Dissertation

Entrepreneurship by Gender: Characteristics, Financing, and Growth

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Abstract

Entrepreneurship by Gender: Characteristics, Financing, and Growth

Women own less than one-third of firms in the United States, despite comprising nearly half of the labor force. The gender gap holds in most local areas, but analysis by county shows that there is significant variation in male- and female- business ownership across space. Though previous studies link entrepreneurial activity to several important regional characteristics, none consider how the impact of these characteristics, particularly the availability small business financing, might vary between men and women. Further, there has been little consideration for separate impacts of male- and female-owned firms on economic growth.

Chapter one identifies the determinants of growth in the propensity for male- and female-owned firms and considers the relative importance of endowment and behavioral differences in explaining the gender gap in business ownership. The results indicate that there are significant endowment and behavioral differences between the male and female populations, particularly with regard to human capital accumulation. Human capital accumulation at the bachelor's degree level increases the propensity for male-owned firms, but the relationship between human capital accumulation and the propensity for female-owned firms forms an inverted "U." Counties with large shares of females at very low and very high education attainment have lower growth in the propensity for female-owned firms, and growth is highest in counties with a large share of female college graduates. Family structure is also a significant factor, shown by the negative effect of the number of children per adult, which is much stronger for males. A Blinder-Oaxaca decomposition demonstrates that though the effect of

endowment differences is larger in absolute value, the behavioral differences captured by the coefficient effect, are key to alleviating the gender disparity in business ownership.

Chapter two analyzes the impact of male- and female-owned firms on economic performance. The results show that counties with higher initial densities of male- and female-owned firms, generally have lower subsequent employment growth. More detailed analysis by employment status shows that male-owned employer firms have the strongest relationship to economic growth compared to female-owned employer firms and non-employer firms owned by either gender. Instrumental variable analysis using the historical mining industry addresses the potential endogeneity created by including births in the empirical model of employment growth.

Chapter three focuses on capital as an especially important input to entrepreneurship, and ultimately, to economic growth. So far as bank loans are critical to the start-up, survival, and expansion of establishments, it is reasonable to expect spatial linkages between lending and establishment births as well as between lending and economic performance. This study examines the effect of small business loans based on Community Reinvestment Act (CRA) data and applies an instrumental variable strategy using money demand shocks to address potential endogeneity between lending and establishment births.

Using an economic growth framework and cross-sectional empirical model for U.S. counties, we test the hypotheses that the establishment birth rate, employment growth, and our measure of entrepreneurship for each gender is higher in counties where bank financing is more available, controlling for community-level characteristics affecting business and economic dynamics. We also consider the long-term effect of small business lending and focus

on establishing the appropriate lag structure. The results indicate that lending has a significant and positive effect on births that is strongest in rural and micropolitan counties. Second, increases in lending appear to have a weakly negative effect on employment growth. There is no effect of lending on entrepreneurship for either gender.

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CHAPTER 1

Introduction

There are large and persistent differences in regional economic performance across the United States. These differences have been explained, at least in part, by local entrepreneurial activity. Regional analyses have linked entrepreneurship to several measures of prosperity including income, employment, and productivity growth (Audretsch and Keilbach, 2004; Rupasingha and Goetz, 2011; Stephens et al., 2013; Acs and Armington, 2004; Shrestha et al., 2007; Henderson and Weiler, 2009; Holtz-Eakin and Kao, 2003). As consequence of the evident local advantages, there has been growing enthusiasm for entrepreneurship among policymakers. Encouraging entrepreneurs and promoting small business are becoming characteristic of local economic development policy.

Given the economic advantages of entrepreneurs and support from policymakers, the rarity of women entrepreneurs compared to men is conspicuous. Despite nearly equal shares of men and women in the labor force, less than one-third of all firms are owned by women (Coleman and Robb, 2012). The gender gap is even wider as measured by sales and employment. At $1.2 trillion, sales by women-owned firms are less than 4% of total and trending downward. Only 12% of women-owned firms have employees and they employ less than 5% of non-farm workers. On the other hand, 23% of men-owned and coed-owned firms have employees and they employ 55% of non-farm workers. Clearly, as indicated by a variety of measures, women business owners are far behind their male counterparts.

Though the gender disparities in business ownership and performance hold across the U.S, a closer look does show significant spatial variation. In some rural southern counties the number of female-owned firms relative to the labor force is as low as 2%, but is greater than

25% in several Colorado and Massachusetts counties, and for men, it ranges from 9% to nearly 70% depending on the county.[1] The spatial variation in male and female entrepreneurship suggests that some regional environments are better able to foster entrepreneurs than others, but the propensities for business ownership by men and by women aren't necessarily high in the same place. Some regions appear better for male entrepreneurs and others better for female entrepreneurs. These regional gender differences in business ownership are the motivation for this study.

1.1. Who becomes an entrepreneur?

Entrepreneurs have been studied extensively in the microeconomic literature. Though female entrepreneurs have received some attention, they are less understood than male entrepreneurs. Early studies tend to focus only on males not considering the implications of gender (Evans and Jovanovic, 1989; Evans and Leighton, 1995). This literature focuses on the characteristics of individuals and analyzes their choice between wage-and-salary employment and self-employment. As stated by Bates (1993, p. 225), "the individual traits most strongly associated with self-employment are wealth holdings, education, and age (a proxy for years of work experience)." Though this statement is still accurate, there is now a better understanding of how these factors impact an individual's decision to become self-employed.

The relationship between capital and entrepreneurship has been detailed repeatedly. Those with greater personal wealth are more likely to be self-employed (Evans and Jovanovic, 1989; Evans and Leighton, 1995; Holtz-Eakin et al., 1994; Dunn and Holtz-Eakin, 1996). The

[1]Prior to 2007, male-owned firms were not tabulated by the Census. Only female-owned firms and the total number of firms were counted. The number of male-owned firms is calculated as the total number of firms less female-owned firms.

relationship between education and entrepreneurship is less straightforward. In their meta-analysis of entrepreneurship selection and performance in industrialized countries, Van Der Sluis et al. (2008) find that the effect of education on selection into entrepreneurship is actually quite mixed. Of studies with significant education results, entry to self-employment was more likely among those with a college education and those with some postgraduate training. Using only U.S. data, other studies have found that relationship between education and entrepreneurship is curvilinear; entrepreneurship has a weakly positive or negative relationship to both low and very high levels of formal education, and a strong positive relationship with mid-level education attainment (Fairlie, 2006; Kim et al., 2006). The impact of work experience is also complex. Simply having worked for more years doesn't necessarily lead to a higher propensity for entrepreneurship. Those with specific experience in management and business are most likely to become entrepreneurs (Kim et al., 2006).

1.2. Women Entrepreneurs

Though the early literature established several key factors affecting entrepreneurship by using all men or by pooling men and women together, female entrepreneurship does warrant its own study. Knowledge, resources, and constraints are distributed differently across members in a society, and certainly across gender. This of course has consequences for entrepreneurship. The existing literature indicates that women entrepreneurs are driven by many of the same factors as men, though to a lesser or greater extent, and by some factors that are unique to their gender. Women can be expected to perceive opportunities differently than men, choose to become entrepreneurs for different reasons, and start and manage their businesses differently.

Women entrepreneurs generally have more formal education than their male peers, but less work experience in business and management (Cowling and Taylor, 2001). Women and men use their human capital in different, though equally innovative, opportunity identification processes (Chandler et al., 2005). Compared to men, women with a lack of education are more aware of their knowledge deficiencies, more likely perceive certain obstacles, and ultimately, less likely to become entrepreneurs (Kourilsky and Walstad, 1998; Huarng et al., 2012). Yet, women that do choose to pursue an entrepreneurial opportunity are rewarded with higher returns to their education relative to men (Van Der Sluis et al., 2008).

Several studies have shown that for women the decision to become self-employed is uniquely intertwined with their household and family responsibilities. Women who are married, particularly those who are married to a self-employed spouse, are more likely to pursue self-employment (Devine, 1994; Bruce, 1999; Taniguchi, 2002). Women with children, especially young children, are also more likely to be self-employed (Boden, 1996, 1999a; Taniguchi, 2002). Likely, women with small children place a premium on a flexible professional life, making self-employment an attractive option (Bender et al., 2005).

The decision to become an entrepreneur is also made more complex for women by discrimination. Weiler and Bernasek (2001) design a model wherein women face a wage discount in the competitive labor market and pursue self-employment in search of higher returns. Budig (2006) finds empirically that discrimination may, in fact, be an important factor. His results indicate that lower than expected wages are positively associated with female entrepreneurship. Yet, even once women leave the discriminatory labor market for self-employment, they may still face discrimination from their suppliers and customers (Weiler

and Bernasek, 2001). In turn, their business performance suffers, lowering the overall success of women-owned firms.

Women generally start their businesses with less capital and are less likely to use institutional finance, perhaps because they face disadvantages in the credit market. Buttner and Rosen (1988) find that bank loan officers perceived females as having less endurance and risk-taking propensity than males and successful entrepreneurs. Coate and Tennyson (1992) show that a group facing discrimination in the labor market will also face statistical discrimination from lenders should they choose to start their own business and apply for a bank loan. Marlow and Patton (2005) suggest that even if women do not face discrimination, they may still be disadvantaged financially. First, they point out that women generally have inferior social networks, which may be costly to the extent that it prevents relationships with lenders and access to financing. They also point out that women often earn less and accumulate less savings putting them at disadvantage to meet collateral requirements.

Undercapitalization has been linked to poor subsequent business performance. This implies that any challenges women do face in acquiring adequate financing could saddle them with a lasting disadvantage (Rosa and Carter, 1998). Budig (2006) finds that nonprofessional women who enter self-employment experience a negative impact on their earnings with the largest penalty accruing to wives and mothers. Professional women, however, experience a wage benefit from self-employment equal to men. His results suggest that some women may be trading earnings for the flexibility of self-employment or the ability to work at home. As additional evidence of these tradeoffs, Edwards and Fields-Hendrey (2002) find that women with children are more likely to choose home-based work.

1.3. Entrepreneurship Across Space

There is a large regional literature on entrepreneurship, but with little attention given to gender. The regional variation in entrepreneurial activity has been studied in relation to the characteristics of regions and the communities that reside in them. Local wealth and income have both proven important as has human capital (Armington and Acs, 2002; Goetz and Freshwater, 2001; Goetz and Rupasingha, 2009; Glaeser, 2007). The relative risk between self-employment and wage-and-salary employment also changes the incentives for choosing self-employment. Goetz and Rupasingha (2009) using an income-based measure of risk and Low and Weiler (2012) using an employment-based measure, find that self-employment decreases as self-employment risk rises. The local industrial composition is also relevant to entrepreneurship. Higher rates of firm entry are associated with the presence of input suppliers and an abundant labor supply in relevant occupations (Glaeser, 2007). Higher industry concentrations in services and construction are also associated with higher levels of self-employment (Goetz and Rupasingha, 2009).

More recently explanations of regional variation in entrepreneurship have focused on the role of information and knowledge spillovers. Acs et al. (2008) develop a model of entrepreneurship where knowledge created endogenously results in knowledge spillovers, which allows entrepreneurs to identify and exploit opportunities. Their study suggests that an increase in the stock of knowledge will lead to an increase in entrepreneurship. Braunerhjelm et al. (2010) offer a variation of knowledge spillover theory wherein entrepreneurship itself generates knowledge spillovers in the form of new firms, thus linking knowledge to economic growth. Knowledge spreads more easily between proximate agents which gives rise to more entrepreneurial opportunities in densely populated areas. To the extent that

knowledge spillovers are spatially constrained, there is resulting variation both in the rate of entrepreneurship and the economic growth (Döring and Schnellenbach, 2006).

