THREE ESSAYS ON ENTREPRENEURSHIP AND ALTERNATIVE ECONOMIC DEVELOPMENT POLICIES

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By

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The undersigned, appointed by the Dean of the Graduate School, have examined the dissertation entitled

THREE ESSAYS ON ENTREPRENEURSHIP AND ALTERNATIVE ECONOMIC DEVELOPMENT POLICIES

Presented by Maria Figueroa Armijos

A candidate for the degree of Doctor of Philosophy of Public Affairs,

And hereby certify that, in their opinion, it is worthy of acceptance.

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DEDICATION

To Serge, for loving me so wholeheartedly and for sharing every precious moment of this exciting life with me. Your love, enthusiasm and dynamism for life brighten up my every morning and fill me up with joyful energy every day. Thank you for the many adventures, for discovering the world with me, and for teaching me so much about so many things. Thank you for being so patient during the crazy times and for supporting me so unconditionally. I am the most fortunate person in the world for having you in my life. Thank you for always caring for me and for making me laugh so much. We are a team. A perfect team. Je t'aime beaucoup!

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THREE ESSAYS ON ENTREPRENEURSHIP AND ALTERNATIVE ECONOMIC DEVELOPMENT POLICIES

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ABSTRACTS

Essay 1

This study examines the effect of rurality on early-stage necessity and opportunity entrepreneurship among women and men in America from three rural typology perspectives. To achieve this objective, I build a dataset that combines GEM U.S. individual data for 2005-2010 and county economic characteristics from the Bureau of Labor Statistics and the Census Bureau. I use three typologies to define rurality and compare the results, the OMB metro-nonmetro classification system (2003), Isserman (2005) and county population density. I further analyze this data in subsamples by gender using cross-section time-series rare events logistic regression with clustered robust errors and year fixed effects. Key findings indicate the three rural typologies show similar results in magnitude, direction and significance, although population density shows sensitivity to the rurality variable and subsamples. Also, compared to women in OMB metro counties in America, women who live in OMB nonmetro counties have a higher probability of engaging in opportunity entrepreneurship. This probability increases with college education and decreases if the woman lives alone or is retired. Among men, living in OMB nonmetro or Isserman rural counties also increases their probability of engaging in opportunity entrepreneurship. College education and being African American also increases this probability. Predictors of necessity entrepreneurship are having an income below 50,000 among women and being employed part time among men.

Essay 2

This study uses the resource-based view of the firm in the context of neoclassical economics and the concept of additionality to determine the effect of public sources of start-up capital on entrepreneurial performance at the business and state levels. To attain this objective, the study develops a dataset that combines the 2007 Survey of Business Owners (SBO) Public Use Microdata Sample (PUMS) (released August 2012) with state data from the Census Bureau's Business Dynamics Statistics. The final dataset contains over one million observations from firms across the US that were operational in 2007, and is analyzed using OLS and two-stage least squares (2SLS) with two alternative instrumental variables. Public sources of start-up capital include government loans, government guaranteed loans and grants, and are combined into one indicator. Results indicate that public intervention in the provision of start-up capital has a marginal negative effect on business employment, and a positive effect in the long term (once the firm is established) on the state establishment entry rate compared to using private sources of capital. This comparative study fills a gap in the literature by providing strong theoretical and empirical evidence on the effect at the business level and the additionality effect at the state level of offering public sources of start-up capital to firms across the US.

Essay 3

The last two decades marked a turning point for entrepreneurship policy, highlighting the crucial role of public policy in generating the conditions that encourage business creation and expansion. As more states design and implement entrepreneurship policies of their own, understanding how these policies can support and harness the full potential of entrepreneurship becomes more critical. This paper reports on the effects of an entrepreneurship policy implemented in 2004 in the state of Kansas as part of the Kansas Economic Growth Act. Specifically, it studies the impact of tax credit funds provided by one of its programs, the Entrepreneurial Community (E-Community) partnership, on the economy of adopter Kansas' counties between 2007 and 2010. The study uses a spatial difference-in-differences statistical technique to analyze the effect of the tax credits provided by Network Kansas on entrepreneurial counties' taxable retail sales per capita (an indicator of local economic performance). The results indicate that the tax credits have a positive effect on the economy of adopter counties, and that the policy has its largest effect at time of adoption. The results also suggest that the policy has a spatial effect that improved performance among adopter counties and their surrounding areas, which may decrease competitiveness in non-adopters and non-neighboring areas.

CHAPTER 1: ENTREPRENEURSHIP IN RURAL AMERICA ACROSS TYPOLOGIES, GENDER AND MOTIVATION

1. Introduction

Female and male entrepreneurs launch and manage new businesses differently. Several studies show that women and men target different sectors and markets using different strategies and goals (Brush, 1992; Carter *et al*., 1997; Chaganti and Parasuraman, 1996; Fisher *et al*., 1993; Verheul, 2003). For instance, women's increased participation in the work force and subsequent higher engagement in entrepreneurial activities (Center for Women's Business Research, 2004) has turned the attention of researchers toward female entrepreneurship and its effect on national economies. In 2004, the Organization for Economic Cooperation and Development (OECD, 2004) identified female entrepreneurs as a latent source of economic growth. Nonetheless, few studies have looked at the probability of women engaging in entrepreneurial activities (Langowitz and Minniti, 2007). Most research to date has explored the relationship between socio-demographic characteristics and women's entrepreneurial behavior (Langowitz and Minniti, 2007). However, little attention has been given to the effect of living in rural America on the probability of women engaging in self-employment, either out of need or for opportunity reasons, and how they compare to men. As a result, the contribution of female entrepreneurship to innovation, job generation and wealth creation, especially in rural America, is still "vastly understudied" (de Bruin, Brush and Welter, 2006). In fact, the overall research on female entrepreneurs represents only ten percent of the entrepreneurship literature (Brush and Cooper, 2012).

This paper addresses the need for research that explores the effects of living in rural America on women's likelihood to start and manage a new business, compared to men, by using three alternative typologies. As Brush (2006) explains, female and male entrepreneurs do not act in similar ways. Thus, this study contributes to the need for understanding the effects of entrepreneurship by gender at the macro level (i.e. context), a need several studies have previously emphasized (de Bruin *et al*., 2007). It also opens up questions for future research that could explore effects at the micro level from a feminist theory approach. This paper also addresses the need for comparative research that analyzes these results from different rurality perspectives. Several rural-urban typologies exist and researchers adopt one or another depending on data accessibility and familiarity. However, to the best of my knowledge there is no single study that compares results from different typologies. Thus, I also contribute to the literature by testing and comparing three rural-urban typologies available in the literature.

The first typology I use is the Office of Management and Budget (OMB) metro-nonmetro classification system from 2003. Although this approach is widely used in social science research, it doesn't precisely translate into urban and rural because the definition of metropolitan area itself includes both rural and urban populations. For the second typology I use the cross-tabulation of metro-nonmetro rural-urban classification systems proposed by Isserman (2005). This typology combines insights from two official rural-urban county classifications to offer a more comprehensive cross-tabulation approach that considers rural-urban separation and rural-urban integration from an integrative functional perspective. Although this typology has not been widely applied yet, it offers a thorough classification of different levels of rurality based on multiple

characteristics. I also use population density as a third typology to observe differences. This latter approach is often used to differentiate urban and rural areas by their level of population concentration. In fact, the OECD and the European Commission use population density as a measurement of rurality by defining as rural those areas with "less than 150 and 100 inhabitants per square kilometer" respectively (European Commission, 1997; OECD, 1996).

Finally, I study entrepreneurship from two perspectives, necessity and opportunity, because recent changes in the economy may have influenced the motivation to become self-employed. As Verheul and colleagues (2006) explain, the Schumpeterian effect of entrepreneurship is positively or negatively related to employment depending on the motivation to pursue it. Opportunity entrepreneurship occurs when an individual identifies an opportunity and decides to start a business. Necessity entrepreneurship, in contrast, occurs when an individual engages in self-employment to offset income loss because of unemployment or underemployment. The reason for distinguishing opportunity entrepreneurs from necessity entrepreneurs is the expectation that opportunity entrepreneurs are more likely to create new firms that contribute to higher economic growth and new jobs (Acs and Varga, 2005).

Thus, I contribute to the literature in three ways. First, I study the role of rurality in boosting or reducing the probability of entrepreneurship in America, compared to urban America. I use and compare the results from three rural-urban typologies available in the literature. Second, I analyze these results by separating the dataset into female and male subsamples and comparing the results. Finally, I design the models from two perspectives, necessity and opportunity, to observe differences related to motivation.

The structure of the paper is as follows. In section 2, I present a review of literature that explores the distinctions between opportunity and necessity entrepreneurship, the particular characteristics of entrepreneurship among women and men in America and the effects of rurality on entrepreneurial activity. In section 3, I discuss the data and method used followed by section 4, where I present the results of the study, which consider the overall effects of rurality and compare them with similar results from the female and male subsamples. The overall sample and subsamples are studied comparing the three rural typologies previously described and the motivation to pursue entrepreneurship (necessity or opportunity). Section 5 presents conclusions and policy implications.

2. Literature Review

2.1 Opportunity and necessity entrepreneurship

Block and Wagner (2010) argue that entrepreneurship occurs when a business opportunity is discovered and exploited. In fact, a number of scholars have identified alertness to opportunities as the essential factor defining the entrepreneur (Eckhardt and Shane, 2003; Shane and Venkataraman, 2000). The exploitation of opportunities provides the entrepreneur with profits from introducing and selling goods or services at higher prices than the cost of producing them (Casson, 1982; Shane and Venkataraman, 2000).

However, in 2001 the Global Entrepreneurship Monitor (GEM) Consortium identified two types of entrepreneurs in their national surveys—opportunity and necessity entrepreneurs (Reynolds *et al*., 2002a). What makes the two types different from each other is their motivation for engaging in entrepreneurial activity. In essence, an opportunity entrepreneur is someone who decides, with little provocation, to set up a

business, in some cases by giving up their position as a paid employee. A necessity entrepreneur, on the other hand, refers to someone who engages in entrepreneurship because no other (or better) external sources of income are readily available. As Verheul and colleagues (2006) explain, negative employment growth leads to a higher number of necessity entrepreneurs, who are pushed to start a business because of the lack of other options available.

The distinction between opportunity and necessity entrepreneurship was utilized in the 2004 GEM Executive Report by Acs and colleagues (2005) to explain the U-shaped relationship between entrepreneurship and economic development in a study of developing and developed economies. In the report, Acs and colleagues find higher levels of entrepreneurship in both low and high-income countries, and conclude this is because of necessity in the case of developing economies (need-based) and opportunity in developed countries (opportunity and innovation-based).

Maritz (2004) defines a necessity entrepreneur as someone who considers entrepreneurship because there are no better options in the market. In his study of New Zealand necessity entrepreneurs, Maritz (2004) found positive relationships between these entrepreneurs and economic growth (real GDP growth rate) and immigration. In contrast, a study conducted by Cowling and Bygrave (2003) shows that necessity entrepreneurship occurs as a response to unemployment or when outside alternatives in the labor market are absent or unsatisfactory (Williams, 2009). A recent study by Figueroa-Armijos and colleagues (2012) found that the recent Great Recession shifted individuals' motivation in America to pursue entrepreneurial activities from opportunity driven to necessity driven.

Among women, the effects of negative employment levels may be even higher than for men because they are more likely to take part-time jobs (Verheul, Van Stel and Thurik, 2006). Orhan and Scott (2001) identified several "push" necessity factors that are particularly common among female entrepreneurs. These are insufficient family income, dissatisfaction with salaries offered for employment, difficulty finding a job and schedule inflexibility to accommodate household responsibilities. Hisrich and Brush (1985) also mention lack of promotion opportunities and recognition as push factors. "Pull" opportunity factors, on the other hand, are higher schedule flexibility and control (Mattis, 2004), independence, self-fulfillment and higher income (Bennett and Dann, 2000; Walker and Webster, 2007). This, paralleled to the literature review section on rurality and entrepreneurship by gender below, leads us to the first set of hypotheses.

H1a. Men in rural America are more likely to engage in opportunity entrepreneurship than women in rural America.

H1b. Women in rural America are more likely to engage in necessity entrepreneurship than men in rural America.

2.2 Gender differences in entrepreneurship

Since the 1970s, women's participation in the labor market has increased in most countries (Verheul, Wennekers, Audretsch and Thurik, 2002; OECD, 1998b). Between 1987 and 1996, the growth in number and sales of women-owned businesses was nearly two times the overall growth in number and sales of businesses in the United States (Kourilsky and Walstad, 1998). Recent evidence shows women are majority owners of almost one-third of all private firms in the United States (de Bruin *et al*., 2006; Minniti, Allen and Langowitz, 2006; Minniti, Arenius and Langowitz, 2005; Wilson, Marlino and

Kickul, 2004). Such growth positions female entrepreneurs as important contributors of jobs, innovation and productivity to the national economy (Allen, Elam, Langowitz and Dean, 2007). Although increased female participation in the labor force does not automatically mean women will engage in more entrepreneurial activity, higher activity might be expected to increase the motivation among women to start new ventures, although some scholars suggest the opposite (Uhlaner, Thurik and Hutjes, 2002; Verheul *et al*., 2006).

Studies on entrepreneurship that do not distinguish differences between males and females are considered "gender-blind" (Goffee and Scase, 1985) or "gender-neutral" (Ahl, 2004; Ahl, 2006; Beasley, 1999) because they fail to recognize women and men are motivated distinctively and behave quite differently in the business world (Schwartz, 1976). More recent work emphasizes the critical role gender plays in self-employment (de Bruin *et al*., 2007; Gupta *et al*., 2008; Marlow *et al*., 2009; Taylor and Marlow, 2010). For instance, Brush (1992) suggests women identify self-employment as a life strategy to balance relationships and networks rather than for generating profits only.

Furthermore, a previous study by Wilson and colleagues (2007) found entrepreneurship education has higher effects among female MBA students than among male MBA students. Their focus on the impact of curricula to build self-efficacy in potential female entrepreneurs shows that pedagogical approaches need to be tailored to the specific entrepreneurial motivations by gender. Ahl and Marlow (2011) support a similar conclusion that entrepreneurship is gender-specific. Research conducted in Turkey by Cetindamar and colleagues (2012) found that "for women, higher education…facilitates entry into entrepreneurship." Another study by Orser and

colleagues (2012) also found that woman-to-woman mentoring plays a critical role in addressing career barriers among female entrepreneurs in the high-tech sector. Accordingly, more in-depth research that captures the 'essence' of female entrepreneurship, especially in rural economies, is justified.

Among the incentives that motivate women to start self-employment is the greater schedule flexibility business ownership offers (Buttner and Moore, 1997), which allows them to balance work and household responsibilities (McGowan, Lewis. Redeker, Cooper and Greenan, 2012; Mattis, 2004; Goffee and Scase, 1983). Other incentives for female entrepreneurship are the desire for new career challenges and financial independence, and also the need posed by life changing events such as divorce (Taylor, 1988) or pregnancy (McGowan *et al*., 2012). In addition, a Vermont study by Sullivan and colleagues (1997) found that entrepreneurship could serve as a means to alleviate poverty among women in rural America. The self-determination and empowerment business ownership offers (Sullivan, Halbrendt, Wang and Scannell, 1997) can enhance women's self-awareness, personal preferences and human capital (Minniti and Arenius, 2003), thus motivating higher involvement in economic activity.

Furthermore, several studies show women face disadvantages when deciding to start a business, compared to men. For instance, Jianakoplos and Bernasek (1998) provide evidence that women are more risk averse than men when it comes to financial decisions. In a study about size differences between men and women-led businesses, Cliff (1998) found women are more concerned than men about fast growing businesses and are more likely to establish a growth threshold that limits risk-bearing. Scherer and colleagues (1990) suggest women's decision to start a new venture also depends on their

self-confidence and perception of success for the new venture. This may explain the lower growth rates of companies where they are identified as the owner (Johnson and Powell, 1994) and the smaller size for ventures started and managed by women (Cliff, 1998).

Several studies also suggest women relate better than men to nonmonetary factors (Acs and Szerb, 2007; Bird and Brush, 2002; Burke, FitzRoy and Nolan, 2002) and to social capital (Acs and Szerb, 2007), which may be influenced by women's role as the household's core (Winn, 2004) or "emotional nurturer and housekeeper" (Unger and Crawford, 1992). Previous studies also suggest women are most frequently found in service businesses (Orser *et al.*, 2006; Cowling, 2008) or part time jobs—this last one especially if they have children (Verheul and Thurik, 2002; Verheul *et al*., 2006). Additionally, research on self-efficacy and entrepreneurial intentions among teen girls shows race and ethnicity also create significant differences at a young age (Marlino and Wilson, 2003; Wilson *et al*., 2004).

Consequently, the combination of household and/or family responsibilities (Loscocco and Robinson, 1991), financial constraints (Carter and Rosa, 1998; Carter *et al*., 1997), lack of access to capital (Cetindamar *et al*., 2012) through formal financial institutions (Carter, 2000; Carter and Cannon, 1992; Hisrich and Brush, 1987; Riding and Swift, 1990; OECD, 1998b), "exclusion from male-dominated networks," lack of role models at top executive levels (McGowan *et al*., 2012) and the lack of self-confidence (Chen *et al*., 1998; Kirkwood, 2009) because of less familiarity (than men) with the business world are some of the 'extra' disadvantages women face when deciding to start a business.

Thus, even though the entrepreneurial differences between men and women are in decline (Minniti and Arenius, 2003), female self-employment rates (as a percentage of female labor force) are still lower when compared to self-employment rates of men (Bais *et al.*, 1995; Driga *et al*., 2009; Gupta and York, 2008; OECD, 1998b; Verheul *et al*., 2006). In 1994, the Small Business Administration projected that women-owned businesses would represent half of all U.S. businesses by 2002 (SBA, 1994). By 2003, however, the actual rate was only thirty percent (Minniti and Arenius, 2003). Based on this evidence and the lack of research on rural settings, I raise the question *is this also true among female entrepreneurs in rural America?*

2.3 Rurality and entrepreneurship by gender

Even though there has been an increase in female entrepreneurship research at the national and cross-country levels (Aidis *et al*., 2007; Du Rietz and Henrekson, 2000; Langowitz and Minniti, 2007; Orhan and Scott, 2001; Petridou and Glaveli, 2008; Terjesen and Amorós, 2010; Verheul *et al*., 2006), there is a lack of studies that consider female entrepreneurial activity in the context of rural America (de Bruin *et al*., 2007; Gupta and York, 2008). In fact, only a few studies have looked at small business success in rural areas by gender (Bird *et al*., 2001; Bird and Saap, 2004; Driga *et al*., 2009; Tigges and Green, 1994), leaving a void in our understanding of the role location plays in the early stages of firm creation and survival (Cooper and Folta, 2000).

Ahl (2006) finds the role of the entrepreneur is stereotyped as belonging to men. This conception seems to be especially true for rural areas (Campbell and Bell, 2000). Chiappe and Flora (1998) argue that the stereotype of women in rural areas, held by both men and women, is that the role of women is in domestic and reproductive activities.

Driga and colleagues (2009) suggest that because "men and women share these stereotypical beliefs, rural women might believe they are less well suited for entrepreneurial activities." Similarly, Gupta and York (2008) suggest:

> "These obstacles and challenges are even greater for women in poor regions where people may have more limited access to education and technology, views about women's participation in the labor force tend to be more traditional and opportunities for economic advancement are fewer (Sullivan *et al*., 1997)".

This leads us to the second set of hypotheses.

H2. Rural America affects negatively the likelihood of entrepreneurial activity compared to metro/urban areas.

H2a. Women in rural America are less likely to engage in entrepreneurial activities than women who reside in metro/urban areas.

H2b. Men in rural America are less likely to engage in entrepreneurial activities than men who reside in metro/urban areas.

By referring back to the section above on gender differences in entrepreneurship, I also hypothesize the following

H3a. Women in rural America are less likely than men in rural America to engage in entrepreneurial activity.

H3b. Women in urban America are less likely than men in urban America to engage in entrepreneurial activity.

3. Data and Methods

3.1 Data selection

The analysis here is primarily based on data from the USA GEM database for years 2005 through 2010. The GEM, a partnership between the London Business School and Babson College, is the largest single study of entrepreneurial dynamics across countries. For fourteen years the GEM has been exploring the role of entrepreneurship in national economic growth, and today is still the most detailed database on the world's entrepreneurs that is comparable across over 70 nations and contexts. The original GEM dataset differentiates between necessity and opportunity entrepreneurs based on a number of survey indicators. The national (U.S.) GEM team utilizes several response variables from the national survey to differentiate and classify entrepreneurs by two types of motivation (i.e. necessity or opportunity). The GEM's methodology is described in detail by Reynolds and colleagues (2005). Scholars from multiple disciplines and countries undertake empirical studies that use GEM data (Eden and Cruickshank, 2004; Elam and Terjesen, 2010; Koellinger and Minniti, 2006; Lee and Wong, 2004; Lafuente et al., 2007; Levie and Autio, 2008).

The sample for this study uses the U.S. GEM's random adult population survey for 2005 through 2010, which includes individuals from both rural and urban areas. Although the GEM has USA data for 1999-2004 as well, those years could not be used in this study because their databases do not have an origin identification variable (i.e. zip code). The initial GEM sample contains 21,502 observations from U.S. individuals for 2005-2010 with zip code identifiers. I match the GEM individual survey information with

characteristics of the individual's county of origin, such as rurality, population density and employment by following two steps.

First, I merge the GEM 2005-2010 dataset with a dataset from the U.S. Census Bureau that contains all USA zip codes and corresponding FIPS codes.[1] Second, this merged dataset is merged again with a dataset of county level characteristics (i.e. Isserman codes, OMB codes, population density, job growth rate) that identifies U.S. counties by FIPS codes. This latter dataset includes information from the OMB (2003) and Isserman (2005) (rurality), U.S. Census Bureau (population) and Bureau of Labor Statistics (employment for control variable job growth rate). The resulting "overall" dataset contains 19,849 individual observations from 2,421 counties, with an average of 8.2 observations per county (maximum of 370 observations per county and minimum of 1 observation per county). This dataset is further reduced to 10,496 observations to create the "female subsample" dataset. This dataset contains observations from 2,036 counties, with an average of 5.15 observations per county (maximum of 175 observations per county and minimum of 1 observation per county). In contrast, the "male subsample" has 9,343 observations from 1,911 counties, with an average of 4.89 observations per county (maximum of 195 observations per county and minimum of 1 observation per county). The primary (overall) dataset is also reduced to subsamples by rural typology to define a "rural only" (Tables 8 and 9) and "urban only" setting (Tables 10 and 11) to study female necessity and opportunity entrepreneurship compared to men in the same rural or urban context. The OMB 2003 rural subsample has 4,302 observations, the Isserman (2005) rural subsample has 9,294 observations, and the population density rural subsample (counties with less than 1000 persons per square mile) has 13,798 observations. The

[1] Zip codes/FIPS dataset available at: http://www.census.gov/geo/www/tiger/zip1999.html

urban OMB (2003) subsample has 15,523 observations, the Isserman (2005) subsample has 10,351 observations, and the population density urban subsample (counties with more than 1000 persons per square mile) has 6,027 observations.

