 to 0.2415. In the third specification, there is also a strong, negative effect of having social motives on the amount of equity funding a firm receives. There is a weak positive effect of for-profit work experience on debt funding magnitudes, and a weakly negative effect of not-for-profit work experience. The equity results indicate that gender related bias is present in the initial financing decision, but not in the amount of funding a firm acquires once it has been selected. While the Heckman results for debt support there is gender bias in both decisions and that the total funding bias was masked by the selection bias previously.

I find that having a female primary founder is associated with an insignificant positive effect on the amount of philanthropic contribution funding a firm is provided, even after

correcting for potential selection bias in projects. The only variable that makes a sizable and significant difference in the amount of funding is the age of the firm founder. These results suggest that philanthropic contribution financing may not incur a gender bias in either the initial financing decision or the subsequent decision over the amount of philanthropic contribution funding.

6. Discussion and Conclusion

This paper seeks to investigate potential gender biases in the access to financial sources for early-stage African entrepreneurs. I do this by applying two analytical techniques to data from the Entrepreneurship Database Project at Emory University. The first analytical technique is to individually estimate the two possible biased decisions of a firm being selected for funding utilizing a probit regression and the amount of funding that the selected firm receives using an OLS model. Since I am concerned about potential selection bias the second technique, I utilize a two-stage Heckman Selection Model which allows the effects on the amount of funding to consider attributes of the entire set of entrepreneurs and not just the ones selected for funding.

These models are conducted for the selection and total amount of funding decisions for three different types of funding sources: equity, debt, and philanthropic contributions. For equity funding, I find, in the individual estimation, evidence of there being a significant negative effect of a female primary founder on both the probability of receiving funding and on the total amount of funding. After incorporating corrections for possible selection bias using the Heckman Selection Model, I find there is consistent evidence of a sizable negative effect of having a female primary founder on the probability of being selected for funding, but that gender is not a significant determinant of the amount of equity funding a firm receives after selection and that estimations of this effect are smaller than in the individual estimations. Within debt financing

decisions I first find evidence from the individual estimations that there is a negative effect of having a female primary founder on both the selection procedure and the amount of money provided to the entrepreneurial firm. After correcting for the initial potential bias, I find evidence that gender is a significant determinant in both the probability of being selected for funding and in the total amount of debt funding a firm receives. These estimations are much larger in the Heckman Selection Model than in the individual estimations. Finally, in the philanthropic contribution selection and awarded amount decisions there appears to be no significant gender effect in either the individual estimations or the Heckman Selection Model.

In response to these results, I believe there are important policy recommendations that can be made for African countries that are wanting to encourage female entrepreneurship with the intent of encouraging economic growth and prosperity. First, policy makers should seek to encourage policy that actively promotes equality in investment practices in both selection and investment decisions. This could involve incentive programs, networking and promotional support for female-led start-ups, or government programs requiring the initial equity financing decisions by public enterprises to be determined by project performance projections. Within debt lending practices, African policy makers can focus on policies which would encourage application decisions to be made on project quality instead of gender. These policies can include equal ability for women to hold property or other equity that can be used as collateral for a loan and policies which would require non-predatory interest rate lending based on gender. Finally, philanthropic contribution financing presents an interesting and unique option for encouraging equality in financing practices. Many philanthropic organizations prioritize making selection decisions based upon project impacts in the community and not on the gender of the entrepreneurial venture founder. Policies that would encourage more philanthropic contribution

financing options can provide a crucial means for access to start-up finance for women entrepreneurs.

This study does have some theoretical, empirical, and practical limitations that need to be addressed. First, the data collected by the Entrepreneurship Database Program at Emory University is collected on entrepreneurs who have ever applied to participate in an accelerator program. Though this is the most extensive currently available dataset, to my knowledge, of early-stage African entrepreneurs it may not be representative of all existing entrepreneurs. This empirical analysis would also benefit from a wider variety of information on the distinct attributes of the entrepreneurs, ventures, and local communities. Since these are anonymized questionnaire responses, I am unable to contact the original participants to gather further information. Finally, future research into this area would be advised from these results to address potential selection bias in their assessment of entrepreneurial finance, especially where there are limited samples sizes.

Chapter 3: Unintended Consequences of BAPCPA: Small Business Entry and Exit Behavior

1. Introduction

The Bankruptcy Abuse Prevention and Consumer Protection Act of 2005 (BAPCPA), was implemented into The United States Bankruptcy Code fourteen years ago, since then, the needs of bankruptcy filers have drastically changed. Over this period average household debt has increased, the methods by which debt is accumulated has changed, and tens of thousands of filers that could benefit from bankruptcy are unable to afford the fees to start the filing process. In April of 2019, the nonpartisan American Bankruptcy Institute which consists of 13,000 judges, attorneys, and other professionals offered a 278-page report from the Commission on Consumer Bankruptcy to Congress regarding proposed changes for the consumer bankruptcy system to reflect these changing economic dynamics. In the wake of this proposed bankruptcy regulation overhaul, I aim to explore how the last amendment, BAPCPA, affected the entry and exit rates of small businesses in order to structure policy recommendations for potential future amendments in order to minimize deterrence of small business ownership.

The implementation of BAPCPA had many unexpected consequences such as instigating a rush on bankruptcy filings, practitioners electing away from specializing in bankruptcy law, and debtors having reduced access to unsecured debt with a higher risk of experiencing financial distress more than 10 years after filing (Borgo 2019; Bak et al. 2008; Eisler 2006; Han & Li 2011). One group that is often overlooked when analyzing consumer bankruptcy protection is small businesses. Approximately 11% of U.S. households have at least one self-employed individual and 17% of personal bankruptcy filings in the U.S. include some amount of business debt (White 2006; White 2011). Since most small businesses and self-employed individuals are

unincorporated, and therefore are not financially separate entities from their businesses, the ability to file for bankruptcy often serves as a form of wealth protection when there is market uncertainty (Lawless 2007, Lawless 2019). Understanding how BAPCPA has affected the entry and exit rates of small businesses will provide insight into the short-term effects of bankruptcy amendments.

The purpose of this paper is to determine if BAPCPA disproportionately affected the entry and exit rates of small businesses. To do this I compare the opening and closure rates of small versus large firms prior to the approval of BAPCPA and the years following BAPCPA's implementation using a Difference-in-Difference empirical approach. To determine the differences between states that already maintaining high and low personal homestead exemptions levels for consumer bankruptcy during the BAPCPA implementation, I employ a Triple-Difference method. All analyses are conducted for the sample of all firms, as well as by each major industry subsector.

This paper contributes to the current literature by furthering the understanding of how the implementation of BAPCPA affected the entry and exit behavior of firms by size and industry. In particular, examining individual entry and exit behavior by industries in this context, to my knowledge, has not currently been addressed in the literature. Doing so helps circumvent the generalities of the policy effect on all businesses which through aggregation may conceal key effects. This research also addresses the current debate on how differences in state-level homestead exemptions affect business reactions to bankruptcy policy shocks. In this paper, I intend to expand the knowledge regarding the effects of bankruptcy amendments to improve future policy changes to manage and minimize potential shocks of bankruptcy amendments on small businesses.

I find the implementation of BAPCPA decreased the percentage of all small firms entering the market relative to primarily unaffected large firms by between 4.91% and 5.11%. This relationship varies greatly by industry, varying from positive effects on entry rates to large entry rate decreases. The effect of BAPCPA on exit rates is far less ambiguous, with an increase in the relative exit rates of small firms of approximately 2.15% to 2.74%. This effect is highly persistent across industries as the effects direction was the same across all industries and statistically significant for 15 of 20 studied industries which was masked in the total firm results. Despite the aforementioned concerns, this study fails to find evidence of small firm entry rate differences in the policy effect between low and high personal homestead exemption states, though there are significant exit rate differences. The exit rate effects varied greatly between industries, ranging from positive to negative exit rate effects when accounting for additional treatment variables representing homestead exemption levels.

This paper proceeds as follows: Section 2 provides an overview of the relevant literature. Section 3 details the data that will be used for analysis. Section 4 develops the empirical methodology and specifications. Section 5 presents the empirical results of the models. Section 6 concludes and discusses policy recommendations.

2. Literature Review

Bankruptcy protection was first utilized in the U.S. during the early 1800s as a way for fur traders to recover from losses stemming from extreme weather conditions. Since then, bankruptcy law has drastically changed and expanded to keep up with policy needs. Though bankruptcy existed in various forms during the 19th and 20th centuries, the most expansive piece of legislation, which is considered the beginning of modern bankruptcy laws, is The Bankruptcy Reform Act of 1978. This act was the first comprehensive federal reform of bankruptcy practices

and provided a structure for multiple forms of debt forgiveness, individual readjustments, and liquidation practices. This act merged and reorganized Chapter X and Chapter XI into the new Chapter 11 form of bankruptcy. It also sought to encourage greater use of Chapter 7 and Chapter 13 bankruptcy, while also maintaining that the individual states have the right to select their own personal exemption levels. The Bankruptcy Code was subject to major amendment changes in both 1994 and 2005 with the most recent amendment being titled the Bankruptcy Abuse Prevention and Consumer Protection Act of 2005 (BAPCPA). The purpose of BAPCPA was to make filing under Chapter 7 bankruptcy more difficult to avoid bankruptcy abuse and fraud while simultaneously encouraging debtors into restructuring rather than liquidation of their debts (Bak et al. 2008; Howard 2005). The most notable BAPCPA changes included incorporating a means test for income levels to determine if Chapter 7 is the appropriate bankruptcy form, a mandatory waiting period between filings, credit counseling and debtor education requirements, and a system of checks and limits of offloaded assets in the months prior to filing (Eisler 2006; White 2007).

BAPCPA had a variety of both expected and unexpected consequences for debtors, lenders, and the macroeconomy (Borgo 2019). In the two months prior to BAPCPA being implemented, there was an unprecedented 550,000 bankruptcy filings, which quickly fell to record lows of roughly 20,000 filings in the six-weeks after implementation (Bak et al. 2008). In the years following the initial decrease, personal bankruptcy filing rates crept back up over time and by 2008 leveled-out at 61% of the pre-BAPCPA filing levels, though these changes in filing rates do vary greatly by region (Flynn & Crewson 2008). Also, post-BAPCPA there has been a large increase in the number of cases that are identified and dismissed as abusive (Spurr & Ball 2013). In these years after the policy implementation, there has been an increase in the cost of

consumer bankruptcy filings and it has been observed that qualified practitioners are electing away from practicing bankruptcy law (Eisler 2006). Debtors often have more limited access to unsecured debt after filing and have been found to still experience financial distress even more than 10 years after filing (Han & Li 2011). Total debt for the average filer has increased, as has reliance on credit cards at the financial expense of credit users, divorce rates, prime and subprime mortgage default rates, foreclosure rates, and revolving debt usage per household even after accounting for the recent financial crisis (Price & Dalton 2007; Simkovic 2009; Traczynski 2011; Li et al. 2011; White 2007; Mitman 2016).