Regional analysis of female entrepreneurship is sparse. One recent study by Rosenthal and Strange (2012) develops an analytical model where females are less networked than their male counterparts and face greater domestic burdens. As consequence of an inferior social network, women benefit less from agglomeration. Additionally, women incur greater commuting costs because of their household responsibilities. These factors result in spatial segregation of female-owned businesses. Their empirical analysis supports the predictions of the model with high degree of segregation and female-owned businesses locating in places that are less exposed to agglomeration.

1.4. Entrepreneurship and Growth

The link between entrepreneurship and local economic benefits has been detailed in a number of studies from the United States. Regional analyses have linked entrepreneurial activity to income growth (Goetz et al., 2012; Stephens and Partridge, 2011) and poverty reduction (Goetz et al., 2012). Additionally, in a variety of industry and spatial studies, entrepreneurial activity has been associated with employment-growth (Acs and Armington, 2004; Acs et al., 2008; Deller, 2011; Henderson and Weiler, 2009; Goetz et al., 2012; Shrestha et al., 2007). Stephens and Partridge (2011) found that, even in isolated rural areas that seemingly lack the economic structure to benefit significantly from entrepreneurs, there are still positive income and employment effects. Henderson and Weiler (2009) found that the relationship between entrepreneurship and employment growth is persistent over time and across space via spillover effects.

This analysis contributes to the literature by analyzing the spatial heterogeneity in male and female business ownership in effort to better understand their driving forces and the economic significance for local economies. Drawing on the existing individual level studies, chapter one analyzes the relationship between human capital and entrepreneurship at the county level for men and women. Chapter two evaluates the effect of both male and female entrepreneurship on economic growth. Chapter three considers the importance of local financing in relation to several measures of entrepreneurship and employment growth.

CHAPTER 2

Regional Determinants of Entrepreneurship by Gender

2.1. Introduction

Small business is of growing importance in economic development strategies implemented by both the public and private sectors. Subsidies, tax breaks, and other incentives have been used at all levels of government in the U.S. with the goal of increasing the number of proprietors in the workforce. Yet, entrepreneurial activity in the United States varies dramatically across space. Regional studies of entrepreneurship show that such spatial variation is not random, but seems systematically related to specific factors associated with particular locations. Several studies, going back as far as Bartik (1985) and more recently by Goetz and Rupasingha (2009), try to identify the location-specific characteristics that explain the spatial variation in entrepreneurship. Though these studies link entrepreneurial activity to several important regional characteristics, none consider how the impact of these characteristics might vary by gender.

Existing studies establish several key relationships, but do so by pooling the entrepreneurial activity of men and women together, using firm births or the self-employment rate for example. Yet, men and women do warrant separate study. Knowledge, resources, and constraints are distributed differently across members of society, and certainly across gender. Women are systematically different from men in their skills, social responsibilities, and opportunities. They can also be expected to assess the local market, value regional characteristics,

and respond to their communities differently from men. This of course has implications for the spatial distribution of entrepreneurial activity for each gender.

In U.S. counties, the number of firms relative to the labor force is 19% on average but ranges from higher than 50% in some counties where entrepreneurs seem to thrive, to less than 5% in other counties where they seem to struggle. However, measures of entrepreneurship that aggregate across gender conceal significant differences between men and women as shown by Figures 2.1 and 2.2. In some rural southern counties the number of female-owned firms relative to the female labor force is as low as 2%, but is greater than 25% in several Colorado and Massachusetts counties, and for men, it ranges from 9% to over 70%.[2] Clearly, the propensity for female-owned firms is higher in some counties than in others and likewise for men, but on average the propensity for female-owned firms is only two-thirds of that for males.

In this study, we consider two possible sources of the gender disparity in business ownership. First, the male and female populations may be characteristically different at the mean, in education attainment for example, referred to here as endowment differences. Second, male- and female-owned firm formation may result from gender-specific local behavioral patterns, indicated by different coefficients in a gendered empirical model. This is the first known regional study using U.S. data to examine both the endowment and behavioral differences in relation to the gender disparity in firm ownership and apply a Blinder-Oaxaca decomposition to establish whether it is endowments or behaviors that are key to alleviating the gender gap.

[2]Prior to 2007, male-owned firms were not tabulated by the Census. Only female-owned firms and the total number of firms were counted. The number of male-owned firms is calculated as the total number of firms less female-owned firms.

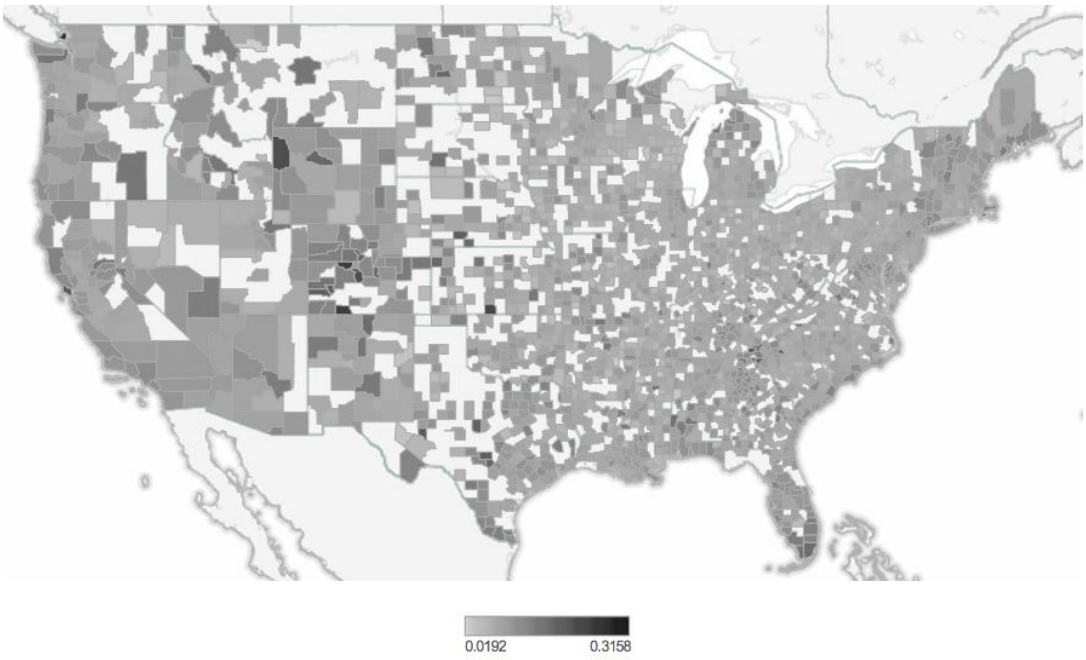

FIGURE 2.1. Propensity for Female-Owned Firms by County 2007

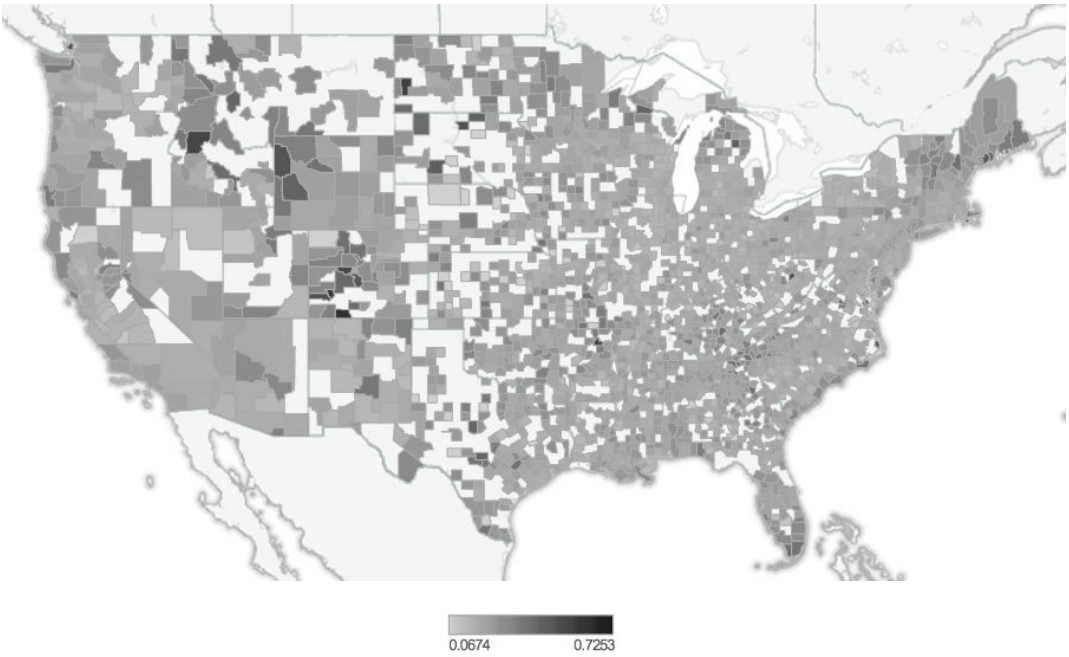

FIGURE 2.2. Propensity for Male-Owned Firms by County 2007

First we identify endowment differences between the male and female populations across counties by evaluating the mean differences. Then the empirical analysis identifies behavioral

differences between the male and female populations as they relate to their respective entrepreneurial outcomes with particular emphasis on human capital and local family structure. We include a number of explanatory variables to control for both place-based and people-based characteristics. Place-based characteristics include features of the location such as the industrial composition and level of natural amenities. People-based characteristics, or demographics, consist of countywide average values, so that each variable proxies for the average characteristics of the pool of workers/potential business owners. As is typical when studying labor market outcomes for various groups, we use a Blinder-Oaxaca decomposition to determine the relative importance of the endowment and behavioral differences between men and women in explaining the gender gap in business ownership.

The results indicate that, at the county level, there are significant endowment and behavioral differences between men and women that drive the gender disparity in business ownership. We focus on these gender differences with regard to education attainment and the local family structure. Growth in the propensity for both male- and female-owned firms is higher in counties with a large share of males and females with bachelor's degrees, respectively, but the effect is much stronger for men. The propensity for female-owned firms lags in regions with a large share of the least and most highly educated women. Though the share of married adults has no effect, the number of children per adult is negatively associated with the growth in the propensity for firms owned by either gender, but again the effect is much larger for men. Last, the Blinder-Oaxaca decomposition shows that though the endowment effect is larger in absolute value, the behavioral differences are key to alleviating the gender disparity in business ownership.

2.2. Measuring Entrepreneurship

The term “entrepreneur” has been used broadly, and consequently, has taken on a variety of meanings depending on the context. Sometimes “entrepreneur" refers simply to someone who is self-employed. At other times it implies specific functions such as risk-bearer or innovator. Unquestionably, entrepreneurs take on several varying roles, blurring the definition. Still, describing someone as an “entrepreneur” does identify that person as having unique qualities apart from others in the business sector. The term at least implies the most fundamental role of business owner or manager and the right to extract excess revenue above costs.

The multifaceted nature of entrepreneurship makes it difficult to measure. Precisely because of these difficulties, Low (2009) argues that economics is beginning to focus on a functional definition of entrepreneurship. The emphasis is now on, “. . . what entrepreneurs do rather than who they are," (Ibid., 5). The three main functions she identifies are (1) ownership or operation of a firm, (2) risk- and uncertainty-bearing, and (3) innovation or the reallocation of resources (Ibid.). Hence, key aspects of entrepreneurship are hard to measure, invisible, implicit, or qualitative. Data that entirely satisfy all of the common concepts of an entrepreneur are non-existent. Where ideal data are nonexistent, research on entrepreneurship has had to resort to what is available.