Table 1 shows that the "overall" dataset has 19,849 observations, with almost equal numbers of females (10,496 observations, or 52.88%) and males (9,353 observations or 47.12%). It also contains 15,547 observations from OMB metro counties (78.33%), 10,545 from Isserman's urban and mixed urban counties (53.13%), 4,302 from OMB non-metro counties (21.67%), 9,304 from Isserman's rural and mixed rural counties (46.88%), 1,075 opportunity entrepreneurs (5.42%), and 234 necessity entrepreneurs (1.18%). In turn, the female subsample has 10,496 observations, and contains 8,185 from OMB metro counties (77.98%), 5,538 from Isserman's urban and mixed urban counties (52.76%), 2,311 from OMB non-metro counties (22.03%), 4,958 from Isserman's rural and mixed rural counties (47.24%), 446 female opportunity entrepreneurs (4.25%), and 100 female necessity entrepreneurs (0.95%). The male subsample has 9,353 observations, and contains 7,362 from OMB metro counties (78.71%), 5,007 from Isserman's urban and mixed urban counties (53.53%), 1,991 from OMB non-metro counties (21.29%), 4,346 from Isserman's rural and mixed rural counties (46.47%), 629 male opportunity entrepreneurs (6.73%), and 134 male necessity entrepreneurs (1.43%).

Table 1. Description year, dependent and independent variables

		Overall sample		Female subsample		Male subsample	
Variable	Type	n	%	n	%	n	%
Total		19849	100	10496	100	9353	100
Year							
2005	Fixed effects	1856	9.35	944	8.99	912	9.75
2006	Fixed effects	2854	14.38	1467	13.98	1387	14.83
2007	Fixed effects	1990	10.03	1009	9.61	981	10.49
2008	Fixed effects	4546	22.9	2707	25.79	1839	19.66
2009	Fixed effects	4916	24.77	2430	23.15	2486	26.58
2010	Fixed effects	3687	18.58	1939	18.47	1748	18.69
Necessity entrepreneurship							
Yes	Binary	234	1.18	100	0.95	134	1.43
No	Binary	19615	98.82	10396	99.05	9219	98.57
Opportunity entrepreneurship							
Yes	Binary	1075	5.42	446	4.25	629	6.73
No	Binary	18774	94.58	10050	95.75	8724	93.27
Female							
Yes	Binary	10496	52.88	10496	100	0	0
Male	Binary	9353	47.12	0	0	9353	100
OMB metro-nonmetro							
Non metro counties	Binary	4302	21.67	2311	22.03	1991	21.29
Metro counties	Binary	15547	78.33	8185	77.98	7362	78.71
Isserman rural-urban							
Rural and Mixed rural counties	Binary	9304	46.87	4958	47.24	4346	46.47
Urban and Mixed urban counties	Binary	10545	53.13	5538	52.76	5007	53.53
Population density (thousands)	Continuous	19849	100	10496	100	9353	100

3.2 Defining rurality

To distinguish between rural and urban counties, I use and compare three typologies. The first typology is the Office of Management and Budget's metropolitan (metro) and non-metropolitan (non-metro) counties classification (2003). Under this typology, I define OMB nonmetro counties as rural (x=1) and OMB metro counties as urban (x=0).

Table 2a. OMB metro-nonmetro classification system 2003

	Number of counties	2010 population
Metro counties	1090	232,579,940
Nonmetro counties	2052	48,841,966

Source: USDA ERS. Based on 2000 census, last updated May 2012.
http://www.ers.usda.gov/topics/rural-economy-population/rural-classifications/what-is-rural.aspx

An alternative typology is a cross tabulation of metro-nonmetro and urban-rural classification systems developed by Isserman (2005). It offers a more concise classification of the rural-urban interface that considers rural-urban separation and rural-urban integration. I define all rural and mixed rural categories as rural (x=1) and urban and mixed urban categories as urban (x=0). I also use population density from the U.S. Census Bureau as a continuous indicator of urbanity.

Table 2b. Isserman's typology, Cross tabulation of urban-rural and metro-nonmetro systems*

Category	Type	Number of counties	Population	Percentage in rural	Density	Rural	Percentage of US rural
1	Urban metro	171	125,926,501	2	1,560	3,000,617	5
2	Mixed urban metro	147	40,931,317	15	446	6,081,653	10
3	Mixed urban nonmetro	11	175,003	21	593	36,328	0
4	Mixed rural metro	467	59,132,936	27	109	15,974,876	27
5	Mixed rural nonmetro	555	27,291,697	47	42	12,700,651	22
6	Rural metro	304	6,589,186	78	36	5,132,955	9
7	Rural nonmetro	1486	21,375,266	75	11	16,134,287	27

*In this study Isserman rural counties are categories 4-7. Isserman urban counties are categories 1-3.
Source: Isserman (2005), Table 4, p.476 (based on 2000 census).

3.3 Dependent variable

As in previous studies in other countries (Driga *et al*., 2009; Vaillant and Lafuente, 2007; Wagner, 2004) this study uses early-stage entrepreneurial activity as the dependent variable. Early-stage entrepreneurial activity is defined as that carried out by adult

individuals who are currently engaged in setting up a business by themselves or with the help of a sponsor (Reynolds *et al*., 2005). Early-stage entrepreneurship also includes the ongoing activity of young businesses (i.e. less than 3.5 years old)[2] carried out by individuals. Thus, this measure includes entrepreneurial activity of all sizes and purposes, including self-employment, family businesses and part-time entrepreneurial activities. It excludes entrepreneurs of established businesses that have been in the market for more than 42 months. In this study, early-stage (opportunity and necessity) entrepreneurial activity is a binary variable equal to 1 if the surveyed individual has engaged in early-stage (opportunity or necessity) entrepreneurial activity and 0 otherwise. Thus, I model the log-odds and the first differences (or attributable risks) in the probability of an individual engaging in early-stage entrepreneurial activity. This probability is defined as:

$$\text{Prob}(Y_{ij}) = (1/B_j)\phi_{ij}$$

where $\text{Prob}(Y_{ij})$ is the probability of the individual i in county j of engaging in early-stage entrepreneurial activity given the average proportion of similar entrepreneurial activity in county j. Because the nature of the dependent variable restricts the modeled probabilities to values between zero and 1, the proportions in this equation are transformed into a logit scale (Khattab, 2006). Therefore, I use the ratio of the probability of engaging in entrepreneurial activity to the probability of not engaging in it as follows.

$$\text{Logit } \phi_{ij} = \ln (\phi_{ij})/(1-\phi_{ij}) = \eta_{ij}$$

where η_{ij} is the log-odds that individual i in county j will engage in entrepreneurial activity versus not engaging in it. Thus, η_{ij} is the dependent variable in this study.

[2] A firm older than 3.5 years is considered an established firm (Reynolds *et al*., 2005).

Parameters estimated from the cross-section time-series rare events logistic regression model indicate the direction of the effect of each explanatory variable on the response probability of becoming entrepreneurial. To interpret the magnitude of these results, I also calculate the first differences or attributable risks of the predicted values. The first differences indicate the change in the probability of becoming entrepreneurial given some change in the independent variable of interest, while holding other independent and control variables at their means (King and Zeng, 1999). For instance, in the case of dummy independent variables, this probability is observed as a result of a discrete change from zero to one in the independent variable, as follows (Wooldridge, 2006):

$$\gamma_x = Pr(\gamma = 1/X=1) - Pr(\gamma=1/X=0)$$

3.4 Independent variables

First, the variable female takes the value 1 for females and 0 for males for the overall sample. Second, rurality is defined based on each of three typologies, one at a time. In this study, rural is a binary variable, equal to 1 if the county is rural, and 0 if urban. For the first typology, rural is defined as nonmetro counties. Urban is defined as metropolitan counties. For the second typology, rural counties include those identified by Isserman (2005) as mixed rural metro, mixed rural nonmetro, rural metro and rural nonmetro (original Isserman categories 4 to 7). Thus, urban includes counties classified as urban metro, mixed urban metro and mixed urban nonmetro (original Isserman categories 1 to 3). For the third model I use population density (thousands of inhabitants per square mile) as the indicator for rurality. Population density is a continuous variable equal to the number of inhabitants per square mile in the county. Information on population density was collected from the U.S. Census Bureau; information on the OMB typology was

collected from the USDA ERS website and the Isserman typology was acquired from the Rural Policy Research Institute (RUPRI). In the rural subsamples presented in Tables 8 to 11, counties with population density of more than 1000 persons per square mile are considered urban, whereas counties with population density of less than 1000 persons per square mile are considered rural. This is based on the official rural definition and classification by USDA ERS[3].

I use year fixed effects to control for differences because of economy-wide contextual differences in a year within the 2005-2010 period. Thus, the variables for each year equals 1 if the individual was surveyed that year and zero otherwise. The base year of comparison is 2005.

3.5 Control variables

To control for individual characteristics, I include individuals' age, education, ethnicity, employment status, household income and household size. Information on these control variables comes from the U.S. GEM dataset for 2005-2010. I also use county job growth rate as a control variable. Job growth rate is a continuous variable that indicates the annual percentage change in employment in the county. Job growth rate per county per year is calculated from employment data collected from the Bureau of Labor Statistics[4]. I use employment data to build job growth rates instead of unemployment data because employment data is a more precise proxy for job availability (i.e. not everyone unemployed files for unemployment). Finally, I use clustered robust errors to control for spatial autocorrelation between survey respondents from the same county and year fixed effects.

[3] Retrieved April 2013. Available online at: http://www.ers.usda.gov/topics/rural-economy-population/rural-classifications/what-is-rural.aspx
[4] Available online at: http://www.bls.gov/lau/#tables

3.6 Method and models

In this study, I examine the effect of being female and the implications of living in a rural county on the change in the probability that individuals (overall) and women (female subsample -compared to a male subsample) in America engage in early-stage (opportunity or necessity) entrepreneurial activity. I analyze the data using cross-section time-series rare events logistic regression with clustered robust errors and year fixed effects. Rare events logistic regression is selected over logit and probit because of the low incidence of the dependent variables (5.42% for opportunity and 1.18% for necessity entrepreneurs in the overall sample; 4.25% for opportunity and 0.95% for necessity in the female subsample; 6.73% for opportunity and 1.43% for necessity in the male subsample). King and Zeng (1999) argue this method corrects for data with rare events in the dependent variable, thus generating unbiased estimates of logit coefficients. The model includes control variables for individual and county characteristics (please see Table 3). I run two sets of regressions (necessity and opportunity separately) on the three datasets. The "overall" dataset includes both women and men whereas the "female subsample" and "male subsample" datasets consider only those observations in which the respondent is a woman or a man, respectively. I also run regressions on "rural only" and "urban only" datasets where urban and rural counties are dropped, respectively, to observe effects across genders within the same setting (i.e. rural only or urban only). The "overall" model is as follows:

$$\eta_{ij} = \beta_{0ij} + \beta_1 \text{Female}_{ij} + \beta_2 \text{Rural}_{ij} + \delta \text{year} + \alpha \text{controls}_{ij} + \varepsilon_{ij}$$

where:

η_{ij}= log-odds of individual i in county j of engaging in early-stage entrepreneurial activity.

The model for the "female subsample" is as follows:

$$\eta_{ij} = \beta_{0ij} + \beta_1 Rural_{ij} + \delta year + \alpha controls_{ij} + \varepsilon_{ij}$$

where:

η_{ij}= log-odds of woman i in county j of engaging in early-stage entrepreneurial activity.

The model for the "male subsample" is as follows:

$$\eta_{ij} = \beta_{0ij} + \beta_1 Rural_{ij} + \delta year + \alpha controls_{ij} + \varepsilon_{ij}$$

where:

η_{ij}= log-odds of man i in county j of engaging in early-stage entrepreneurial activity.

The model for the "rural only" subsample is as follows:

$$\eta_{ij} = \beta_{0ij} + \beta_1 Female_{ij} + \delta year + \alpha controls_{ij} + \varepsilon_{ij}$$

where:

η_{ij}= log-odds of individual i in rural county j of engaging in early-stage entrepreneurial activity.

The model for the "urban only" subsample is as follows:

$$\eta_{ij} = \beta_{0ij} + \beta_1 Female_{ij} + \delta year + \alpha controls_{ij} + \varepsilon_{ij}$$

where:

η_{ij}= log-odds of individual i in urban county j of engaging in early-stage entrepreneurial activity.

To facilitate interpretation of results, we calculate the first differences in the probability of being involved in early-stage entrepreneurial activity for all regressions. The results for the three models for the three typologies for rurality are presented in Table 4 (necessity entrepreneurship) and Table 6 (opportunity entrepreneurship). Their corresponding first differences are illustrated in Tables 5 and 7. The results for the "rural only" and "urban only" subsamples are presented in Tables 8 and 10 respectively. Their corresponding first differences are illustrated in Tables 9 and 11.

4. Findings

This section discusses the findings of the cross-section time-series rare events logistic regression models described above. Table 1 presents a summary of the main variables in the models. Tables 2a and 2b present the OMB metro-nonmetro classification system (2003) and the cross-tabulation of urban-rural and metro-nonmetro systems proposed by Isserman (2005), respectively. Table 3 shows descriptive statistics for all variables in the models. Table 4 summarizes the results for the first model, which predicts early-stage necessity entrepreneurship for the three rural typologies, the OMB metro-nonmetro classification (2003), Isserman's classification (2005) and population density. Table 5 illustrates the first differences of the results in Table 4, which indicate the change in the probability of becoming a necessity entrepreneur. Table 6 presents the results for the second model, which predicts early-stage opportunity entrepreneurship for the three rural typologies. Table 7 illustrates the first differences for Table 6. The results from Tables 4-7 are presented for the overall sample, the female subsample and the male subsample.

Table 8 presents the results across genders in rural only settings using the three typologies. Table 9 reports the first differences for Table 8. Table 10 presents the results

across genders in urban only settings using the three typologies. Table 11 reports the first differences for Table 10.

Table 3. Descriptive Statistics

	Overall sample				
Variable	Obs.	Mean	(SD)	Min	Max
Female	19849	0.529	(0.499)	0	1
Necessity	19849	0.012	(0.108)	0	1
Opportunity	19849	0.054	(0.226)	0	1
OMB nonmetro	19849	0.217	(0.412)	0	1
Isserman rural	19849	0.469	(0.499)	0	1
Population density	19849	1.619	(5.571)	0	71.063
Job growth rate	19849	-0.541	(2.815)	-20.702	22.656
No high school degree	19849	0.100	(0.301)	0	1
High school degree	19849	0.256	(0.436)	0	1
Some college or higher	19849	0.629	(0.483)	0	1
Employed full time	19849	0.373	(0.484)	0	1
Employed part time	19849	0.092	(0.289)	0	1
Other occupation	19849	0.427	(0.495)	0	1
Income below 50,000	19849	0.235	(0.424)	0	1
Income 50,000-200,000	19849	0.281	(0.449)	0	1
Income over 200,000	19849	0.28	(0.164)	0	1
Household size 1	19849	0.230	(0.421)	0	1
Household size 2 or more	19849	0.769	(0.421)	0	1
White	19849	0.623	(0.485)	0	1
African-American	19849	0.046	(0.209)	0	1
Other ethnicity	19849	0.045	(0.208)	0	1
Ages 18 to 64	19849	0.707	(0.455)	0	1
Ages 65 to 99	19849	0.293	(0.455)	0	1

Table 3 (continued). Descriptive Statistics

	Female subsample				
Variable	Obs.	Mean	(SD)	Min	Max
Female	10496	1.000	(0.000)	1	1
Necessity	10496	0.009	(0.097)	0	1
Opportunity	10496	0.042	(0.202)	0	1
OMB nonmetro	10496	0.220	(0.414)	0	1
Isserman rural	10496	0.472	(0.499)	0	1
Population density	10496	1.567	(5.298)	0	71.063
Job growth rate	10482	-0.504	(2.756)	-17.258	18.395
No high school degree	10496	0.100	(0.301)	0	1
High school degree	10496	0.269	(0.444)	0	1
Some college or higher	10496	0.615	(0.487)	0	1
Employed full time	10496	0.312	(0.463)	0	1
Employed part time	10496	0.118	(0.323)	0	1
Other occupation	10496	0.467	(0.498)	0	1

Income below 50,000	10496	0.264	(0.441)	0	1
Income 50,000-200,000	10496	0.258	(0.438)	0	1
Income over 200,000	10496	0.019	(0.137)	0	1
Household size 1	10496	0.255	(0.436)	0	1
Household size 2 or more	10496	0.745	(0.436)	0	1
White	10496	0.636	(0.481)	0	1
African-American	10496	0.048	(0.214)	0	1
Other ethnicity	10496	0.041	(0.198)	0	1
Ages 18 to 64	10496	0.691	(0.462	0	1
Ages 65 to 99	10496	0.309	(0.462)	0	1

Table 3 (continued). Descriptive Statistics

	Male subsample				
Variable	Obs.	Mean	(SD)	Min	Max
Female					
Necessity	9353	0.014	(0.119)	0	1
Opportunity	9353	0.067	(0.250)	0	1
OMB nonmetro	9353	0.213	(0.409)	0	1
Isserman rural	9353	0.465	(0.499)	0	1
Population density	9353	1.677	(5.863)	0.000	71.063
Job growth rate	9353	-0.583	(2.879)	-20.702	22.656
No high school degree	9353	0.101	(0.301)	0	1
High school degree	9353	0.240	(0.427)	0	1
Some college or higher	9353	0.646	(0.478)	0	1
Employed full time	9353	0.443	(0.497)	0	1
Employed part time	9353	0.062	(0.241)	0	1
Other occupation	9353	0.383	(0.486)	0	1
Income below 50,000	9353	0.202	(0.401)	0	1
Income 50,000-200,000	9353	0.306	(0.461)	0	1
Income over 200,000	9353	0.037	(0.189)	0	1
Household size 1	9353	0.202	(0.401)	0	1
Household size 2 or more	9353	0.798	(0.401)	0	1
White	9353	0.609	(0.488)	0	1
African-American	9353	0.043	(0.202)	0	1
Other ethnicity	9353	0.050	(0.218)	0	1
Ages 18 to 64	9353	0.726	(0.446)	0	1
Ages 65 to 99	9353	0.274	(0.446)	0	1

In general, for both necessity and opportunity models, I observe there is not a notable difference among the three rural typologies analyzed. The results in Tables 4 through 7 illustrate that the three typologies produce results with the same sign, and similar magnitude and significance levels. Nonetheless, population density as a typology is sensitive to the variable that indicates rurality. Also, Tables 8 through 11 suggest that

when a particular setting is selected (rural only or urban only), although fairly consistent, some differences across the three typologies emerge.

Table 4. Rare events logistic regression models on early-stage necessity entrepreneurship in the USA 2005-2010

	Overall		
Necessity Entrepreneurship	OMB nonmetro	Isserman rural	Pop density (thousands)
Female	-0.488****	-0.488****	-0.487****
	(0.132)	(0.132)	(0.132)
Rural	0.171	0.042	0.005
	(0.145)	(0.129)	(0.005)
Job growth rate	0.023	0.021	0.022
	(0.032)	(0.032)	(0.033)
High school degree	0.440*	0.439*	0.439*
	(0.246)	(0.245)	(0.245)
Some college or more	0.345	0.335	0.329
	(0.241)	(0.241)	(0.240)
Employed part time	0.754****	0.754****	0.752****
	(0.209)	(0.210)	(0.210)
Other occupation	0.397**	0.395**	0.395**
	(0.176)	(0.176)	(0.176)
Income below 50,000	0.606***	0.619***	0.632***
	(0.227)	(0.228)	(0.229)
Income 50,000-200,000	-0.020	-0.019	-0.014
	(0.232)	(0.232)	(0.232)
Household size 1	-0.156	-0.160	-0.164
	(0.172)	(0.172)	(0.172)
African-American	0.057	0.045	0.029
	(0.256)	(0.254)	(0.257)
Other ethnicity	-0.059	-0.067	-0.078
	(0.293)	(0.293)	(0.295)
Ages 65 to 99	-1.941****	-1.940****	-1.940****
	(0.282)	(0.281)	(0.282)
Intercept	-4.502****	-4.474****	-4.453****
	(0.344)	(0.344)	(0.333)
Wald (X2)	124.13****	126.6****	128.48****
Pseudo R2	0.057	0.057	0.057
Log pseudolikelihood	-1198.43	-1198.94	-1198.96
Observations	19825	19825	19825
Number of clusters (counties)	2419	2419	2419
Control for year	Yes	Yes	Yes
Controls for individuals	Yes	Yes	Yes
Controls for county	Yes	Yes	Yes
Clustered-robust standard errors	Yes	Yes	Yes

Table 4 (continued). Rare events logistic regression models on early-stage necessity entrepreneurship in the USA 2005-2010

	Female subsample		
Necessity Entrepreneurship	OMB nonmetro	Isserman rural	Pop density (thousands)
Female			
Rural	0.247	-0.161	0.015
	(0.213)	(0.189)	(0.012)
Job growth rate	0.073	0.077	0.075
	(0.058)	(0.063)	(0.061)
High school degree	0.556	0.549	0.547
	(0.376)	(0.375)	(0.375)
Some college or more	0.248	0.212	0.223
	(0.359)	(0.359)	(0.357)
Employed part time	0.405	0.402	0.399
	(0.301)	(0.301)	(0.302)
Other occupation	0.327	0.323	0.322
	(0.246)	(0.245)	(0.245)
Income below 50,000	1.039***	1.110***	1.082***
	(0.381)	(0.378)	(0.385)
Income 50,000-200,000	0.245	0.256	0.249
	(0.412)	(0.409)	(0.411)
Household size 1	0.002	-0.027	-0.021
	(0.246)	(0.246)	(0.248)
African-American	0.159	0.101	0.108
	(0.358)	(0.359)	(0.356)
Other ethnicity	-0.334	-0.389	-0.380
	(0.599)	(0.605)	(0.599)
Ages 65 to 99	-1.984****	-1.981****	-1.980****
	(0.414)	(0.414)	(0.414)
Intercept	-5.245****	-5.082****	-5.182****
	(0.559)	(0.556)	(0.541)
Wald (X2)	84.38****	86.54****	82.25****
Pseudo R2	0.069	0.069	0.069
Log pseudolikelihood	-525.57	-525.75	-525.89
Observations	10482	10482	10482
Number of clusters (counties)	2036	2036	2036
Control for year	Yes	Yes	Yes
Controls for individuals	Yes	Yes	Yes
Controls for county	Yes	Yes	Yes
Clustered-robust standard errors	Yes	Yes	Yes

Table 4 (continued). Rare events logistic regression models on early-stage necessity entrepreneurship in the USA 2005-2010

	Male subsample		
Necessity Entrepreneurship	OMB nonmetro	Isserman rural	Pop density (thousands)
Female			
Rural	0.127	0.198	0.003
	(0.204)	(0.175)	(0.014)
Job growth rate	-0.012	-0.014	-0.014
	(0.032)	(0.031)	(0.032)
High school degree	0.309	0.308	0.309
	(0.339)	(0.338)	(0.339)
Some college or more	0.394	0.406	0.384
	(0.333)	(0.331)	(0.331)
Employed part time	1.199****	1.202****	1.196****
	(0.291)	(0.290)	(0.291)
Other occupation	0.494**	0.492**	0.494**
	(0.235)	(0.234)	(0.235)
Income below 50,000	0.188	0.167	0.205
	(0.299)	(0.301)	(0.299)
Income 50,000-200,000	-0.177	-0.187	-0.172
	(0.278)	(0.278)	(0.278)
Household size 1	-0.253	-0.252	-0.254
	(0.243)	(0.243)	(0.242)
African-American	-0.025	0.000	-0.039
	(0.425)	(0.421)	(0.427)
Other ethnicity	0.126	0.145	0.122
	(0.345)	(0.343)	(0.348)
Ages 65 to 99	-1.958****	-1.957****	-1.958****
	(0.395)	(0.395)	(0.396)
Intercept	-4.276****	-4.355****	-4.239****
	(0.411)	(0.418)	(0.402)
Wald (X2)	60.37****	60.40****	63.68****
Pseudo R2	0.061	0.062	0.061
Log pseudolikelihood	-658.91	-658.44	-659.03
Observations	9343	9343	9343
Number of clusters (counties)	1911	1911	1911
Control for year	Yes	Yes	Yes
Controls for individuals	Yes	Yes	Yes
Controls for county	Yes	Yes	Yes
Clustered-robust standard errors	Yes	Yes	Yes

Note: Standard errors are in parenthesis. *, **, ***, **** means significant at the 0.10, 0.5, 0.01, and 0.001 levels, respectively.