Small business owners are an important group to focus on when determining the effects of bankruptcy law changes on economic welfare. Self-employment and small business ownership can be inherently risky and have high failure rates, especially in recessions or periods of macroeconomic hardship. U.S. bankruptcy law attempts to make self-employment and entrepreneurship more attractive for individuals by providing a form of partial wealth insurance in the event of a business failure. Approximately 11% of U.S. households have at least one self-employed worker and 17% of all personal bankruptcy filings in the U.S. include business debt which suggests the importance of bankruptcy for small businesses (White 2006). Since most small businesses and self-employed individuals are unincorporated, and therefore are not a financially separate entity from their business, Chapter 7 is the most commonly utilized form of bankruptcy by small, entrepreneurial business owners (Fan & White 2003). Since these small businesses are often unincorporated it also means that their ability to access credit based on their personal financial stability is crucial, which is often hindered by bankruptcy filing status (Berkowitz & White 2004; Han & Li 2011). Personal bankruptcy provides two types of essential wealth protection, first, over future assets with the discharge of debt obligations, and second,

over current assets with personal exemptions (White 2001). This relationship between small business owners and personal bankruptcy means that the introduction of BAPCPA may have disproportionately affected individuals who owned or were considering starting a business since the availability of Chapter 7 utilization became significantly more restrictive under the federal amendment.

Large firms who utilize Chapter 11 bankruptcy are not immune to the effects of BAPCPA. Teloni (2015) finds BAPCPA is associated with decreases in Chapter 11 case duration and an increased number of firms that refile for bankruptcy. This means that in the time since the amendment changes many debtors quickly emerge from the bankruptcy process having not achieved rehabilitation even though credit counseling and debtor education was a main goal of the BAPCPA changes. Cerqueiro et al. (2019) finds when studying business dynamism, that debtor protection can increase firm exit and destruction rates for both large and small firms. They also find evidence of lenient personal bankruptcy laws being associated with increases in firm entry only for sectors requiring low start-up capital. The entry and exit rates of firms can be highly variable by industry, size, and the value of necessary capital for business operation (Dunne & Samuelson 1988). Lawless (2007) ascertains that many of the statues within BAPCPA were not developed or written to include considerations for business owners, which could disproportionately hurt small businesses relative to large businesses since many small firms are unincorporated and therefore the business owners would be faced with personal liability for business debts in the event of business failure. Small businesses are common in all industries, but these businesses often have shorter life expectancies than their larger counterparts (Geroski 1995; Hopenhayn 1992). Rohlin and Ross (2014), examined business turnover rates of firms located near state borders, they found that entry decisions are also partially driven by differences

in wealth protection, and that increases in wealth protection, mainly through the homestead exemption, can both positively impact the entry of new firms and the longevity of existing firms.

Homestead exemptions allow debtors to retain up to a set level of their accumulated wealth in the event of undue hardship, and in some states even allow individuals to retain their homes and other assets while their personal debts and obligations for repayment are discharged. For small business owners who are unincorporated, the largest wealth protection aspect of bankruptcy is the homestead exemption of Chapter 7, which varies greatly as they are set by the individual states. Overall, studies have found that having the option of bankruptcy is valuable to households, especially households with high variance in returns to their wealth in high exemption states (White 1998). These personal exemption levels are thought to reflect the relative cost of filing formal bankruptcy versus informal default (Lefgren & McIntyre 2009).

Having the metaphorical safety net of personal bankruptcy in the event of business failure has many short and long-term effects on the choices and outcomes of self-employed individuals and small business owners. These effects can greatly differ based upon if the individual is located in a state with a high or low level of homestead exemptions. Fan and White (2003) find high bankruptcy exemption levels benefit potential entrepreneurs who are risk averse by providing partial wealth insurance, which directly increases the probability of these individuals electing into self-employment or starting a business venture. Primo and Green (2011) find areas with more generous personal exemptions are linked to having less productive "innovation" entrepreneurship and that though these favorable laws increase the level of self-employment, these effects are non-monotonic with the level of asset protection. Contrastingly, having the additional protection over personal assets from debt obligations causes credit suppliers to limit the amount of credit that they extend to self-employed individuals and small business owners.

Consequently, it has been found that higher personal exemption levels are associated with a higher likelihood of small business owners filing for bankruptcy (Berkowitz & White 2002; Agarwal et al. 2005).

Since BAPCPA was implemented in 2005, some may question why analyzing this question is relevant to public policy in 2019. The short-term effects of BAPCPA were highly unexpected and volatile with a rush on bankruptcy filings and widespread mortgage defaults, as real estate is the most commonly used collateral for small business loans (Bak et al. 2008; Mitman 2016; Spurr & Ball 2013). Federal consumer bankruptcy restructuring has again become an important topic for legislatures as the needs of financially constrained consumers have changed; student loan debts have reached historical levels, the legal fees for initially filing bankruptcy have become too expensive for many households to afford, and crowdfunding personal and business ventures has become more commonplace. As previously mentioned, the Commission on Consumer Bankruptcy of the American Banking Institute released a final report to Congress detailing recommendations for their policy recommendations regarding the recommended legal changes for the next amendment to the Bankruptcy Act (Lawless 2019). As these changes are being discussed, I believe it is important to reflect on the short-term impact of previous sweeping Federal changes in order to recommend policy procedures for how future amendments can be written to minimize adverse impacts on individuals who utilize the bankruptcy system, starting with firm entry and exit behaviors.

3. Data

The entry and exit rates of firms are determined by matching and tracking unique firm identifier codes annually across historical individual establishment data collected through ReferenceUSA. A firm is considered to have exited if it was present in the current year data but

did not appear in the next year's data. Similarly, a firm is considered to have entered if it appeared in the current year data but not in the prior year's data. Information regarding the number of firms in each year of historical data and the percent of firms that are considered small, identified has having 20 or fewer employees, in this analysis are presented in Table 39. Additional information in the data includes firm location, number of employees, and primary six-digit NAICS codes (used to determine a firm's industry).

I also incorporate information on the consumer bankruptcy environment of each state. The largest exemption in consumer bankruptcy for a debtor is the personal exemption which differs across states. This is the amount of personal assets an individual or household can retain in the event of filing for personal bankruptcy. Since the business owner's marital status is unknown, I utilize the exemption level for married individuals under the age of 65 for the years 2004 and 2006 as the state personal exemption level. These homestead exemption levels were first found in Rohlin and Ross (2014) and then confirmed using Elias et al. (2011). The homestead exemption levels by state are provided in Table 40. For the main results, a state is considered to have a low exemption level if the homestead exemption was less than $50,000 in 2006.

4. Empirical Methodology

Personal bankruptcy is a form of wealth protection for small, unincorporated business owners. When filing, debtors utilizing the bankruptcy system also often have accumulated business debt from failed ventures. Small businesses in the United States have inherent risk that may cause small business owners to choose not to enter a market or to prematurely exit a market if they expect that this form of wealth protection may be changed.

To first analyze the effects of BAPCPA, I utilize a difference-in-difference regression model, which allows for the comparison of small and large firms before and after the treatment, or the implementation of BAPCPA, while differencing out time invariant heterogeneity. Due to the nature of the data and computational limitations, an examination at the firm level is infeasible; therefore the observations are at the industry-state-year level for the percentage of entry and exit of small and large firms. The model takes the following form:

$$Entry_{st} = \alpha_0 + \beta_1 Small_s + \beta_2 Post_t + \delta_1 (Small*Post_{st}) + \varepsilon_{st} \quad (1)$$

Where $Entry_{st}$ is the percentage of firms that entered the market in a given industry, state, and year. $Small_s$ is equal to 1 if the dependent variable is for small firms. $Post_t$ is a binary variable equal to 1 if the observation is observed after the policy change. $(Small*Post)_{st}$ is a treatment variable equal to 1 if the observation is both for small firms and after the policy change. δ_1 is the coefficient of interest as it explains the additional variation on the entry rates of small firms after BAPCPA that is not accounted for by the individual coefficient estimations. The specification is the same for exits with the appropriate outcome variable, $Exit_{st}$.

Using the difference-in-difference methodology requires a strong assumption of common trends. Meaning, there is the required assumption that the entry and exit rates of small and large firms would have evolved similarly if not for the BAPCPA amendment being implemented. This assumption may not hold as variation in personal homestead exemptions by state affected the amount of personal liability some business owners face. Business owners in high exemption states may have been less likely to change their entry and exit patterns in response to an

upcoming federal change due to the large personal asset safety net already provided within their state.

To account for the concern that there may be differing reactions to BAPCPA based on level of state exemptions, I implement a Triple Differencing method, which allows the comparison of BAPCPA's affects to also be between low and high exemption states. As with the difference-in-difference model the observations are at the industry-state-year level. The model takes the following form:

$$Entry_{st} = \alpha_0 + \beta_1 Small_s + \beta_2 Post_t + \beta_3 Low_s + \delta_1 (Small*Post)_{st} + \delta_2 (Post*Low)_{st} + \delta_3 (Small*Low)_s + \lambda_1 (Small*Post*Low)_{st} + \varepsilon_{st} \quad (2)$$

Where $Entry_{st}$ is the percentage of firms that entered the market. $Small_s$ is a binary variable equal to 1 if the dependent variable is for small firms. $Post_t$ is equal to 1 if the observation is from the time period after the policy change. Low_s is equal to 1 if the observation is from a low homestead exemption state. $(Saml*Post)_{st}$ is a treatment variable equal to 1 if the observation is for small firms after the policy change. $(Post*Low)_{st}$ is a treatment variable equal to 1 if the dependent variable is from a low exemption state and observed after the policy change. $(Small*Low)_s$ is equal to 1 if the observation is for small firms within a low homestead exemption state. λ_1 is the coefficient of interest in the triple difference estimation which explains the additional variation of small firms after the policy change in low exemption states that are not explained by the individual coefficient estimates or the series of combined estimates. $(Small*Post*Low)_{st}$ is a treatment variable equal to 1 if the observation is for small firms in low exemption states after

the policy change. The specification is the same for exits with the appropriate outcome variable, $Exit_{st}$.

Each sector in the economy may respond differently to policy changes. The effects of a bankruptcy reform act may not affect, for example, businesses in the agricultural sector in the same way that it affects the information sector. There are also sector specific trends over this time period that would cause both small and large firms to change entry and exit decisions in a way that may not be present in other sectors. Since these sector differences may persist, the difference-in-difference and triple difference models are also conducted for each individual two-digit NAICS code classifications. The breakdown of industry subsectors by two-digit NAICS codes is listed in Table 41.

5. Empirical Results

Table 42(43) presents the Difference-in-Difference entry(exit) results. Specification (1) contains no additional terms from equation (1). Specification (2) includes additional state-level fixed effects, while specification (3) further contains industry fixed effects. I find a persistent, statistically significant, negative treatment effect in all specifications. This means that there is a decrease of approximately 4.91% in the amount of small firms entering the market in the post-BAPCPA period, even after accounting for the individual estimates for the policy effect and firm size. I find that there is a comparative increase of 2.74% in the amount of small firms exiting the markets in the post-policy period. In conjunction with the results for entries, this means that when considering the pool of all firms, there was an overall decrease in small firms due to increased short-run exit and decreased entry after the implementation of BAPCPA.