In this study, we measure the local entrepreneurial propensity by the number of female (male)-owned firms relative to the female (male) labor force. Gendered data on business ownership by county comes from the 2002 and 2007 Survey of Business Owners administered by the U.S. Census Bureau. Firms are classified as woman-owned if women hold 51 percent or more of the stock or equity in the company. Firms are male-owned if women hold less

than 51 percent of the stock or equity in the company. Though the number of firms relative to the labor force does not entirely capture the essence of entrepreneurship, it is available and gender disaggregated.

2.3. Regional Entrepreneurship and Gender

2.3.1. Regional Explanations of Entrepreneurship.

The spatial variation in entrepreneurial activity has been linked to the characteristics of regions and the communities that reside in them. Previous studies show that the industrial composition, policy environment, and labor market all influence local levels of entrepreneurship. In addition, the demographic profile of some regions is more conducive to new business. That is, some locations have a population of people that is more entrepreneurial than others. Counties with more attractive natural amenities also tend to lure new businesses and host more entrepreneurs (Florida, 2002).

To the extent that the local labor market determines the relative returns to self-employment, it has an important role in establishing the incentives for entrepreneurship. Goetz and Rupasingha (2009) find that proprietor earnings have a positive and significant impact on the growing density of proprietors, whereas wage-and-salary income has a negative impact, suggesting that individuals do in fact make their employment choice according to relative returns. Similarly, Low and Weiler (2012) find that in regions where the relative risk of self-employment is higher, the self-employment rate is lower. Reasonably, the level of local joblessness also factors into the wage-and-salary option, although the unemployment rate can have a spurious relationship to measures of entrepreneurship (Storey, 1991).

The local industrial composition also explains much of the variation in entrepreneurship (Glaeser, 2007). Some industries are more conducive to entrepreneurship, and some locations

are more conducive to certain industries. The regional industrial mix will influence the opportunities that potential entrepreneurs are likely to see and exploit in a particular place. For example, Goetz and Rupasingha (2009) find that entrepreneurial activity is higher in counties with higher industry concentrations in construction and services. Conversely, mining and utilities do not support high levels self-employment (Glaeser, 2007). New firms in particular industries also require certain inputs. Glaeser (2007) finds that concentrations of industry suppliers have a strong positive effect on self-employment rates.

Human capital has long been considered an important driver of entrepreneurship both at the individual and regional levels. Higher self-employment rates are generally found in locations with older and more educated populations yet various measures of human capital and entrepreneurship yield mixed results (Glaeser, 2007; Acs and Armington, 2004; Lee et al., 2004; Low et al., 2005; Goetz and Rupasingha, 2009; Goetz and Freshwater, 2001). For example, Low et al. (2005) find that entrepreneurial depth, the value added by business owners, is higher in counties with higher college education attainment, but entrepreneurial breadth, the size and quantity of small businesses, is unaffected.

Recent studies in the microeconomic literature have found that the relationship between education and entrepreneurship is curvilinear. Entrepreneurship is most strongly associated with education attainment at the bachelor's degree level, whereas both low and very high levels of formal education have a relatively weak or negative relationship to self-employment (Fairlie, 2006; Kim et al., 2006), perhaps indicative of the evolving opportunity cost of self-employment across levels of education attainment. At relatively low levels of education, even low-wage employment could be more lucrative than the income potential of self-employment. At high levels of education, the return in the wage-and-salary labor market may well exceed

the return in self-employment. Consequently, the propensity for entrepreneurship may be highest among those with mid-level education attainment. It is quite possible that a similar pattern exists at the regional level. Local human capital accumulation at the bachelor's degree level may be most conducive to local entrepreneurial activity.

A few regional studies include both the shares of high school graduates and college graduates as determinants of entrepreneurial activity. Acs and Armington (2004) find that the share of college graduates and, unexpectedly, the share of high school dropouts are both positively associated with higher entrepreneurial activity. They explain the unexpected effect of high school dropouts in terms of labor supply: entrepreneurs may benefit from abundantly available low-skill labor. In some cases, after controlling for age as a proxy for work experience, which is positive and statistically significant, the share of college graduates has no effect (Goetz and Rupasingha, 2009; Bartik, 1989). The mixed results across regional studies suggest that the relationship of local human capital accumulation to entrepreneurial activity is still somewhat unclear.

2.3.2. Gender Considerations: Human Capital and Family Structure. Regional factors such as human capital, labor market conditions, industrial composition, and natural amenities seem to drive entrepreneurship, but none of these factors have been considered in relation to gender. One recent study by Rosenthal and Strange (2012) focuses on women entrepreneurs and the importance of knowledge spillovers and agglomeration in their business location decision. They develop an analytical model where females are less networked than their male counterparts, and as a consequence, have limited access to knowledge spillovers. Empirically, the authors demonstrate evidence that women are in fact located

further from agglomerated areas. Yet, even this recent study provides only a very limited picture of female entrepreneurs in a regional context.

Previous studies of entrepreneurship in the microeconomic literature indicate that there are systematic differences between men and women business owners and those differences likely have implications for their respective local entrepreneurial activity. Women entrepreneurs generally have less work experience in business and management, but more formal education than their male counterparts (Cowling and Taylor, 2001). Compared to men, women with less education are more aware of their knowledge deficiencies, more likely to perceive certain obstacles, and ultimately, less likely to become entrepreneurs (Kourilsky and Walstad, 1998; Huarng et al., 2012). Additionally, because of their lack of previous work experience, those women who do choose to start their business often fail to remain self-employed (Rosti and Chelli, 2005).

Human capital is not the only factor that enters into the self-employment decision differently for men and women. Family and children also influence men and women differently in their decision to become self-employed (Boden, 1996, 1999b; Hundley, 2000; Fairlie, 2006). Women still have primary responsibility for family and children, which means they have less flexibility in their daily lives (OECD (2004)). For women, self-employment may allow the flexibility to stay at home and meet the demands of being a spouse and mother (Hundley, 2000). Women with small children in the household are more likely to enter self-employment (Boden, 1996; Bruce, 1999) yet, the presence of young children had no significant impact for men (Boden, 1999b). As further evidence of the demands of child rearing, women, especially women with young children, cite reasons related to family and schedule flexibility as their primary motivation for becoming self-employed (Boden, 1999b). However, it seems that both

men and women considering self-employment benefit from the support of a spouse. Marriage has positive effect on male and female self-employment (Taniguchi, 2002; Boden, 1999b).

2.3.3. Regional Implications of Gender in Entrepreneurship. The gender differences in entrepreneurship have mostly been determined in the microeconomic literature, which tends to consider entrepreneurship in an occupational choice framework. In this framework, each person rationally chooses between entrepreneurship and wage-and-salary employment based on the utility maximizing principle. Both pecuniary benefits, which are largely a function of human capital, and non-pecuniary factors, such as family responsibilities enter into the equation. In an efficient equilibrium allocation, only those entrepreneurial opportunities that are the most lucrative will motivate departure from the competitive labor market. Hence, the extent of entrepreneurship in a given region represents the share of individuals with a self-employment opportunity that is better than their wage-and-salary option.

The gender differences previously discussed, suggest that human capital and family structure, in particular, are considered in a consistently different way between men and women, and as a result, men and women make systematically different occupational decisions. Extrapolating this model out to the regional level implies that the local human capital profile and family composition would relate differently to the local propensity for male- and female-owned firms. While occupational choice theory focuses on individual characteristics, in this study, as in Goetz and Rupasingha (2009), county characteristics are used as proxies for the average characteristics of the population pool from which entrepreneurs are drawn, and to reflect the local environment in which they make their employment decisions. We use these

factors to explain the propensity for male-owned firms and the propensity for female-owned firms, then draw gender comparisons.

2.4. Hypotheses and Empirical Model

2.4.1. Hypotheses. To develop the first hypothesis we consult recent studies of entrepreneurship that focus on human capital. Kim et al. (2006) suggest that entrepreneurial propensity is not a strictly increasing function of human capital. Individuals with less and very high levels of human capital are less likely to become entrepreneurs compared to those with a college degree who are most likely to become entrepreneurs. Men and women with only a high school diploma may lack the skills and resources necessary to earn high returns as an entrepreneur, and consequently, are more likely to choose wage-and-salary employment. Doctorates may also coincide with a lower propensity for entrepreneurship, but in contrast to those with high school education, because the highly educated generally have lucrative wage-and-salary options. Those with a college degree are likely well suited for a relatively profitable entrepreneurial option compared to wage-and-salary employment. In light of these findings, we hypothesize the regional parallel: the propensity for female (male)-owned firms is higher in regions with a large share of females (males) with bachelor's degrees, and lower in regions with larger shares of less and highly educated females (males). Hence, the relationship between local education attainment and the propensity for firms owned by either gender forms an inverted "U." Women entrepreneurs, though, tend to have more education than their male counterparts (Cowling and Taylor, 2001). We hypothesize the same inverted U-shape relationship between education attainment and the propensity business ownership for both genders, but centered on a higher level of education attainment for females.

A secondary, but important consideration in a gendered study of entrepreneurship, is the impact of a spouse and children. Family structure and the demands of household production impact the entrepreneurial propensity of men and women very differently. Previous literature suggests children have a positive impact on the self-employment propensity for women as they seek a flexible professional life that can accommodate their family life. Children, however, have no impact on male self-employment. These gender differences suggest that women still bear the primary responsibilities of child rearing. It is reasonable to think that gender roles will have cumulative implications reflected in the local propensity for male- and female-owned firms. We hypothesize that the number of children per adult woman will positively impact the propensity for female-owned firms and the number of children per adult man will have no impact on the propensity for male-owned firms. With regard to marriage, we hypothesize that the propensity for firm ownership is higher where larger shares of men and women are married.

2.4.2. Empirical Model. Regional studies of entrepreneurship that focus on gender are sparse, hence there is little guidance for developing a gendered empirical model. As highlighted above, there are gender specific considerations that motivate occupational choice. It seems that the utility maximizing solutions are systematically different by gender, primarily because men and women consider their human capital and family situation differently. The regional drivers of male- and female-owned firms are also likely to be systematically different making it appropriate to use a gendered empirical model. The model developed here is applied separately, yet in parallel, to the propensity for male- and female-owned firms. The explanatory variables were selected based on the regional characteristics previously shown to drive entrepreneurship based on the work of Goetz and Rupasingha (2009), Glaeser (2007),

Acs and Armington (2006), and Acs and Armington (2004), as well as aggregate measures of the educational and demographic characteristics shown significant in the regional and micro literature based on the work of Kim et al. (2006), Boden (1999b), and Taniguchi (2002). Considering each gender separately has the advantage of allowing us to compare coefficients across models and gain insight into how education and family structure factor differently into entrepreneurship for men and women.

We test the hypotheses discussed previously using a model that includes a vector of control variables with an additional vector of human capital variables and measures of marriage and children. In large part, we follow Goetz and Rupasingha (2009) in their choice of explanatory variables, so that we can focus the analysis on the human capital variables **h**, and measures of family structure **f**. The model can be described generally as follows, where e is the propensity for either male- or female-owned firms.

$$\Delta e = h\delta + f\gamma + r\zeta + \epsilon \tag{1}$$

For example, for women Δe is equal to the change in the propensity for female-owned firms, **h** contains variables measuring the education of the female population, **f** measures marriage and children in relation to the female population, and **r** is a set of regional control variables that are the same for the male and female models.

In this study, human capital is measured by the individual's highest level of education attainment, aggregated and normalized into population shares. In the U.S. Census and American Community Survey, schooling is broken down into 16 levels of education attainment for each gender. Their highest level of education attainment classifies respondents. For this

study, the four most advanced levels of attainment will be considered, namely, a high school diploma, bachelor's degree, master's degree, and doctorate degree. Professional degrees, such as a J.D. or M.D., are excluded. We normalize the number of people at each level of education attainment by the adult population (age 25+) for each county by gender.