Table 5. Rare events logistic models on early-stage necessity entrepreneurship in the USA 2005-2010: First differences

	Overall		
Necessity Entrepreneurship	OMB nonmetro	Isserman rural	Popdensity (thousands)
Female	**-0.0042**	**-0.0042**	**-0.0042**
Rural	0.0016	0.0004	0.0045
Job growth rate	0.0117	0.0111	0.0112
High school degree	**0.0043**	**0.0043**	**0.0043**
Some college or more	0.0028	0.0027	0.0026
Employed part time	**0.0091**	**0.0091**	**0.0091**
Other occupation	**0.0035**	**0.0035**	**0.0035**
Income below 50,000	**0.0063**	**0.0064**	**0.0066**
Income 50,000-200,000	-0.0001	-0.0001	-0.0000
Household size 1	-0.0012	-0.0012	-0.0013
African-American	0.0008	0.0007	0.0005
Other ethnicity	-0.0002	-0.0002	-0.0003
Ages 65 to 99	**-0.0127**	**-0.0127**	**-0.0127**

Table 5 (continued). Rare events logistic models on early-stage necessity entrepreneurship in the USA 2005-2010: First differences

	Female subsample		
Necessity Entrepreneurship	OMB nonmetro	Isserman rural	Popdensity (thousands)
Female			
Rural	0.0019	-0.0011	0.0188
Job growth rate	0.0390	0.0443	0.0414
High school degree	0.0047	0.0046	0.0046
Some college or more	0.0016	0.0013	0.0014
Employed part time	0.0036	0.0035	0.0035
Other occupation	0.0023	0.0023	0.0022
Income below 50,000	**0.0098**	**0.0105**	**0.0103**
Income 50,000-200,000	0.0020	0.0021	0.0021
Household size 1	0.0001	-0.0001	-0.0000
African-American	0.0016	0.0012	0.0012
Other ethnicity	-0.0012	-0.0015	-0.0014
Ages 65 to 99	**-0.0107**	**-0.0107**	**-0.0107**

Table 5 (continued). Rare events logistic models on early-stage necessity entrepreneurship in the USA 2005-2010: First differences

	Male subsample		
Necessity Entrepreneurship	OMB nonmetro	Isserman rural	Popdensity (thousands)
Female			
Rural	0.0015	0.0021	0.0084
Job growth rate	-0.0059	-0.0067	-0.0069
High school degree	0.0039	0.0038	0.0039
Some college or more	0.0038	0.0039	0.0037
Employed part time	**0.0229**	**0.0229**	**0.0229**
Other occupation	**0.0056**	**0.0055**	**0.0056**
Income below 50,000	0.0024	0.0022	0.0026
Income 50,000-200,000	-0.0016	-0.0017	-0.0016
Household size 1	-0.0023	-0.0023	-0.0023
African-American	0.0005	0.0008	0.0004
Other ethnicity	0.0021	0.0023	0.0020
Ages 65 to 99	**-0.0152**	**-0.0151**	**-0.0152**

Notes: The first differences or attributable risks estimate the change in the probability of Y [Pr(Y=1)] given a discrete change in the independent variable (x), holding other variables at their means, i.e. Yx = Pr(Y=1/X=1) - Pr(Y=1/X=0).

Table 6. Rare events logistic regression models on early-stage opportunity entrepreneurship in the USA 2005-2010

	Overall		
Opportunity Entrepreneurship	OMB nonmetro	Isserman rural	Pop density (thousands)
Female	-0.439****	-0.439****	-0.438****
	(0.065)	(0.065)	(0.065)
Rural	0.229***	0.178***	-0.002
	(0.081)	(0.068)	(0.006)
Job growth rate	0.022	0.017	0.018
	(0.016)	(0.016)	(0.016)
High school degree	-0.084	-0.083	-0.084
	(0.140)	(0.140)	(0.140)
Some college or more	0.358***	0.358***	0.335**
	(0.130)	(0.129)	(0.129)
Employed part time	0.148	0.150	0.146
	(0.106)	(0.105)	(0.106)
Other occupation	-0.565****	-0.565****	-0.564****
	(0.095)	(0.095)	(0.095)
Income below 50,000	-0.438***	-0.443***	-0.409***
	(0.128)	(0.128)	(0.128)
Income 50,000-200,000	-0.267***	-0.274***	-0.261***
	(0.097)	(0.097)	(0.098)
Household size 1	-0.155	-0.155	-0.163*
	(0.095)	(0.095)	(0.094)
African-American	0.409***	0.418***	0.388***
	(0.140)	(0.141)	(0.141)
Other ethnicity	0.079	0.081	0.066

	(0.159)	(0.159)	(0.159)
Ages 65 to 99	-1.104****	-1.103****	-1.102****
	(0.124)	(0.124)	(0.124)
Intercept	-2.306****	-2.334****	-2.229****
	(0.154)	(0.154)	(0.152)
Wald (X2)	511.55****	512.73****	509.64****
Pseudo R2	0.064	0.064	0.063
Log pseudolikelihood	-3907.08	-3907.57	-3911.17
Observations	19825	19825	19825
Number of clusters (counties)	2419	2419	2419
Control for year	Yes	Yes	Yes
Controls for individuals	Yes	Yes	Yes
Controls for county	Yes	Yes	Yes
Clustered-robust standard errors	Yes	Yes	Yes

Table 6 (continued). Rare events logistic regression models on early-stage opportunity entrepreneurship in the USA 2005-2010

	Female subsample		
Opportunity Entrepreneurship	OMB nonmetro	Isserman rural	Pop density (thousands)
Female			
Rural	0.232*	0.162	-0.019
	(0.121)	(0.101)	(0.013)
Job growth rate	0.004	-0.001	0.001
	(0.024)	(0.024)	(0.025)
High school degree	-0.228	-0.229	-0.231
	(0.207)	(0.207)	(0.207)
Some college or more	0.369*	0.369*	0.353*
	(0.189)	(0.189)	(0.189)
Employed part time	0.162	0.166	0.163
	(0.143)	(0.143)	(0.143)
Other occupation	-0.573****	-0.575****	-0.576****
	(0.139)	(0.139)	(0.139)
Income below 50,000	0.182	0.182	0.200
	(0.183)	(0.182)	(0.181)
Income 50,000-200,000	0.126	0.119	0.127
	(0.158)	(0.158)	(0.158)
Household size 1	-0.426***	-0.428***	-0.429***
	(0.148)	(0.148)	(0.148)
African-American	0.117	0.123	0.119
	(0.251)	(0.252)	(0.251)
Other ethnicity	0.197	0.188	0.192
	(0.234)	(0.233)	(0.234)
Ages 65 to 99	-0.931****	-0.927****	-0.929****
	(0.179)	(0.179)	(0.179)
Intercept	-2.707****	-2.723****	-2.611****
	(0.239)	(0.238)	(0.236)
Wald (X2)	233.51****	230.36****	235.30****

Pseudo R2	0.056	0.056	0.056
Log pseudolikelihood	-1740.46	-1741.01	-1740.68
Observations	10482	10482	10482
Number of clusters (counties)	2036	2036	2036
Control for year	Yes	Yes	Yes
Controls for individuals	Yes	Yes	Yes
Controls for county	Yes	Yes	Yes
Clustered-robust standard errors	Yes	Yes	Yes

Table 6 (continued). Rare events logistic regression models on early-stage opportunity entrepreneurship in the USA 2005-2010

	Male subsample		
Opportunity Entrepreneurship	OMB nonmetro	Isserman rural	Pop density (thousands)
Female			
Rural	0.226**	0.188**	0.004
	(0.106)	(0.089)	(0.006)
Job growth rate	0.033	0.029	0.029
	(0.021)	(0.021)	(0.021)
High school degree	-0.004	-0.003	-0.000
	(0.184)	(0.183)	(0.184)
Some college or more	0.331*	0.335*	0.309*
	(0.171)	(0.171)	(0.171)
Employed part time	0.128	0.127	0.124
	(0.181)	(0.181)	(0.181)
Other occupation	-0.543****	-0.542****	-0.536****
	(0.125)	(0.125)	(0.125)
Income below 50,000	-0.991****	-0.997****	-0.957****
	(0.179)	(0.179)	(0.179)
Income 50,000-200,000	-0.525****	-0.533****	-0.515****
	(0.129)	(0.130)	(0.131)
Household size 1	0.031	0.032	0.021
	(0.115)	(0.114)	(0.114)
African-American	0.646***	0.656***	0.607***
	(0.193)	(0.192)	(0.193)
Other ethnicity	0.006	0.014	-0.012
	(0.207)	(0.207)	(0.206)
Ages 65 to 99	-1.191****	-1.193****	-1.189****
	(0.168)	(0.168)	(0.168)
Intercept	-2.314****	-2.352****	-2.248****
	(0.190)	(0.191)	(0.188)
Wald (X2)	227.37****	229.09****	229.65****
Pseudo R2	0.067	0.067	0.066
Log pseudolikelihood	-2148.69	-2148.58	-2150.81
Observations	9343	9343	9343
Number of clusters (counties)	1911	1911	1911
Control for year	Yes	Yes	Yes
Controls for individuals	Yes	Yes	Yes
Controls for county	Yes	Yes	Yes

Clustered-robust standard errors	Yes	Yes	Yes

Note: Standard errors are in parenthesis. *, **, ***, **** means significant at the 0.10, 0.5, 0.01, and 0.001 levels, respectively.

Table 7. Rare events logistic models on early-stage opportunity entrepreneurship in the USA 2005-2010: First differences

	Overall		
Opportunity Entrepreneurship	OMB nonmetro	Isserman rural	Popdensity (thousands)
Female	**-0.0178**	**-0.0178**	**-0.0178**
Rural	**0.0097**	**0.0071**	-0.0016
Job growth rate	0.0417	0.0327	0.0354
High school degree	-0.0031	-0.0031	-0.0031
Some college or more	**0.0136**	**0.0136**	**0.0128**
Employed part time	0.0064	0.0065	0.0063
Other occupation	**-0.0218**	**-0.0218**	**-0.0219**
Income below 50,000	**-0.0156**	**-0.0157**	**-0.0147**
Income 50,000-200,000	**-0.0099**	**-0.0102**	**-0.0098**
Household size 1	-0.0059	-0.0058	**-0.0062**
African-American	**0.0197**	**0.0203**	**0.0186**
Other ethnicity	0.0037	0.0038	0.0031
Ages 65 to 99	-0.0368	-0.0368	-0.0369

Table 7 (continued). Rare events logistic models on early-stage opportunity entrepreneurship in the USA 2005-2010: First differences

	Female subsample		
Opportunity Entrepreneurship	OMB nonmetro	Isserman rural	Popdensity (thousands)
Female			
Rural	**0.0081**	0.0053	-0.0213
Job growth rate	0.0057	-0.0009	0.0024
High school degree	-0.0068	-0.0068	-0.0069
Some college or more	**0.0115**	**0.0115**	**0.0109**
Employed part time	0.0058	0.0059	0.0059
Other occupation	**-0.0185**	**-0.0186**	**-0.0186**
Income below 50,000	0.0064	0.0064	0.0070
Income 50,000-200,000	0.0044	0.0042	0.0045
Household size 1	**-0.0125**	**-0.0125**	**-0.0126**
African-American	0.0049	0.0051	0.0049
Other ethnicity	0.0078	0.0074	0.0076
Ages 65 to 99	-0.0262	-0.0261	-0.0261

Table 7 (continued). Rare events logistic models on early-stage opportunity entrepreneurship in the USA 2005-2010: First differences

	Male subsample		
Opportunity Entrepreneurship	OMB nonmetro	Isserman rural	Popdensity (thousands)
Female			
Rural	**0.0119**	**0.0093**	0.0206
Job growth rate	0.0833	0.0729	0.0747
High school degree	0.0002	0.0003	0.0004
Some college or more	**0.0155**	**0.0157**	**0.0146**
Employed part time	0.0073	0.0072	0.0071
Other occupation	**-0.0254**	**-0.0253**	**-0.0252**
Income below 50,000	**-0.0382**	**-0.0384**	**-0.0373**
Income 50,000-200,000	**-0.0236**	**-0.0239**	**-0.0233**
Household size 1	0.0018	0.0018	0.0012
African-American	**0.0428**	**0.0437**	**0.0398**
Other ethnicity	0.0012	0.0016	0.0003
Ages 65 to 99	-0.0479	-0.0479	-0.0479

Notes: The first differences or attributable risks estimate the change in the probability of Y [Pr(Y=1)] given a discrete change in the independent variable (x), holding other variables at their means, i.e. Yx = Pr(Y=1/X=1) - Pr(Y=1/X=0).

Table 8. Rare events logistic regression models on early-stage entrepreneurship in the USA 2005-2010: Rural subsample

	Necessity Entrepreneurship		
	OMB nonmetro[1]	Isserman rural[2]	Pop density<1000 per sq mile (thousands)[3]
Female	-0.384	-0.641***	-0.560***
	(0.262)	(0.190)	(0.163)
Job growth rate	0.056	-0.002	0.022
	(0.050)	(0.040)	(0.035)
High school degree	0.847*	0.709**	0.459
	(0.493)	(0.354)	(0.290)
Some college or more	0.658	0.521	0.260
	(0.492)	(0.347)	(0.279)
Employed part time	0.790*	0.867***	0.942***
	(0.413)	(0.303)	(0.259)
Other occupation	0.524*	0.525**	0.546***
	(0.305)	(0.234)	(0.208)
Income below 50,000	1.326*	0.967**	0.798**
	(0.719)	(0.404)	(0.318)
Income 50,000-200,000	0.451	0.225	0.302
	(0.805)	(0.424)	(0.334)
Household size 1	-0.126	-0.219	-0.124
	(0.346)	(0.247)	(0.213)
African-American	-0.587	-0.514	-0.803
	(1.028)	(0.590)	(0.588)
Other ethnicity	-0.578	-0.178	-0.175
	(1.015)	(0.529)	(0.415)
Ages 65 to 99	-3.022***	-2.369***	-2.422***
	(1.017)	(0.470)	(0.407)
Intercept	-5.395***	-4.663***	-4.340***

	(0.867)	(0.506)	(0.379)
Wald (X2)	75.81***	110.96***	132.85***
Pseudo R2	0.115	0.084	0.074
Log pseudolikelihood	-279.73	-575.59	-828.38
Observations	4302	9294	13798
Number of clusters (counties)	1426	2094	2325
Control for year	Yes	Yes	Yes
Controls for individuals	Yes	Yes	Yes
Controls for county	Yes	Yes	Yes
Clustered-robust standard errors	Yes	Yes	Yes

Table 8. Rare events logistic regression models on early-stage entrepreneurship in the USA 2005-2010: Rural subsample

	Opportunity entrepreneurship		
	OMB nonmetro[1]	Isserman rural[2]	Pop density<1000 per sq mile (thousands)[3]
Female	-0.379***	-0.410***	-0.396***
	(0.138)	(0.096)	(0.077)
Job growth rate	0.020	0.011	0.016
	(0.023)	(0.019)	(0.017)
High school degree	-0.057	-0.117	-0.209
	(0.250)	(0.175)	(0.149)
Some college or more	0.414*	0.274*	0.215
	(0.227)	(0.161)	(0.139)
Employed part time	0.101	0.137	0.114
	(0.226)	(0.154)	(0.126)
Other occupation	-0.626***	-0.672***	-0.590***
	(0.206)	(0.143)	(0.115)
Income below 50,000	-0.574**	-0.515***	-0.397***
	(0.265)	(0.181)	(0.154)
Income 50,000-200,000	-0.134	-0.408**	-0.336**
	(0.248)	(0.171)	(0.138)
Household size 1	-0.150	-0.259*	-0.268**
	(0.201)	(0.136)	(0.110)
African-American	0.119	-0.062	0.183
	(0.409)	(0.305)	(0.224)
Other ethnicity	-0.290	-0.510	-0.095
	(0.434)	(0.310)	(0.200)
Ages 65 to 99	-1.074***	-1.102***	-1.188***
	(0.250)	(0.180)	(0.143)
Intercept	-2.325***	-2.084***	-2.073***
	(0.286)	(0.192)	(0.163)
Wald (X2)	135.48***	261.10***	374.25***
Pseudo R2	0.078	0.073	0.069
Log pseudolikelihood	-868.99	-1844.43	-2713.68
Observations	4302	9294	13798
Number of clusters (counties)	1426	2094	2325
Control for year	Yes	Yes	Yes
Controls for individuals	Yes	Yes	Yes
Controls for county	Yes	Yes	Yes

Clustered-robust standard errors	Yes	Yes	Yes

Notes: [1]includes only counties classified by OMB (2003) as nonmetro (categories 4 to 9). [2]includes only counties classified by Isserman (2005) as mixed rural metro, mixed rural nonmetro, rural metro and rural nonmetro (categories 4 to 7). [3]includes only counties that have a population density of less than 1000 persons per square mile.

Table 9. Rare events logistic models on early-stage entrepreneurship in rural America 2005-2010: First differences

	Necessity Entrepreneurship		
	OMB nonmetro[1]	Isserman rural[2]	Pop density (thousands)[3]
Female	-0.0031	**-0.0053**	**-0.0044**
Job growth rate	0.0229	-0.0006	0.0079
High school degree	**0.0084**	**0.0069**	0.0041
Some college or more	0.0054	0.0040	0.0019
Employed part time	**0.0096**	**0.0107**	**0.0112**
Other occupation	**0.0043**	**0.0044**	**0.0043**
Income below 50,000	**0.0162**	**0.0105**	**0.0079**
Income 50,000-200,000	0.0062	0.0025	0.0029
Household size 1	-0.0009	-0.0015	-0.0008
African-American	-0.0014	-0.0025	-0.0038
Other ethnicity	-0.0014	-0.0003	-0.0007
Ages 65 to 99	**-0.0180**	**-0.0143**	**-0.0141**
Observations	4302	9294	13798

Table 9 (continued). Rare events logistic models on early-stage entrepreneurship in rural America 2005-2010: First differences

	Opportunity entrepreneurship		
	OMB nonmetro[1]	Isserman rural[2]	Pop density (thousands)[3]
Female	**-0.0159**	**-0.0165**	**-0.0157**
Job growth rate	0.0287	0.0179	0.0247
High school degree	-0.0019	-0.0043	-0.0077
Some college or more	**0.0171**	**0.0107**	0.0082
Employed part time	0.0051	0.0061	0.0049
Other occupation	**-0.0254**	**-0.0260**	**-0.0225**
Income below 50,000	**-0.0210**	**-0.0182**	**-0.0140**
Income 50,000-200,000	-0.0046	**-0.0141**	**-0.0118**
Household size 1	-0.0056	**-0.0095**	**-0.0097**
African-American	0.0084	-0.0009	0.0087
Other ethnicity	-0.0080	-0.0153	-0.0029
Ages 65 to 99	**-0.0377**	**-0.0367**	**-0.0389**
Observations	4302	9294	13798

Notes: The first differences or attributable risks estimate the change in the probability of Y [Pr(Y=1)] given a discrete change in the independent variable (x), holding other variables at their means, i.e. Yx = Pr(Y=1/X=1) - Pr(Y=1/X=0).

Table 10. Rare events logistic regression models on early-stage entrepreneurship in the USA 2005-2010: Urban subsample

	Necessity Entrepreneurship		
	OMB metro[1]	Isserman urban[2]	Pop density>1000 per sq mile (thousands)[3]
Female	-0.521***	-0.323*	-0.321
	(0.153)	(0.183)	(0.222)
Job growth rate	-0.004	0.083	0.030
	(0.043)	(0.053)	(0.090)
High school degree	0.256	0.055	0.308
	(0.285)	(0.342)	(0.451)
Some college or more	0.189	0.043	0.426
	(0.277)	(0.335)	(0.483)
Employed part time	0.739***	0.654**	0.355
	(0.244)	(0.289)	(0.337)
Other occupation	0.338	0.250	0.059
	(0.213)	(0.262)	(0.321)
Income below 50,000	0.411	0.284	0.433
	(0.254)	(0.303)	(0.373)
Income 50,000-200,000	0.025	0.007	-0.207
	(0.260)	(0.311)	(0.387)
Household size 1	-0.161	-0.098	-0.226
	(0.195)	(0.236)	(0.304)
African-American	0.259	0.425	0.753***
	(0.264)	(0.288)	(0.283)
Other ethnicity	0.129	0.139	0.273
	(0.306)	(0.341)	(0.406)
Ages 65 to 99	-1.626***	-1.503***	-1.045***
	(0.299)	(0.358)	(0.397)
Intercept	-4.106***	-4.164***	-4.557***
	(0.369)	(0.448)	(0.724)
Wald (X2)	77.64***	59.63***	45.99***
Pseudo R2	0.048	0.044	0.045
Log pseudolikelihood	-908.67	-614.68	-359.98
Observations	15523	10531	6027
Number of clusters (counties)	993	325	178
Control for year	Yes	Yes	Yes
Controls for individuals	Yes	Yes	Yes
Controls for county	Yes	Yes	Yes
Clustered-robust standard errors	Yes	Yes	Yes

Table 10 (continued). Rare events logistic regression models on early-stage entrepreneurship in the USA 2005-2010: Urban subsample

	Opportunity entrepreneurship		
	OMB metro[1]	Isserman urban[2]	Pop density>1000 per sq mile (thousands)[3]
Female	-0.459***	-0.464***	-0.524***
	(0.074)	(0.089)	(0.125)
Job growth rate	0.025	0.028	0.020
	(0.021)	(0.029)	(0.040)
High school degree	-0.103	-0.037	0.428

	(0.170)	(0.235)	(0.357)
Some college or more	0.324**	0.461**	0.855***
	(0.158)	(0.219)	(0.323)
Employed part time	0.169	0.174	0.237
	(0.119)	(0.144)	(0.192)
Other occupation	-0.545***	-0.459***	-0.497***
	(0.107)	(0.127)	(0.164)
Income below 50,000	-0.380***	-0.380**	-0.531**
	(0.146)	(0.186)	(0.234)
Income 50,000-200,000	-0.373***	-0.283**	-0.306
	(0.123)	(0.144)	(0.189)
Household size 1	-0.154	-0.082	0.051
	(0.108)	(0.131)	(0.174)
African-American	0.466***	0.628***	0.645***
	(0.151)	(0.166)	(0.199)
Other ethnicity	0.159	0.365*	0.302
	(0.174)	(0.201)	(0.274)
Ages 65 to 99	-1.105***	-1.091***	-0.891***
	(0.144)	(0.174)	(0.244)
Intercept	-2.214***	-2.427***	-2.838***
	(0.179)	(0.244)	(0.358)
Wald (X2)	405.37***	277.12***	176.59***
Pseudo R2	0.062	0.060	0.058
Log pseudolikelihood	-3032.08	-2053.73	-1186.14
Observations	15523	10531	6027
Number of clusters (counties)	993	325	178
Control for year	Yes	Yes	Yes
Controls for individuals	Yes	Yes	Yes
Controls for county	Yes	Yes	Yes
Clustered-robust standard errors	Yes	Yes	Yes

Notes: [1]includes only counties classified by OMB (2003) as metro (categories 4 to 9). [2]includes only counties classified by Isserman (2005) as urban metro, mixed urban metro, mixed urban nonmetro (categories 1 to 3). [3]includes only counties that have a population density of more than 1000 persons per square mile.