However, not all industries are inherently identical and may have different behavior patterns after a policy shock. Table 46(47) displays the direction and significance for entry(exit)

by individual industries, defined by the 20 two-digit NAICS code subsectors, to allow for an understanding of potential heterogeneity of bankruptcy amendment policy effects. I find that the estimate of the treatment effect varies greatly across industries and does not maintain a cohesive pattern for the percentage of firms entering the market for entries, with seven having positive treatment effects, meaning an increase in firm entry was observed, and nine having negative treatment effects. This result is important because it shows that when BAPCPA was implemented not all industries were affected the same with some industries experiencing an increase in small business entry. There does not appear to be an obvious pattern regarding the directional effect by industries, as the industries divided by effect direction have a mix of start-up fund, capital, and labor requirements. Unlike the ambiguity with entry patterns, in nearly every industry there is a statistically significant positive increase to the percent of small firms exiting the market in the post-policy period that is unaccounted for in the individual coefficient estimates. Notable exceptions to this pattern are the five industries with insignificant treatment effects, and the significant decrease in Education Services exits in the post-BAPCPA period. In conjunction, the entry and exit results show that general flow of firms by industry is also heterogeneous. Overall, the industry results do highlight the importance of analyzing industries separately, especially the entry results, as the reactions to bankruptcy can be heterogeneous.

Since previous literature has found notable effects of homestead exemption levels on firm behavior, it is crucial to investigate if the effects of BAPCPA also vary by personal homestead exemption levels. It may be the case that individuals in states with large safety nets in the event of unincorporated, small business default may not have changed their entry and exit behavior in the same way as an individual in a state with a small safety net. To address this concern Table 44(45) presents the results for a Triple-Differenced regression on firms' market

entry(exits). I do not find evidence of a significant difference in the effects of policy change on the rate of small business entry between high and low exemption states. With the inclusion of the interactions with exemption level, the treatment effect of the policy on entry is still a statistically significant decrease of 5.11%. Similar to the entry case, I fail to find evidence of a statistically significant difference in the effect of the BAPCPA implementation on small businesses in low exemption states, relative to high exemption states when considering the entire sample of firms. With the additional controls, the treatment effects are no longer significant; however the direction and magnitude of the treatment effect term is similar to the previous estimates, with a 2.15% increase in exits.

Table 48(49) presents the direction and significance for the Triple-Difference regressions on entry(exit) by industry. Again, there is no evidence of a statistically significant difference in the post-policy effects of small business entry between low and high exemption states that is not explained by the original treatment effect (Small*Post), and there are still mixed directional effects of the policy change. For exits however, the exemption level causes mixed results in the effect of the policy. There is a positive and significant interaction term in the Information sector, and positive insignificant estimates for 13 of the 19 remaining industries meaning there is an increased percentage of exits in low exemption states not explained by other interactions or controls, leaving three industries as having significantly negative triple difference treatment effect, and three industries as insignificantly negative. The negative Triple-Differenced interaction term means than low exemption states experienced a relative decrease in the percentage of small firms exiting the market in the post policy period. For exits, there is still a generally positive and statistically significant treatment effect of the post-policy period on small firms, but not all industries behave identically, with some now having significantly negative

policy treatments on exiting behavior. The exit rates of small firms between exemption levels over the whole time period vary widely relative to large firms, with eight industries having significant and negative coefficients, two being positive and significant, and 10 industries having insignificant estimates.

It is interesting to note for entries that, though not statistically significant, the direction of the (Small*Post*Low) interaction terms in 15 of the 20 industries is negative. In the same 15 industries there is a positive, yet insignificant, interaction of entry rates in low exemption states in the post-policy implementation period. These two results indicate that low exemption states may have greater firm entry in the post policy period compared to high exemption level states, but that the differences by firm size are ambiguous in direction.

6. Conclusion and Discussion

This study analyzes the potential effects of BAPCPA on small business entry and exit behavior utilizing multiple empirical strategies. I find evidence of a significant decrease of approximately 4.91% on the aggregate entry of small businesses. This effect is ambiguous at the industry level, as individual industries vary substantially on percent of small businesses entering the market in the post-policy period, and these effects were negative just as often as positive. Though the industry level effects on entry are ambiguous, the relationship between BAPCPA and small business exit patterns is more salient. BAPCPA increased the percentage of small businesses exiting the market in the post-policy period by approximately 2.74%. 15 of the 20 industries also show evidence of a similar increase in small business exit.

Utilizing a Triple-Differencing methodology, I fail to find significant evidence that the entry rates of small businesses in the post-implementation period of BAPCPA differed substantially between states with low or high homestead exemptions. When accounting for these

additional variables and potential interactions, small business entry by industry in the post-policy period is still ambiguous in direction. There is some evidence that there is a negative and statistically significant effect of low homestead exemptions interacting with the general treatment effect of the policy, with lower exits in low exemption states.

These results have important implications for structuring future policy. First, policymakers should realize that consumer bankruptcy changes may have unintended consequences on small business owners with varying affects by industry. Therefore, when designing future bankruptcy amendments there needs to be considerations in the disproportionately high number of bankruptcy filers that have business related debts. Second, studies should be conducted identifying at risk industries and designing relief strategies to minimize harm for current and potential business owners. Finally, the approval and implementation of BAPCPA happened in an abnormally short period of time, which could have caused additional effects due to uncertainty for businesses. In future policy, I recommend either a larger implementation time period to avoid another bankruptcy filing rush or to have the amendment changes implemented in stages.

There are limitations of this study that should be acknowledge to improve future research. First, though this novel dataset is robust, publicly available data is not able to identify the incorporation status or self-employment status of each firm, only if the firm is public, private, or a branch location. This public data is also unable to determine if a business owner has filed for bankruptcy or is financially insolvent. Future research would benefit from government' business and individual tax records. This project is also currently restricted by limits in computational resources for using individual firm-level data across time, and instead had to be aggregated to the

state-level, losing much of the rich empirical rigor that would be available with specific business attributes.

Appendix A

There are 109 different state border pairs, (including a few that consist of a single point, such as Georgia-North Carolina). For the empirical results I conduct this analysis on buffer zones of 10-, 5-, and 1-kilometer sizes. First, I use geographic information systems (GIS) to overlay my cross-sectional firm location data from April 2017 onto detailed state maps. I use the longitude and latitude for the location of each firm, to determine both the firm's exact location on a map and its distance from other geographic features. I identify the shortest possible distance from each firm to its closest state border containing two or more states. I then use GIS to draw buffer zone around state borders and identify each firm that falls within particular ranges of distance. For graphical illustration, Figure 2. shows a map of the 299,746 businesses that started their business within a 10-kilometer buffer of a state border pair. Figure 3. provides a zoomed-in look at a selection of states.

Figure 2: Map of Firm Locations within 10-km of a State Border Pair
299,746 businesses located with a 10-km buffer zone of state borders in April 2017

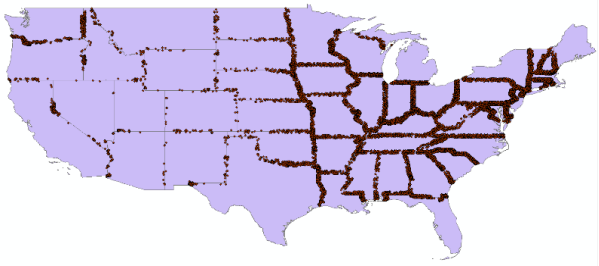
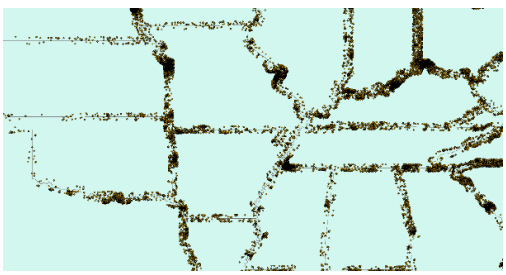


Figure 3: Zoomed-In Map of Firm Locations within 10-km of a Border Pair
Zoomed in representation of the firms located within a 10-km buffer zone of state borders in April 2017



Appendix B

Figure 4. Density of Firms around Border

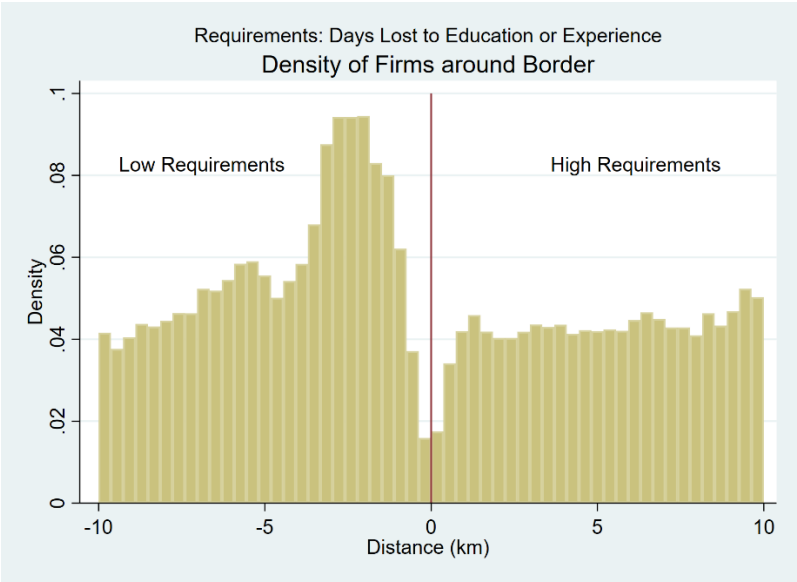


Table 1. Summary Statistics

	Industry	Number Observations	Percent Dataset
1	Agriculture, Fishing, Forestry, and Mining	102,124	3.22%
2	Construction	313,058	9.86%
3	Finance, Insurance, and Real Estate	328,292	10.34%
4	Manufacturing	83,957	2.64%
5	Public Administration	19,188	0.60%
6	Retail Trade	600,313	18.91%
7	Services	1.460,624	46.01%
8	Transport	158,026	4.98%
9	Wholesale Distribution	109,088	3.44%
Total		**3,174,670**	**100%**

Table 2. Match Industry Pairs

	Match Type	Generally Licensed Employees	Generally Unlicensed Employees
1	Transportation	Taxi Services	Other Transit & Ground Passenger transport
2	Architecture & Design	Architecture Services	Other Specialized Design Services
3	Building Repair	Residential Remodelers	Other Personal & Household Good Repair and Maintenance
4	Healthcare Assistance	Other Miscellaneous Health Practitioners	Other Personal Services
5	Landscaping	Landscaping Services	Nursery, Garden Center, and Farm Supply Stores
6	Lending	Commercial Banking	Consumer Lending

Table 3. Summary Statistics of State Variables

Variable	Mean	Min	Max	Standard Deviation
Average Fees	$268.14	$76.00	$704.00	$113.77
Days Required	373.69	117.2	987.7	199.54
State Tax Rate	5.11%	0%	7.25%	1.96%
Average Local Tax	1.36%	-0.03%	5.01%	1.50%
Minimum Wage	$8.32	$7.25	$11.50	$1.22
Labor Force Participation Rate	62.25%	52.09%	69.55%	4.08%
Unemployment Rate	4.23%	2.5%	6.3%	0.87%

Table 4. Summary Statistics of Cross-Differenced State Variables

Cross-Differenced	Mean	Min	Max	Standard Deviation
Average Fees	$91.92	$1.00	$540.00	$87.94
Days Required	168.86	8.3	550.7	124.59
State Tax Rate	5.22%	0.04%	7.25%	1.70%
Average Local Tax	1.49%	0.00%	5.01%	1.53%
Minimum Wage	$1.00	$0.00	$4.25	$0.94
Labor Force Participation Rate	3.35%	0.01%	14.13%	2.67%
Unemployment Rate	0.79%	0.00%	3.70%	0.62%