The variables that measure family structure focus on marriage and children separately. In the model of the propensity for female-owned firms, for example, we include married women as a share of women over the age of 15. We also include the number of children (age 17 or under) per female over the age of 16. Similarly, we include married males as a share of males over the age of 15 and the number of children per male in the model of the propensity for male-owned firms.

The explanatory variables include a number of demographic and regional characteristics widely used in regional models of entrepreneurship. This group of variables includes controls for the local labor market conditions, industry shares, and characteristics of the local community. In addition to the measures of education attainment, we also include the median age of the population of each gender to capture the typical amount of work experience in the local population. Labor market conditions are measured by the employment-population ratio, with the expectation that as employment increases the relative return to self-employment likely decreases as does the incentive to own a firm. Proprietor earnings per job and wage-and-salary earnings per job are included to account for the relative incentives to each type of employment, expecting that as proprietor earnings fall, firm ownership will decrease and vice versa for wage-and-salary earnings. Wealth, as a form of collateral, is important to potential entrepreneurs who may seek loan financing. Owning a home and higher home value improve the prospects of securing the loan financing for a new venture. We include the share

of owner-occupied homes and median value of homes. To control for economic growth, we include the growth rate of income per capita during the five-year period preceding the business ownership measure. Services, retail trade, and construction industries are included to control for the local industrial mix and the growth patterns of different sectors, measured as a share of total establishments (Malecki, 1994). Last, the natural amenities score is included with the expectation that entrepreneurs who are more footloose will locate in more scenic areas. All variable descriptions and sources can be found in the appendix.

2.5. Data

2.5.1. Sources. Business ownership data come from the Survey of Business Owners (SBO), which is administered by the U.S. Census Bureau every five years (specifically, years ending in 2 and 7). The U.S. Census Bureau compiles a list of all nonfarm firms with and without paid employees operating during the year of the survey with receipts greater than $1000 based on tax return data. A sample of those firms is questioned on their employment, payroll, and receipts. The resulting data are reviewed, edited, and tabulated, then made available to the public by geographic area.

Data from the Survey of Business Owners is withheld for many counties because the estimates do not meet publication standards, by having a relative standard error that is too high for example. Other data is withheld to avoid disclosing data for individual companies. Given the criteria for excluding an observation, there may be certain counties that are systematically absent from the full sample. Rural and sparsely populated counties where there are fewer businesses are more likely missing because of a higher variance in the data and the risk of exposing specific firms.

The panel of data was constructed to match the data from the 2002 and 2007 SBO. Each cross-section of the SBO has to be matched with demographic data from a different survey administered by the U.S. Census Bureau. A report by the Global Entrepreneurship Monitor states that the average time between an entrepreneur's decision to create a new organization and the initial operation of the business is about two years (Reynolds et al., 2002). In light of these findings, data from the SBO is likely tied to factors from one to two years prior. With this reasoning, we match the 2002 and 2007 SBO data with demographic data from 2000 and 2005, respectively. The 2002 SBO data are matched with data from the 2000 Decennial Census and the 2007 SBO data are matched with data from 2005 American Community Survey.

The 2007 SBO is matched with the 2005 annual estimates of county-level demographic data from the American Community Survey (ACS). The 1- and 3-year estimates are limited by area size and consequently, do not include all counties. Only areas with a population greater than 65,000 people are estimated annually. Data from the 2002 SBO are matched with the 2000 U.S Decennial Census, the last decennial census to make use of the Long Form. The Long Form collects detailed demographic, economic, and housing data that are useful for this study. The data definitions and measurement in the 2000 Decennial Census are consistent with the 2005 ACS. For example, all surveys report education attainment as the highest level attained by the respondent. From these sources data on education, marital status, children, age, and labor force participation is available by gender, in addition to data on homeownership and housing values.

Whereas the availability of demographic data is limited at the county level, data describing industry, wages, and income are more readily available. To be consistent with the

demographic data, we use measures of employment and the local industrial mix from two years prior to the measure of business ownership. The wage and income data are from the Bureau of Economic Analysis Regional Data Center. The industry shares are calculated as a share of total establishment based on data available from the County Business Patterns. Data on natural amenities come from the United States Department of Agriculture (USDA)-Economic Research Service (ERS). The ERS calculates a natural amenities score for each county based on topography and climate, ranging from roughly -7 to 12, which is assumed constant over time.

2.5.2. Panel Construction. Counties are becoming a common unit of analysis in studies of entrepreneurship (Goetz and Rupasingha, 2009; Rupasingha and Goetz, 2011; Bunten et al., 2015). Arguably, metro areas are a favorable unit of analysis because they capture cities, which are a more intuitive economic unit. Similarly, the commuting zones are a natural choice for regional analyses, as they link metro areas to the labor supply from surrounding counties. Counties too are a sensible unit of analysis for a regional study of entrepreneurship. They are generally centered on a large city, often the county seat, which anchors local labor and consumer markets. The county seat typically hosts a number of local government agencies that attract private businesses and residents. While commuting activity may blur county boundaries, people generally prefer to live close to their workplace and will choose to reside near the employment center in their county. Counties thus have the advantage of being a smaller geographic unit, within which there is reasonably cohesive economic activity.

The panel dataset consists of observations on 645 counties over two time periods. The counties included are those with a population greater than 65,000 in 2005. The counties

are limited in this way to take advantage of the American Community Survey 2005 annual estimates, which are produced only for a subset of counties above the 65,000 population threshold. This restriction is the most limiting factor in data availability, as it reduces the number of possible counties included in the analysis to fewer than 700. Missing values in the American Community Survey and Survey of Business Owners require that additional counties be dropped, further limiting the cross-section analyzed here.

Truncating the counties included in the analysis by population as described above limits the analysis almost entirely to metro areas. Of the 645 counties included 88% are metropolitan counties, with an urban core greater than 50,000. The remaining 12% of counties are micropolitan counties with an urban core between 10,000 and 50,000. Rural counties are excluded entirely from this analysis due to the population threshold. The counties included are pictured in Figure 2.3. Though the spatial pattern of the remaining counties may have consequences for the analytic approach as shown in the appendix, the results are substantively unaffected.

FIGURE 2.3. Counties

2.5.3. Summary Statistics. The regional gender differences in the propensity for male- and female-owned firms may be a function of endowment differences and/or behavioral differences. We hypothesize that the populations of men and women are different in both ways: characteristically (a difference in means $\bar{x}$) and behaviorally (a difference in coefficients β). The regression analysis to follow describes the behavioral differences in detail. First, we examine the differences in characteristics shown by the descriptive statistics.

The propensity for female-owned firms is much lower than that for male-owned firms and the gap is persistent over time. On average the propensity for female-owned firms was 9.5% is 2002, less than half of the propensity for male-owned firms at 22.60%. The propensity for female-owned firms increased in 2007 to 10.6%, but the gender gap remained relatively constant as the propensity for male-owned firms also increased to 24.5%. The male propensity is not only higher on average but spread across a much wider range from approximately 4.5% to more than 40%, whereas the propensity for female-owned firms is as low as 2% and 25% at the highest.

Table 2.2 shows that education attainment at all levels differs between genders. In 2000, 31% of women and 29% men, held a high school diploma as their highest degree, the largest share for both genders. At all higher levels of education attainment the share of women is smaller than that for men. However, the gender differences are slim with close to 15% of the population holding a bachelor's degree at the highest for both genders and close to 6% holding a master's degree for both genders. The largest gender difference is at the doctorate level; 1.4% of men have a doctorate, nearly three times the share of women with a doctorate.

By 2005, women had shifted into higher levels of education attainment. Still though, at 30.7% a larger share of women than men held a high school diploma as their highest degree.

The shares of men and women at the bachelor's, master's degree, and doctorate level all increased. Nearly 17% of women and just over 17% of men had earned a bachelor's degree as their highest degree. Women, it seems, are advancing in education attainment compared to men as the gender gap at higher levels of education is narrowing.

In both years, there is a larger share of married men than women and there are more children per male than female. However, the share of married adults has declined over time, as has the number of children. In 2000, the employment population ratio was much higher for men at 67% than women at 55% and changed little by 2005. The retail trade and construction industry shares were relatively stable over time, but services, the largest sector of the three, increased noticeably. Both the share of owner occupied homes and the value of homes increased during the period, which is not surprising given housing market activity during the early 2000s. The median age increased over time for both men and women, consistent with the aging demographic pattern in the U.S.

2.5.4. Difference in Means. The difference in the mean propensity for male- and female-owned firms is clear from Table 2.2. However, the differences between genders in education attainment, the share of married adults, and children per adult may seem quite small. Table 2.1 shows that these differences are actually statistically significant. So, even if the behavioral differences are small or nonexistent, it is still the case that there are meaningful endowment differences between genders that may explain regional variation in the propensity for male- and female-owned firms.

2.6. Analysis

We use panel data for U.S. counties to assess the relationship between the propensity for firms owned by each gender and regional characteristics. Our data consists of observations

TABLE 2.1. Difference in Means

Year = 2002 **Variable**	**Female Mean**	**Male Mean**	**t-statistic**	**p-value**
Ratio Firms to the Labor Force	9.54%	22.60%	-90.39	0.000
High school graduates, as % of adult population	31.14%	29.19%	25.25	0.000
College graduates, as % of adult population	14.74%	15.81%	-18.84	0.000
Persons with MA degree, as % of adult population	5.63%	5.76%	-2.99	0.003
Persons with Doctorate Degree, as % of adult population	0.56%	1.42%	-25.78	0.000
Married persons as a share of the adult population	55.87%	59.84%	45.19	0.000
Children Per Person Age 16 and Over	0.58	0.62	30.56	0.000
Employment Population Ratio	55.35%	66.62%	-70.50	0.000
Median Age	36.76	34.38	-69.07	0.000
Year = 2007 **Variable**	**Female Mean**	**Male Mean**	**t-statistic**	**p-value**
Firms Relative to the Labor Force	10.62%	22.60%	-100.00	0.000
High school graduates, as % of adult population	30.70%	29.19%	2.54	0.011
College graduates, as % of adult population	16.82%	15.81%	-4.63	0.000
Persons with MA degree, as % of adult population	7.07%	5.76%	11.93	0.000
Persons with Doctorate Degree, as % of adult population	0.74%	1.42%	-26.37	0.000
Married persons as a share of the adult population	54.63%	59.84%	37.63	0.000
Children Per Person Age 16 and Over	0.56	0.62	37.03	0.000
Employment Population Ratio	55.89%	66.62%	-79.61	0.000
Median Age	37.82	34.38	-56.24	0.000