Table 11. Rare events logistic models on early-stage entrepreneurship in urban America 2005-2010: First differences

	Necessity Entrepreneurship		
	OMB metro[1]	Isserman urban[2]	Pop density>1000 per sq mile (thousands)[3]
Female	**-0.0047**	**-0.0029**	-0.0034
Job growth rate	0.0003	0.0927	0.0517
High school degree	0.0026	0.0008	0.0041
Some college or more	0.0015	0.0002	0.0036
Employed part time	**0.0092**	**0.0084**	0.0049
Other occupation	0.0031	0.0023	0.0007
Income below 50,000	0.0043	0.0031	0.0056
Income 50,000-200,000	0.0004	0.0003	-0.0016
Household size 1	-0.0013	-0.0007	-0.0020
African-American	0.0029	0.0052	**0.0115**
Other ethnicity	0.0016	0.0019	0.0039

Ages 65 to 99	**-0.0111**	**-0.0109**	**-0.0087**
Observations	15523	10531	6027

Table 11 (continued). Rare events logistic models on early-stage entrepreneurship in urban America 2005-2010: First differences

	Opportunity entrepreneurship		
	OMB metro[1]	Isserman urban[2]	Pop density>1000 per sq mile (thousands)[3]
Female	**-0.0185**	**-0.0189**	**-0.0222**
Job growth rate	0.0485	0.0621	0.0527
High school degree	-0.0037	-0.0009	0.0219
Some college or more	**0.0121**	**0.0168**	**0.0305**
Employed part time	0.0074	0.0078	0.0114
Other occupation	**-0.0209**	**-0.0178**	**-0.0198**
Income below 50,000	**-0.0135**	**-0.0134**	**-0.0186**
Income 50,000-200,000	**-0.0132**	**-0.0102**	-0.0113
Household size 1	-0.0058	-0.0030	0.0025
African-American	**0.0229**	**0.0332**	**0.0353**
Other ethnicity	0.0073	**0.0177**	0.0155
Ages 65 to 99	**-0.0365**	**-0.0365**	**-0.0313**
Observations	15523	10531	6027

Notes: The first differences or attributable risks estimate the change in the probability of Y [Pr(Y=1)] given a discrete change in the independent variable (x), holding other variables at their means, i.e. Yx = Pr(Y=1/X=1) - Pr(Y=1/X=0).

Hypothesis 1a proposed that men in rural America are more likely to engage in opportunity entrepreneurship than women in rural America. As shown in Table 6, I find that men in rural America are indeed more likely to engage in opportunity entrepreneurship, when compared to women in rural America. This result is significant and consistent across the OMB and Isserman typologies ($p < .05$). Thus, this hypothesis is supported.

Hypothesis 1b, in contrast, proposed that women in rural America are more likely to engage in necessity entrepreneurship than men in rural America. Results in Table 4 show no effect in the female subsample compared to the male subsample. Therefore, this hypothesis is not supported.

Hypothesis 2 proposed that rural America triggers smaller levels of entrepreneurial activity given its limited economic conditions. Results in Table 6 indicate the opposite, that rurality does in fact trigger significantly higher levels of opportunity entrepreneurship. For the female subsample, only the OMB typology is marginally significant ($p<.10$). However, the male subsample shows significant results ($p<.05$) for the OMB and Isserman typologies. Furthermore, the overall sample, which includes both women and men, presents highly significant results ($p<.01$) for the rurality variable. Thus, hypothesis 2 is rejected for opportunity entrepreneurship. I found no effects for necessity entrepreneurship

Hypotheses 2a and 2b proposed that women and men who live in rural America are less likely to engage in entrepreneurship (either necessity or opportunity) than women and men, respectively, who reside in metro/urban areas. As shown in Table 4, I found no effects for necessity entrepreneurship, for either women or men. However, as Table 6 illustrates, I found rurality increases the rate of opportunity entrepreneurship among women who live in OMB nonmetro counties ($p <.10$) and among men who reside in OMB nonmetro and Isserman rural counties ($p <.05$ for both). The overall sample for opportunity entrepreneurship in Table 6 also shows that OMB nonmetro counties and Isserman rural counties are positively and significantly associated with opportunity entrepreneurship ($p <.01$). Thus, this second set of hypotheses is significantly rejected for men and only marginally rejected for women for entrepreneurial activity driven by opportunity. I found no effects for entrepreneurial activity driven by necessity.

Regarding comparison across genders in the same setting (either rural or urban), hypothesis 3a proposed that women in rural America are less likely than men in rural

America to engage in entrepreneurship. Table 8 indicates that women in rural America are indeed less likely to engage in necessity or opportunity entrepreneurship when compared to men in rural America ($p < .01$). Thus, this hypothesis is supported. Similarly, hypothesis 3b proposed that women in urban America are less likely than men in urban America to engage in entrepreneurship. Table 10 indicates that indeed women in urban America are also less likely than men in urban America to engage in opportunity entrepreneurship ($p<.01$). For necessity entrepreneurship, this same result is statistically significant for OMB metro counties ($p<.01$), but only marginally for Isserman urban counties ($p<.10$), and no effect occurs when population density is used as a typology. Thus, hypothesis 3b is supported for opportunity entrepreneurship across the three typologies. Regarding necessity entrepreneurship, hypothesis 3b is only supported for OMB metro counties and marginally for Isserman urban counties.

The control variables for the necessity and opportunity entrepreneurship models show significant results worthy of discussion. Regarding necessity entrepreneurship among women, I found that having an income below $50,000 ($p < .01$) is a positive predictor, whereas retirement ($p < .001$) is a negative predictor. Among men, I found that being employed part time ($p < .01$) or having another occupation (i.e. not full time or part time employment) ($p < .05$) are positive predictors of necessity entrepreneurship. Furthermore, like in the case for women, retirement among men negatively effects engagement in entrepreneurship driven by need ($p < .001$).

Regarding opportunity entrepreneurship, I found having college or higher levels of education is a positive factor among women and men ($p < .10$). In the female subsample, women who live in a household of 1 are less likely to start a new venture (p

<.01). In the male subsample, having an income below $50,000 or between $50,000 and $200,000 (p <.001 for both) decreases the likelihood of men engaging in opportunity-driven entrepreneurship. Furthermore, being African-American increases the likelihood of men engaging in entrepreneurial activity driven by opportunity (p <.01). As in the model for necessity entrepreneurship, being 65 or older decreases the likelihood of engaging in opportunity entrepreneurship for both women and men (p<.001 for both).

In rural America specifically, positive factors for necessity entrepreneurship are being employed part time (p <.01), having an income below $50,000 (p <.05) and having a high school degree (p <.10). A negative factor for necessity entrepreneurship is being 65 or older (p <.01). A positive predictor of opportunity entrepreneurship in rural America is having college education or higher (p <.10), whereas negative predictors include having incomes below $200,000 (p <.05), living alone (p <.10), or being 65 or older (p <.01).

In urban America specifically, positive predictors of necessity entrepreneurship include being employed part time (p <.01) or being African American (p <.01), whereas being 65 or older is a negative factor (p <.01). Positive predictors of opportunity entrepreneurship include having college education or higher (p <.05) and being African American (p <.01). Negative predictors of opportunity entrepreneurship in urban America include having incomes below $200,000 (p <.01) or being 65 or older (p <.01).

Finally, I found no effect between job growth rate and necessity or opportunity entrepreneurship. This result is consistent across typologies and across the overall sample, female and male subsamples, and rural and urban subsamples.

5. Conclusions and Policy Implications

Despite the increasing interest in entrepreneurship research, little is known about differences in the probability of engaging in entrepreneurial activity between rural and urban areas and between women and men. Contributions of entrepreneurship to economic performance differ across contexts (rural or urban/metro or nonmetro), gender and motivation (necessity and opportunity). This study aimed to examine the effects of rurality on early-stage necessity and opportunity entrepreneurship among women and men in America, using alternative models. To explore these relationships, I created a dataset that combined individual GEM U.S. survey responses with corresponding county characteristics from OMB (2003), Isserman (2005), BLS and the U.S. Census Bureau for 2005-2010. I used cross-section time-series rare-events logistic regression with year fixed effects and clustered robust errors for the analyses.

Key findings in this study suggest there is not a notable difference among the three typologies compared, the metro-nonmetro OMB classification system, Isserman's cross tabulation of metro-nonmetro urban-rural classification systems (2005) and population density. The results of the models using each typology are substantially similar in magnitude, direction and significance for most variables, other than the rural variable, which is logical given this is where the distinction is the greatest. The OMB and Isserman codes generate similar results but the population density basis is much less discerning. Population density ignores the concentration of population within counties and is sensitive to the geographic size of counties. Thus, this research would suggest caution in the use of this basis for classifying counties as rural. However, the slight differences between the OMB and Isserman rural-urban typologies may not significantly

alter the results of empirical studies. Nevertheless, the rural and urban subsamples in this study illustrate small differences in the significance levels across the typologies for some of the key and control variables, suggesting that, in practice, some differences might occur depending on which typology is used. Scholars need to consider these differences and perhaps compare results across typologies, if appropriate and plausible, to confirm their hypotheses and suggest policy changes.

Another key conclusion of the study is that living in rural America does not decrease the likelihood of men and women engaging in entrepreneurship as some studies suggest. In the case of opportunity entrepreneurship, both women and men who live in OMB nonmetro counties (and also men in Isserman rural counties) have a higher probability of engaging in opportunity entrepreneurship than their urban counterparts after controlling for other contextual economic, demographic and educational differences. Thus, despite the widely known disadvantages for entrepreneurship rural America offers (i.e. lower demand, lower knowledge spillover, less access to markets, financial capitals, suppliers and transportation accessibility), rural areas do spawn operating networks and competitive firms (Acs and Malecki, 2003), which are indicative of increasing levels of entrepreneurial activity. In fact, wide disparities exist among rural areas themselves (Smallbone, 2009) such that it would not be surprising to find some rural areas contain thriving businesses while others do not. Overall, I conclude that rural residents have at least as much ability and incentive to start successful businesses once differences in local economic conditions and personal characteristics are taken into account.

Furthermore, the results from this study confirm that women are indeed less likely to engage in entrepreneurial activity, either for necessity or opportunity reasons, than men

in both rural and urban settings. These results confirm the abundant evidence that suggests men are more likely to become entrepreneurs. The comparative nature of the results across genders confirms this is true across contextual settings (urban or rural) and motivation (necessity or opportunity). Nevertheless, there are important differences between male and female entrepreneurs. Unlike male entrepreneurship, which tends to be greatest among those with incomes between $50,000 and $200,000, women engage in entrepreneurship across the income spectrum. This suggests increases in support for entrepreneurs may disproportionately benefit lower income women.

More importantly, college or higher levels of education is positively related to opportunity entrepreneurship in both the female and male subsamples. In rural America, high school education is positively related to necessity entrepreneurship and college education is positively related to opportunity entrepreneurship. In urban America, college education is important for opportunity entrepreneurship, but I observe no effect of high school education on necessity entrepreneurship.

Findings regarding gender differences and the critical role of education have important policy implications for education and mentoring programs that aim to boost women involvement in entrepreneurship in rural America. As indicated in the literature review section on female entrepreneurship, motivations for female entrepreneurship are distinctly different from those of men. Also, women seem to capture better the effects of entrepreneurship education. Thus, considering the critical role of education (i.e. high school education for necessity entrepreneurship in rural America and college education for opportunity entrepreneurship in both rural and urban America) to make a difference in empowering entrepreneurs, customized educational and mentoring programs in rural

America hold potential for raising female participation in entrepreneurship and reducing the entrepreneurship gap with respect to men. Previous studies suggest increased involvement in entrepreneurial activities by women would contribute to reducing poverty in rural America. Hence, pairing the complementary effects of increased levels of educational attainment and higher entrepreneurship involvement to address economic disadvantages in both rural and urban America offer practical opportunities to achieve higher levels of economic growth and development.

Other findings in this study suggest being African American increases men's probability of pursuing a business opportunity, and higher rates of necessity (just marginally significant at $p < .10$) and opportunity entrepreneurship in urban America. This supports previous research that suggests entrepreneurial activity among African Americans "is about 50 percent higher than for whites" (Reynolds *et al*., 2002b). Further research focused on race differences should explore characteristics of these entrepreneurs and the potential for entrepreneurship to help this minority group overcome underrepresentation in the business world and elsewhere.

Retirees in America, both women and men, are not engaging in business venturing in significant numbers. This result is consistent across genders and across settings, indicating a clear trend worthy of discussion. This finding opens up opportunities for further research that looks into the investment portfolio of American retirees. Some scattered case studies in the practitioner world illustrate examples of retirees who invest their savings as venture capitalists or small business owners in their local economies; however, these retirees might represent only a small fraction of the universe such that the large dataset developed for this study cannot capture it

significantly. Retirees might in fact represent an untapped resource of entrepreneurship that interested researchers could explore.

Living alone negatively affects the probability of women engaging in opportunity entrepreneurship in rural America. Previous studies suggest women are more likely to start a firm with their husband or their family, which may be because of the presence of dual incomes or family support. More research is needed to understand the constraints and incentives facing single or unmarried individuals and what would be needed to increase their engagement in entrepreneurial activity.

This paper suggests the need for additional research, particularly for studies that look at the impact of rurality, college education, household size (or marital status), income and retirement on opportunity-based female entrepreneurship and on the emergence of entrepreneurial activity in rural America. The results of this study suggest, other things equal, living in a rural area may actually increase the likelihood that both women and men will start new ventures, especially driven by opportunity motivations. This finding contradicts previous studies, which find entrepreneurship is lower in rural areas. By controlling for local economic conditions and differences in demographic and other characteristics of the population, I suggest it may be these factors that lead to lower levels of entrepreneurship. This suggests policies designed to increase rural entrepreneurship should address these contextual issues as to tailor programs to the special demographic and educational characteristics of rural populations. It also suggests the need to focus more research on the nature of constraints faced by rural entrepreneurs. The payoff for such research is the potential that a better understanding of the role of

entrepreneurship in the current and future economic development of rural communities can improve the results of policy.

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CHAPTER 2: THE ADDITIONALITY OF START-UP CAPITAL ON U.S. ENTREPRENEURIAL PERFORMANCE

1. Introduction

Stimulated by the increased attention on the entrepreneur in the last decade and the budget limitations that new firms face, governments are increasingly investing on providing public sources of start-up capital as an alternative to get new firms afloat. Although research on the critical role of start-up capital among new firms has increased in recent years, much remains to be explored regarding the public financial choices available for start-ups.

This study uses the Resource-Based View (RBV) of the firm in the context of neoclassical economics to position start-up capital as a key resource for business creation and competitiveness. It also uses the concept of additionality from the economic development literature to investigate how the outcome (entrepreneurial performance) differs depending on whether the source of start-up capital originates from private sources or public intervention. The resource-based view of the firm in the context of neoclassical economics offers a sound theoretical framework for exploring how the firm's assets and capabilities allow it to transform homogeneous resources, such as public start-up capital, into heterogeneous positive economic outcomes for both, the firm and the state economy. The concept of additionality, which refers to the additional output generated that is directly associated with the public intervention (Wren, 2007), reveals "the extent to which an activity is undertaken on a larger scale, takes place at all, or earlier, or within a geographical area of policy concern, as a result of public intervention' (HM Treasury, 1997, p. 96).

Utilizing two-stage least squares regression on a dataset that combines the 2007 Survey of Business Owners (SBO) Public Use Microdata Sample (PUMS) with state data from the Census Bureau's Business Dynamics Statistics, this study finds that businesses that used public sources of start-up capital hired fewer employees (a negative effect) by 2007 than businesses that used private sources of start-up capital. Nonetheless, firms that used public sources of start-up capital increased the state establishment entry rate by 24 percent in 2008 and by 26 percent in 2009, compared to firms that used only private sources. Evidence by business stage indicates that the negative employment effect at the business level is not observed among recent recipient firms (still nascent or early-stage) but instead over time, when the firms are more established or have been in the market for 4 or more years. These results provide useful insights into how public sources of start-up capital might generate a positive contribution to the economy in the long term by increasing the number of establishments and therefore competition, but at the cost of reducing employment generation per firm. As the national and state budgets become increasingly constrained, optimizing public intervention becomes more critical. Given the contradictory findings in the literature on the challenges and opportunities of public intervention in the private sector, this study contributes strong theoretical and empirical evidence that suggests that providing public sources of start-up capital to the private sector has indeed a mixed effect in the long term.

2. Conceptual framework and hypotheses

This study uses the resource-based view of the firm in the context of neo-classical economics to position public sources of start-up capital as a potential competitive advantage for new businesses. It also uses the concept of additionality to explain the

additional effect that public sources of start-up capital has on increasing entrepreneurial performance by business stage at the business and state levels. The following subsections offer details on how each framework contributes to understanding this phenomenon.

2.1 Resource-based view and neoclassical economics

This paper utilizes the resource-based view (RBV) of the firm (Barney, 1986a, 1991, 2001a), relative to the neo-classical microeconomics perspective (Ricardo, 1817; Barney, 2001b), to explain the effect of using public sources of start-up capital on entrepreneurial performance at the firm and state levels. The use of the resource-based view of the firm in the context of neoclassical economics theory is considered an appropriate framework for studies exploring the relationship between firm resources (i.e. tangible and intangible assets, capabilities) and economic outcomes (Barney, 2001). This approach allows the researcher "to evaluate the competitive potential (i.e. value) of the different strategic alternatives firms face" (Barney, 2001, p. 53).

Some of the main assumptions of neoclassical economics are that 1) economic actors (i.e. entrepreneurs) are rational income-constrained individuals who seek to maximize their utility (i.e. entrepreneurs seek to maximize their profits); 2) individuals and firms act independently and have access to full information; 3) market forces determine supply and demand and therefore prices, outputs and income; and 4) the supply of factors of production (i.e. the individual's or firm's resources) is fixed. RBV adopts the major assumptions of neoclassical economics and adds that, although most factors of production might indeed be fixed in supply, some may be inelastic (Peteraf, 1993) and imperfectly mobile (Barney, 2001a), providing those firms with access to such inelastic and potentially immobile resources a profitable advantage over the market (Dierickx &

Cool, 1989; Barney, 1991). In this framework, homogeneous resources (e.g. same sources of start-up capital) may be homogeneously distributed among firms but used heterogeneously by each (Alvarez & Busenitz, 2001).

Because firms use and control their internal resources differently and some of them (i.e. capabilities) may not be easily transferable in the market (Barney, 1991), this heterogeneity in the use of resources withstands over time potentially generating a competitive advantage (Alvarez & Busenitz, 2001). Indeed, entrepreneurs at each firm possess the ability to identify and endure opportunities from certain resources that other entrepreneurs might find elsewhere (Alvarez & Busenitz, 2001).

Although a great deal of attention has focused on studying the effects of a firm's resources and capabilities on the firm's performance (Godfrey & Hill, 1995; Barnett, Greve & Park, 1994; Henderson & Cockburn, 1994), much remains to be explored regarding the economic implications at the state-level of the heterogeneous use of firms' resources. Furthermore, most research on start-up capital has evolved around private investment, leaving a void in our understanding on the role of public intervention. This study seeks to explore the value of start-up capital provided by public intervention, compared to private investment, by estimating the effect at the firm level and the additional impact on performance at the state level.

2.2 Additionality and economic development

This study applies the concept of additionality to explain outcome differences between public and private sources of start-up capital by business stage. The additionality of a public investment refers to the additional sources of revenue generated, or the contribution to the economy (i.e. new firms) of a support measure that goes above and

beyond what would have happened in the absence of the policy. It is based on the assumption that without government intervention the outcomes achieved from a policy would not have occurred (i.e. the counterfactual). By the same token, if the outcomes of the incentive would have happened anyway, then the government has wasted its time and money.

Although the term 'additionality' is fairly new in U.S. literature, it is not uncommon in the U.K. or the E.U., especially regarding policy evaluations. As Pearce and Martin (1996) explain, the logic of additionality is true and fairly simple in theory, but in practice isolating the effects of a particular policy becomes much more challenging. This is primarily because the positive and negative effects from a policy intervention may reach beyond their anticipated audience and cause unintended consequences (Schwartz & Clements, 1999) that are hardly accounted for in traditional regression analyses. For instance, many empirical applications fail to account for the selection problem induced by the type of firms that choose to apply for public sources of start-up capital.

Recent public sector budget cuts and high unemployment rates have increased public attention and demand for accountability on how public resources are distributed. This has in turn exacerbated political concern for higher efficiency and social distributional goals. As a result, calculating the additionality of public investment by business stage (to control for business size) has become a more salient term in the public policy arena to address analytically the need for higher transparency and accountability. Its application is intended to overcome inconsistencies across empirical studies so that

new research can isolate the additional effect that can only be attributed to a program, and not to historical trends or other interventions.

2.3 Start-up capital

Entrepreneurship is widely acknowledged as a generator of sustainable means to achieve economic growth. Evidence suggests that this is true regardless of the type of economy under study because entrepreneurs set roots in the community where they start and typically continue to contribute to that economy beyond the boundaries of their business. Audretsch and Keilbach (2002) also suggest that entrepreneurship generates higher rates of economic growth because an increasing number of firms in the market lead to increased competition, and competition generates more externalities than monopoly (Porter, 1990). Thus, under this approach having more firms entering the market is more desirable than maintaining the status-quo.

Aside from becoming a key objective in several state economies' agendas, entrepreneurship also seems to be an aspirational goal for a majority of Americans on the work force. A study by Steinmetz and Wright (1989) found that almost two thirds of Americans in the work force from a diversity of jobs aspire to become self-employed one day. Nonetheless, only "40 percent of U.S. adults will experience a spell of self-employment […] over their lifetimes" (Kim, Aldrich, & Keister, 2006, p. 5). What is stopping the other approximately 20 percent? The literature suggests that risk aversion and limited resources might hold most of the answers. Indeed, availability and access to start-up capital constitutes a critical resource for encouraging small high-risk firms to take off.