Table 5. Logit Function for Days Required within 10-km

	(1)	(2)	(3)	(4)
Cross-Differenced Days Required	-0.0003*** ($4.61e^{-06}$)	-0.0003*** (0.0001)	-0.0001*** ($1.42e^{-06}$)	-0.0001*** ($3.54e^{-05}$)
Cross-Differenced Average Fees Greater than $100	-0.6617*** (0.0032)	-0.6622*** (0.0150)	-0.0154*** (0.0006)	-0.0149*** (0.0007)
Cross-Differenced Labor Force Participation Rate			0.0877*** (0.0165)	0.0939*** (0.0119)
Cross-Differenced Minimum Wage Over $1			0.0004 (0.0005)	0.0004 (0.0005)
Cross-Differenced State Tax Rate			-0.0034*** (0.0002)	-0.0033*** (0.0002)
Cross-Differenced Local Tax Rate			-0.0044*** (0.0006)	-0.0045*** (0.0002)
Cross-Differenced Unemployment Rate			-0.0001 (0.0007)	0.0003 (0.0005)
Firm or Individual				-0.0034*** (0.0005)
Home Business				-0.0006*** (0.0002)
Private Company				-0.0011 (0.0007)
Single Location				-0.0020*** (0.0008)
Headquarter				-0.0002 (0.0009)
Branch				-0.0013 (0.0008)
Number Obs.	299,746	297,897	297,897	297,897
Clustered SE	No	Yes	Yes	Yes
R^2	0.137	0.137	0.993	0.993

Table 6. Logit Function for Days Required within 5-km

	(1)	(2)	(3)	(4)
Cross-Differenced Days Required	-0.0005*** ($6.38e^{-06}$)	-0.0005*** (0.0001)	-0.0001*** ($2.13e^{-06}$)	-0.0001*** ($2.02e^{-06}$)
Cross-Differenced Average Fees Greater than $100	-0.6037*** (0.0049)	-0.6044*** (0.0320)	-0.0191*** (0.0008)	-0.0180*** (0.0009)
Cross-Differenced Labor Force Participation Rate			0.0545*** (0.0196)	0.0671*** (0.0201)
Cross-Differenced Minimum Wage Over $1			-0.0001 (0.0007)	-0.0001 (0.0007)
Cross-Differenced State Tax Rate			-0.0044*** (0.0003)	-0.0041*** (0.0003)
Cross-Differenced Local Tax Rate			-0.0045*** (0.0008)	-0.0047*** (0.0008)
Cross-Differenced Unemployment Rate			-0.0016* (0.0009)	-0.0008 (0.0010)
Firm or Individual				-0.0035*** (0.0007)
Home Business				-0.0009*** (0.0002)
Private Company				-0.0005 (0.0011)
Single Location				-0.0039*** (0.0013)
Headquarter				-0.0015 (0.0016)
Branch				-0.0024 (0.0015)
Number Obs.	160,281	158,432	158,432	158,432
Clustered SE	No	Yes	Yes	Yes
R^2	0.100	0.102	0.992	0.992

Table 7. Logit Function for Days Required within 2.5-km

	(1)	(2)	(3)	(4)
Cross-Differenced Days Required	-0.0004*** ($9.46e^{-06}$)	-0.0004*** (0.0001)	-0.0001*** ($3.35e^{-06}$)	-0.0001*** ($3.30e^{-06}$)
Cross-Differenced Average Fees Greater than $100	-0.5152*** (0.0075)	-0.5145*** (0.0398)	-0.0194*** (0.0009)	-0.0190*** (0.0010)
Cross-Differenced Labor Force Participation Rate			0.1027*** (0.0186)	0.1078*** (0.0173)
Cross-Differenced Minimum Wage Over $1			-0.0020** (0.0010)	0.0016* (0.0010)
Cross-Differenced State Tax Rate			-0.0046*** (0.0005)	-0.0045*** (0.0005)
Cross-Differenced Local Tax Rate			-0.0070*** (0.0007)	-0.0066*** (0.0007)
Cross-Differenced Unemployment Rate			0.0006 (0.0005)	0.0009* (0.0015)
Firm or Individual				-0.0049*** (0.0011)
Home Business				-0.0012*** (0.0003)
Private Company				0.0005 (0.0014)
Single Location				-0.0084*** (0.0017)
Headquarter				-0.0004 (0.0017)
Branch				-0.0061*** (0.0020)
Number Obs.	160,281	158,432	158,432	158,432
Clustered SE	No	Yes	Yes	Yes
R^2	0.100	0.102	0.992	0.992

Table 8. Logit Function on Days Required within 10-kilometers of Border by Industry

Industry	Cross-Differenced Days Required	Cross-Differenced Avg Fees > $100	Observations	R^2
Agriculture, Forestry, Fishing, Mining	-0.0001*** ($5.91e^{-06}$)	-0.0267*** (0.0031)	7,106	0.984
Construction	-0.0002*** ($2.62e^{-05}$)	-0.0190*** (0.0011)	26,484	0.991
Finance, Insurance, and Real Estate	-0.0001*** ($1.77e^{-06}$)	-0.0117*** (0.0007)	33,880	0.993
Manufacturing	-0.0002*** (4.37^{e-06})	-0.0239*** (0.0018)	7,722	0.988
Retail Trade	-0.0001*** ($1.48e^{-06}$)	-0.0143*** (0.0008)	59,638	0.993
Services	-0.0001*** ($1.48e^{-06}$)	-0.0133*** (0.0008)	134,853	0.994
Transportation	-0.0001*** ($3.14e^{-06}$)	-0.0105*** (0.0018)	15,778	0.995
Wholesale Distribution	-0.0002*** ($3.15e^{-06}$)	-0.0200*** (0.0031)	10,325	0.990

Table 9. Logit Function on Days Required within 5-kilometers of Border by Industry

Industry	Cross-Differenced Days Required	Cross-Differenced Avg Fees > $100	Observations	R^2
Agriculture, Forestry, Fishing, Mining	-0.0001*** ($9.27e^{-06}$)	-0.0306*** (0.0071)	3,499	0.982
Construction	-0.0002*** ($3.74e^{-05}$)	-0.0255*** (0.0019)	12,672	0.989
Finance, Insurance, and Real Estate	-0.0001*** ($2.15e^{-06}$)	-0.0127*** (0.0012)	18,593	0.993
Manufacturing	-0.0003*** (5.11^{e-06})	-0.0251*** (0.0007)	4,224	0.986
Retail Trade	-0.0001*** ($2.25e^{-06}$)	-0.0176*** (0.0008)	32,889	0.992
Services	-0.0001*** ($2.50e^{-06}$)	-0.0168*** (0.0012)	72,068	0.993
Transportation	-0.0001*** ($3.31e^{-06}$)	-0.0138*** (0.0017)	7,704	0.992
Wholesale Distribution	-0.0002*** ($5.07e^{-06}$)	-0.0222*** (0.0040)	5,533	0.992

Table 10. Logit Function on Days Required within 2.5-kilometers of Border by Industry

Industry	Cross-Differenced Days Required	Cross-Differenced Avg Fees > $100	Observations	R^2
Agriculture, Forestry, Fishing, Mining	-0.0001*** ($1.89e^{-05}$)	-0.0334*** (0.0048)	1,578	0.976
Construction	$-2.06e^{-05}$*** ($5.06e^{-06}$)	-0.0274*** (0.0019)	5,575	0.988
Finance, Insurance, and Real Estate	$-1.48e^{-05}$*** ($3.50e^{-06}$)	-0.0135*** (0.0006)	8,685	0.991
Manufacturing	$-2.04e^{-05}$*** (5.96^{e-06})	-0.0238*** (0.034)	2,093	0.985
Retail Trade	$-1.74e^{-05}$*** ($3.20e^{-06}$)	-0.0174*** (0.0011)	15,916	0.990
Services	$-1.59e^{-05}$*** ($3.52e^{-06}$)	-0.0170*** (0.0012)	34,591	0.990
Transportation	$-3.11e^{-05}$*** ($4.40e^{-06}$)	-0.0175*** (0.0020)	3,468	0.988
Wholesale Distribution	$-1.39e^{-05}$*** ($4.95e^{-06}$)	-0.0181*** (0.0025)	2,665	0.991

Table 11: Density Manipulation Test

VARIABLES	(1) 10 kilometer	(2) 5 Kilometer	(3) 2.5 kilometer
DMT Estimate	-7.0679***	-3.5500***	-7.5861***
Observations	307,773	171.181	96,815
Kernel Type	Triangular	Triangular	Triangular
Standard Error	Jackknife	Jackknife	Jackknife
Conventional p-value	0.0000	0.0000	0.0000
Robust p-value	0.0000	0.0000	0.0000
Order Loc. Poly. (p)	1	1	1
Order Bias (q)	2	2	2

Table 12: GRDD: Employment within 10-kilometers of Border

VARIABLES	(1) Employees	(2) Employees	(3) Employees
RD Estimate	0.1360	-0.2569	-0.2540
Observations	307,773	307,773	307,773
Robust 95% CI	[-1.49 ; 1.76]	[-2.50 ; 1.98]	[-2.71 ; 2.199]
Kernel Type	Triangular	Triangular	Triangular
BW Type	MSE-Optimal	MSE-Optimal	MSE-Optimal
Cluster	NN	NNcluster(State)	NNcluster(State)
Conventional Std. Error	0.8294	1.1438	1.2517
Conventional p-value	0.870	0.822	0.839
Robust p-value	0.868	0.856	0.686
Order Loc. Poly. (p)	1	1	2
Order Bias (q)	2	2	3
BW Loc. Poly. (h)	1.424	1.744	2.066
BW Bias (b)	2.387	2.230	3.352

Table 13: GRDD: Employment within 5-kilometers of Border

VARIABLES	(1) Employees	(2) Employees	(3) Employees
RD Estimate	-2.3421**	-2.2869*	-2.4453*
Observations	171,181	171,181	171,181
Robust 95% CI	[-4.56 ; -0.12]	[-4.72 ; 0.15]	[-5.05 ; 0.15]
Kernel Type	Triangular	Triangular	Triangular
BW Type	MSE-Optimal	MSE-Optimal	MSE-Optimal
Cluster	NN	NNcluster(State)	NNcluster(State)
Conventional Std. Error	1.1338	1.2439	1.3266
Conventional p-value	0.039	0.066	0.065
Robust p-value	0.020	0.023	0.027
Order Loc. Poly. (p)	1	1	2
Order Bias (q)	2	2	3
BW Loc. Poly. (h)	0.632	0.597	0.870
BW Bias (b)	1.460	1.358	1.676

Table 14: GRDD: Employment within 2.5-Kilometers of Border

VARIABLES	(1) Employees	(2) Employees	(3) Employees
RD Estimate	-2.3498*	-2.2002*	-1.9815
Observations	96,815	96,815	96,815
Robust 95% CI	[-4.85 ; 0.15]	[-4.70 ; 0.30]	[-4.95 ; 0.99]
Kernel Type	Triangular	Triangular	Triangular
BW Type	MSE-Optimal	MSE-Optimal	MSE-Optimal
Cluster	NN	NNcluster(State)	NNcluster(State)
Conventional Std. Error	1.2774	1.276	1.5161
Conventional p-value	0.066	0.085	0.191
Robust p-value	0.109	0.125	0.345
Order Loc. Poly. (p)	1	1	2
Order Bias (q)	2	2	3
BW Loc. Poly. (h)	0.482	0.521	0.517
BW Bias (b)	0.799	0.755	1.745