TABLE 2.2. Summary Statistics

Variable	Year = 2002 Obs = 645 Mean	Std. Dev.	Min	Max	Year = 2007 Obs=645 Mean	Std. Dev.	Min	Max
Female-owned firms relative to the female labor force	9.54%	2.26%	4.44%	20.54%	10.62%	2.46%	5.63%	25.14%
Female HS graduates, as % of adult females	31.14%	6.63%	13.11%	52.17%	30.70%	6.50%	10.62%	51.43%
Female BA graduates, as % of adult females	14.74%	5.25%	5.63%	34.52%	16.82%	5.37%	7.30%	35.74%
Females with MA degree, as % of adult females	5.63%	2.53%	1.65%	18.75%	7.07%	2.96%	1.87%	23.66%
Females with PhD, as % of adult females	0.56%	0.55%	0.04%	4.75%	0.74%	0.67%	0.03%	5.92%
Married females as % of females age 15+	55.87%	5.59%	34.10%	73.24%	54.63%	5.35%	31.64%	70.32%
Children Per Female over 16	0.58	0.09	0.27	0.95	0.56	0.08	0.30	0.91
Female Emp. Pop Ratio	55.35%	6.08%	35.26%	72.01%	55.89%	5.73%	34.61%	74.02%
Female Median Age	36.76	3.64	23.10	55.40	37.82	3.64	25.40	54.20
Male-owned firms relative to the male labor force	22.60%	4.62%	12.06%	41.81%	24.47%	4.81%	13.79%	42.09%
Male HS graduates, as % of adult males	29.19%	7.04%	10.13%	51.41%	30.49%	7.00%	9.56%	53.57%
Male BA graduates, as % of adult males	15.81%	5.57%	6.06%	38.64%	17.09%	5.63%	6.03%	38.77%
Males with MA degree, as % of adult males	5.76%	2.72%	1.74%	20.20%	6.46%	2.94%	1.73%	23.01%
Males with Doctorate Degree, as % of adult males	1.42%	1.35%	0.09%	11.57%	1.54%	1.37%	0.20%	12.10%
Married males as % of males age 15+	59.84%	5.23%	39.65%	74.75%	58.62%	4.83%	37.84%	70.64%
Children Per Male over 16	0.62	0.09	0.26	0.96	0.60	0.09	0.31	1.01
Male Emp. Pop. Ratio	66.62%	7.45%	36.38%	86.35%	67.71%	5.91%	44.10%	84.85%
Male Median Age	34.38	3.42	23.40	52.70	35.55	3.33	24.60	51.00
Proprietor Income Per Job	24.14	10.87	6.25	85.74	26.50	11.92	8.52	94.50
Wage-and-Salary Income Per Job	30.87	6.34	21.20	75.03	36.31	6.82	24.78	72.92
Growth Rate of Income Per Capita	19.79	4.38	2.51	34.02	21.15	5.91	4.68	69.24
Service Estabs, % of Total	37.82%	3.94%	25.07%	59.36%	39.14%	3.92%	27.54%	59.69%
Retail Trade Estabs, % of Total	24.61%	3.48%	16.01%	41.39%	24.15%	3.41%	15.08%	39.19%
Contruction Estabs, % of Total	11.37%	3.19%	3.38%	24.12%	11.69%	3.49%	3.64%	27.16%
Owner-Occupied Homes, % of total	69.05%	8.71%	19.54%	88.08%	72.10%	8.47%	22.43%	92.71%
Median Housing Value	120007	52701	47700	514600	180801	116609	53100	868200
Natural Amenities Scale	0.66	2.64	-5.01	11.17	0.66	2.64	-5.01	11.17

on counties over two time periods. Using first differences has the advantage of eliminating unobserved heterogeneity that would otherwise be captured by fixed effects. However, when explaining entrepreneurship as a function of regional characteristics, perhaps initial conditions or levels are more relevant. In this panel of data, which spans only five years, most changes in the explanatory variables are quite small. In fact, compared to changes in the propensity for firm ownership, which have changed relatively quickly, the changes in most explanatory variables are small relative to their mean. Hence, the empirical model explains the change in the propensity for firm ownership as a function of initial conditions given by the lagged regional characteristics. The model can be written as

$$e_{git,t-\tau} = h_{gi,t-\tau}\delta + f_{gi,t-\tau}\gamma + r_{i,t-\tau}\zeta + \epsilon_{gi,t-\tau} \tag{2}$$

where the subscript indicates the gender of focus g, at time t, in county i. e is the change in the ratio of firms to the labor force between time t and t-τ, **h** is a vector of human capital variables, **f** is vector of family structure variables, and **r** is a vector of regional control variables. δ, γ, and ζ are the parameters to be estimated.

We estimate the male and female models using ordinary least squares (OLS) and then combine the results using seemingly unrelated estimation, which applies the Eicker-Huber-White sandwich covariance estimator. The coefficients will be the same between the OLS and seemingly unrelated estimation but the standard errors are smaller in the latter estimation

because it uses a larger number of observations to estimate the simultaneous (co)variance matrix. The standard errors are valid regardless of cross-equation correlation or heteroskedasticity. Estimating the model in this way allows for cross-model hypotheses that are useful for making gender comparisons.[3]

TABLE 2.3. Seemingly Unrelated Estimation

Number of obs= 645							
Variable	Coef.		Robust SEs	Variable	Coef.		Robust SEs
Female high school graduates, as % of female adult population	-0.0778	***	0.0165	Male high school graduates, as % of male adult population	0.0085		0.0254
Female college graduates, as % of female adult population	0.0734	***	0.0283	Male college graduates, as % of male adult population	0.1599	***	0.0428
Females with MA degree, as % of female adult population	0.0926	*	0.0549	Males with MA degree, as % of male adult population	-0.0850		0.0905
Females with Doctorate Degree, as % of female adult population	-0.6407	***	0.2401	Males with Doctorate Degree, as % of male adult population	-0.0026		0.1056
Married females as a share of the adult female population	0.0111		0.0209	Married males as a share of the adult male population	0.0424		0.0323
Children Per Female over 16	-0.0561	***	0.0124	Children Per Male over 16	-0.0764	***	0.0172

Notes: Significance at the 1, 5, and 10% level shown by ***, **, and *, respectively.

Selected results are presented in Table 2.3; the complete results are reported in the appendix. Clearly, human capital and family structure do matter in determining changes in the propensity for both male- and female-owned firms. The results for female human capital accumulation are entirely consistent with our hypothesis. Growth in the propensity for female-owned firms is lower in regions with a larger share of females with only a high school diploma. Also consistent with the hypothesis is the strong positive effect of the share

[3]Employment decisions for men and women are likely determined to some extent by the household and for that reason it may not be appropriate to estimate the regressions separately. Instead, the propensity for male- and female-owned firms may be correlated via household decision-making. Consequently, the models may be related via correlated error terms. If the two error terms are correlated, then estimating the equations jointly is a more efficient alternative to estimating them equation-by-equation. If the errors are uncorrelated across equations, then the estimates will be identical to the OLS estimates of each equation, which are reported in the appendix. Though the results of the SUR model are reported in the appendix and differences are slight, we focus on seemingly unrelated estimation, which is robust to cross-model correlation and heteroskedasticity.

of females with a bachelor's degree. The coefficient on the share of females with a master's degree is also positive but only marginally significant. The relationship between human capital and growth in the propensity for female-owned firms turns strongly negative again at the doctorate level. It seems the relationship of human capital accumulation to growth in the propensity for female-owned firms forms an inverted "U." Growth is lower in counties with large shares of females with either a high school diploma or a doctorate, and growth is higher in counties with a large share of females with a bachelor's degree and, to lesser extent, a large share of females with a master's degree.

It seems that the regional human capital profile that is most conducive to increasing the propensity for male-owned firms is simpler than that for women. The relationship of human capital to growth in the propensity for male-owned firms is concentrated entirely on the strong positive relationship to the share of males with a college degree. The coefficients on the shares of the male population with a high school diploma or doctorate degree, though insignificant, are either much smaller or negative. The inverted "U" relationship observed for females is only true for males to the extent that the college-educated seem to have the greatest potential for firm ownership. It seems that for a county interested in increasing male-owned firms, college educated males hold the most entrepreneurial potential.

Marriage has a positive relationship to changes in the propensity for firms owned by either gender as hypothesized, though the result is statistically insignificant. Counties with more children per adult female have lower growth in the propensity for female-owned firms. The number of children per adult male also has a negative effect on growth in the propensity for male-owned firms. The effect of children is contrary to our hypothesis, suggesting that children actually lessen the propensity for firms owned by either gender. It seems that a

local demographic with many young children would also feature a lower propensity for both male- and female- owned firms.[4]

TABLE 2.4. Difference in Coefficients

	Female	Male	t-stat	p-value
High school graduates, as % of adult population	-0.0778	0.0085	7.95	0.00
College graduates, as % of adult population	0.0734	0.1599	2.86	0.09
Adults with MA degree, as % of adult population	0.0926	-0.0850	2.86	0.09
Adults with Doctorate Degree, as % of adult population	-0.6407	-0.0026	7.19	0.01
Married adults as a share of the adults population	0.0111	0.0424	0.72	0.40
Children Per Adult	-0.0561	-0.0764	1.03	0.31

As a first step toward understanding gender differences, we compare the coefficients on human capital, marriage, and children from each model shown in Table 2.4. Most of the coefficients are in fact statistically different, to varying degrees, as shown by the large test statistics and low p-values. The male and female coefficients for the share of high school graduates and the share with doctorate are highly significant. However, the results from Table 2.3 indicate that those coefficients are only significant in explaining the change in the propensity for female-owned firms. The coefficients on the share of college graduates are strongly statistically significant in both models, but only weakly differ between genders. The coefficients on the number of children per adult are also strongly significant in both models, but there is no statistically significant difference between genders. .

[4]This study uses all children under the age of 17 to calculate children per adult. However, it may be the case that the relationship between children per adult and the propensity for firms depends on the age distribution of children. As children age and become more independent, women in particular may be better able to commit themselves to a business venture or, as the case may be, pursue wage-and-salary employment. Using the National Longitudinal Survey of Youth, Taniguchi (2002) finds that small children have no effect on women's entry into self-employment, though it has a negative effect on transitions into wage-and-salary employment. However, having older children who are more self-sufficient does positively impact transition in self-employment. To explore this further, the measure of children per adult was broken down further into three groups: children age 5 and under per adult male/female, children age 6-11 per adult male/female, and children age 12-17 per adult male/female. Each group was considered separately the empirical model as well as all three together. In all cases the variables were negative but with varying significance. Results are available from the author. Access to health insurance likely interacts with the responsibility of raising children. Parents with insurance through their employer may be reluctant to transition to self-employment if it means reducing or giving up their coverage entirely. Unfortunately, insurance coverage is beyond the scope of this county-level study, but should be considered in future research.

TABLE 2.5. Difference in Impulse Response (As Percentage Point Change)

	Female	Male
high school graduates, as % of adult population	-0.52%	0.06%
college graduates, as % of adult population	0.39%	0.89%
Adults with MA degree, as % of adult population	0.23%	-0.23%
Adults with Doctorate Degree, as % of adult population	-0.35%	0.00%
Married adults as a share of the adults population	0.06%	0.22%
Children Per Adult	-0.52%	-0.68%

Notes: Significance at the 1, 5, and 10% level shown by ***, **, and *, respectively.

Comparing the coefficients as in Table 2.4 is informative, but incomplete for identifying gender differences. To get a more accurate sense of the gender differences it is necessary to consider the coefficients with respect to the data. Table 2.5 shows the impulse response to each variable, the percentage point change in the growth of the propensity for male- and female-owned firms that results from a one standard deviation change in each variable. Even though the coefficients are only significantly different in some cases as shown in Table 2.4, there are large gender differences as measured by the impulse responses shown in Table 2.5.

To simplify the discussion, we focus only on the impulse responses for statistically significant coefficients from the regression models. For both men and women the largest positive impulse response is at the bachelor's degree level of human capital accumulation, though much larger for men. A one standard deviation increase in the share of college educated males corresponds to an almost .9 percentage point increase to the change in the propensity for male-owned firms, which is more than double the change for women. An increase of .9 percentage points may seem small but the propensity for male-owned firms increased by less than 2 percentage points at the mean from 2002 to 2007, so relatively speaking the increase is significant. The share of females with a master's degree also corresponds to an increase in the change in the propensity for female-owned firms of .23 percentage points. A one standard deviation increase in the share of females with high school graduates and the share of

females with doctorates correspond to a .5 and .4 percentage point decrease, respectively, to the change in the propensity for female-owned firms relative to the labor force.

The impulse response to a one standard deviation change in the number of children per adult is also larger for men. An increase of children per adult of 0.09 corresponds to a roughly .5 percentage point decrease in the change in the propensity for female-owned firms relative to the labor force and a .7 percentage point decrease in the change in the propensity for male-owned firms relative to the labor force.