Evans and Jovanovic's theory of liquidity constraints (1989) suggests that starting a new firm requires a sizeable amount of start-up capital, which when accessible holds a key financial advantage in the pursuit of self-employment (Kim et al, 2006).

Furthermore, Cassar (2004) argues that the source of financing for start-ups is critical to understanding the business' operation and performance, risk of failure and potential for growth. Private sources of start-up capital for new firms typically include personal savings, personal assets, home equity, credit cards, bank loans, loans from family and friends and venture capital. Because not all entrepreneurs hold the financial resources or network ties needed to start a new firm, some entrepreneurial opportunities and their potential contribution to the economy might never take off. In this scenario, public intervention in the form of government loans, government guaranteed loans and grants might hold the key to encourage some of these potential small firms to enter the market.

But, exercising control over key resources is only part of the puzzle; it is the combination of control and value that determine higher rates of effectiveness, efficiency, and rent maximization. The economic value of a resource is determined by the context and conditions (i.e. market settings) in which the firm competes and where the resources are acquired or developed (Priem & Butler, 2001); thus, it is exogenous to the firm and highly dependent on the firm-market relationship (Barney, 2001a). Although firms use and control their internal resources differently, it would be inappropriate to study the value of a firm's resource without considering the market settings that condition whether or not it is worth the investment and time. As Audretsch and colleagues (2002) suggest, the entrepreneur and the changes they introduce are bound by the legal, institutional and

social factors of the system surrounding them. For instance, DeAngelo and Masulis (1980) suggest that tax regimes pose an incentive for start-ups to incur debt because this can later be deducted from tax liabilities.

Government grants and loans require "very stringent compliance and reporting measures to ensure the money is well spent" (SBA, 2012) and are usually included in the general budget of the state. Indeed, grants and loans are typically considered by politicians and the public alike as reasonable spending programs, especially when compared to other public incentives such as tax credits which are not included in state budgets and do not have reporting requirements other than eligibility. Nonetheless, major concerns among policymakers regarding public intervention deal with the optimal use of public resources by investing in initiatives that could draw other sources of funding or that would produce comparable outcomes regardless of the policy (Pearce & Martin, 1996). In some instances, failures may occur, producing unanticipated consequences. For instance, institutional failures may occur when "different institutions within the system do not operate well together or if the regulatory and legal frameworks do not encourage innovative activity" and network failures might occur "when the activities of different actors are poorly coordinated because of lack of interaction between these" (Autio et al, 2008, p. 62).

There are contradictory findings in the literature regarding the effects of public intervention in the private sector, and these are mostly due to the lack of specificity in empirical models on the additionality of public intervention. On the one hand, evidence suggests that public intervention might displace private investment that would have happened otherwise. A study by Wallsten (2000) finds that firms that received R&D

grants from the Small Business Innovation Research Program replaced dollar for dollar private R&D spending. An extensive review by David and colleagues (2000) also finds that approximately one third of the studies analyzed showed a substitution effect where public funding substituted previous private investment.

On the other hand, studies find that government intervention stimulates innovative firm activity that might have otherwise not taken place (Busom, 2000; González, Jaumandreu, & Pazó, 2005; Lach, 2002; Hussinger, 2003), such as products that require long-term research and development. Lentile and Mairesse (2009) also argue that firms "tend to invest less in R&D projects than they should since they know that other firms will capture part of the returns" and "firms will normally tend to increase their R&D expenditures to the size where their expected private returns and marginal costs will match," but no further (p. 146). Similarly, Keuschnigg and Nielsen (2007) find that subsidies are positively correlated with entrepreneurship creation although they worry about the welfare effects at large. Thus, public intervention through the provision of start-up capital might promote innovation and wealth generation in new firms that would not be possible otherwise. From this evidence, I propose the following hypotheses

H1. Public intervention through the provision of public sources of start-up capital contributes positively to entrepreneurial performance at the business level

H1a. The use of government loans, government guaranteed loans and grants has a positive effect on the firm's receipts

H1b. The use of government loans, government guaranteed loans and grants has a positive impact on the number of employees the firm hires

H2. Public intervention through the provision of public sources of start-up capital contributes positively to the state economy where the firm operates

H2a. The use of government loans, government guaranteed loans and grants at the firm level contributes to higher rates of establishment entry at the state level

H2b. The use of government loans, government guaranteed loans and grants at the firm level contributes to positive establishment net growth at the state level

Business outcomes and contributions to the economy differ by business stage. Ample prior research suggests that most firms are likely to fail in their nascent (Kirchhoff 1994; Mata 1994; Wagner 1994) and early-stage (McKaskill, 2011; Kazanjian & Drazin, 1990) periods. Established firms, on the contrary, are those which survived the early stage and were able to capture a market share that allowed them to stay afloat. Analyses in subgroups by business stage allow the researcher to capture additionality differences on the economy due to business size. Thus, I propose the following hypotheses

H3. Established firms that used public sources of start-up capital are more likely to generate positive outcomes at the business level than recent recipients, nascent and early-stage firms

H3a. Established firms that used public sources of start-up capital generate higher receipts at the business level than recent recipients, nascent and early-stage firms

H3b. Established firms that used public sources of start-up capital hire more employees at the business level than recent recipients, nascent and early-stage firms

H4. Established firms that used public sources of start-up capital are more likely to generate positive additional outcomes at the state level than recent recipients, nascent and early-stage firms

H4a. Established firms that used public sources of start-up capital are more likely to increase the establishment entry rate at the state level than recent recipients, nascent and early-stage firms

H4b. Established firms that used public sources of start-up capital are more likely to increase the establishment net growth at the state level than recent recipients, nascent and early-stage firms

3. Data, model design and method

3.1 Data

I combine various sources of data to build a composite dataset for this study. The first and main source is the 2007 Survey of Business Owners Public Use Microdata Sample (PUMS), released in August 2012, which is the first and only Survey of Business Owners PUMS available to the public at this level of detail. The 2007 SBO PUMS, an initiative of the Census Bureau, is built from a random survey of over two million businesses from twenty NAICS sectors (2007 NAICS) in the U.S that at the time of the survey had receipts of $1,000 or more. Some NAICS industries are excluded in the source[5].

The 2007 SBO PUMS offers a rich picture of U.S. business characteristics and the characteristics of their owners for the year 2007. It was built from data from the Survey of Business Owners and Self-Employed Persons (SBO), and combines business identification, classification, and measurement data from specific 2007 tax forms[6] from the Internal Revenue Service (IRS), the 2007 Economic Census and other corresponding

[5] Crop and Animal production (NAICS 111, 112); Scheduled passenger air transportation (481111); Rail transportation (482); Postal service (491); Funds, trusts, and other Financial Vehicles (525); Religious, Grantmaking, Civic, Professional, and Similar Organizations (813); Private Households (814); and Public Administration (92).

[6] [Form 1040 Schedule C, "Profit or Loss from Business" (Sole Proprietorship), form 1065 "U.S. Return of Partnership Income", any one of the 1120 corporation tax forms, form 941 "Employer's Quarterly Federal tax Return", form 944 "Employer's Annual federal Tax Return"]. Source: http://www.census.gov/econ/sbo/methodology.html

information from administrative records. Each observation/record in the 2007 SBO PUMS corresponds to a business at the firm level and includes businesses with paid employees and businesses with no paid employees. Business characteristics also include characteristics of up to four business owners and identification by state and sector. In this study, the unit of analysis is the business (firm) and its context is the state within which it operates, indicated by the state FIPS codes for each business.

The FIPS code variable in the original 2007 SBO PUMS dataset was used to match firm-level observations with corresponding state-level characteristics prepared from data from the Census Bureau's Business Dynamics Statistics. The dataset initially contained 2,092,902 business observations across the US, but was reduced to only businesses that were still operating and contributing to the economy in 2007. The final dataset had 1,223,474 observations at the firm level (Table 2). This dataset does not contain publicly traded businesses (see section 3.8 below for details).

3.2 Independent variables

This study has one independent variable of interest to test the hypotheses proposed. The variable "public_capital" is built from a set of variables available in the 2007 SBO PUMS dataset. Public_capital equals 1 if the business used all or part of its start-up capital from government loans, government guaranteed loans or government grants. It equals zero if the business used other sources (i.e. private or other). The comparison group includes personal savings, personal assets, home equity, credit cards, bank loan, family loan, venture capital, and other. Table 1 provides descriptive statistics for the variables used to build public_capital.

Table 1. Descriptive statistics for public_capital and comparison group

Source	N	Mean	SD	Min	Max
Public_capital	1,223,474	0.020	0.141	0	1
Government loan	1,223,474	0.009	0.097	0	1
Government guaranteed loan	1,223,474	0.011	0.104	0	1
Grant	1,223,474	0.002	0.044	0	1
Comparison group					
Personal savings	1,223,474	0.616	0.486	0	1
Personal assets	1,223,474	0.092	0.289	0	1
Home equity	1,223,474	0.064	0.246	0	1
Credit cards	1,223,474	0.099	0.299	0	1
Bank loan	1,223,474	0.158	0.365	0	1
Family loan	1,223,474	0.039	0.193	0	1
Venture capital	1,223,474	0.006	0.079	0	1
Other	1,223,474	0.025	0.157	0	1

Additional analyses are performed to provide evidence by the stage of the business in 2007. Firms are subdivided into three subsamples by business stage: Nascent (Tables 7 and 8 only), early stage and established (Tables 7, 8, 9 and 10). The nascent group includes only businesses that were in their first year of operations in 2007. The early stage firms are businesses that were in operations for less than four years by 2007. The established group includes only businesses that were in operations for four years or more by 2007. The nascent group is not analyzed for state level variables (Tables 9 and 10) because it is unlikely that recent start-ups would impact the establishment entry rate and establishment net growth measured during that same year. These subsamples are designed to observe the effect *over time* of using public sources of start-up capital (i.e. within the same year for nascent firms, within the first years for early stage firms and over a longer period of time for established firms).

3.3 Dependent variables

Entrepreneurial performance is defined by two variables at the state level and two variables at the business level. At the state level, the outcome variables of interest are establishment entry rate and establishment net growth rate for 2007, 2008 and 2009 to observe mid/long term contributions and differences across years. These variables were obtained from the Census Bureau's Business Dynamics Statistics. Establishment entry rate is used in its original form whereas establishment net growth is the difference between establishment entry rate and establishment exit rate for each year. Establishment data was chosen over firm data for these outcome variables because although new firms are considered a clear indicator of entrepreneurship in the economy, additional establishment creation is an indicator of both entrepreneurship (defined as business creation) and additional economic development.

At the business level, this study uses firm receipts and firm employment from the 2007 SBO PUMS for year 2007 as the outcome variables of interest. Business receipts range between zero and 14 million dollars, with a mean of 3,889.25 dollars. Business employment ranges between zero and 58,000 employees, with a mean of 18.15 employees. Table 2 includes descriptive statistics for the four outcome variables of interest.

3.4 Instrumental variables

3.4.1 Owners born in the U.S.

Access to public sources of start-up capital, although not restricted to US citizens, may be affected by the knowledge among business owners that these sources of seed capital exist. For instance, Cassar (2004) explains that market access and finance discrimination

are two of the major factors that entrepreneurs face when starting a business. Financiers are often reluctant to offer start-up capital to finance new business ideas that not only pose high risk of failure, but which may also come accompanied by the entrepreneurs' lack of a trustworthy or lengthy financial record. Berger and Udell (1998) and Huyghebaert (2001) argue that due to the information asymmetry among new firms, the financial decisions regarding the new business rely greatly on the entrepreneur's knowledge of how to acquire the much needed financial capital. Cassar (2004) adds that the idiosyncratic characteristics of the entrepreneur play a key role in the financial decisions they make, especially on non-publicly traded firms (such as the observations used in this study).

Thus, it is likely that US born business owners are more prone than foreign-born business owners to know about and seek public sources of financial capital. Whether at least one of the business owners was born in the US is selected as an instrumental variable for Models (2) and (4) because it represents a natural experiment that offers US citizens a competitive advantage over foreign-born business owners in the US. This is a binary variable that equals 1 if at least one of the business owners was born in the U.S. and zero otherwise.

3.4.2 Business was inherited or received as a gift

In his seminal paper on the resource-based view of competitive advantage, Barney (1991) positioned the historical conditions of the firm as an imperfectly imitable resource, thus unique. Specifically, he states "once this particular unique time in history passes, firms that do not have space-and time- dependent resources cannot obtain them, and thus these resources are imperfectly imitable" (Barney, 1991, p. 107). In this study, the second

instrumental variable used to test the effects of public intervention on entrepreneurial performance is whether the business was inherited or received as a gift. Given the unusual nature of these developments, whether the owner received the business from inheritance or as a gift is considered jointly as an exogenous variable that emphasizes the unique position of the firm in space and time. A great amount of scholarly work that dates back to the 1960's confirms Barney's argument that the historical path dependence of a firm provides it with an exclusive resource inimitable by other firms in the market (Arthur, Ermoliev & Kaniovsky, 1984, 1987; Burgelman & Maidique, 1988; David, 1985; Winter, 1988; Zucker, 1977). This instrumental variable is coded 1 if at least one of the business owners inherited the business or received it as a gift, and zero otherwise. Models (3) and (4) on Table 4 use this instrumental variable at the business level.

3.5 Control variables

This study includes control variables at the business owner, business, and state levels. At the business' owner level, the control variables include average age of business owners, average education of business owners, and whether the business is owned by a majority Hispanic, females and Whites, separately. The indicators for age and education in the original 2007 SBO PUMS were given by categorical values, one through seven for education and one through six for age for each of the business owners surveyed (i.e. up to four). The variable age in the dataset prepared for this study equals 1 if the owners are in the 25 to 44 age range and zero otherwise. This variable is set to capture the age group that most highly represents active entrepreneurs in the US economy (Reynolds, Gartner, Greene, Cox, & Carter, 2002). Similarly, the variable education is set to equal 1 if the business owner has some college education or higher (i.e. some college, associate's,

bachelor's, master's or higher), and zero otherwise. Some college education or higher is considered instead of completed college education or higher because although the majority of the most successful entrepreneurs (in economic terms) in the market finished college according to Forbes richest 400-list (Forbes, 2011), some eminent examples started college but decided to drop out later (e.g. Mark Zuckerberg, Bill Gates, Steve Jobs, Michael Dell). This indicator is designed to also capture that small outlier portion of the population for whom one or two years of college was deemed enough.

The variables to indicate majority Hispanic, majority females and majority Whites were created following the guidelines from the 2007 SBO PUMS data user guide. The percentages owned by each owner per business were added up. The 'majority' threshold was determined when a particular ethnicity, gender or race owned more than 50 percent of the business.

At the business level, control variables include the sector in which the business operates, years since the business was established, number of owners, whether the business operates at least 40 hours per week, whether the business is operated as a franchise, whether it is a family business, whether the business operates outside of the U.S., and whether the business transactions are conducted in English. The variable sector is a set of dummy variables that equal 1 for each NAICS code between 11 (agriculture, forestry, fishing and hunting - nonfarm) and 99 (non-classifiable establishments). The variable that indicates the number of years since the business was established is given in the 2007 SBO PUMS as a categorical variable between one and nine (i.e. 1=before 1980 and 9=2007). This variable was transformed to a mid-point estimate and reversed to reflect the number of years the business has been in the market. The new variable equals

1 if the business was established in 2007; it equals 2 if it was established in 2006, and so on. The mid-point estimate calculation was specifically used in the new variable for the original categories 1 through 4 which included more than one year per category.

Similarly, the variable that indicates the number of owners is available from the 2007 SBO PUMS as a categorical variable that ranges from one to seven, where 1 indicates one owner and 7 indicates 50 or more. The new variable in the dataset was created using the same technique as for the 'number of years since the business was established', so that it equals 1 if the business has 1 owner and a mid-point estimate for categories 5 (i.e. 5 to 9 owners is now 7) through 7 (i.e. 50 or more is now 50). Whether the business operates at least 40 hours per week, whether the business is operated as a franchise, whether the business is family owned, whether the business operates outside of the US and whether the business transactions are conducted in English are coded as dummy variables that equal 1 if 'yes' and zero otherwise.

To control for variability at the state level, generated by potential homogeneous characteristics among businesses that operate within the same state, the analyses use clustered robust errors by state FIPS code.

3.6 Models and Method

This study measures entrepreneurial performance at the business level and at the state level in two models as follows

$$Y_{1ij} = \beta_{10} + \beta_1 X_{1ij} + \beta_2 \lambda_{ij} + \beta_3 \alpha_{ij} + \beta_4 z_{ij} + \varepsilon$$

$$Y_{2jt} = \beta_{20} + \beta_{21} X_{1ij} + \beta_{22} \lambda_{ij} + \beta_{23} \alpha_{ij} + \beta_{24} z_{ij} + \varepsilon$$

where

Y_1 = entrepreneurial performance, business level (business sales, business employment)

Y_2 = entrepreneurial performance, state level (establishment entry rate, establishment net growth)

X_1 = used start-up capital from public sources

λ = business controls

α = business owner's controls

z = instrumental variable(s) – not in Model (1)

i = 1,…N (business)

j = 1,…N (state)

t = 2007, 2008, 2009 (year)

Variable X_1 is a binary indicator equal to 1 if the business used start-up capital from a public source (i.e. government loan, government guaranteed loan, grant) and 0 otherwise. The comparable group is private_capital which means that the business used start-up capital from a private source (i.e. personal savings, assets, home equity, credit cards, bank loans, family loan, or venture capital) or other sources.

β_2 represents a vector of parameters of business controls that have been shown to affect entrepreneurial performance. These include sector in which the business operates, number of years that the firm has been in the market, number of owners, whether the business operates at least 40 hours per week, whether the business operates as a franchise, whether it is a family business, whether the business operates outside of the US, and whether business transactions are conducted in English. Section 3.5 above explains in detail how these variables are coded.

β_3 represents a vector of parameters of business owner characteristics that have been found to affect the performance of the firm in the economy. These include average

age and average educational attainment of business owners, ethnicity, gender and race controls. Section 3.5 above explains in detail how these variables are constructed for this study. All variables at the business level have an id variable that indicates the business' location (i.e. state).

This study uses Ordinary Least Squares (OLS) (Model 1) and Two-Stage Least Squares (2SLS) (Models 2,3,4) regression techniques and offers four models to compare results at the business level in Table 4. Model (1) presents the results of an OLS regression without the assistance of instrumental variables. Model (2) uses, as an instrumental variable, whether at least one of the business owners was born in the United States. Model (3) uses whether the business was inherited or received as a gift by at least one business owner as the instrumental variable in 2SLS. Model (4) uses both variables as instruments for use of public sources of start-up capital in 2SLS. The equation for instrumenting the independent variable of interest, public_capital, in Models (2), (3) and (4) is as follows

$$\text{Public\_capital} = \pi_0 + \pi_1 z_{xi} + \upsilon$$

$_{x1}$= at least one business owner was born in the United States

$_{x2}$= at least one business owner inherited or received the business as a gift

$_{x3}$= includes both instruments

Table 4 presents the results at the business level of the OLS and 2SLS regressions for the four models. Based on its large first-stage F-statistic value and the number of observations retained in the regressions, Model (2) seems to be the strongest model of the four. Thus, based on the robustness of the results from Table 4, only Models (1) and (2) are used comparatively for the remaining regressions.

3.6 Sensitivity analyses

Robustness checks were conducted to ensure validity of the instruments used in Models (2), (3) and (4). First, as suggested by Murray (2006) and Levitt (1996, 1997), reduced form regressions were performed where the instrumental variables were used alone and together as the explanatory variable. In a first set, the dependent variable was the instrumented variable (public_capital). In a second set, the dependent variable was the dependent variable from each model, one at a time. The results from these reduced form regressions show coefficients for the instrumental variables that are statistically different from zero and whose signs support the relationships under study.

"Getting similar results from alternative instruments enhances the credibility of instrumental variable estimates" (Murray, 2006, p. 118). Alternative instruments were used separately in Models (2) and (3) and together in Model (4). The results in Table 4 are for the most part consistent across Models (1), (2), (3) and (4) (i.e. they lead to the same interpretation). The coefficient and significance results for the public_capital variable are consistent across models which confirms the validity of the model design and the instruments used.

Finally, the cluster-robust first-stage F-statistics from the 2SLS models (2), (3) and (4) were compared to the critical values on table 2 of Stock and Yogo (2002). The cluster-robust first-stage F-statistics from the three models are far larger than the critical values suggested by Stock and Yogo, therefore indicating that the instruments used are very strong. Indeed, Model (2) is the stronger of the two instruments compared and retains a larger number of observations. Thus, Model (2) is used comparatively with Model (1) for regressions in Tables 5 through 10.

3.7 Treatment of missing values

The original 2007 SBO PUMS dataset reports missing values as "0" to indicate "not reported". For this study, these values were re-coded as missing in STATA, which is indicated by a "." in the new dataset. This was set to avoid confusion in the analyses. A "0" in the new dataset indicates a negative response or the comparison group to the value of interest.

When running regressions, STATA ignores observations that have many missing values, therefore the results in Tables 4 and 5 show a different number of observations for Models (1) through (4). Models (3) and (4) show the least number of observations (i.e. 175,199 and 169,232) used for the regressions because the instrumental variable that indicates whether the business was inherited or received as a gift by at least one of the business owners has only 185,295 usable observations (i.e. non-missing). The Census Bureau, concerned about the amount of not-reported values in the original 2007 SBO PUMS dataset, examined differences between respondents and non-respondents by receipts-size. Four percent of non-respondents were selected and their values for 2007 were replaced by values from the 2002 Survey of Business Owners. The main findings in their report[7] indicate that non-respondents had in general lower average receipts than respondents and the universe, and that "response rates were lower among smaller businesses (sole proprietors and firms without paid employees)" (US Census Bureau, 2007b, p. 5). This means that the results from this study may not capture fully effects related to these groups.

[7] 'Nonresponse Analysis for the 2007 Survey of Business Owners' report. Available online at: http://www.census.gov/econ/sbo/methodology.html

3.8 Data Shortcomings and Limitations

In order to protect the confidentiality of these surveyed firms, the 2007 SBO PUMS does not offer data for publicly traded businesses, which limits the external validity of the results to relatively small businesses and family-owned businesses only. Also, the results do not reflect the following eight states: Alaska, Delaware, the District of Columbia, North Dakota, Rhode Island, South Dakota, Vermont and Wyoming. The Census Bureau grouped these eight states into four new state categories because each had fewer than 100,000 weighted businesses in the 2007 survey.

Other precautions were taken in the 2007 SBO PUMS to protect surveyed businesses. Specific estimates –receipts, payroll, and employment- were rounded to the next digit and were noise-infused. Thus, as with any survey sample, sampling and non-sampling errors may be present. Prior publication of the data, the Census Bureau "detected and corrected most of the important operational and data errors through an automated data edit designed to review the data for reasonableness and consistency". Nonetheless, errors may still exist in the original dataset. Further details on the methodology used for collection and preparation of the 2007 SBO PUMS is available on the methodology section regarding the 2007 SBO on the Census Bureau's website[8].