Table 15. Difference-in-Difference for Firm-Industry Pairs: All Groups

Variables	20-Kilometers			10-Kilometers			5-Kilometers			2.5-Kilometers		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
High Side	1.0954***	1.1017*	1.9536*	0.2335	0.2393	1.1401	1.8128**	1.8559	3.4110	0.8777	0.9681	2.5075
	(0.3881)	(0.6033)	(0.7555)	(0.5825)	(0.9987)	(1.2856)	(0.9211)	(2.3178)	(2.775)	(1.7404)	(3.7633)	(4.0260)
Licensed Industry	1.235***	1.2410***	1.2292***	1.295***	1.3052**	1.2800*	1.4951**	1.5141**	1.4707*	1.6309	1.6691	1.6670
	(0.3357)	(0.4117)	(0.4400)	(0.4771)	(0.6082)	(0.6686)	(0.6818)	(0.6873)	(0.7227)	(1.2124)	(1.2713)	(1.3229)
Interaction (H*OL)	-1.5330***	-1.5409**	-1.8648**	-1.2364*	-1.2474	-1.5785	-3.3269***	-3.3810	-3.9741	-3.2410*	-3.3652	-3.8537
	(0.4521)	(0.6888)	(0.7339)	(0.6830)	(1.1345)	(1.2191)	(1.0689)	(2.4782)	(2.6379)	(2.0065)	(3.8180)	(3.8479)
C-D Average Fees			0.3152			0.3127			-0.8461			-0.9961
			(0.3762)			(0.6699)			(0.7947)			(0.9907)
C-D Labor Force Participation Rate			-5.9883			-7.5076*			-12.2504			-14.4000
			(4.6400)			(7.1467)			(9.1745)			(15.4972)
C-D Minimum Wage > $1			0.9005**			1.0558*			1.3896*			2.1144
			(0.3781)			(0.4529)			(0.7950)			(1.6537)
C-D State Tax Rate			-0.0918***			-0.686			-0.0986			-0.0651
			(0.0313)			(0.0505)			(0.0707)			(0.1307)
C-D Average Local Tax Rate			-0.0271			-0.0914			-0.1892			-0.2179
			(0.0617)			(0.1144)			(0.2295)			(0.2697)
C-D Unemployment Rate			-0.5091***			-0.5370*			-0.5518			-0.8887
			(0.1891)			(0.2937)			(0.3856)			(0.7358)
Number Obs.	30,850	30,850	30,850	17,305	17,305	17,305	8,510	8,510	8,510	2,889	2,889	2,889
Clustered SE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yea
R^2	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.005	0.002	0.002	0.005

Table 16. Difference-in-Difference for Firm-Industry Pairs: Group Pair 1

Variables	20-Kilometers			10-Kilometers			5-Kilometers			2.5-Kilometers		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
High Side	0.6931	0.69957	1.8418	-0.7260	-0.7216	0.9629	1.8951*	1.9128	-3.0662	3.4736	3.5715*	-5.3979
	(0.5681)	(1.1095)	(1.5992)	(0.8616)	(1.4500)	(2.9265)	(1.0748)	(1.1683)	(2.9875)	(2.5491)	(1.7887)	(3.7820)
Licensed Industry	-0.4966	-0.4966	1.8418	-0.6488	-0.6488	-0.8534	0.8862	0.8862	0.7092	3.5059	3.5059	3.5969
	((0.7342)	(1.1777)	(1.5992)	(1.0428)	(1.5107)	(1.4814)	(1.1373)	(1.7974)	(1.6188)	(2.3534)	(4.0848)	(3.2965)
Interaction (H*OL)	-1.2137	-1.2177	-0.7899	0.7125	0.7061	1.1480	-1.2800	-1.3041	-0.7337	-6.8705*	-7.0231	-6.6446
	(0.8289)	(1.3102)	(1.3478)	(1.2484)	(1.6808)	(1.6583)	(1.5196)	(2.3125)	(2.1019)	(3.6030)	(4.7092)	(3.5686)
C-D Average Fees			0.0233			0.0820			-2.6953			-3.0037
			(2.0042)			(3.1831)			(1.7946)			(3.3111)
C-D Labor Force Participation Rate			-16.6735			-12.9585			9.6092			194.57
			(29.2876)			(49.2399)			(87.4050)			(176.18)
C-D Minimum Wage > $1			-1.8786			-2.1066			-10.3346**			-13.0086*
			(2.4864)			(4.1862)			(4.1553)			(6.9866)
C-D State Tax Rate			-0.5956**			-0.8341**			-0.6880***			-0.8066**
			(0.4977)			(0.3744)			(0.2278)			(0.3055)
C-D Average Local Tax Rate			-0.5690			-0.8767			0.9704			2.4363**
			(0.4977)			(0.7942)			(0.8413)			(0.9780)
C-D Unemployment Rate			-0.6416			-0.8032			0.8573			-1.2404
			(0.9448)			(1.4282)			(0.6786)			(1.1235)
Number Obs.	4,715	4,715	4,715	2,591	2,591	2,591	948	948	948	293	293	293
Clustered SE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
R^2	0.004	0.004	0.029	0.000	0.000	0.031	0.004	0.004	0.100	0.013	0.013	0.178

Table 17. Difference-in-Difference for Firm-Industry Pairs: Group Pair 2

Variables	20-Kilometers			10-Kilometers			5-Kilometers			2.5-Kilometers		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
High Side	-0.0012	-0.0012	-0.0226	0.3852	0.3852	-0.1823	1.6450	1.6450	1.4624	1.4825	1.4825	1.8698
	(1.2503)	(1.1224)	(1.1217)	(1.9771)	(1.0429)	(1.1498)	(2.9823)	(1.3064)	(1.1620)	(3.8188)	(2.1672)	(2.6397)
Licensed Industry	3.0292***	3.0317*	2.5840**	4.6102***	4.6166***	4.2934***	6.3225***	6.3386***	5.9775***	6.4701***	6.4979***	6.6281***
	(0.9774)	(1.1426)	(1.2160)	(1.3746)	(0.8247)	(0.7655)	(2.1386)	(0.7538)	(0.8435)	(2.3663)	(0.8864)	(1.1775)
Interaction (H*OL)	-0.9341	-0.9348	-0.6759	-1.5803	-1.5818	-1.5099	-4.5428	-4.5521**	-4.8964**	-3.4109	-3.4114	-5.0868
	(1.3922)	(1.5053)	(1.5183)	(2.1625)	(1.7795)	(1.6290)	(3.2578)	(2.1020)	(1.8278)	(4.1479	(3.3322)	(2.7945)
C-D Average Fees			-0.5951			-0.0623			-1.3877			-1.0735
			(1.1235)			(1.5344)			(0.9301)			(2.5363)
C-D Labor Force Participation Rate			-25.9956** (10.6098			-33.0239** (15.3460)			-29.3019 (18.2712)			-24.2005 (24.6795)
C-D Minimum Wage > $1			0.9930			0.6763			0.7889			-0.4300
			(0.7659)			(0.9312)			(1.2306)			(1.8751)
C-D State Tax Rate			0.0787			0.1510			0.1187			-0.0236
			(0.1097)			(0.1577)			(0.2295)			(0.2395)
C-D Average Local Tax Rate			-0.0643			-0.1696			-0.1624			0.0381
			(0.1987)			(0.3291)			(0.3484)			(0.3961)
C-D Unemployment Rate			-1.0004			-1.1787			-1.7183			-2.5841
			(0.5870)			(0.7356			(1.0276)			(1.9107)
Number Obs.	1,969	1,969	1,969	,1257	1,257	1,257	789	789	789	466	466	466
Clustered SE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
R^2	0.009	0.009	0.019	0.013	0.013	0.026	0.018	0.018	0.036	0.021	0.021	0.047

Table 18. Difference-in-Difference for Firm-Industry Pairs: Group Pair 3

Variables	20-Kilometers			10-Kilometers			5-Kilometers			2.5-Kilometers		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
High Side	0.6999	0.7057	0.7304	-0.2575	-0.2314	-0.2127	-0.8654	-0.8563	*0.8241	-1.4061	-1.5313**	-1.4061
	(.04673)	(0.7551)	(0.7809)	(0.6865)	(0.8117)	(0.8679)	(1.1079)	(1.2757)	(1.4696)	(0.8564)	(0.5781)	(0.8564)
Licensed Industry	0.0597	0.0555	0.0803	-0.2273	-0.2335	-0.1746	-0.320	-0.3279	-0.1843	1.1774*	0.9879	1.1774*
	(0.3556)	(0.3573)	(0.3605)	(0.5072)	(0.5847)	(0.5778)	(0.7868)	(0.7971)	(0.7716)	(0.5502)	(0.6335)	(0.5502)
Interaction (H*OL)	-1.2797**	-1.2794*	-1.3341*	+0.3271	-0.3223	-0.4010	0.3281	0.3454	0.0610	-1.0177	-0.3835	-1.0177
	(0.5025)	(0.7765)	(0.7864)	(0.735)	(0.8674)	(.8646)	(1.1904)	(1.3198)	(1.3459)	(1.2406)	(0.5757)	(1.2406)
C-D Average Fees			0.0574			-0.7018			0.3848			-0.3688
			(0.3878)			(0.4457)			(1.0911)			(1.0319)
C-D Labor Force Participation Rate			-8.5552**			-11.7172**			-17.2931**			-17.9658
			(4.3413)			(4.6936)			(7.3227)			(14.5860)
C-D Minimum Wage > $1			0.0258			0.3188			-0.0133			0.3133
			(0.3219)			(0.5195)			(0.7804)			(1.3918)
C-D State Tax Rate			0.0220			0.0761			0.0429			0.1375
			(0.0300)			(0.0563)			(0.0898)			(0.2088)
C-D Average Local Tax Rate			-0.1314**			-0.1996**			-0.2039			-0.2727
			(0.0643)			(0.0847)			(0.1538)			(0.3323)
C-D Unemployment Rate			-0.1443			-0.1176			-0.1821			-0.4514
			(0.1763)			(0.2841)			(0.4827)			(1.1804)
Number Obs.	5,756	5,756	5,756	3,209	3,209	3,209	1,520	1,520	1,520	657	657	657
Clustered SE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
R^2	0.003	0.003	0.005	0.002	0.002	0.007	0.002	0.002	0.007	0.010	0.010	0.018