The coefficient differences between men and women are relatively weak when we consider just the coefficients that are statistically significant in both models. It may be easy to conclude that behavioral differences between men and women do little to explain the gender disparity in business ownership. However, the impulse responses, which combine for each gender the behavioral component given by the coefficient with the endowment, show that the gender differences are substantial. In some cases, the impulse response is more than twice as high for men than women. In addition, though the gender difference on any particular coefficient may be small, it is also useful to consider the behavioral differences in aggregate. Combining the slight behavioral differences across the coefficients results in a cumulative effect that explains a significant portion of the gender gap as shown in the following section.

2.7. Blinder-Oaxaca Decomposition

As in many studies that focus on the difference in labor-market outcomes between groups, we decompose the mean differences in the change in the propensity for male- and female-owned firms based on the above linear regression models using the Blinder-Oaxaca Decomposition. Whereas the difference in means, coefficients, and impulse responses have been

broken down for each variable of interest in the previous section, the Oaxaca-Blinder decomposition nicely summarizes the importance of the behavioral differences taken together versus endowment differences taken together. As in Jann (2008), the question is how much of the mean outcome difference,

$$D = E(e_{mit,t-\tau}) - E(e_{fit,t-\tau}) \tag{3}$$

where $e_{git,t-\tau}$ denotes the expected value of the change in propensity for male- or female-owned firms between time t and $t-\tau$, is accounted for by group differences in the explanatory variables.

Based on the linear model

$$e_{git,t-\tau} = X'_{gi,t-\tau}\beta_g + \epsilon_{git}, \quad E(\epsilon_{git}) = 0 \quad g \in (m, f) \tag{4}$$

where **h**, **f**, and **r** are summarized by **X**, β summarizes the estimated parameters, and ϵ is the error term, the mean differential can be expressed as the difference in the group-specific means of the regressors as follows

$$D = E(e_{mit,t-\tau}) - E(e_{fit-t-\tau}) = E(X_{mi,t-\tau})'\beta_m - E(X_{fi,t-\tau})'\beta_f \tag{5}$$

because

(6) $$e_{git,t-\tau} = E(X'_{gi,t-\tau}\beta_g + \epsilon_{git}) = E(X'_{gi,t-\tau}\beta_g) + E(\epsilon_{git}) = E(X_{gi,t-\tau})'\beta_g$$

where E(β_{git})=β_{git} and E(ϵ_{git})=0 by assumption.

To identify the contribution of group differences in the explanatory variables to the outcome difference (6) can be rearranged and expressed as follows.

(7)

$$D = (E(X_{mi,t-\tau}) - E(X_{fi,t-\tau}))'\beta_f + E(X_{fi,t-\tau})'(\beta_m - \beta_f) + (E(X_{mi,t-\tau}) - E(X_{fi,t-\tau}))'(\beta_m - \beta_f)$$

The decomposition is expressed in three parts.

(8) $$D = E + C + I$$

The first part,

(9) $$E = (E(X_{mi,t-\tau}) - E(X_{fi,t-\tau}))'\beta_f$$

captures the component of the differential that is due to characteristic differences between the male and female population, also called the “endowments effect." The second part,

(10) $$C = E(X_{fi,t-\tau})'(\beta_m - \beta_f)$$

measures the part of the differential attributable to behavioral differences measured by the differences in coefficients. Last,

$$I = (E(X_{mi,t-\tau}) - E(X_{fi,t-\tau}))'(\beta_m - \beta_f) \tag{11}$$

is an interaction term which captures the fact that differences in endowments and coefficients exist simultaneously between men and women.

The decomposition described here is formulated from the viewpoint of females. So, the group differences in the predictors are weighted by the coefficients of females to measure the endowments effect (E). The E component measures the expected change in the growth in the propensity for female-owned firms if the female population had the same characteristics as the male population captured by equivalent mean values of the explanatory variables. Similarly, the C component measures the expected change in the growth in the propensity for female-owned firms, if the female population behaved as the male population, and therefore, had the male population's coefficients.

TABLE 2.6. Blinder-Oaxaca Decomposition

	Coef.		Robust SE
Change in the Propensity for Male-Owned Firms	0.0187	***	0.0008
Change in the Propensity for Female-Owned Firms	0.0108	***	0.0006
Difference	0.0079	***	0.0010
Endowments	-0.0579	***	0.0061
Coefficients	0.0171	***	0.0047
Interaction	0.0488	***	0.0076

Notes: Significance at the 1, 5, and 10% level shown by ***, **, and *, respectively.

Table 2.6 reports the mean predictions of the change in the propensity for male- and female-owned firms and the difference in the top panel, while the decomposition is in the bottom panel. In this sample, the mean change in the propensity for male-owned firms is

0.0187 or close to two percentage points. The mean change in the propensity for female-owned firms is 0.0108 or close to one percentage point. The differential of 0.0079 is divided into three components. The largest component, the “endowments effect" shows the importance of characteristic differences between the male and female population. It reflects the adjustment at the mean in the change in the propensity for female-owned firms that we might expect if the female population was characteristically the same as the male population. The decrease of 0.0579 indicates that if the differences in education attainment, family structure, and other explanatory variables were eliminated and the female population was characteristically the same as the male population, the change in the growth of propensity for female-owned firms would actually be much negative. At the mean, the propensity for female-owned firms would have fallen from close to 9.5% in 2002 to just below 4.8% in 2007. The negative change is equivalent to losing over 4000 female-owned firms in the average metropolitan county during the period from 2002 to 2007.

The second term of 0.0171 measures the increase in the growth of the propensity for female-owned firms if coefficients from the male model were applied to the female population's characteristics. Adding the increase of 0.0171 to the actual change in the propensity for female-owned firms of 0.0108, shows that if women behaved as men, the change in the propensity for female-owned firms would be more than twice as high. Under this scenario, the propensity for female-owned firms would have increased from close to 9.5% in 2002 to 12.3% in 2007, at the mean. This implies an additional 1400 female-owned firms in 2007 for the typical county in the sample. The third component is the interaction term that measures the simultaneous effect of differences in endowments and coefficients. In this case, it captures the offsetting effects of the difference in characteristics and the differences coefficients.

The implications of these results are important as they relate to policy. A policy that results in the female population acquiring characteristics more similar to the male population may actually result in an increased gender disparity in business ownership. As long as women behave differently, equalizing characteristics may do little to alleviate the gender disparity in firm ownership. For example, if highly educated women are consistently more likely to enter wage-and-salary employment relative to their male counterparts, increasing the share of highly educated women to match the share of highly educated men will likely only reduce female entrepreneurship.

Rather, a locality interested in increasing the propensity for female-owned firms may be better served by a policy that instead focuses on behavioral differences. The female population does not behave as the male population and policies aimed at increasing the change in the propensity of female-owned firms must recognize the gender-specific behaviors. For example, clearly the populations of men and women who hold a bachelor's degree have the greatest potential for business ownership. Yet, the propensity for college educated males to act in terms of entrepreneurship is roughly twice that for females as indicated by the coefficients shown in Table 2.4 and the impulse responses shown in Table 2.5. A policy that either incentivizes college-educated women to choose entrepreneurship or relaxes the constraints they face could effectively change the behavior of women in a way that increases the propensity for female-owned firms resulting in greater equality in business ownership.

2.8. Future Anlaysis

Recent studies have shown that the risk of self-employment relative to wage-and-salary employment also determines local entrepreneurial activity. To risk-averse populations, the risk associated with self-employment, measured either by income streams or job stability, will

make it a less attractive option (Goetz and Rupasingha, 2009; Low and Weiler, 2012). The gender differences in risk preference are demonstrated by Jianakoplos and Bernasek (1995) in relation to investment. We might also expect different risk preferences between genders in relation to firm ownership. If women are more averse to risk in employment decisions as they are in investment decisions, the risk factor may explain the relatively small share of female-owned firms.

2.9. Conclusion

This study indicates that the determinants of growth in the propensity for male- and female-owned firms are different, particularly with regard to local human capital accumulation. For men, only human capital accumulation at the bachelor's degree level is significant whereas for women all four measures of human capital accumulation are significant to varying degrees. The share of females with a doctorate and the share with only a high school diploma are both negatively related to changes in the propensity for female-owned firms, demonstrating that female-owned firms may not necessarily increase as the female population becomes more educated. The negative effect of large shares of less and very highly educated females combined with the positive effect at the bachelor's and master's degree level, suggests that the relationship between female entrepreneurial activity and human capital accumulation forms an inverted "U." The same relationship is true for men only to the extent that there is a strong positive effect at the college level.

Family structure is also an important determining factor in the growth of male- and female-owned firms. In contrast to some previous studies that suggest that children have a positive relationship to entrepreneurship, our results show that the effect of children per adult has a highly significant negative effect on changes in the propensity for both male- and

female-owned firms. Marriage, however, has no effect on either gender. As far as children do constrain entrepreneurship, enhancing programs and policies that assist with childcare may increase the propensity for both male- and female-owned firms.

The Blinder-Oaxaca decomposition shows that even though the endowment effect is much larger in absolute value, the behavioral differences between men and women are crucial for closing the gender gap in business ownership. If the female population had the same endowments as the male population, the gender gap in the propensity for firm ownership may actually be much wider. Conversely, though the effect is smaller, if women exhibited the same behavior as males but were still characteristically different from men, the increase in the propensity for female-owned firms would be higher, resulting in a narrower gender gap. The decomposition makes clear that policies aimed at enhancing entrepreneurship may affect men and women differently. Any policy would likely have to account for these differences in order to effectively and equitably enhance entrepreneurship.