4. Results

This section summarizes the results from the four models undertaken to explain the effect of firms' use of public sources of start-up capital on entrepreneurial performance at the business and state levels. Model (1) used OLS regression for reference. Models (2), (3), and (4) used 2-Stage Least Squares. Model (2) used whether the business owner(s) was born in the US as the instrumental variable for whether the business used a public source

[8] http://www.census.gov/econ/sbo/methodology.html

of start-up capital, compared to those using private sources. Model (3) used whether the business was inherited or received as a gift as the instrumental variable. Model (4) combined both instrumental variables to observe differences due to over-identification.

The four models used control variables for business characteristics, business owner(s) characteristics and sector where the business operates. Business owner characteristics included the average age, educational attainment, ethnicity, gender and race for all business owners per firm. The four models also used clustered robust errors by state FIPS code to account for homogeneous characteristics shared by businesses that operate within the same state.

The first-stage F-statistics from the four models were compared against the critical values proposed on table 2 on Stock and Yogo (2002), which proposes a minimum critical value of 16.38 for one instrument and 19.93 for two instruments to reject the null hypothesis that $\beta=0$. Model (2) produced the highest first-stage F-statistic of the four models ($F=73.97$) and retained the largest number of observations, indicating that the instrument regarding US citizenship was the strongest of the two alternative instruments used, and therefore suggesting that the results from Model (2) are the strongest for discussion.

Table 2 provides descriptive statistics for dependent, independent, instrumental and control variables used in the four models using both OLS and 2SLS techniques. Table 3 offers correlation coefficients for all variables from Table 2. Table 4 presents the results from Models (1) through (4) for outcome dependent variables at the business level. Tables 5 and 6 report results for Models (1) and (2) using establishment entry rate and establishment net growth as the state dependent variables for 2007, 2008 and 2009.

Tables 7, 8, 9 and 10 illustrate results by business stage for the nascent, early-stage and established subsamples using models (1) and (2). Section 3.2 above explains how these subsamples were constructed. Table 7 and Table 8 use business receipts and employment as the dependent variables of interest respectively at the business level, both for 2007. Tables 9 and 10 use establishment entry rate and establishment net growth respectively as the dependent variables of interest at the state level for 2007, 2008, and 2009.

Table 2. Descriptive statistics for all variables

	n	Mean	SE	Min	Max
Business level dependent variables					
Business sales (receipts) 2007	1,223,474	3,889.25	43,874.37	0	14,000,000
Business employment 2007	1,223,474	18.15	140.17	0	58,000
State level dependent variables					
Establishment entry rate 2007	1,223,474	11.995	1.623	9.6	16.5
Establishment entry rate 2008	1,223,474	10.369	1.350	7.9	14.1
Establishment entry rate 2009	1,223,474	8.962	1.163	7.2	12.1
Establishment net growth 2007	1,223,474	1.591	1.109	-0.3	5.3
Establishment net growth 2008	1,223,474	0.117	0.781	-1.5	1.6
Establishment net growth 2009	1,223,474	-2.970	1.082	-5.8	-0.9
Independent variable					
Used public sources of start-up capital	1,223,474	0.02	0.141	0	1
Instrumental variables					
At least one of the owners was born in the US	952,923	0.997	0.054	0	1
At least one of the owners inherited the firm or received it as a gift	185,295	0.732	0.443	0	1
Business control variables					
Years since firm was established	1,164,570	15.184	10.548	1	30
Number of owners	1,080,845	3.308	9.729	1	100
Operates more than hours per week	1,202,481	0.723	0.447	0	1
Operates as a franchise	1,218,813	0.032	0.178	0	1
Family business	1,081,632	0.348	0.476	0	1
Operates outside of the US	1,219,924	0.012	0.108	0	1
Conducts transactions in English	1,220,284	0.992	0.086	0	1
Business owners control variables					
Average age of owners	810,356	0.104	0.305	0	1
Average educational attainment of owners	878,626	0.642	0.479	0	1
Ethnicity (Hispanic)	1,223,474	0.064	0.245	0	1
Race (White)	1,223,474	0.493	0.499	0	1
Gender (Woman)	1,223,474	0.889	0.314	0	1

Results from Model (2) in Table 4 indicate no effect of using public sources of start-up capital on business receipts. Thus, hypothesis 1a is not supported. Results from Model (2) in Table 4 also indicate that businesses that used public sources of start-up capital hired 649.57 fewer employees (a negative effect) than firms that used private sources of start-up capital. This result contradicts hypothesis 1b, and thus rejects hypothesis 1.

Table 4 also shows that, as expected, the more established the firm (i.e. more years have passed since inception) the higher the receipts and number of employees the firm hires. Model (2) indicates that for every extra year that the firm has been in the market, it experienced an additional 169.96 dollars in sales (receipts) and hired .69 more employees in 2007 (both at $p < .01$). By the same token, one more owner in the firm increased business receipts by 508.9 dollars and hired 1.7 employees in 2007 (both at $p < .01$).

Businesses for which the business owner(s) invested more than 40 hours a week in managing and/or operating the business increased business receipts by 3,156 dollars and hired 25 more employees in 2007 (both at $p < .01$), compared to firms where the business owner invested less than 40 hours a week in the business. Firms operated as a franchise had 7,197 dollars more in receipts and hired 40 more employees (both at $p < .01$) in 2007 than businesses not operated as a franchise. Interestingly, family businesses generated 1,328 dollars more in receipts ($p < .05$) and hired 9 more employees ($p < .01$) than non-family businesses. Finally, firms with units operating outside of the US generated 8,572 dollars more in receipts ($p < .01$) and hired 22.4 more employees ($p < .01$) in 2007.

Results from Model (2) in Table 5 indicate that business use of public sources of start-up capital had a positive effect on establishment entry rate in 2008, although only marginally significant ($p < .10$). In 2009, this effect is also positive and significant ($p < .05$). There was no effect in 2007. The results from 2008 and 2009 support hypotheses 2 and 2a. On the contrary, results from Model (2) in Table 6 suggest that firms that used public sources of start-up capital impacted negatively on the net establishment growth rate in 2007, although this result is only marginally significant ($p < .10$). No results were found for 2008 of 2009. This result contradicts hypothesis 2b.

Results from Model (2) in Table 7 indicate no effect of using public sources of start-up capital on business receipts for either group. Thus, hypothesis 3a is not supported. However, for every additional business owner, firms that were in early stage or established stage by 2007 increased their receipts by 31 ($p < .05$) and 443 ($p < .01$) dollars respectively in 2007. Firms that were in their established stage by 2007 where the business owner(s) invested more than 40 hours per week in operating and/or managing the business increased their receipts by 3,829.3 dollars in 2007 ($p < .01$). Established firms that were operating as a franchise in 2007 also saw an increase in their receipts by 6,594.7 dollars in 2007 ($p < .01$). Established family businesses also had 1,844.6 dollars more in receipts by 2007 ($p < .01$). Established businesses that had units operating outside the US in 2007 also saw an increase of 9,657.8 dollars in their 2007 receipts ($p < .01$).

Results from Model (2) in Table 8 indicates a marginal negative effect on business employment in 2007 among firms that used public sources of start-up capital. In fact, it suggests that firms that used public sources of start-up capital hired 572 fewer employees ($p < .10$) than firms that used private sources of start-up capital. This result

contradicts hypothesis 3b, and therefore rejects hypothesis 3. Other results show that for every owner, early stage firms hired .12 more employees ($p < .10$) and established firms hired 1.4 more employees ($p < .01$) in 2007. Established firms where the business owner invested more than 40 hours per week in operating and managing the business also hired 28.4 more employees in 2007 ($p < .01$). Firms that operated as a franchise, family businesses and those that had units operating outside the US hired 35.4 ($p < .01$), 11.2 ($p < .01$) and 26.1 ($p < .01$) more employees respectively in 2007.

Results from Model (2) in Table 9 indicate that established businesses that used public sources of start-up capital increased establishment entry rate by almost 24 percent in 2008 ($p < .10$) and by 26 percent in 2009 ($p < .05$). No results were observed for early-stage firms. These results support hypotheses 4 and 4a. Results from Model (2) in Table 10 do not support hypothesis 4b.

Table 3. Correlation coefficients for all right-hand side variables

id	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Public intervention	1														
2	Business owners were born in the US	-0.0243	1													
3	Business owners inherited business or received as gift	-0.0351	0.1407	1												
4	Number of years since business was established	-0.0496	0.1112	0.333	1											
5	Number of owners	0.003	-0.0032	-0.2028	0.0437	1										
6	Operates more than 40 hours per week	0.0084	0.0077	-0.0246	0.1567	0.0833	1									
7	Business operates as a franchise	0.0295	-0.0507	-0.0283	-0.0335	-0.0257	0.0377	1								
8	Family business	0.0055	0.0048	0.3395	0.1601	-0.1453	-0.0227	0.0202	1							
9	Business has operations outside the US	-0.0008	-0.0168	-0.0295	0.0068	0.1529	0.0238	-0.0174	-0.0273	1						
10	Business transactions are conducted in English	-0.0077	0.0842	0.0131	0.014	-0.0166	0.0128	0.0021	0.001	-0.0267	1					
11	Business owners are in 25-44 age group	0.0093	-0.0416	-0.0129	-0.1825	-0.0288	-0.0558	0.0016	0.0187	-0.0022	-0.0048	1				
12	Business owners have some college education or more	-0.0092	0.0163	-0.1172	-0.0173	0.1188	0.0482	-0.0098	-0.1559	0.0496	0.0075	-0.0014	1			
13	Ethnicity (Hispanic)	0.0181	-0.0835	-0.0486	-0.1076	-0.0243	-0.027	-0.0059	-0.0264	0.0133	-0.0476	0.0459	-0.0244	1		
14	Gender (female)	0.0186	0.0047	0.1935	-0.0156	-0.1031	-0.0859	0.0107	0.3474	-0.0483	0.0092	0.0291	-0.1206	0.021	1	
15	Race (White)	-0.0259	0.3362	0.0537	0.1183	0.0067	0.0492	-0.0361	0.0113	-0.0105	0.0416	-0.0457	-0.0182	-0.0279	-0.0317	1

Table 4. Results for business outcomes, OLS (1) and 2SLS (2) models

Variables/Models	Business receipts				Business employment			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Used public sources of start-up capital	-1,604.09***	-64,684.7	246,288.3***	233,637.7***	-2.98***	-649.57*	580.10***	422.53***
	(191.88)	(77,103.74)	(61,879.5)	(60,460.44)	(0.82)	(365.81)	(168.45)	(153.73)
Number of years since business was established	185.60***	169.96***	472.51***	474.30***	0.83***	0.69***	1.56***	1.47***
	(8.34)	(18.52)	(47.42)	(48.97)	(0.03)	(0.10)	(0.12)	(0.12)
Number of owners	442.85***	508.87***	604.88***	621.68***	1.48***	1.65***	1.83***	1.89***
	(24.00)	(29.15)	(34.37)	(35.57)	(0.08)	(0.10)	(0.12)	(0.11)
Business owner invests more than 40 hours per week	2,259.32***	3,156.24***	2,768.82***	2,977.65***	14.96***	24.83***	22.29***	24.36***
	(79.01)	(1,066.88)	(593.17)	(583.72)	(0.41)	(5.23)	(1.59)	(1.46)
Business operates as a franchise	4,780.58***	7,196.73***	4,149.59***	5,026.30***	19.17***	39.69***	10.39***	13.92***
	(289.05)	(2,429.43)	(1,290.87)	(1,269.90)	(0.90)	(11.40)	(3.51)	(3.06)
Family business	891.47***	1,328.03**	-806.33	-876.99*	4.46***	9.20***	0.84	1.05
	(113.68)	(608.28)	(520.50)	(508.26)	(0.48)	(2.82)	(1.60)	(1.53)
Business has operations outside the US	7,703.99***	8,572.04***	3,545.68**	3,846.01**	18.94***	22.37***	9.91**	10.86***
	(1,066.32)	(1,400.92)	(1,533.72)	(1,559.17)	(3.45)	(3.33)	(3.91)	(3.93)
Business transactions are conducted in English	1,303.63***	771.60	1,990.55	4,287.97	5.31***	-0.13	12.40**	17.47**
	(310.03)	(1,279.88)	(2,796.59)	(4,046.55)	(1.12)	(5.82)	(5.57)	(8.15)
Business owners controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control for sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustered by state FIPS code	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1,011,998	887,133	175,199	169,232	1,011,998	887,133	175,199	169,232
F (from first stage)	415.03	118.85	25.85	41.94	798.89	118.85	25.85	41.94
Adjusted R2 (from first stage)	.029	.010	.009	.009	.026	.010	.009	.009
Wald Chi^2		8,654.95	5,028.33	3,747.33		8,623.52	7,038.58	5,091.79

Notes: (1) OLS, no instrument, (2) 2SLS One instrument, onwers born in US, (3) 2SLS One instrument, owners inherited or received business as a gift, (4) 2SLS Two instruments (both above). *** significant at .01, **significant at .05, *significant at .10.

Table 5. Results for state outcomes, OLS (1) and 2SLS (2) models: Establishment entry rate

Variable/Model	2007		2008		2009	
	(1)	(2)	(1)	(2)	(1)	(2)
Used public sources of start-up capital	-0.135*	17.345	-0.138**	25.303*	-0.133**	28.949**
	(0.076)	(15.031)	(0.058)	(13.596)	(0.053)	(14.087)
Number of years since business was established	-0.013***	-0.009**	-0.010***	-0.005	-0.008***	-0.002
	(0.003)	(0.004)	(0.002)	(0.004)	(0.002)	(0.003)
Number of owners	0.001	0.002***	0.001	0.002**	0.000	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Business owner invests more than 40 hours per week	0.068**	-0.169	0.043	-0.305*	0.032	-0.366**
	(0.032)	(0.201)	(0.027)	(0.182)	(0.026)	(0.185)
Business operates as a franchise	-0.039	-0.577	-0.065*	-0.846*	-0.067*	-0.957**
	(0.039)	(0.490)	(0.034)	(0.434)	(0.036)	(0.451)
Family business	0.072*	-0.059	0.025	-0.164	-0.002	-0.217*
	(0.041)	(0.138)	(0.031)	(0.117)	(0.027)	(0.120)
Business has operations outside the US	0.174***	0.112**	0.171***	0.084	0.160***	0.058
	(0.052)	(0.052)	(0.039)	(0.057)	(0.037)	(0.058)
Business transactions are conducted in English	-0.182	-0.001	-0.247***	0.039	-0.313***	0.041
	(0.122)	(0.124)	(0.077)	(0.149)	(0.065)	(0.168)
Business owners controls	Yes	Yes	Yes	Yes	Yes	Yes
Clustered by state FIPS code	Yes	Yes	Yes	Yes	Yes	Yes
Control for sector	Yes	Yes	Yes	Yes	Yes	Yes
N	1,011,998	887,133	1,011,998	887,133	1,011,998	887,133
F (from first stage)	25.50	118.85	7.30	118.85	9.16	118.85
R2 (from first stage)	.027	.010	.030	.010	.034	.010
Wald Chi^2		494.89		168.71		107.56

Notes: (1) OLS, no instrument, (2) 2SLS One instrument, onwers born in US. *** significant at .01, **significant at .05, *significant at .10

Table 6. Results for state outcomes, OLS (1) and 2SLS (2) models: Establishment net growth

Variable/Model	2007		2008		2009	
	(1)	(2)	(1)	(2)	(1)	(2)
Used public sources of start-up capital	-0.027	-12.857*	-0.007	-7.344	0.047	-8.558
	(0.047)	(7.326)	(0.039)	(9.220)	(0.047)	(11.026)
Number of years since business was established	-0.008***	-0.011***	-0.002	-0.004**	0.004**	0.002
	(0.002)	(0.003)	(0.002)	(0.001)	(0.002)	(0.003)
Number of owners	0.002***	0.002***	0.001**	0.001*	0.001	0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Business owner invests more than 40 hours per week	0.062***	0.245**	0.016	0.122	-0.001	0.122
	(0.019)	(0.103)	(0.019)	(0.116)	(0.024)	(0.148)
Business operates as a franchise	0.028	0.419*	0.006	0.228	0.024	0.289
	(0.027)	(0.229)	(0.028)	(0.300)	(0.039)	(0.358)
Family business	0.091***	0.186**	0.017	0.073	-0.023	0.044
	(0.031)	(0.080)	(0.018)	(0.078)	(0.033)	(0.104)
Business has operations outside the US	0.043	0.092**	0.006	0.050**	-0.047	-0.006
	(0.028)	(0.037)	(0.042)	(0.021)	(0.048)	(0.030)
Business transactions are conducted in English	0.082	-0.110	0.037	-0.092	-0.018	-0.121*
	(0.071)	(0.093)	(0.092)	(0.058)	(0.114)	(0.065)
Business owners controls	Yes	Yes	Yes	Yes	Yes	Yes
Clustered by state fips code	Yes	Yes	Yes	Yes	Yes	Yes
Control for sector	Yes	Yes	Yes	Yes	Yes	Yes
N	1,011,998	887,133	1,011,998	887,133	1,011,998	887,133
F (from first stage)	5.80	118.85	3.47	118.85	6.83	118.85
R2 (from first stage)	.016	.010	.005	.010	.008	.010
Wald Chi^2		219.61		193.41		197.13

Notes: (1) OLS, no instrument, (2) 2SLS One instrument, onwers born in US. *** significant at .01, **significant at .05, *significant at .10

Table 7. Results for business outcomes by business stage, OLS (1) and 2SLS (2) models: Receipts

Variable/Model	nascent		early-stage		established	
	(1)	(2)	(1)	(2)	(1)	(2)
Used public sources of start-up capital	-379.627***	-300,992	-220.65**	289,246.44	-1,852.06***	-40,835.2
	(115.79)	(1,220,638)	(97.65)	(1,465,366.2)	(214.550)	(71,013.06)
Number of owners	19.018*	17.34	25.30***	31.345**	364.75***	442.92***
	(10.32)	(25.24)	(9.09)	(13.98)	(17.15)	(23.79)
Business owner invests more than 40 hours per week	862.21***	2,766.69	794.87***	-2,591.04	3,294.97***	3,829.26***
	(49.83)	(7,357.46)	(40.72)	(17,469.84)	(109.84)	(926.28)
Business operates as a franchise	1,432.45***	13,245.60	1,230.76***	-14,921.19	5,119.26***	6,594.69***
	(217.96)	(47,136.87)	(111.09)	(82,311.79)	(334.83)	(1,803.58)
Family business	485.06***	4,486.952	441.99**	-3,113.98	1,678.89***	1,844.57***
	(69.890)	(16,228.688)	(163.86)	(18,176.02)	(117.04)	(461.25)
Business has operations outside the US	2,422.53	4,110.035	1,756.07**	-623.69	8,968.75***	9,657.83***
	(1,586.69)	(12,374.75)	(746.12)	(10,306.98)	(1,211.85)	(1,508.25)
Business transactions are conducted in English	475.55***	-3,161.55	464.05***	1,953.69	2,393.39***	1,665.80
	(83.98)	(16,491.42)	(68.74)	(7,042.44)	(356.28)	(1,311.59)
Business owners controls	Yes	Yes	Yes	Yes	Yes	Yes
Clustered by state FIPS code	Yes	Yes	Yes	Yes	Yes	Yes
Control for sector	Yes	Yes	Yes	Yes	Yes	Yes
N	92,381	73,520	202,082	162,901	886,592	784,288
F (from first stage)	156.99	23.91	419.18	56.75	518.27	122.15
Adjusted R2 (from first stage)	.012	.012	.004	.018	.025	.009
Wald Chi^2		166.31		201.47		7879.85

Notes: (1) OLS, no instrument, (2) 2SLS One instrument, onwers born in US. *** significant at .01, **significant at .05, *significant at .10.

Table 8. Results for business outcomes by business stage, OLS (1) and 2SLS (2) models: Employment

Variable/Model	nascent		early-stage		established	
	(1)	(2)	(1)	(2)	(1)	(2)
Used public sources of start-up capital	-1.159	-1,848.23	0.222	1,337.60	-3.547***	-572.023*
	(1.061)	(7,592.06)	(0.607)	(6,672.99)	(0.884)	(299.48)
Number of owners	0.069*	0.050	0.097***	0.122*	1.217***	1.419***
	(0.035)	(0.153)	(0.033)	(0.064)	(0.061)	(0.084)
Business owner invests more than 40 hours per week	5.177***	17.098	5.074***	-10.319	19.963***	28.438***
	(0.418)	(45.788)	(0.258)	(79.532)	(0.576)	(4.071)
Business operates as a franchise	12.350***	84.783	9.652***	-65.101	20.684***	35.384***
	(3.000)	(294.169)	(1.315)	(374.774)	(1.162)	(7.574)
Family business	2.451***	27.169	1.734***	-14.784	7.908***	11.229***
	(0.562)	(101.073)	(0.295)	(82.726)	(0.540)	(1.887)
Business has operations outside the US	7.955	21.711	4.013	-7.536	23.025***	26.109***
	(6.354)	(78.588)	(2.985)	(47.551)	(3.897)	(3.698)
Business transactions are conducted in English	2.387***	-20.749	2.463***	9.353	9.810***	2.712
	(0.400)	(102.170)	(0.339)	(31.909)	(1.182)	(4.885)
Business owners controls	Yes	Yes	Yes	Yes	Yes	Yes
Clustered by state fips code	Yes	Yes	Yes	Yes	Yes	Yes
Control for sector	Yes	Yes	Yes	Yes	Yes	Yes
N	92,381	73,520	202,082	162,901	886,592	784,288
F (from first stage)	69.37	23.91	135.84	56.75	1200.86	122.15
Adjusted R2 (from first stage)	.009	.012	.012	.018	.021	.009
Wald Chi^2		70.55		177.5		7213.71

Notes: (1) OLS, no instrument, (2) 2SLS One instrument, onwers born in US. *** significant at .01, **significant at .05, *significant at .10.