Table 19. Difference-in-Difference for Firm-Industry Pairs: Group Pair 4

Variables	20-Kilometers			10-Kilometers			5-Kilometers			2.5-Kilometers		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
High Side	0.2675	0.2675	1.1742	0.834	0.8385	1.8687	2.4237	2.4627	3.4525	4.0645	4.2080	6.5381
	(0.7339)	(0.9719)	(1.0134)	(0.9417)	(1.5500)	(1.5118)	(1.6512)	(3.3760)	(3.0691)	(3.3293)	(7.1651)	(6.1470)
Licensed Industry	2.1283***	2.1286***	1.8314**	1.2395	1.2363**	0.9463	1.1121	1.0966	0.4278	-0.5575	-0.6534	-1.694
	(0.7162)	(0.6989)	(0.7488)	(0.9334)	(0.5780)	(0.8244)	(1.5162)	(1.0191)	(1.2920)	(2.9643)	(1.5822)	(2.2621)
Interaction (H*OL)	2.2627**	2.2703	2.3199	3.9928***	4.0148	3.8585	2.6669	2.7032	2.1255	8.2379	8.5570	7.9143
	(1.0813)	(1.7072)	(1.8677)	(1.4593)	(2.8728)	(3.1879)	(2.5751)	(6.0801)	(6.9274)	(5.3871)	(15.5368)	(17.7067)
C-D Average Fees			0.5449			0.8397			-3.0919			-4.0274
			(1.5593)			(2.6348)			(3.3106)			(5.2724)
C-D Labor Force Participation Rate			-19.2632			-29.1782			-43.2588			-35.3843
			(17.7267)			(26.7935)			(40.2505)			(84.3196)
C-D Minimum Wage > $1			2.5295			4.412			3.5913			6.9382
			(1.8077)			(2.8498)			(4.0007)			(8.2404)
C-D State Tax Rate			0.0364			0.1236			0.2528			0.2416
			(0.1347)			(0.2386)			(0.4491)			(0.7284)
C-D Average Local Tax Rate			-0.4158			-0.4048			-0.6158			-0.7105
			(0.2865			(0.4623)			(0.9899)			(1.4925)
C-D Unemployment Rate			-1.2553			-2.2713			-2.1389			-2.1310
			(1.0327)			(1.4860)			(2.2048)			(3.9007)
Number Obs.	3,696	3,696	3,696	2,283	2,283	2,283	1,550	1,550	1,550	536	536	536
Clustered SE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
R^2	0.012	0.012	0.021	0.0157	0.016	0.035	0.010	0.010	0.031	0.019	0.020	0.041

Table 20. Difference-in-Difference for Firm-Industry Pairs: Group Pair 5

Variables	20-Kilometers			10-Kilometers			5-Kilometers			2.5-Kilometers		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
High Side	3.4161*** (1.3314)	3.4234 (5.5100)	3.9986 (5.5342)	5.5773** (2.3625)	5.5652 (11.2999)	6.3575 (11.3577)	26.1280*** (3.5675)	26.2214 (23.9243)	26.7246 (23.8548)	0.4799 (1.2547)	0.6498 (1.8763)	0.8558 (1.7965)
Licensed Industry	-2.8763*** (1.0129)	-2.8668 (2.7135)	-2.7372 (2.6568)	-4.7220*** (1.6982)	-4.7279 (4.7010)	-4.5833 (4.6482)	-0.0924 (2.4145)	0.0104 (0.5316)	0.1945 (0.5072)	0.0189 (0.8136)	0.2165 (0.8051)	0.2766 (0.8243)
Interaction (H*OL)	-2.9474*** (1.3958)	-2.9551 (5.5260)	3.1960 (5.4544)	-5.4128** (2.4743)	-5.4040 (11.3122)	-5.6488 (11.1603)	-26.1339*** (3.7205)	-26.2342 (23.9066)	26.1397 (23.3838)	-0.7406 (1.3141)	-0.9349 (1.7226)	-1.1297 (1.7087)
C-D Average Fees			-0.3654 (0.5370)			-0.9818 (0.9162)			-1.2623 (1.5513)			0.3803 (0.8073)
C-D Labor Force Participation Rate			-12.7934* (6.7174)			-3.9196 (10.6281)			5.4751 (19.1167)			-14.4165* (7.6398)
C-D Minimum Wage > $1			0.5776 (0.6695)			0.7929 (1.2201)			-0.2588 (0.8475)			0.1401 (0.8370)
C-D State Tax Rate			-0.1265*** (0.0362)			-0.1235** (0.0583)			-0.1268** (0.0546)			0.0675 (0.0497)
C-D Average Local Tax Rate			-0.0606 (0.1460)			-0.1403 (0.2712)			-0.5346 (0.5511)			0.1018 (0.0869)
C-D Unemployment Rate			-0.7018** (0.3336)			-0.1923 (0.4466)			0.4040 (0.5691			-0.0338 (0.2430)
Number Obs.	6,746	6,746	6,746	3,541	3,541	3,541	1,707	1,707	1,707	776	776	776
Clustered SE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
R^2	0.007	0.007	0.011	0.011	0.011	0.014	0.050	0.050	0.055	0.001	0.001	0.014

Table 21. Difference-in-Difference for Firm-Industry Pairs: Group Pair 6

Variables	20-Kilometers			10-Kilometers			5-Kilometers			2.5-Kilometers		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
High Side	-0.0886	-0.0859	0.9851	-1.3772	-1.3911	-0.6478	-1.9759	-1.9906	0.8573	-1.7675	-1.7236	1.4133
	(1.2471)	(1.3760)	(1.6782)	(1.8246)	(1.5725)	(2.1894)	(2.5341)	(2.6530)	(3.7061)	(5.0190)	(5.4271)	(8.5336)
Licensed Industry	4.4844***	4.4944***	5.0006***	5.2959***	5.3115***	5.6030***	3.9637**	3.9653	4.7788*	4.9912	4.9924	5.5922
	(-0.9113)	(1.0962)	(1.2271)	(1.2519)	(1.6630)	(1.8219)	(1.6367)	(2.3124)	(2.8341)	(3.3351)	(5.2083)	(6.4752)
Interaction (H*OL)	-1.2596	-1.2569	-1.8429	-1.8646	-1.8483	-2.1826	-1.7243	-1.7018	-2.8292	-4.0850	-4.1282	-5.0881
	(1.4038)	(1.5907)	(1.7618)	(2.0737)	(1.9927)	(2.2413)	(2.9019)	(3.0856)	(3.6692)	(5.8481)	(6.5344)	(7.8315
C-D Average Fees			1.3632			3.5367			-0.4191			-1.6964
			(2.1731)			(3.9855)			(1.7178)			(4.1602)
C-D Labor Force Participation Rate			17.9790			21.0807			19.3932			48.1173
			(11.2438)			(17.1365)			(17.9039)			(42.6084)
C-D Minimum Wage > $1			1.4538			1.0375			3.5883			3.0404
			(1.0132)			(1.4566)			(2.2951)			(4.8665)
C-D State Tax Rate			-0.1378**			-0.1113			-0.1437			-0.0198
			(0.0689)			(0.1050)			(0.1427)			(0.3397)
C-D Average Local Tax Rate			-0.0238			-0.0902			-0.2300			-1.3014
			(0.1181)			(0.2045)			(0.3541)			(0.8546)
C-D Unemployment Rate			-0.3023			-0.0563			-0.0605			0.2191
			(0.2821)			(0.3728)			(0.4742)			(1.0707)
Number Obs.	7,966	7,966	7,966	4,536	4,536	4,536	2,510	2,510	2,510	751	751	751
Clustered SE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
R^2	0.004	0.004	0.006	0.006	0.006	0.009	0.005	0.005	0.009	0.005	0.004	0.009

Appendix C

Table 22. Countries of Interest and their respective colonial rulers, independence, and political authoritarian structure variant post-independence.

Country	Colonial Ruler	Independence Day	Regime Variant
Ghana	Britain	March 6th, 1957	Military Oligarchy
Kenya	Britain	December 12th, 1963	Competitive One-Party System
Nigeria	Britain	October 1st, 1960	Military Oligarchy
S. Africa	Britain	December 11th, 1931	Settler Oligarchy
Uganda	Britain	October 9th, 1962	Military Oligarchy
Tanzania	Britain	April 26th, 1964	Competitive One-Party System

Table 23. Breakdown of Business Classification of EDP businesses.

Country	Non-Profit	For-Profit	Undecided	Other
Ghana	23.16	69.47	1.05	6.32
Kenya	6.83	84.54	1.90	6.74
Nigeria	8.01	84.75	2.33	4.91
South Africa	11.67	74.17	4.58	9.58
Uganda	21.18	68.99	2.60	7.22
Tanzania	12.15	77.35	1.10	9.39
All	12.63	78.02	2.32	7.03

Table 24. Percentage of EPD businesses with forms of technology or invention protection.

Country	Patents (%)	Copyright (%)	Trademark (%)
Ghana	3.16	12.63	17.89
Kenya	12.41	12.12	25.19
Nigeria	9.04	8.79	28.94
South Africa	12.92	15.42	16.67
Uganda	9.04	9.62	27.00
Tanzania	14.84	15.38	14.84
All	10.81	11.42	24.61

Table 25. Number of observations by country and geographic zone.

Country	Observations	Geographic Zone
Ghana	95	West
Kenya	1,056	East
Nigeria	387	West
South Africa	240	South
Uganda	852	East
United Republic of Tanzania	182	East

Total number of observations: 2,812

Table 26. Percentage of EPD Businesses for Each Country that Utilize a Particular Type of Equity Investment.

Country	Own Money	Angel Investor	Companies	Government	Venture Capital	N/A	Other
Ghana	67.37	8.42	0	0	3.16	5.26	3.16
Kenya	69.79	3.98	0.28	0.57	1.80	3.13	7.48
Nigeria	63.57	2.58	0.78	0.26	1.60	1.03	1.03
S. Africa	60.83	4.58	1.25	1.25	0.83	4.58	7.08
Uganda	80.52	1.53	0.70	0.35	0.47	2.46	2.00
Tanzania	70.33	3.85	3.85	1.10	0	3.30	7.14
All	71.38	3.24	0.78	0.53	1.21	2.84	4.73

Table 27. Percentage of EPD Businesses for Each Country that Utilize a Particular Type of Debt.

Country	Banks	Non-Bank Institution	Government	Companies	Family	Other Individual	Other
Ghana	3.16	5.26	0	1.05	1.05	4.21	3.16
Kenya	7.39	2.84	0.85	1.99	2.08	3.69	5.68
Nigeria	2.84	1.29	0.52	0.26	0.26	1.29	0.78
S. Africa	2.92	0.83	0.83	1.25	1.25	2.08	2.50
Uganda	5.87	3.29	0.82	1.53	0.59	2.93	1.53
Tanzania	6.59	2.20	1.10	0.55	2.75	4.95	2.20
All	5.73	2.63	0.78	1.42	1.32	3.09	3.17

Table 28. Percentage of Businesses where the Primary Founder is Female and Percentage of Businesses where any of the Founders are Female.

Country	Primary Founder Female	Any Founder Female
Ghana	28.26	44.57
Kenya	29.55	43.01
Nigeria	25.07	45.55
South Africa	37.55	47.26
Uganda	24.58	39.59
Tanzania	27.53	31.46
All	27.95	41.98

Table 29. Macroeconomic Descripting Statistics for Each Country of Interest.

Country	Population (millions)	GNI per Capita (2017 USD)	Population Density (people per sq km)	Time Required to Start Business (days)	Human Development Index (2017)	HDI Rank (2017)
Ghana	28.83	$1,880	126.7	14	0.592	140
Kenya	49.70	$1,460	87.3	23	0.590	143
Nigeria	190.89	$2,100	209.6	19	0.532	156
S. Africa	56.72	$5,430	46.8	45	0.699	111
Uganda	42.86	$600	213.8	24	0.516	162
Tanzania	57.31	$910	64.7	29	0.538	154

Table 30. Probit Regression of Equity Financing

This table contains a Probit Regression of various attributes on the probability of a firm being selected to receive a positive amount of Equity financing.