County Maps

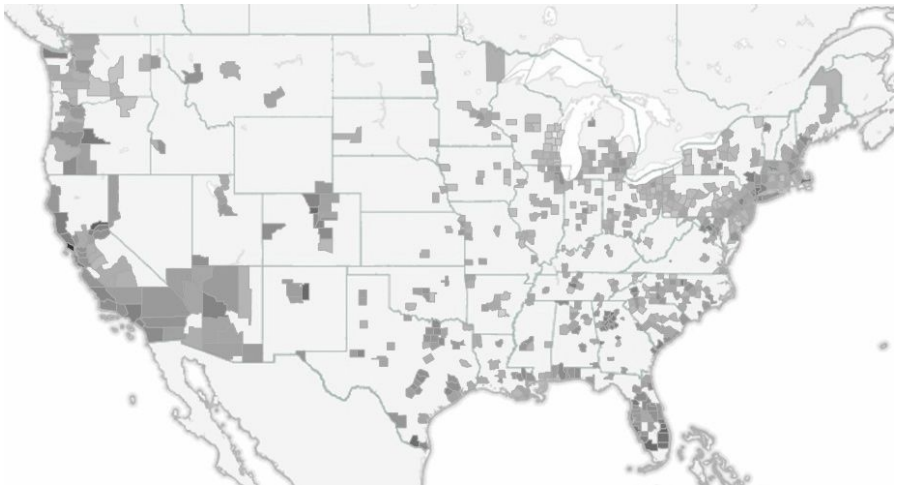

FIGURE 2.4. Propensity for Female-Owned Firms by County 2007

645 Counties included in the Analysis using 2005 Labor Force Estimates

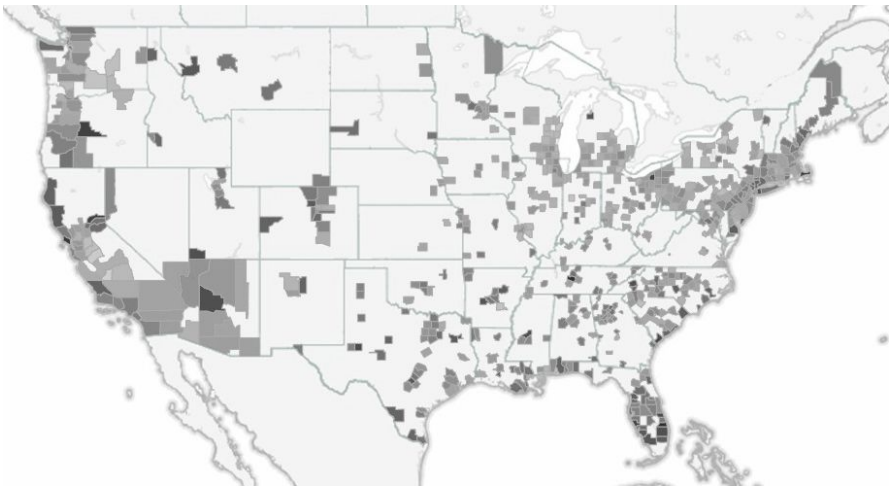

FIGURE 2.5. Propensity for Male-Owned Firms by County 2007

645 Counties included in the Analysis using 2005 Labor Force Estimates

Data Definitions

Table 2.7. Data Sources and Descriptions

Variable	Source	Description
Firms Relative to the Labor Force	Suvey of Business Owners 2002 and 2007, Census 2000, American Community Survey (ACS) 2005 Estimates	The ratio of female-owned (non-female owned) firms to the female (male) labor force
		**Education level determined by highest degree attained*
High School Graduates, as % of male/female adult population	Census 2000, ACS 2005	The ratio of female (male) high school graduates to the female (male) population age 25 or older
College Graduates, as % of male/female adult population	Census 2000, ACS 2005	The ratio of female (male) college graduates to the female (male) population age 25 or older
Persons with MA degree, as % of male/female adult population	Census 2000, ACS 2005	The ratio of female (male) MA graduates to the female (male) population age 25 or older
Persons with Doctorate Degree, as % of male/female adult population	Census 2000, ACS 2005	The ratio of female (male) PhD graduates to the female (male) population age 25 or older
Employment Population Ratio	Census 2000, ACS 2005	
Median Age	Census 2000, ACS 2005	
Proprietor Income Per Job	Bureau of Economic Analysis	The ratio of proprietor income to proprietor employment.
Wage-and-Salary Income Per Job	Bureau of Economic Analysis	The ratio of wage-and-salary disbursements to wage-and-salary employment.
Median Housing Value	Census 2000, ACS 2005	
Owner-Occupied Homes	Census 2000, ACS 2005-2010	
Growth Rate of Income Per Capita	Bureau of Economic Analysis	Growth rate of per capita income for the five year period ending in the year of the measure of firm ownership (i.e. 1997-2002)
Construction Establishments	County Business Patterns	
Service Establishments	County Business Patterns	
Retail Trade Establishments	County Business Patterns	
Natural Amenities Scale	United States Department of Agriculture, Economic Research Service	The natural amenities of a location based are based on topography and climate. A high natural amenity score for a county is associated with warm, sunny winters, low-humidity summers, and mountainous or otherwise scenic terrain.

Table 2.8. OLS Results

Number of Obs=645 R^2=0.2739				Number of obs=645 R^2=0.1738			
Δ Propensity for female-owned firms	Coef.		Robust SE	Δ Propensity for male-owned firms	Coef.		Robust SE
Ratio of Female-Owned Firms to the Female Labor Force, 2002	-0.3486	***	0.0397	Ratio of Male-Owned Firms to the Male Labor Force, 2002	-0.1057	***	0.0255
Female high school graduates, as % of female adult population	-0.0785	***	0.0167	Male high school graduates, as % of female adult population	0.0025		0.0258
Female college graduates, as % of female adult population	0.0771	***	0.0282	Male college graduates, as % of male adult population	0.1536	***	0.0427
Females with MA degree, as % of female adult population	0.0956	*	0.0559	Males with MA degree, as % of male adult population	-0.0592		0.0914
Females with Doctorate Degree, as % of female adult population	-0.7038	***	0.2469	Males with Doctorate Degree, as % of male adult population	-0.0404		0.1082
Median Age	-0.0009	***	0.0003	Median Age	-0.0016	***	0.0005
Female Employment Population Ratio	-0.0847	***	0.0158	Male Employment Population Ratio	-0.0012		0.0210
Married females as a share of the adult female population	0.0041		0.0215	Married males as a share of the adult male population	0.0449		0.0328
Children Per Female over 16	-0.0552	***	0.0125	Children Per Male over 16	-0.0761	***	0.0173
Proprietor Income Per Job	-0.0002	**	0.0001	Proprietor Income Per Job	-0.0001		0.0001
Wage-and-Salary Income Per Job	0.0000		0.0002	Wage-and-Salary Income Per Job	-0.0008	***	0.0002
Median Housing Value	0.0000		0.0000	Median Housing Value	0.0000		0.0000
Owner-Occupied Homes, % of total	0.0153		0.0120	Owner-Occupied Homes, % of total	0.0092		0.0193
Growth Rate of Income Per Capita	0.0001		0.0001	Growth Rate of Income Per Capita	0.0000		0.0002
Service Employment, % of Total	-0.0139		0.0248	Service Employment, % of Total	-0.0175		0.0386
Retail Trade Employment, % of Total	-0.0209		0.0276	Retail Trade Employment, % of Total	-0.0665	*	0.0391
Construction Employment, % of Total	0.0073		0.0314	Construction Employment, % of Total	-0.1173	***	0.0394
Natural Amenities Scale	0.0005		0.0003	Natural Amenities Scale	0.0009	**	0.0005
Constant	0.1615	***	0.0233	Constant	0.1593	***	0.0343

TABLE 2.9. Seemlingly Unrelated Regressions

Δ Propensity for female-owned firms	Coef.		SE	Δ Propensity for male-owned firms	Coef		SE
Ratio Female-owned firms to the female labor force 2002	-0.3723	***	0.0346	Ratio Female Male-owned Firms Relative to the labor force 2002	-0.1199	***	0.0223
Female high school graduates, as % of female adult population	-0.0786	***	0.0169	Male high school graduates, as % of male adult population	0.0082		0.0235
Female college graduates, as % of female adult population	0.0772	***	0.0273	Male college graduates, as % of male adult population	0.1625	***	0.0376
Females with MA degree, as % of female adult population	0.0873	*	0.0529	Males with MA degree, as % of male adult population	-0.0670		0.0826
Females with Doctorate Degree, as % of female adult population	-0.6032	***	0.2127	Males with Doctorate Degree, as % of male adult population	-0.0023		0.1065
Married females as a share of the adult female population	0.0122		0.0198	Married males as a share of the adult male population	0.0438		0.0286
Children Per Female over 16	-0.0533	***	0.0128	Children Per Male over 16	-0.0762	***	0.0147
Female Employment Population Ratio	-0.0826	***	0.0157	Male Employment Population Ratio	-0.0017		0.0176
Median Age	-0.0008	**	0.0003	Median Age	-0.0016	***	0.0004
Proprietor Income Per Job	0.0000	**	0.0001	Proprietor Income Per Job	-0.0001		0.0001
Wage-and-Salary Income Per Job	-0.0001		0.0002	Wage-and-Salary Income Per Job	-0.0006	***	0.0002
Median Housing Value	0.0000		0.0000	Median Housing Value	0.0000		0.0000
Owner-Occupied Homes, % of total	0.0160		0.0122	Owner-Occupied Homes, % of total	0.0133		0.0179
Growth Rate of Income Per Capita	0.0000		0.0001	Per Capita Income Growth	-0.0001		0.0002
Service Establishments, % of Total	-0.0081		0.0242	Service, % of Total	-0.0346		0.0359
Retail Trade Establishments, % of Total	-0.0087		0.0233	Retail Trade, % of Total	-0.0582	*	0.0344
Construction Establishments, % of Total	0.0177		0.0275	Construction, % of Total	-0.1108	***	0.0378
Amenities	0.0006	*	0.0003	Amenities	0.0011	***	0.0004
Constant	0.1478	***	0.0219	Constant	0.1538	***	0.0309

Notes: Significance at the 1, 5, and 10% level shown by ***, **, and *, respectively.

Table 2.10. Seemlingly Unrelated Estimation

Number of obs= 645

Δ Propensity for female-owned firms	Coef.		Robust SEs	Δ Propensity for male-owned firms	Coef.		Robust SEs
Ratio of female-owned firms to the female labor force 2002	-0.3515	***	0.0394	Ratio of male-owned firms to the male labor force 2002	-0.1026	***	0.0253
Female high school graduates, as % of female adult population	-0.0778	***	0.0165	Male high school graduates, as % of male adult population	0.0085		0.0254
Female college graduates, as % of female adult population	0.0734	***	0.0283	Male college graduates, as % of male adult population	0.1599	***	0.0428
Females with MA degree, as % of female adult population	0.0926	*	0.0549	Males with MA degree, as % of male adult population	-0.0850		0.0905
Females with Doctorate Degree, as % of female adult population	-0.6407	***	0.2401	Males with Doctorate Degree, as % of male adult population	-0.0026		0.1056
Married females as a share of the adult female population	0.0111		0.0209	Married males as a share of the adult male population	0.0424		0.0323
Children Per Female over 16	-0.0561	***	0.0124	Children Per Male over 16	-0.0764	***	0.0172
Female Employment Population Ratio	-0.0818	***	0.0158	Male Employment Population Ratio	0.0012		0.0208
Median Age	-0.0009	**	0.0003	Median Age	-0.0017	***	0.0005
Proprietor Income Per Job	0.0000		0.0001	Proprietor Income Per Job	-0.0001		0.0001
Wage-and-Salary Income Per Job	0.0000		0.0002	Wage-and-Salary Income Per Job	-0.0006	***	0.0002
Median Housing Value	0.0000		0.0000	Median Housing Value	0.0000		0.0000
Owner-Occupied Homes, % of total	0.0167		0.0121	Owner-Occupied Homes, % of total	0.0130		0.0192
Growth Rate of Income Per Capita	0.0000		0.0001	Per Capita Income Growth	-0.0001		0.0002
Service Establishments, % of Total	-0.0093		0.0241	Service, % of Total	-0.0253		0.0383
Retail Trade Establishments, % of Total	-0.0084		0.0262	Retail Trade, % of Total	-0.0529		0.0375
Contruction Establishments, % of Total	0.0183		0.0309	Contruction, % of Total	-0.1076	***	0.0394
Amenities	0.0005		0.0003	Amenities	0.0010	**	0.0005
Constant	0.1502	***	0.0225	Constant	0.1473	***	0.0332

Notes: Significance at the 1, 5, and 10% level shown by ***, **, and *, respectively.

Spatial Model. In many studies it may be reasonable to assume independence across the units of observation i. In the case of spatial data samples, this assumption would imply that regions near to each other are no more closely related than those that are far apart. The growing consensus in the regional science literature is that regional economic conditions do exhibit spatial dependence (Goetz and Rupasingha (2009); Low and Weiler (2012)). Effectively, counties are open economies where economic circumstances and changes in one county affect those in neighboring counties. Chinitz (1961) makes the case that the supply of entrepreneurship is a function of society, capital availability, and willingness to bear risk—all of which vary regionally. Reasonably then, the propensity for firms will depend on characteristics of own and adjacent counties, as well as the structure and strength of the spatial connection.

In this sample of counties that is discontinuous across space, the spatial dependence is at least partially unobserved. This aspect of the data conflicts with the motivation of using a spatial model in that spatial dependence is substantive, yet the complete structure of the spatial relationships is unknown to the extent that the missing counties are spatially related to those that are observed. We proceed with the spatial analysis despite these limitations in order to try to capture local spillovers such as those as those in a metro area.