Table 9. Results for state outcomes by business stage, OLS (1) and 2SLS (2) models: Establishment entry rate

Variable/Model	2007				2008				2009			
	early-stage		established		early-stage		established		early-stage		established	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Used public sources of start-up capital	-0.184**	-94.77	-0.115	18.13	-0.178**	-154.6	-0.122**	23.58*	-0.167**	-172.42	-0.122**	26.02**
	(0.090)	(503.34)	(0.076)	(13.61)	(0.071)	(793.41)	(0.058)	(12.27)	(0.067)	(879.37)	(0.052)	(12.54)
Number of owners	-0.000	0.000	0.000	0.002**	-0.000	0.001	0.000	0.002**	0.000	0.001	-0.000	0.002**
	(0.001)	(0.004)	(0.001)	(0.001)	(0.000)	(0.006)	(0.001)	(0.001)	(0.000)	(0.007)	(0.000)	(0.001)
Business owner invests more than 40 hours per week	0.067**	1.202	0.037	-0.202	0.047*	1.896	0.016	-0.293*	0.035	2.097	0.010	-0.331**
	(0.030)	(5.985)	(0.027)	(0.176)	(0.026)	(9.442)	(0.023)	(0.157)	(0.024)	(10.47)	(0.022)	(0.158)
Business operates as a franchise	-0.059	5.255	-0.029	-0.476	-0.078**	8.610	-0.057	-0.640*	-0.077**	9.621	-0.061	-0.703**
	(0.042)	(28.30)	(0.040)	(0.369)	(0.034)	(44.606)	(0.036)	(0.327)	(0.032)	(49.434)	(0.037)	(0.335)
Family business	0.137**	1.319	0.029	-0.085	0.067*	1.992	-0.010	-0.154	0.024	2.173	-0.030	-0.187*
	(0.053)	(6.232)	(0.039)	(0.112)	(0.040)	(9.837)	(0.029)	(0.096)	(0.035)	(10.908)	(0.026)	(0.097)
Business has operations outside the US	0.206***	0.853	0.179***	0.114**	0.200***	1.256	0.172***	0.093*	0.193***	1.363	0.161***	0.072
	(0.062)	(3.584)	(0.052)	(0.051)	(0.046)	(5.621)	(0.040)	(0.051)	(0.040)	(6.229)	(0.037)	(0.050)
Business transactions are conducted in English	-0.196	-0.429	-0.230*	0.005	-0.259***	-0.684	-0.279***	0.057	-0.321***	-0.791	-0.333***	0.059
	(0.132)	(2.398)	(0.116)	(0.142)	(0.081)	(3.778)	(0.074)	(0.157)	(0.068)	(4.189)	(0.062)	(0.169)
Business owners controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustered by state fips code	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control for sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	202,082	162,901	886,592	784,288	202,082	162,901	886,592	784,288	202,082	162,901	886,592	784,288
F (from first stage)	12.59	56.75	21.97	122.15	8.75	56.75	6.50	122.15	12.47	56.75	10.73	122.15
Adjusted R2 (from first stage	.027	.018	.019	.009	.031	.018	.023	.009	.038	.018	.028	.009
Wald Chi^2		71.89		250.01		24.07		176.10		25.13		142.93

Notes: (1) OLS, no instrument, (2) 2SLS One instrument, onwers born in US. *** significant at .01, **significant at .05, *significant at .10.

Table 10. Results for state outcomes by business stage, OLS (1) and 2SLS (2) models: Establishment net growth

Variable/Model	2007				2008				2009			
	early-stage		established		early-stage		established		early-stage		established	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Used public sources of start-	-0.052	67.53	-560.03**	106,358.51	-0.009	29.642	35.652	-10,337.24	0.049	37.88	1,102.97**	-231,601.15
up capital	(0.053)	(339.64)	(223.55)	(61,597.61)	(0.048)	(163.38)	(143.88)	(32,634.09)	(0.049)	(205.69)	(431.87)	(118,546.76)
Number of owners	-0.000	-0.000	0.158	8.967*	0.001**	0.001	1.825	0.756	0.001***	0.001	4.607**	-14.34
	(0.000)	(0.002)	(1.201)	(5.370)	(0.000)	(0.001)	(1.216)	(1.694)	(0.000)	(0.002)	(1.922)	(10.33)
Business owner invests more	0.051***	-0.748	-8.658	-1,388.73	0.013	-0.334	-12.882	138.82	-0.009	-0.455	208.643	3,242.77**
than 40 hours per week	(0.019)	(4.051)	(117.99)	(859.38)	(0.017)	(1.949)	(58.26)	(399.06)	(0.021)	(2.448)	(198.45)	(1,586.67)
Business operates as a franchi	-0.004	-3.827	-165.11	-2,813.66	-0.021	-1.707	31.412	277.89	-0.008	-2.148	611.24*	6,352.81*
	(0.033)	(19.07)	(223.16)	(1,709.15)	(0.026)	(9.172)	(124.96)	(873.43)	(0.039)	(11.56)	(340.69)	(3,287.74)
Family business	0.15***	-0.686	-127.254	-780.00*	0.036	-0.328	-17.867	50.584	-0.034	-0.497	379.67***	1,782.09**
	(0.041)	(4.212)	(81.973)	(471.28)	(0.024)	(2.023)	(69.97)	(252.00)	(0.044)	(2.537)	(134.76)	(908.68)
Business has operations	0.059	-0.387	464.820***	137.89	0.018	-0.159	13.887	117.40*	-0.043	-0.286	-692.19**	69.61
outside the US	(0.047)	(2.382)	(146.59)	(179.06)	(0.048)	(1.165)	(169.24)	(70.63)	(0.058)	(1.463)	(310.08)	(363.83)
Business transactions are	0.074	0.284	-1,462.02***	279.62	0.045	0.080	-49.945	-280.812	0.009	0.078	2,732.91***	-1,329.57
conducted in English	(0.074)	(1.610)	(506.53)	(816.44)	(0.103)	(0.786)	(402.12)	(215.39)	(0.128)	(0.995)	(910.129)	(1,537.72)
Business owners controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustered by state fips code	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control for sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	202,082	162,901	886,592	784,288	202,082	162,901	886,592	784,288	202,082	162,901	886,592	784,288
F (from first stage)	3.91	56.75	5.32	122.15	4.91	56.75	6.95	122.15	9.09	56.75	10.67	122.15
Adjusted R2 (from first stage)	.014	.018	.031	.009	.005	.018	.004	.009	.007	.018	.027	.009
Wald Chi^2		52.54		56.86		33.60		206.51		110.10		48.40

Notes: (1) OLS, no instrument, (2) 2SLS One instrument, onwers born in US. *** significant at .01, **significant at .05, *significant at .10.

5. Discussion and policy implications

This study sought to explain whether firms that used public start-up capital generated increases in sales (receipts) and employment at the firm level, and whether they contributed in the mid and long term to two entrepreneurship indicators at the state level, establishment entry rate and net establishment growth rate. Prior evidence is clear in that having access to start-up capital is critical for determining whether a new firm enters the market. The source of the capital determines the conditions, pressure and risk under which the entrepreneur operates. Having higher financial liquidity to access critical factors of production presents advantages for new firms because it provides freedom and ease of mind for the entrepreneur to focus on innovative practices and strategies for competitive advantage, aside from being able to start the firm. When seed money is not available elsewhere, through personal means or networks, government support can be recognized as a suitable alternative, especially nowadays where entrepreneurship is identified as a vital booster of economic growth.

In the portfolio of public subsidies, government loans and grants are considered by many to be better means of support than other highly criticized types of subsidies such as tax credits. The former are recognized as having higher accountability and transparency than tax credits because they are included in state budgets and generally require recipient firms to submit reports and to comply with a specific set of measurements. Under the framework that more competition is better than monopolies or lack of innovation, all new firms that enter the market make a contribution to the economy *ceteris paribus*, suggesting that as more competition is desirable, all start-ups aspiring to enter the market should have a chance to do so. A conclusion of this sort

would certainly justify public intervention in the provision of start-up capital, however evidence regarding this effect remains mixed.

The empirical evidence available to date suggests a myriad of effects regarding public intervention that fails to offer a clear-cut assessment for policy decision-making. Whereas many studies suggest that public intervention in the provision of start-up capital is essential to address a shortage of financial resources in the market (a market imperfection), many others find the cost-benefit trade-off of investing public dollars in the private sector is not justifiable in the end. Even in cases where the contribution to the economy of public intervention is positive and significant in the medium or long-run, questions remain as to whether such analyses are able to account for unforeseeable policy consequences and the opportunity costs of not investing those dollars in more productive activities. This study finds that firms that used public dollars as start-up capital contributed positively and significantly to state establishment entry rate in 2008 and 2009, suggesting that firms that used public start-up capital at initiation (2007 for nascent, 2005-2007 for early stage and 2004 or earlier for established firms) contributed positively to the rate of new establishment openings in subsequent years. Further disaggregation of the data in subsamples by business stage (to observe the effect over time) indicate that this effect might be highly influenced by firms which by 2007 had been in the market for four years or more. Indeed, this study finds that older firms (by 2007) that used public sources of start-up when they started (2004 or before) increased the establishment entry rate by 24 percent in 2008 and by 26 percent in 2009. This finding parallels prior scholarly economic development evidence that suggests that effects of policies targeted to the private sector are most likely to be found in the long

run, when the firm has become more competitive and has established its share in the market.

Results regarding net establishment growth indicate a negative although marginal effect in 2007. This marginal effect is inconclusive because it may mean that the more establishments that open, the more establishments that close because most new businesses fail. It may also mean a higher closure rate than entry rate, but neither can be concluded with certainty from the marginal effect observed for the general sample for 2007.

At the business level, this study found that there was no effect of using public sources of start-up capital on business receipts in 2007. It found, however, that firms that used public sources of start-up capital hired on average 650 fewer employees (a negative although marginal effect) than firms that used private sources of start-up capital. By business stage, this same marginal effect is observed among firms that were established by 2007, which hired 572 fewer employees than the comparison group.

The question that arises from these results is whether the cost of current public intervention justifies the mid or long-term contributions to the economy. What if the cost for the taxpayer of providing public start-up capital to new firms, including administrative and operational costs, is higher than the mid and long-term contribution to the economy that arises when firms become more established? Although the results regarding negative employment at the business level are only marginal, the coefficients indicate a potentially negative effect. This result might also suggest that firms that use public sources of start-up capital may remain small firms in the long run, compared to those that use private sources of capital which may become larger in size.

Some scholars suggest that government provision of start-up capital to the private sector may actually dis-incentivize entrepreneurial behavior and hinder additional efforts to achieve success. In some cases like grants, the seed money does not need to be returned to the funding source; only reporting and compliance with the rules is required. In this latter case, if the firm fails (and the majority of new start-ups do) the money invested is an opportunity immediately lost in the short run. Thus, is the public investment worth the cost? Does it incentivize or dis-incentivize entrepreneurial activity? Some may argue that encouraging new firms to start, measured by establishment entry rate and net establishment growth in this study, is worthy in itself regardless of how many fail or how many public dollars are lost in the effort, because in the long-run the investment is likely to pay off with more firms trying to enter the market, generating competition, employment and higher innovation rates.

The theoretical and empirical contributions from this study confirm that start-up capital is indeed a key critical factor of production for firms across the US, and that its availability represents a competitive financial advantage in the market. Firms without access to start-up capital might simply not take off, or might take a long time to do so. Using public sources of start-up capital to launch a business contributes positively to state establishment entry rate in the mid/long term, indicating an advantage over businesses using only private sources of capital. Although some established firms might positively contribute to the growth rate of new firms entering the market in just four years after taking off, some might take longer than that (established firms range between 4 and 30+ years of age). Also, the marginal evidence found in this study regarding negative employment at the business level may suggest that public provision of start-up capital

might be benefiting start-ups whose potential for growth might be lower than those who do not apply for these sources and decide to use private sources instead.

From an additionality perspective, the additional 24 and 26 percent increase in the rate of establishment entry that is attributed to the policy indicates a positive return to investment, *ceteris paribus,* that leads to more competition and perhaps more innovation. Nonetheless, further research is needed to understand the net benefit to the economy that also considers the cost of providing public start-up capital, and whether the return is higher than the cost. Findings regarding the rate of establishment net growth in this study suggest a negative marginal net effect in 2007 but no effect afterwards. Moreover, as explained above, this policy may be targeting firms which have lower potential for growth or fast/high growth, which might justify the finding on negative employment at the firm level. Further research is warranted to understand the characteristics of firms that benefit from this policy and the differences between firms that fail and those that remain afloat and become established.

Some scattered scholarly evidence suggests that combining public and private sources of start-up capital might be a better driver toward economic success. Future research could explore this question and perhaps observe differences across nascent, early stage and established firms as presented here. Much remains to be done empirically, and a multitude of empirical methods may prove useful (i.e. econometric models, cost-benefit and impact analyses), to inform how policy can successfully support entrepreneurs by addressing market imperfections such as the lack of start-up capital. Panel data or studies that look at effects on the economy in the medium and long run might prove particularly useful in understanding this phenomenon.

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CHAPTER 3: ENTREPRENEURSHIP POLICY AND ECONOMIC GROWTH, SOLUTION OR DELUSION? EVIDENCE FROM A SPATIAL DIFFERENCE-IN-DIFFERENCES DESIGN

1. Introduction

In 1934, Schumpeter positioned the innovating entrepreneur at the center of the creative destruction process that leads to economic development. Nowadays, entrepreneurship is broadly recognized as the essential factor in the process of accelerating and sustaining economic growth (Acs & Szerb, 2007; Acs & Varga, 2005; Audretsch & Keilbach, 2004; Thurik, Carree, van Stel, & Audretsch, 2008; van Stel, Carree, & Thurik, 2005; Wennekers, Van Stel, Thurik, & Reynolds, 2005). In fact, scholars argue that an economy with reduced entrepreneurial activity is likely to show reduced economic growth (Audretsch, Carree, van Stel, & Thurik, 2002). In the United States alone, two million entrepreneurs start new businesses every year, contributing to approximately seventy percent of economic growth (Kansas Department of Commerce, 2004).

In this scenario, small firms are increasingly recognized as the creators of most of the jobs and innovation in the US economy (Pages & Markley, 2004) due to their higher effectiveness at identifying opportunities, appropriating new knowledge, and commercializing new products (Johnson, 2007). Some even suggest that we are living in an entrepreneurial era characterized by "flexibility, turbulence, diversity, novelty, innovation, linkages and clustering" (Audretsch & Thurik, 2004; Thurik, 2007, p. 6). Thus, entrepreneurship policy is becoming a popular economic development policy tool at the local, state, regional and federal levels of government (Johnson, 2007).

Some of the most common economic development incentives of our time are tax

credit policies, subsidies and exemptions that motivate new start-ups and stimulate economic growth (Assibey-Yeboah & Mohsin, 2011). But, do particular entrepreneurship policies deliver the economic growth as intended and often purported? This study analyzes the case of the Entrepreneurial Community (E-Community) partnership's tax credit program administered by Network Kansas in an effort to empirically answer this question, and advance our discussion of how entrepreneurship policy can rightfully support business creation and retention, and contribute to long-term economic growth and development. The E-Community Partnership's tax credit program was selected for this study because it offers an unusual structural process in which communities organize themselves to receive funds that allow them to support their local entrepreneurs, which differentiate this program from others where the tax credits are directly allocated to businesses or are targeted at particular industries. The atypical nature of this strategy may prove useful for future practice, and thus its effects are worthy of exploration and analysis.

In 2004, Kansas Sen. Nick Jordan (R-Shawnee) and Rep. Kenny Wilk (R-Lansing) introduced a plan that promised to lead Kansas to new economic growth. The plan was shortly approved as The Kansas Economic Growth Act (KEGA). KEGA is a set of initiatives investing more than $530 million in economic development incentives by 2014. It was designed with two key components at its core: Entrepreneurship and bioscience. The entrepreneurship component seeks to produce and maintain entrepreneurial ventures throughout the state, so that they develop sustainable contributions to the Kansas economy. This initiative led, among other programs, to the creation of the Kansas Center for Entrepreneurship or Network Kansas, the Kansas

Community Entrepreneurship Fund, and the E-Community Partnership program, which are the focus of this study.

Network Kansas opened with the 2006 fiscal year. Its mission is "to promote an entrepreneurial environment across the state of Kansas by establishing a central portal that connects entrepreneurs and small business owners with key resources" (Network Kansas, 2011). Network Kansas also oversees and manages the Kansas Community Entrepreneurship Fund, which was created to provide seed capital to qualified entrepreneurial communities (i.e., counties, cities, clusters of towns) in the E-Community Partnership through tax credit funds.

Since 2006, Network Kansas annually invites entrepreneurial communities in the state to apply in a competitive process to be part of its innovative E-Community Partnership program. Becoming part of the partnership enables entrepreneurial communities to have access to tax credit funds to invest in their local businesses. E-Communities can raise seed money from donations of individuals or businesses within the community who in return can receive "up to a 50 percent tax credit for their contributions" (KEGA, 2004). The community's local financial board administers the seed capital application process from local businesses and distributes the funds raised through the program as matching loans and grants to local new or expanding businesses. The allocation of tax credit funds to competitive E-Communities started in 2007 and continues today. To date, E-Communities have raised $4.7 million in funds through the partnership, and this amount is estimated to create investment in rural businesses that is seven times its value (Network Kansas, 2011).

The purpose of this study is to examine the impact of the KEGA's entrepreneurship policy investment. Specifically, it focuses on how the allocation of Network Kansas tax credit funds through the Entrepreneurial Communities (E-Community) partnership (i.e., cities, counties) has affected the economic performance of adopter Kansas' counties. Key findings of this paper indicate that the tax credit portion of the E-Communities partnership has a positive effect on the economy of adopter counties, and that the policy has its largest effect at time of adoption. The results also suggest that the policy has a spatial effect that benefits adopter counties and their surrounding areas, which may decrease competitiveness in non-adopters and non-neighboring areas.

The remainder of this paper is organized as follows. Section 3 examines the rationales underlying entrepreneurship policy and economic growth, and discusses the often-contradictory findings in the literature regarding the effects of tax credit programs on supporting entrepreneurship, and accelerating and sustaining economic growth. Section 4 presents and discusses the Kansas Economic Growth Act and the Entrepreneurship policy contained within. Section 5 describes the empirical implementation and data used for the spatial difference-in-differences analyses. This section also explains how the indicator of local economic performance developed for this study was built. Section 6 presents the key results from the analyses. Section 7 provides a conclusion of the study and discusses practical and policy implications, and suggestions for potential future research on entrepreneurship policy.

2. Background and context

2.1 Entrepreneurship and economic growth

Entrepreneurship is increasingly recognized as a key catalyst for economic organization (Klein & Cook, 2006; Thurik, 2007), economic development (OECD, 1998; Verheul, Wennekers, Audretsch, & Thurik, 2002), job creation (Johnson, 2007), and innovation policy (Lafuente, Vaillant, & Serarols, 2010). Moreover, policymakers identify entrepreneurship as the essential factor in accelerating (Acs & Szerb, 2007), restoring (Acs & Audretsch, 2009) and sustaining economic growth (Dubini, 1989; Acs, 2002; Acs & Audretsch, 2005; Acs & Szerb, 2007; Acs & Varga, 2005; Serarols et al, 2009; Sexton, 1986; Storey, 1994; Van Stel et al, 2005; Wennekers & Thurik, 1999; Wennekers et al, 2005).

Scholars argue that entrepreneurship generates growth because it stimulates innovation, change (Carree & Thurik, 2002), knowledge spillovers (Acs & Audretsch, 1988; Acs & Varga, 2004; Acs & Szerb, 2007; Drucker, 1985; Pavitt et al, 1987), competition, higher productivity of factors of production (Johnson, 2007), and job creation (Verheul et al, 2002). Johnson (2007) further argues that, "a vibrant entrepreneurial population leads to a transformation in the individuals, firms, governments, and institutions" (p. 5) and to the creation of new markets. Accordingly, some of the issues addressed in the second Global Entrepreneurship Research Conference focused on the influence of regulation on new firm startups as a development strategy (Acs & Szerb, 2007). Holcombe (1998) states that integrating entrepreneurship as a key element into the economic growth agenda leads to "more promising economic policy recommendations for fostering economic growth" (p. 60). Some even conclude, "Federal

economic development programs in the US should encourage and strengthen innovation, entrepreneurship, and competitiveness" (Drabenstott et al, 2003).

2.2 Entrepreneurship policy

> "Policy which spurs economic growth and development may be justified either as a correction of markets which fail to adequately reward private investors for generating growth in an economy, to produce a public good in the form of increased social benefits, or to increase the rate of growth in lagging regions for distributional reasons. The ideal economic policy generates the largest amount of benefits relative to its costs, as possible. We must therefore answer the question, what are the net benefits of entrepreneurship policy?" (Johnson, 2007, p.8).

Entrepreneurship policy differs from traditional business policy in that while the latter frequently constrains firms, the former fosters invention and the commercialization of knowledge broadly (Acs & Szerb, 2007). Since the 1990's, countries have identified entrepreneurship policies as mechanisms to stimulate economic growth (Gilbert, Audretsch, & McDougall, 2004), employment generation, and competitiveness within (Huggins & Izushi, 2007) and in global markets (Lundstrom & Stevenson, 2005). In the last decade, the role of economic policy has shifted from regulating businesses to stimulating entrepreneurial activity (Audretsch & Thurik, 2001; Audretsch et al, 2009; Eisinger, 1988). In Sweden, for example, the Swedish Business Development Agency identifies 'good entrepreneurship' as one of the four pillars of its growth policy

(Lundstrom & Boter, 2003). This innovation initiative also identifies the need for investment tax credits, new venture capital funds, and seed and risk financing as crucial components to support a business climate that favors early-stage entrepreneurial activity (Lundstrom & Boter, 2003).

Policymakers are increasingly pressured to assess and report the effectiveness and costs of new and existing policies. Entrepreneurship policy often needs to consider measurements of its direct effect on the entrepreneurial activity in a region, and the subsequent consequences of those activities for society (Lundstrom & Stevenson, 2005). And, although the determinants of entrepreneurship policy have been studied in the last two decades through both theoretical and empirical studies (Carree & Thurik, 2002), the cumulative effects of entrepreneurship policy are only evident in the long run due to 'cultural embeddings' (Acs et al, 2007; Minniti & Nardone, 2007; Szerb et al, 2007; Tominc & Rebernik, 2007) and transformational effects. Johnson (2007) also suggests that regional conditions –culture, institutions, incentive systems, business organizations, business climate, and availability of assets to entrepreneurs- play a key role in influencing local and regional levels of entrepreneurship that form the basis for "long-term economic development" (p. 8).

As the leading entrepreneurial economy in the world (Schramm, 2006), both in entrepreneurship research and practice, the US has led the development of a more comprehensive entrepreneurship policy framework, when compared to moderately developed (Acs & Szerb, 2007) and developing countries. One of the policies directed specifically to entrepreneurs within any leading entrepreneurial framework is their access to finance (Acs & Szerb, 2007; Cassar, 2004). Most organizational entrepreneurship

ventures, particularly new firms, are characterized by severe resource constraints (Baker & Nelson, 2005; Román, Congregado & Millán, 2012). Established firms generally have access to venture and public capital markets, but these resources are not widely available to new (Holtz-Eakin et al, 1994; National Venture Capital Association, 2001) or small firms. In an effort to address market inefficiencies, governments frequently use economic development incentives such as tax credit policies, subsidies and exemptions to motivate investment decisions and stimulate economic growth (Assibey-Yeboah & Mohsin, 2011).

Thus, considering that entrepreneurship policy has become a popular economic and political tool in the last two decades and that its widespread effects are still vastly understudied, empirical evidence becomes more salient and critical. New methodologies and updated frameworks are warranted for policy design and implementation that leads to sustainable levels of economic growth through business creation, attraction, retention, and/or expansion.

Furthermore, research on entrepreneurship policy across disciplines is highly disconnected. On the one hand, scientists in macroeconomics and public policy are mostly concerned with the macro effects of entrepreneurship on the economy. On the other hand, entrepreneurship and the management fields are rightly focused on the individual and the firm but do not extend to their implications on the economy (Audretsch, Grilo, & Thurik, 2007). This study aims to further advance prior research efforts on entrepreneurship policy's best practices by evaluating a state entrepreneurship policy using a multi-disciplinary theoretical and methodological lens.