	(1)	**(2)**	**(3)**
Female	-0.2724***	-0.2890***	-0.2338***
	(0.0782)	(0.0798)	(0.0815)
Age	-0.0287*	-0.0385**	-0.0410**
	(0.0167)	(0.0175)	(0.1788)
Age Squared	0.0003	0.0004**	0.0004*
	(0.0002)	(0.0002)	(0.0002)
For Profit Experience		0.0001	0.2675**
		(0.0001)	(0.1272)
Non Profit Experience		0.0004	0.0004
		(0.0003)	(0.0004)
Established Profit Goals			0.2675**
			(0.1272)
Social Motivation			0.0487
			(0.1740)
Invention Based			0.2107***
			(0.0708)
Patents			0.4107***
			(0.0962)
Copyrights			0.0370
			(0.1011)
Trademarks			0.2724***
			(0.0748)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Education FE	No	Yes	Yes
R^2	0.034	0.043	0.071
No. Observations	2,722	2,695	2,695

Table 31. Probit Regression of Debt Financing

This table contains a Probit Regression of various attributes on the probability of a firm being selected to receive a positive amount of Debt financing.

	(1)	**(2)**	**(3)**
Female	-0.1434**	-0.1611**	-0.1615**
	(0.0716)	(0.0726)	(0.0736)
Age	0.0794***	0.0720***	0.0689***
	(0.0187)	(0.0192)	(0.0194)
Age Squared	-0.0008***	-0.0007***	-0.0007***
	(0.0002)	(0.0002)	(0.0002)
For Profit Experience		-6.10e-06	-9.40e-06
		(0.0002)	(0.0002)
Non Profit Experience		0.0002	0.0002
		(0.0004)	(0.0004)
Established Profit Goals			0.3516***
			(0.1216)
Social Motivation			0.0299
			(0.1608)
Invention Based			-0.0280
			(0.0657)
Patents			0.0324
			(0.1020)
Copyrights			-0.0626
			(0.1014)
Trademarks			0.1433**
			(0.0719)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Education FE	No	Yes	Yes
R^2	0.052	0.060	0.066
No. Observations	2,722	2,716	2,716

Table 32. Probit Regression of Philanthropic Contribution Financing

This table contains a Probit Regression of various attributes on the probability of a firm being selected to receive a positive amount of Philanthropic Contribution financing.

	(1)	**(2)**	**(3)**
Female	0.0686 (0.0570)	0.0587 (0.0577)	0.0806 (0.0590)
Age	-0.0089 (0.0136)	-0.0135 (0.0140)	-0.0073 (0.0143)
Age Squared	0.00001 (0.0002)	0.0002 (0.0002)	0.0001 (0.0001)
For Profit Experience		0.0002 (0.0001)	0.0002 (0.0001)
Non Profit Experience		-0.0002 (0.0004)	-0.0004 (0.0001)
Established Profit Goals			-0.6081*** (0.0846)
Social Motivation			0.1083 (0.1325)
Invention Based			0.1542*** (0.0541)
Patents			0.0653 (0.0835)
Copyrights			0.1863*** (0.0800)
Trademarks			0.2380 (0.0601)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Education FE	No	Yes	Yes
R^2	0.011	0.017	0.044
No. Observations	2,722	2,722	2,722

Table 33. OLS Regression of Equity Financing

This table contains an Ordinary Least Squares Regression of various attributes on the log amount of Equity financing a firm receives once they are selected to receive funding.

	(1)	**(2)**	**(3)**
Female	-0.4044	-0.8348**	-0.7122**
	(0.3444)	(0.3492)	(0.3547)
Age	0.2075***	0.1520**	0.1608**
	(0.0664)	(0.0672)	(0.0668)
Age Squared	-0.0019**	-0.0014*	-0.0015*
	(0.0008)	(0.0008)	(0.0008)
For Profit Experience		-0.0002	-0.0002
		(0.0005)	(0.0004)
Non Profit Experience		-0.0004	-0.0005
		(0.0009)	(0.0009)
Established Profit Goals			1.2376**
			(0.5596)
Social Motivation			-1.6084**
			(0.5596)
Invention Based			0.2565
			(0.2910)
Patents			0.2157
			(0.3545)
Copyrights			0.5778
			(0.3831)
Trademarks			0.1216
			(0.2824)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Education FE	No	Yes	Yes
R^2	0.151	0.235	0.268
No. Observations	301	301	301

Table 34. OLS Regression of Debt Financing

This table contains an Ordinary Least Squares Regression of various attributes on the log amount of Debt financing a firm receives once they are selected to receive funding.

	(1)	**(2)**	**(3)**
Female	-0.5526**	-0.5903**	-0.6607***
	(0.2458)	(0.2411)	(0.2446)
Age	0.1944***	0.1376**	0.1297**
	(0.0611)	(0.0673)	(0.0609)
Age Squared	-0.0012**	-0.0009	-0.0008
	(0.0008)	(0.0007)	(0.0008)
For Profit Experience		0.0830*	0.0720
		(0.0474)	(0.0480)
Non Profit Experience		-0.0847*	-0.0738
		(0.0474)	(0.0498)
Established Profit Goals			0.5978
			(0.4419)
Social Motivation			-0.0316
			(0.5415)
Invention Based			-0.1535
			(0.2190)
Patents			-0.0175
			(0.3446)
Copyrights			-0.4519
			(0.3382)
Trademarks			0.2891
			(0.2291)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Education FE	No	Yes	Yes
R^2	0.198	0.278	0.291
No. Observations	372	372	372

Table 35. OLS Regression of Philanthropic Contribution Financing

This table contains an Ordinary Least Squares Regression of various attributes on the log amount of Philanthropic Contribution financing a firm receives once they are selected to receive funding.

	(1)	**(2)**	**(3)**
Female	0.1030	0.0501	0.0474
	(0.1611)	(0.1624)	(0.1633)
Age	0.1160***	0.0942***	0.0897**
	(0.0352)	(0.0363)	(0.0367)
Age Squared	-0.0008**	-0.0006	-0.0006
	(0.0004)	(0.0004)	(0.0004)
For Profit Experience		0.0004**	0.0004**
		(0.0002)	(0.0002)
Non Profit Experience		0.0020	0.0017
		(0.0021)	(0.0021)
Established Profit Goals			-0.1273
			(0.2058)
Social Motivation			0.1900
			(0.3977)
Invention Based			-0.1124
			(0.1529)
Patents			0.2962
			(0.2258)
Copyrights			-0.2456
			(0.2112)
Trademarks			0.3155*
			(0.1622)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Education FE	No	Yes	Yes
R^2	0.081	0.124	0.132
No. Observations	804	804	804

Table 36. Heckman Selection Model for Equity Financing

This table contains the results of the two-stage Heckman Model for sample selection in the decision to provide Equity finance to a company, and the magnitude of funding given after considering potential selection bias in projects.

	(1)	(2)	(3)
Magnitude of Funding			
Female	-0.1105	-0.6682	-0.5640
	(0.4970)	(0.5144)	(0.5084)
Age	0.2415***	0.1753**	0.1784**
	(0.0789)	(0.0849)	(0.0899)
Age Squared	-0.0022**	-0.0017*	-0.0017
	(0.0009)	(0.0010)	(0.0010)
For Profit Experience		-0.0003	-0.0002
		(0.0005)	(0.0005)
Non Profit Experience		-0.0006	0.0007
		(0.0010)	(0.0010)
Established Profit Goals			0.9531
			(0.6408)
Social Motives			-1.5814**
			(0.7184)
Invention Based			0.1688
			(0.5389)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Education FE	No	Yes	Yes
Selection Decision			
Mean Patents	0.7109***	0.6686***	0.5916**
	(0.2548)	(0.2597)	(0.2626)
Female	-0.2630***	-0.2800***	-0.2446***
	(0.0785)	(0.0801)	(0.0808)
Age	-0.0279*	-0.0375**	-0.0389**
	(0.0168)	(0.0176)	(0.0179)
Age Squared	0.0003	0.0004*	0.0004*
	(0.0002)	(0.0002)	(0.0002)
For Profit Experience		0.0001	0.0001
		(0.0001)	(0.0001)
Non Profit Experience		0.0004	0.0004
		(0.0003)	(0.0004)
Established Profit Goals			0.2631**
			(0.1260)
Social Motives			0.0818
			(0.1741)
Invention Based			0.2695***
			(0.0690)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Education FE	No	Yes	Yes
Lambda	-1.3638	-0.7181	-0.7354
No. Observations	2,722	2,722	2,722
Selected	301	301	301
Not Selected	2,421	2,421	2,421

Table 37. Heckman Selection Model for Debt Financing

This table contains the results of the two-stage Heckman Model for sample selection in the decision to provide Debt finance to a company, and the magnitude of funding given after considering potential selection bias in projects.

	(1)	(2)	(3)
Magnitude of Funding			
Female	-0.8322**	-0.8538**	-0.9643**
	(0.3794)	(0.3755)	(0.4217)
Age	0.3621**	0.2626*	0.2877*
	(0.1668)	(0.1431)	(0.1605)
Age Squared	-0.0033*	-0.0022	-0.0024
	(0.0018)	(0.0015)	(0.0017)
For Profit Experience		0.0786*	0.0655
		(0.0464)	(0.0473)
Non Profit Experience		-0.0801*	-0.0668
		(0.0464)	(0.0473)
Established Profit Goals			1.3441
			(0.8588)
Social Motives			0.1435
			(0.6133)
Invention Based			-0.2106
			(0.2423)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Education FE	No	Yes	Yes
Selection Decision			
Mean Trademarks	0.4234**	0.4165**	0.3795*
	(0.2102)	(0.2115)	(0.2124)
Female	-0.1408**	-0.1596**	-0.1604**
	(0.0717)	(0.0727)	(0.0734)
Age	0.0789***	0.0714***	0.0699***
	(0.0187)	(0.0192)	(0.0194)
Age Squared	-0.0008***	-0.0007***	-0.0007***
	(0.0002)	(0.0002)	(0.0002)
For Profit Experience		-3.43e-06	-1.01e-05
		(0.0002)	(0.0002)
Non Profit Experience		0.0002	0.0002
		(0.0004)	(0.0004)
Established Profit Goals			0.3438***
			(0.1216)
Social Motives			0.0299
			(0.1606)
Invention Based			-0.0167
			(0.0639)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Education FE	No	Yes	Yes
Lambda	2.5184	2.0691	2.5824
No. Observations	2,722	2,722	2,722
Selected	372	372	372
Not Selected	2,350	2,350	2,350

Table 38. Heckman Selection Model for Philanthropic Contribution Financing

This table contains the results of the two-stage Heckman Model for sample selection in the decision to provide Philanthropic Contribution finance to a company, and the magnitude of funding given after considering potential selection bias in projects.