2.3 Entrepreneurship policy and tax credits

Entrepreneurship policy alone has not been the only 'hot potato' of the last two decades. Its development interestingly parallels an increase in the use of economic development incentives in the United States (Chi, 1994; Greenberg, 1998; Hicks & LaFaive, 2011; LaFaive & Hicks, 2005). Prior research finds that US state and local governments spend approximately USD50 billion every year on incentives for economic development (Peters & Fisher, 2004; Thomas, 2000) such as tax credits. The intervention is likely aimed at fixing market failures that derive from capital market imperfections (Catozzella & Vivarelli, 2011) and the non-rivalry of knowledge, which prevents the private sector from fully capturing all the benefits derived from their investments (Arrow, 1962).

'Business' tax credits in particular, sometimes contained within a so-called entrepreneurship policy, are primarily used to support technological innovation (Wu, 2005), joint ventures' riskier research (Bozeman & Link, 1985), encourage reinvestment in empowerment zones (Lorenz, 1995), induce business creation, support expansion and relocation of existing businesses, and protect them from failure and competition (Buss, 2001). Their benefits are perceived by states to be higher than their costs because ultimately states recover their investment through direct payments or indirectly through taxes and growth (Buss, 2001). Nonetheless, there are conflicting views among scholars and policymakers regarding the net benefits of business tax credit policies.

A large body of literature argues that the public's return on tax credit investments is lower than assumed because the programs distort the economic dynamics (Auerbach & Summers, 1979), reduce government revenues (Assibey-Yeboah & Mohsin, 2011),

displace private investment that would have happened otherwise (see Catozzella & Vivarelli, 2011 and Wallsten, 2000 for examples), are inadequate for fiscal accountability (Hicks & LaFaive, 2011), and increase the burden on state taxpayers (Buss, 1994; Watson, 1995). Pereira (1994) concludes that tax credit incentives are negatively related to investment and output. In the short run, because taxpayers are the bearers of the cost of tax credit policies, economies where these policies are implemented experience a decline in aggregate consumption expenditures due to an income effect (Assibey-Yeboah & Mohsin, 2011). In a study of the California's enterprise zone program, Kolko and Neumark (2010) find that there is a negative relationship between employment generation and the time that it takes for firms to apply for tax credits. They also find that enterprise zones that dedicate a higher share of time to marketing and outreach endeavors experience higher returns on employment.

Furthermore, tax credit incentive programs are also criticized for increasing inequality among firms (Hicks & LaFaive, 2011) and among municipalities. Longitudinal evidence suggests that more prosperous cities tend to adopt tax credit programs more frequently than poorer municipalities (Buss, 2001). Reese (2006) argues that prosperous cities benefit the most from this type of program due to a higher familiarity with the process than less wealthy cities. Similarly, Hanel (2003) finds that large companies are the most recurrent recipients of tax credits, compared to firms of smaller sizes. And, firms tend to frequently allocate tax credits to projects that promise the highest rate of return (David et al, 2000), which implies that tax credits are likely to be used on high-growth short-term projects (Cznarnitzki et al, 2004).

As Johnson (2007) explains, "[…] the role of most economic policy is to correct market failure, produce public goods, and to improve the distribution of income" (p.8). Cznarnitzki and colleagues (2004) argue that, despite some of their benefits, tax credits may not be the most efficient tool to correct market failure because their selection and allocation process by governmental agencies is itself a 'government failure', that in some cases may be "even larger than the market failure it is supposed to correct" (p.8). A study of enterprise zone programs by Wilder and Rubin (1996) indicates that tax incentives can become more effective when they are combined with other economic development strategies such as technical assistance or location/site analysis.

In contrast, tax credits are seen as good politics (as opposed to good policy) because while taxpayers are unaware of or indifferent to the loss of public revenues, businesses and communities that receive tax incentives become more supportive of government (Buss, 2001). Accordingly, risks to politicians who introduce tax incentives are very low. Often, tax incentive programs are not required to be included in annual budgets and therefore avoid scrutiny. Any failure in these programs is attributed to economics, market forces or mismanagement (Buss, 2001). Other evidence in favor of tax credit policies suggests that government intervention stimulates innovative firm activity that might have otherwise not taken place (Busom, 2000; González, Jaumandreu, & Pazó, 2005; Lach, 2002; Hussinger, 2003). Research suggests that because they reduce the cost of capital investment, the economy experiences a rise in the number of jobs and investment capital available, while it also increases workers productivity (Assibey-Yeboah & Mohsin, 2011). Moreover, in a study of R&D tax credits in manufacturing

firms in Canada, Cznarnitzki and colleagues (2004) find that R&D tax credit policy increases investment in R&D among firms, which leads to added innovation productivity.

3. The object of study

3.1 The Kansas Economic Growth Act (KEGA)

The Kansas Economic Growth Act (KEGA) was passed in the state of Kansas in 2004. It was designed with Entrepreneurship and Bioscience at its core, and a budget of $530 million to be allocated in development incentives over the subsequent decade (KEGA, 2004). The entrepreneurial initiative of the KEGA focuses primarily on the creation and expansion of entrepreneurial ventures so that they can sustainably contribute to developing the Kansas economy. The entrepreneurship plan in KEGA highlights the creation of: 1) the Kansas Center for Entrepreneurship or Network Kansas, 2) the Kansas Community Entrepreneurship Fund, 3) the Kansas Downtown Redevelopment, 4) the Enterprise Facilitation Program, and 5) the Angel Investment Tax Credit Program. This study focuses on a partnership that involves the first two.

The Kansas Center for Entrepreneurship or Network Kansas was founded to work with all entrepreneurship organizations in Kansas to create policies that foster entrepreneurship throughout the state, particularly targeting rural and distressed communities. Network Kansas oversees collaboration among federal, state, and local economic development and entrepreneurial assistance organizations. It was also designed to manage the Kansas Community Entrepreneurship Fund, created to provide seed funding for qualified entrepreneurs through the Entrepreneurship Community (E-Community) Partnership's Tax Credit program.

The total budget for both Network Kansas and the Kansas Community

Entrepreneurship Fund totals $3.5 million (KEGA, 2004). Every year, the E-Community Partnership's Tax Credit program assists qualified partner communities (i.e., counties, cities, towns, clusters of towns) in the creation of local loan funds that support local entrepreneurs. Local organizations can contribute to the local fund and receive in return a tax credit, which allows an investor to utilize 50 percent of a qualifying investment as a dollar-for-dollar credit to reduce their income tax owed to the state. At its creation, Network Kansas was projected to generate approximately three million dollars in business development resources after five years of operations. By 2011, E-Communities reached beyond that goal, by raising $4.7 million in funds through the Partnership (Network Kansas, 2011).

3.2 Network Kansas and the E-Community Partnership

> Network Kansas started operations with the 2006 fiscal year. Its mission is "To promote an entrepreneurial environment throughout the state of Kansas by establishing a central portal that connects entrepreneurs and small business owners with the right resources - expertise, education, and economic resources" (Network Kansas, 2011).

Since 2006, Network Kansas has held an annual competition in which Kansas' counties, cities, or clusters of towns can apply to be part of an innovative Entrepreneurship Community Partnership where each participant county/city/cluster or towns is referred to as an E-Community. Becoming an E-Community gives participant communities an opportunity to invest in new or expanding businesses in their own community. E-Communities can apply for up to $300,000 in tax credits from the Network Kansas Entrepreneurship Tax Credit program (Network Kansas, 2011).

To become an E-Community, participants must have demonstrated community leadership and must have a leadership team in charge of developing the entrepreneurial vision for the community. It must also have a local financial board to administer the community's loan fund that Network Kansas creates to allocate tax credit funds and raise local seed capital.

This study focuses solely on the Entrepreneurship Community (E-Community) Partnership's Tax Credit program and the recipient counties. The analysis has three parts. The first part focuses on the development of an indicator of economic growth, changes in taxable retail sales, to explain changes in economic performance. The second part uses a spatial difference-in-differences statistical technique to study how becoming an E-Community and receiving tax credit funds affects participant counties' economic growth. The third and final part includes three sensitivity analyses that corroborate the internal validity of the findings.

4. Empirical implementation

4.1 Spatial difference-in-differences

This study uses a spatial difference-in-differences statistical technique to calculate the effect of the Entrepreneurship Community Partnership Tax Credit program on participating counties. The difference-in-differences specification is a method often used to comparatively evaluate the before and after effects of a treatment on those who receive it, compared to a control group with similar characteristics which does not receive treatment (Artz et al, 2005). Several studies use difference-in-differences to address endogeneity in policy causal models. For instance, Kneller and McGowan (2011) use a

difference-in-differences technique to address endogeneity bias of tax policy on firm entry and exit dynamics.

Furthermore, this study uses a spatial difference-in-differences because the location of the E-Community counties across the state suggests that spatial autocorrelation may exist (see Moran's I test on Table 1). I use Moran's I statistics to test for the potential spatial autocorrelation in the estimated covariance matrix due to 'spillover' effects of participation in the E-Community program. The Moran's I statistic is generated as (Anselin & Bera, 1998, p. 265):

$$I = e_s' W e_s / e_s' e_s \qquad (1)$$

where,

W = weight matrix defined using county latitude and longitude coordinates (at centroid)

The null hypothesis for Moran's I statistic is that there is zero spatial autocorrelation present in the dependent variable of interest, taxable sales per capita, in participant counties (E-communities). This hypothesis is rejected ($p < 0.01$), which confirms the expected presence of spatial dependence (Table 1).

Table 1. Moran's I - Measure of global spatial autocorrelation

Variable	I	E(I)	SD(I)
Taxable sales per capita 2010-2006	0.013***	-0.012	0.01

Notes: Spatial autocorrelation based on Latitude and Longitude values. 1-tail test.
*** means significant at 0.01 level.

I use a spatial lag difference-in-differences model to correct for outcome in county i depending on outcomes in nearby (or spatially dependent) counties. The spatial term in our model is a spatial weights matrix (also in equation 1) defined using county

latitude and longitude coordinates (at centroid), which parameterizes the spatial dependence (distance) between Kansas' counties. It follows Tobler's first law of geography (1970), which states, "everything is related to everything else […] but near things are more related than distance things" (p. 236). I build an inverse-distance matrix *W* from Latitude and Longitude data by county of the form

$$Wij = 1/D(i,j) \qquad (2)$$

where,

D(i,j) = distance between counties i and j

"The presence of a spatial lag term, $W\gamma$, on the right side of (3) induces a nonzero correlation with the error term, similar to the presence of an endogenous variable" (Anselin & Bera, 1998, p. 246). In the presence of spatial (lag) dependence, parameter estimates in linear regression models will generally be biased and inconsistent (Anselin, 1988). The use of spatial econometrics is also "in general widely accepted as highly relevant in the analysis of cross-sectional data" (Anselin & Bera, 1998). I select spatial difference-in-differences over other methods because this approach allows us to correct for endogeneity bias caused by observed and unobserved spatial effects (Greenstone & Gayer, 2007). Anselin and Bera (1998) and Haining (1990) offer more details on how to deal with spatial correlation by using a spatial term in the model.

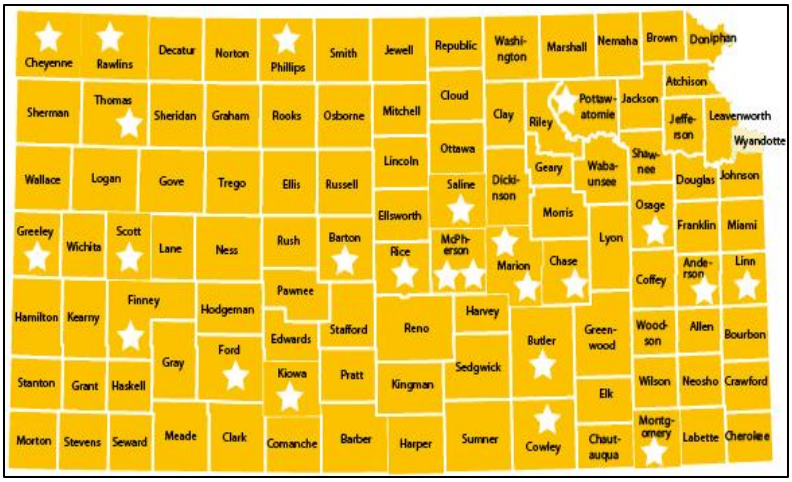

Figure 1. Spatial location of E-communities (counties + cities)
Source: Network Kansas website (2011).

4.2 Dependent and independent variables

Our dependent variable, an indicator of local economic performance, is the change in taxable retail sales per capita between 2006 and 2010. This outcome measure is calculated by subtracting 2006 taxable retail sales (the year before tax credits were first allocated) from 2010 taxable retail sales (last year of tax credit allocations at the time of this study).

Taxable retail sales per capita for each county is calculated in five steps. First, I obtained sales tax distribution data for all Kansas counties for years 2000 to 2010 from the Public Sales Tax Report compiled by the Kansas Department of Revenue. Second, I converted county retail sales tax data into taxable retail sales by dividing sales tax distributions by the corresponding tax rates. Third, I adjusted taxable sales data for Kansas's counties to 2010 dollars using Consumer Price Index (CPI) from the Bureau of Labor Statistics. CPI reflects the usual basket of goods and services that individuals consume and is the most general indicator of price inflation. Fourth, I calculated per capita taxable sales for Kansas' counties using the corresponding yearly population

estimates for Kansas' counties from the Census Bureau. Finally, I calculated the difference between taxable sales per capita in 2010 (the last year of tax credit allocation to date) and 2006 (the year before tax credit allocation started). This measure, taxable sales per capita 2010-2006 is the dependent variable in the spatial difference-in-differences analysis.

Changes in retail sales do not show dramatic year-to-year increases but are likely to change significantly over longer time spans. Thus, the spatial difference-in-differences model specification estimates how taxable retail sales per capita in participant counties (E-Communities) changes due to the tax credits received from the E-Community program, compared to non-participant counties (non E-Communities). The use of a spatial difference-in-differences specification allows our model to control for observed and unobserved spatial interdependencies across counties and other influencing factors. Furthermore, the use of the spatial lagged term in the equation captures endogeneity in the model and facilitates a nonzero correlation with the error term.

The main explanatory variable in this model is a continuous variable that represents the tax credit allocation per capita received by the participating county or E-Community over a four-year period (2007-2010). Tax credit amounts allocated to each county were obtained directly from Network Kansas. I also include years in the program in the model. 'Years in the program' is a continuous variable that indicates the number of years since the county received its first tax credit allocation (e.g., 0, 1, 2, 3, 4).

4.3 Model specification

The spatial difference-in-differences model for this study is as follows:

$$\gamma_{it+1} - \gamma_{it} = \beta_{0i} + \rho W\gamma + \beta_1 \text{Tax credit per capita}_i + \beta_2 \text{Years in program}_i + u \qquad (3)$$

where

γ = taxable sales per capita

ρ = spatial autoregressive parameter

W = spatial weights matrix

$W\gamma$ = spatially lagged dependent variable

$u = (\varepsilon_{it+1} - \varepsilon_{it}) \sim N(0, \sigma^2)$

$_i$ = county

$_{t+1}$ = 2010

$_t$ = 2006

4.4 Sensitivity analyses

I ran a spatial error model and a non-spatial difference-in-differences model as sensitivity analyses. I also ran placebo tests where the dependent variable is lagged to the time before the policy was established (2006-2001) for each one of the models. In Table 3 I compare the results of the spatial lag model (main model) to the results of the two sensitivity analyses and their corresponding placebo tests. I also ran several alternative models using control variables such as job growth rate 2010-2006, number of establishments per capita 2010-2006, highway adjacency, and rurality. The results obtained were the same as without the control variables. This is justified by the presence of the spatial lagged term in the model which captures endogeneity due to spatial correlation, and therefore implies a non-zero correlation with the error term. The results of the alternative models with control variables are available from the authors upon request.

5. Results

This section discusses the findings from the spatial difference-in-differences model that measures the effectiveness of the E-Community Partnership's Tax Credit program. The analysis includes 85 Kansas counties, 15 of which are E-Communities and 70 which are non E-Communities. Twenty other counties had zero or missing retail tax sales or tax rate data for our years of interest, so they could not be included in the study. These counties were Butler, Clark, Coffey, Comanche, Ellis, Grant, Harper, Kearny, Kingman, Lane, Marion, Marshall, Montgomery, Morton, Ness, Rooks, Rush, Smith, Stevens, Wallace.

Table 1 presents the results of the Moran's I statistic that checks for spatial autocorrelation for the dependent variable among participant E-Community counties. Table 2 shows descriptive statistics for the variables in the main model and sensitivity analyses. Table 3 presents the results of the spatial (lag) difference-in-differences model, compared to the results of a spatial (error) difference-in-differences model and a linear regression. Each also includes a placebo test that uses the same methodology in data pre-policy 2001-2006 to contribute to our accounting for endogeneity bias.

Table 2. Descriptive Statistics

Variable	n	Mean	(SD)	Min	Max
Taxable sales per capita 2010-2006	85	1313.22	(7928.32)	-9499.17	63742.23
Tax credit per capita	85	4.275	(13.45)	0	86.68
Years in the program	85	0.459	(1.108)	0	4
Taxable sales per capita 2006-2001	85	326.06	(2137.69)	-6560.11	6829.13
Latitude	85	38.567	(0.829)	37.15	39.828
Longitude	85	-97.874	(2.186)	-101.806	-94.765
Job growth rate 2010-2006	85	0.936	(6.518)	-16.38	24.92
Highway adjacent	85	0.353	(0.481)	0	1
Number of establishments 2010-2006	85	-0.001	(0.002)	-0.007	0.005

Results of the spatial difference-in-differences model indicate that tax credits per capita have a positive significant effect on taxable retail sales per capita in participant Kansas' counties ($p < .01$). The results also indicate that counties benefit the most from the program immediately following adoption, and that this benefit decreases over time ($p < .01$). Results are consistent across models, however only the spatial lag model produces strong statistical results as indicated by the non-significant rho term that indicates that there is no correlation between the coefficients and the error term. Specifically, the non-significant rho in the spatial model indicates that the explanatory variables have been correctly specified as to capture the spatial dependence. As Andersson and Gråsjö (2009) explain, "a well-formed model should most likely not produce spatial correlation at all" (p. 160).

Table 3. Difference-in-differences results – spatial and non-spatial models and placebo tests

	Spatial lag model		Spatial error model		Non-spatial model	
Taxable sales per capita	**2010-2006**	**Placebo test 2006-2001**	**2010-2006**	**Placebo test 2006-2001**	**2010-2006**	**Placebo test 2006-2001**
Tax credit per capita	**99.524*****	17.453	**89.396****	19.884	**108.043*****	22.475
	(33.717)	(15.023)	(38.551)	(15.396)	(33.982)	(13.838)
Years in the program	**-1238.78*****	-175.374	**-1178.95*****	-257.186	**-1227.19*****	-210.780
	(411.289)	(147.045)	(381.276)	(179.192)	(401.444)	(166.819)
Rho	0.016	**-0.092****				
	(0.012)	(0.037)				
Lambda			0.015	**-0.094****		
			(0.013)	(0.037)		
Intercept	586.328	1391.493	512.218	**1469.814****	1414.444	292.182
	(1181.723)	(515.749)	(1254.736)	(624.427)	(999.334)	(252.225)
Observations	85	85	85	85	85	85
Chi2	1.703	6.236	1.386	6.527		
Sigma	7791.3	4010.96	7797.36	1907.16		
Log likelihood	-882.275	-762.786	-882.341	-762.654		
F					6.87	1.41
R-squared					0.0155	0.0096
Robust model	Yes	Yes	Yes	Yes	Yes	Yes

Note: Standard errors are in parenthesis. **, ***, **** means significant at the 0.5, 0.1, and 0.01 levels, respectively.

None of the variables of interest in the placebo tests (i.e., for the years before the policy was in place) are statistically significant. This confirms that our spatial difference-

in-differences model accounts for the endogeneity bias that can be encountered in policy analysis models.

6. Conclusions

The results suggest that counties that participate as an E-Community and receive tax credit funds, experience a more rapid growth in economic growth as indicated by their taxable retail sales per capita, when compared to counties that do not participate. This implies that the funds that are eventually allocated to businesses in participant counties are positively contributing to the growth of the state economy. The results also indicate that participating counties benefit the most from the program immediately upon adoption, and that this effect decreases thereafter. Moreover, the Moran's I statistic and the results of the spatial difference-in-differences model show that participating E-Community counties are spatially correlated and that they have an immediate economic effect in their neighbors. This finding indicates that nodal areas that benefit the most from the program see their economy and that of their immediate neighbors grow faster, while other more distant areas lack the benefits of this spillover effect.

These findings suggest that participating E-Community counties may be benefiting economically from being a member of the E-Community Partnership program, perhaps at the expense of other counties. The increase in retail sales enjoyed by participating counties may be a combination of new net economic activity in the state driven by small new or expanding businesses, plus a shift in sales from neighboring counties. However, the spatial analyses do not support the shift hypothesis. In fact the rho and lambda coefficients, while not statistically significant, are positive, providing weak

support for the possibility that counties benefit from economic growth in neighboring counties.

Furthermore, in order to participate in the E-Community Partnership program, counties must have demonstrated leadership and a financial committee organized to manage and allocate the tax credit funds. This prerequisite limits the number of counties that can succeed in the application process and thereafter benefit from the program to those with public or social entrepreneurs as well as those with private entrepreneurs willing to invest in their community. These empirical results suggest that the program is successfully stimulating economic growth in participating counties but if regional economic convergence is a goal of the state, then additional efforts to encourage underperforming counties to participate should be considered.

Thus, I conclude that the E-Community Partnership's Tax Credit program is succeeding in its goal of improving the performance of participating counties and providing capital to their businesses, but that the effect may not be sustainable from a regional or state perspective. This may be because of the growing number of counties in the program, which concentrates the areas that benefit from it (see Figure 1). In this scenario, a county may be disadvantaged as near-by counties join the program, win back and perhaps benefit at the expense of non-participating counties, and then find this benefit eroding as still more counties join the program. These findings and this interpretation are consistent with previous research that suggests that the levels of entrepreneurship achieved through development incentive programs vary greatly depending on regional conditions.

More analysis would be needed to make a definite conclusion regarding the long-term effectiveness of the Tax Credit program developed and managed by Network Kansas. Markley and colleagues (2008) suggest that studies regarding economic growth should have at least 10 years of data post-policy implementation. Although the time frame for this study falls short of this ideal, the analyses and results presented here serve as a point of reference for policymakers that deal with tax credit policies that target entrepreneurship. Future research on this program should expand the present study by using longitudinal data that includes more years post-adoption. In addition, it would be useful to determine if the overall state economy is enhanced by the program.

Furthermore, Wilder and Rubin (1996) argue that development programs that combine tax incentives with other strategies such as local technical assistance are more effective than tax incentive programs on their own. Considering the goal of the E-Community Partnership to create a self-sustaining entrepreneurial ecosystem in the state, further research could explore the networking assistance and activities that the partnership offers to entrepreneurs and small businesses in addition to the E-Community Tax Credit program, and examine how the increased networking and access to resources through the network contributes to the economic performance of their corresponding communities.

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