	(1)	(2)	(3)
Magnitude of Funding			
Female	0.0971 (0.1937)	0.0387 (0.1877)	0.0304 (0.1956)
Age	0.1168*** (0.0380)	0.0969** (0.0426)	0.0960*** (0.0367)
Age Squared	-0.0008* (0.0005)	-0.0007 (0.0005)	-0.0006 (0.0004)
For Profit Experience		0.0004 (0.0003)	0.0004 (0.0003)
Non Profit Experience		0.0021 (0.0020)	-0.0020 (0.0020)
Established Profit Goals			-0.0191 (0.9343)
Social Motives			0.2421 (0.4287)
Invention Based			-0.0995 (0.3345)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Education FE	No	Yes	Yes
Selection Decision			
Mean Competition Age	-0.0142* (0.0075)	-0.0133* (0.0075)	-0.0133* (0.0076)
Female	0.6640 (0.0570)	0.0570 (0.0578)	0.0694 (0.0587)
Age	-0.0058 (0.0134)	-0.0103 (0.0142)	-0.0012 (0.0145)
Age Squared	0.0001 (0.0002)	0.0001 (0.0002)	4.25e-05 (0.0002)
For Profit Experience		0.0002 (0.0001)	0.0002 (0.0001)
Non Profit Experience		-0.0002 (0.0004)	-0.0003 (0.005)
Established Profit Goals			-0.6034*** (0.0843)
Social Motives			0.1267 (0.1325)
Invention Based			0.1915*** (0.0528)
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Education FE	No	Yes	Yes
Lambda	-0.1175	-0.2629	-0.1755
No. Observations	2,722	2,722	2,722
Selected	804	804	804
Not Selected	1,918	1,918	1,918

Appendix D

Table 39. Information on Firms Included in Historical ReferenceUSA Data

Year	Number of Individual Firms	Percent Firms < 20 Employees
2003	12,655,586	89.05%
2004	12,523,962	89.27%
2005	13,095,624	88.91%
2006	13,230,400	88.78%
2007	13,582,340	91.31%
2008	13,766,183	91.29%
2009	13,557,763	91.34%
2010	13,724,001	89.68%

Table 40. State Homestead Exemption Levels in the Pre- and Post-Policy Change

State	2004 Homestead Exemption	2006 Homestead Exemption
Alabama	10,000	10,000
Alaska	54,800	67,500
Arizona	100,000	150,000
Arkansas	Unlimited	Unlimited
California	75,000	75,000
Colorado	90,000	90,000
Connecticut	150,000	150,000
Delaware	0	50,000
District of Columbia	Unlimited	Unlimited
Florida	Unlimited	Unlimited
Georgia	20,000	20,000
Hawaii	20,000	20,000
Idaho	50,000	50,000
Illinois	15,000	30,000
Indiana	15,000	30,000
Iowa	Unlimited	Unlimited
Kansas	Unlimited	Unlimited
Kentucky	10,000	10,000
Louisiana	25,000	25,000
Maine	70,000	70,000
Maryland	0	0
Massachusetts	300,000	500,000
Michigan	18,450	31,900
Minnesota	200,000	200,000
Mississippi	150,000	150,000
Missouri	15,000	15,000
Montana	200,000	100,000
Nebraska	12,500	12,500
Nevada	200,000	350,000
New Hampshire	200,000	200,000
New Jersey	18,450	18,450
New Mexico	60,000	60,000

New York	20,000	100,000
North Carolina	20,000	37,000
North Dakota	80,000	80,000
Ohio	10,000	10,000
Oklahoma	Unlimited	Unlimited
Oregon	33,000	39,600
Pennsylvania	18,450	18,450
Rhode Island	150,000	200,000
South Carolina	10,000	10,000
South Dakota	Unlimited	Unlimited
Tennessee	7,500	7,500
Texas	Unlimited	Unlimited
Utah	40,000	40,000
Vermont	150,000	150,000
Virginia	10,000	10,000
Washington	40,000	40,000
West Virginia	50,000	50,000
Wisconsin	40,000	40,000
Wyoming	20,000	20,000

Table 41. List of Industry Subsectors by 2-Digit NAICS Codes

2-Digit NAICS	Subsector
11	Agriculture, Forestry, Fishing and Hunting
21	Mining, Quarrying, and Oil and Gas Extraction
22	Utilities
23	Construction
31-33	Manufacturing
42	Wholesale Trade
44-45	Retail Trade
48-49	Transportation and Warehousing
51	Information
52	Finance and Insurance
53	Real Estate and Rental and Leasing
54	Professional, Scientific, and Technical Services
55	Management of Companies and Enterprises
56	Administrative and Support and Waste Management and Remediation Services
61	Educational Services
62	Health Care and Social Assistance
71	Arts, Entertainment, and Recreation
72	Accommodation and Food Services
81	Other Services (except Public Administration)
92	Public Administration

Table 42. Difference-in-Difference coefficient estimations on the percent of businesses that entered the market for each firm type, state, industry, and year.

	(1)	(2)	(3)
Post Policy Change	0.0245***	0.0245***	0.0245***
	(0.0084)	(0.0085)	(0.0085)
Small Firm	0.7717***	0.7717***	0.7717***
	(0.0084)	(0.0085)	(0.0085)
(Post*Small)	-0.0491***	-0.0491***	-0.0491***
	(0.0119)	(0.0120)	(0.0120)
State FE	No	Yes	Yes
Industry FE	No	No	Yes
Adjusted R^2	0.755	0.753	0.752
Observations	5,090	5,090	5,090

Table 43. Difference-in-Difference coefficient estimations on the percent of businesses that exited the market for each firm type, state, industry, and year.

	(1)	(2)	(3)
Post Policy Change	-0.0137*	-0.0137*	-0.0137*
	(0.0079)	(0.0080)	(0.0080)
Small Firm	0.7230***	0.7230***	0.7230***
	(0.0079)	(0.0080)	(0.0080)
(Post*Small)	0.0274**	0.0274**	0.0274**
	(0.0112)	(0.0112)	(0.0113)
State FE	No	Yes	Yes
Industry FE	No	No	Yes
Adjusted R^2	0.773	0.771	0.770
Observations	5,086	5,086	5,086

Table 44. Triple-Difference coefficient estimations on the percent of businesses that entered the market for each firm type, state, industry, and year.

	(1)	(2)	(3)
Post Policy Change	0.0256**	0.0256**	0.2556**
	(0.0121)	(0.0121)	(0.0122)
Small Firm	0.7758***	0.7758***	0.7758***
	(0.0121)	(0.0121)	(0.0122)
Low Exemption State	0.0040	0.0040	0.0040
	(0.0119)	(0.0320)	(0.0321)
(Post*Small)	-0.0511***	-0.0511***	-0.0511***
	(0.0171)	(0.0171)	(0.0172)
(Post*Low)	-0.0002	-0.0020	-0.0020
	(0.0169)	(0.0170)	(0.0170)
(Small*Low)	-0.0079	-0.0079	-0.0079
	(0.0169)	(0.0170)	(0.0170)
(Post*Small*Low)	0.0041	0.0041	0.0041
	(0.0239)	(0.0240)	(0.0241)
State FE	No	Yes	Yes
Industry FE	No	No	Yes
Adjusted R^2	0.755	0.753	0.751
Observations	5,090	5,090	5,090

Table 45. Triple-Difference coefficient estimations on the percent of businesses that exited the market for each firm type, state, industry, and year.

	(1)	(2)	(3)
Post Policy Change	-0.0107 (0.0113)	-0.0107 (0.0114)	-0.0107 (0.0114)
Small Firm	0.7348*** (0.0113)	0.7348*** (0.0114)	0.7348*** (0.0114)
Low Exemption State	0.0115 (0.0112)	0.0115 (0.0300)	0.0115 (0.0301)
(Post*Small)	0.0215 (0.0160)	0.0215 (0.0161)	0.0215 (0.0161)
(Post*Low)	-0.0058 (0.0159)	-0.0058 (0.0159)	-0.0058 (0.0159)
(Small*Low)	-0.0231 (0.0158)	-0.0231 (0.0159)	-0.0231 (0.0159)
(Post*Small*Low)	0.0116 (0.0224)	0.0116 (0.0225)	0.0116 (0.0226)
State FE	No	No	Yes
Industry FE	No	No	Yes
Adjusted R^2	0.773	0.771	0.770
Observations	5,086	5,086	5,086

Table 46. Sign and significance of the Difference-in-Difference coefficient estimates on the percent of businesses that entered the market by industry.

Industry	Post Policy Change	Small Firm	(Post*Small)
11	– ***	+ ***	+ ***
21	+	+ ***	–
22	– *	+ ***	+ **
23	–	+***	+***
31-33	+***	+***	–***
42	+*	+***	–***
44-45	+***	+***	–***
48-49	–***	+***	+***
51	–	+***	+*
52	+***	+***	–***
53	+	+***	–
54	+***	+***	–***
55	+***	+***	–***
56	–	+***	+
61	+***	+***	–***
62	–**	+***	+***
71	–*	+***	+***
72	–	+***	+
81	+	+***	–*
92	+***	+***	–***

Table 47. Sign and significance of the Difference-in-Difference coefficient estimates on the percent of businesses that exited the market by industry.

Industry	Post Policy Change	Small Firm	(Post*Small)
11	–	+***	+*
21	–*	+***	+**
22	–**	+***	+***
23	–***	+***	+***
31-33	–***	+***	+***
42	–***	+***	+***
44-45	+	+***	–
48-49	–***	+***	+***
51	–	+***	+
52	–***	+***	+***
53	–	+***	+
54	–**	+***	+***
55	–**	+***	+***
56	–***	+***	+***
61	+***	+***	–***
62	+	+***	–
71	–	+***	+
72	–***	+***	+***
81	–**	+***	+***
92	–***	–***	+***

Table 48. Triple-Difference coefficient estimations on the percent of businesses that entered the market by Industry

Industry	Post Policy	Small Firm	Low Exemption	(Post* Small)	(Post* Low)	(Small* Low)	(Small* Post*Low)
11	–***	+***	–	+***	+	+	–
21	+	+***	–	–	–	+	+
22	–	+***	+	+	–	–	+
23	–**	+***	+	+***	+	–	–
31-33	+***	+***	+***	–***	–	–***	+
42	+	+***	+	–**	+	–*	–
44-45	+***	+***	+	–***	+	–	–
48-49	–***	+***	+	+***	+	–	–
51	–	+***	–	+*	+	+*	–
52	+**	+***	–	–***	+	+	–
53	+	+***	+	–	+	–	–
54	+***	+***	+	–***	–	–	+
55	+***	+***	+	–***	–	–	+
56	–	+***	–	+	+	+	–
61	+***	+***	–	–***	+	+	–
62	–	+***	–	+**	+	+	–
71	–*	+***	–	+**	+	+	–
72	–	+***	–	+*	+	+	–
81	+	+***	–	–	+	+	–
92	+***	+**	–	–***	+	+	–

Table 49. Triple-Difference coefficient estimations on the percent of businesses that exited the market by industry

Industry	Post Policy	Small Firm	Low Exemption	(Post* Small)	(Post* Low)	(Small* Low)	(Small* Post*Low)
11	–**	+***	–	+***	+**	+**	–***
21	–	+***	+**	+	–	–***	+
22	–	+***	+	+	–	–*	+
23	–***	+***	+	+***	–	–	+
31-33	–***	+***	+***	+***	–	–***	+
42	–***	+***	+*	+***	–	–***	+
44-45	+	+***	+	–	–	–**	+
48-49	–	+***	+**	+**	–	–***	+
51	+	+***	–	–	–	+	+*
52	–**	+***	+	+***	+	–	–
53	–	+***	+	+	–	–	+
54	–	+***	+	+	–	–*	+
55	–	+***	–	+**	+	+	–
56	–**	+***	–	+***	+	+	–
61	+**	+***	+	–***	–	–	+
62	+	+***	+	–*	–	–	+
71	–*	+***	–	+**	+	+	–*
72	–**	+***	+**	+***	–	–**	+
81	–**	+***	–	+***	+	+*	–*
92	–**	–***	+***	+	–	–	+

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Vita

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