We adopt a flexible spatial model specification that can accommodate the different types of data generating processes, namely the spatial Durbin model (SDM). It is a higher order spatial model that combines the spatial autoregressive model (SAR) and spatial error model (SEM) specification. We can take advantage of the fact that the SDM nests alternative

models and determine whether the model can be simplified to either an SAR or SEM specification. We use STATA routines developed by Shehata (2011) to estimate the following model

$$e_{git,t-\tau} = \rho W e_{gi,t-\tau} + x_{gi,t-\tau}\beta + W x_{gi,t-\tau}\theta + \epsilon_{gi,t-tau} \tag{12}$$

where e is defined as before , and **h**, **f**, and **r** can be summarized by **x**, W is an *nxn* spatial weights matrix, and ρ, β,and θ are parameters to be estimated.

We use a row-standardized inverse distance matrix W calculated using geographic centroids. An inverse distance matrix has intuitive appeal because it implies that the strength of the connection between two counties decays as they get further apart. In the context of this data set, using inverse distance matrix is advantageous because it allows a connection between counties that are near but not contiguous neighbors such as Denver and Larimer Counties in Colorado, but by establishing a distance threshold, it excludes a connection between Larimer County and Yellowstone County in Montana, which would be the case in this dataset if we used a nearest neighbors matrix. The weights considered here are strictly cross-sectional and constant over time.

As suggested by LeSage and Pace (2009), we test for autocorrelation in the SAR model and use a likelihood ratio test to compare the SDM and SEM model. The spatial lag of the dependent variable is significant in the SAR model: z=3.26 and p=0.001. The SDM model of the propensity for female-owned firms does not simplify to SEM: LR=55.5462 and p=0.0000. The spatial lag of the dependent variable is significant in the SAR model: z=2.24 and p=0.025. The SDM model of the propensity for male-owned firms does not simplify to

SEM: LR=18.619 and p=0.0001. Generally, the results are very similar to the non-spatial model. Results are available from the author upon request.

CHAPTER 3

Regional Growth: Employment and Business Ownership by Gender

3.1. Introduction

Economists and policy makers argue that local economic performance depends on the presence and quality of entrepreneurship. The local economic benefits of entrepreneurship have been detailed in a number of studies. Regional analyses have linked entrepreneurial activity to poverty reduction (Rupasingha and Goetz, 2011), income growth (Rupasingha and Goetz, 2011; Stephens and Partridge, 2011), and employment growth ((Acs and Armington, 2004; Acs and Mueller, 2006; Henderson and Weiler, 2009; Rupasingha and Goetz, 2011; Shrestha et al., 2007; Deller and Deller, 2010)). Stephens and Partridge (2011) find that even in isolated rural areas that seemingly lack the economic structure to benefit significantly from entrepreneurs, there are still positive income and employment effects. Further, Henderson and Weiler (2009) find that the relationship between entrepreneurship and employment growth is persistent over time and across space via spillover effects.

Despite the growing number of studies on the relationship of entrepreneurship to growth, there has been little consideration for gender. This research considers the role of male and female business owners in a model of economic growth. The presence and importance of women-owned firms, in particular, has certainly been increasing with women now owning nearly one-third of firms. Yet, at the mean male- and female-owned firms are characteristically different. Male business owners tend to be concentrated in industries with high start-up costs such as construction, manufacturing, and transportation (Coleman and Robb,

2012). They are also more likely to have employees, and earn higher sales (Ibid.). Female business owners tend to be concentrated in industries with relatively low start-up costs such as retail and services, earn much lower sales, and have few employees if any (ibid.). In fact, female-owned firms employ only 4% of non-farm workers. Given the characteristic differences between the typical male- and female-owned business, it is worth considering whether they relate differently to economic performance.

This study builds on a string of endogenous growth models and empirical studies that focus on the role of entrepreneurs. Audretsch and Keilbach (2004) expand on the idea of knowledge spillovers, the hallmark of endogenous growth theory, by arguing that entrepreneurship is the mechanism that translates spillovers into growth. They introduce entrepreneurship capital into the production function alongside physical and human capital. Acs and Armington (2004) view knowledge spillovers as exposing new entrepreneurial opportunities, which ultimately lead to firm births and enhance economic performance. In a formalized growth framework, Braunerhjelm et al. (2010) suggest that entrepreneurs convert new knowledge from R&D activities into economically relevant information. Most recently, in a model distinct from prior knowledge spillover theories, Bunten et al. (2015) focus on how entrepreneurs themselves generate market-based information that enhances growth.

Gender is incorporated into the following model of economic performance model using the densities of male- and female-owned firms. Incorporating gender in this way is based on a literature that is tangential to endogenous growth, namely agglomeration economies. Areas with a higher density of firms feature knowledge spillovers and other advantages that arise when businesses collocate. The firm-level benefits of labor pooling, shared suppliers, and knowledge sharing provide incentive for firms to cluster together. Due to the benefits of

clustering, the birth rate for each industry should increase with the density of firms in each sector of the economy (Krugman, 1991), As the density of firms in an industry increases so can the positive externalities that lead to industrial expansion and local economic growth. Potentially, the economy-wide advantages of clustering include increased employment, innovation, and productivity (Glaeser et al., 1992; Feldman and Audretsch, 1999).

For this analysis, we use the framework and empirical strategy developed by Bunten et al. (2015) to consider the effect of the densities of male- and female-owned businesses on employment growth. The results indicate that counties with initially higher densities of male- and female-owned firms have subsequently lower births as well as lower employment growth. However, when employment growth is disaggregated by gender, the empirical model performs better in explaining employment growth in male-owned firms than in female-owned firms. Further analysis shows that when male- and female-owned firm densities are separated into their employer and non-employer components, only male-owned employer firms have a significant relationship to growth, though still negative. The analysis addresses potential endogeneity by applying an instrumental variable strategy based on the work of Chinitz (1961); Glaeser et al. (2012).

3.2. Motivation and Background

In the process of economic growth, Schumpeter (1934) assigned entrepreneurs their original role of adopting innovations. His depiction of entrepreneurs shows them taking ideas and inventions to market, but not themselves responsible for innovating. Entrepreneurs transformed economies by delivering the next wave of products, services, and businesses. The role of entrepreneurs in implementing innovation is certainly critical for economic progress and

business development, yet thinking of entrepreneurs exclusively in this role does not capture the diverse ways in which they may actually contribute to economic growth.

The role of entrepreneurs in economic growth has been implied, described, and formalized in several different ways. Beginning with Romer (1986), early growth models describe aspects of entrepreneurship but do not explicitly include entrepreneurs. His and the traditional endogenous growth models that followed emphasize investments in new knowledge that lead to technological change and economic growth (Romer, 1990; Aghion and Howitt, 1992). Conceptually, it's easy to suppose entrepreneurs are the individuals who engage in profit-maximizing behavior. They could be innovators investing in new R&D and/or as those bringing innovations to market. Still, the focus in early endogenous growth models is not on entrepreneurs so much as knowledge spillovers.

Knowledge spillovers are an important mechanism underlying early endogenous growth theory, but most models do not fully address how knowledge spreads between firms and individuals. More recent endogenous growth theory has expanded to focus on the mechanisms that translate knowledge spillovers into economic growth, namely entrepreneurship. In their analysis, Audretsch and Keilbach (2004) introduce entrepreneurship capital into production together with physical, human, and knowledge capital. Defined as the legal, institutional, and social factors that are conducive to creating new firms, they argue that entrepreneurship capital is the mechanism by which knowledge spills over making it an important input to economic growth. Acs and Armington (2004) suggest that knowledge spillovers expose and enhance entrepreneurial opportunities that lead to economic growth. Empirically, they use firm births to measure entrepreneurial activity, which corresponds to the spillover externality and has a positive impact on growth.

Braunerhjelm et al. (2010) and Bunten et al. (2015) develop endogenous growth models based on a strong relationship between information and entrepreneurial activity. The former develop a model of growth where knowledge spillovers are realized and contribute to economic performance through entrepreneurship. Entrepreneurs distill knowledge spillovers into economically relevant information. New knowledge that goes unused by an existing firm has the potential for an entrepreneurial opportunity. In their formulation, entrepreneurs exploit current knowledge developed but not commercialized by incumbent firms. As more opportunities present themselves via knowledge spillovers, the capacity for entrepreneurship expands and with it economic growth.

In a similar but distinctive framework, Bunten et al. (2015) see the value of entrepreneurs as their ability to generate market-relevant information. Previous endogenous growth theories tend to focus on explicit investments in R&D as the source of useful knowledge externalities that enhance entrepreneurship, rather than on the information that comes from each entrepreneurial project. Yet, each entrepreneurial opportunity that is pursued, whether it fails or thrives, generates information about the local market. The information generated by each project exposes details about the local economic landscape and accrues to incoming entrepreneurs who are evaluating their next project (Weiler, 2000). The next wave of entrepreneurs will have insight about sustainable market opportunities and successful niches. They will be better informed about consumer demand, supplier networks, and the availability of labor, for example. In this way, the information accumulated from the experiences of previous projects enhances the business activity of future generations of entrepreneurs.

The agglomeration literature also focuses on the importance of shared knowledge and other positive externalities that can be used to understand gender in the context of economic

growth. As described by Cohen and Paul (2010, p. 101), "...factors external to the firm but associated with firm density or clustering increase firm productivity..." These theories suggest that knowledge spillovers accrue to firms located in dense concentrations leading to industrial and regional growth. However, there are several other features of agglomeration that benefit firms and encourage entry including shared suppliers and labor pooling. As stated by Krugman (1991, p. 484), "The concentration of several firms in a single location offers a pooled market for workers with industry-specific skills, ensuring a lower probability of a labor shortage." The advantages of a higher firm density suggest that the start-up rate for each industry sector should increase with the density of firms in each sector of the economy (Armington and Acs 2010). Lowrey (2005) shows that the states with higher business density do tend to have more start-ups.

Through factors that shift firms' production or cost curves, firm density enhances economic growth. Agglomeration leads to growing industries that ultimately benefit the economic performance of their region. In addition to encouraging entry, the economy-wide benefits include more competition, new innovations, as well as increased productivity and employment. Fleming and Goetz (2011) find empirically that there is a positive relationship between the density of small locally owned firms and per capita income growth, suggesting that not only density but the type of ownership matters for growth. Using a 1997 cross section of state data, Lowrey (2005) also finds a positive effect of business density on the level and growth of gross state product. To the extent that we can relax the assumption these advantages are isolated within an industry or assume that there are similar advantages that exist for each gender segment of the economy, higher densities of male and female-owned firms may enhance economic performance.

The benefits of agglomeration, as well as knowledge and information, whether from births or the exchange of ideas between workers, are location-based and can be used to explain variation in local economic performance. A local resident likely has more access to the information that comes from R&D at a nearby firm and the professional insights of her neighbor than does a distant acquaintance. The details of business projects are also specific to a place and market. Demand, supply, and cost all take shape depending on the local context in terms of the natural resources available and the characteristics of consumers, for example. Access to labor pools and supplier networks are also inherently geographic. The spatial quality of the positive externalities described above lead to regional variations in economic growth explored in following sections.

3.3. Theoretical Framework

The following spatial endogenous growth model is borrowed from Bunten et al. (2015). The model stems primarily from two earlier models by Roback et al. (1982) and Stephens et al. (2013). Roback et al. (1982) describes a spatial equilibrium model that determines wages and rents as a function of amenities, which vary across space. Stephens et al. (2013) describe labor market dynamics in the context of an endogenous growth model. The model to follow focuses on location choices based primarily on amenities and labor market conditions for households and factors that affect profitability for firms.

Household migration depends mainly on labor market conditions and local characteristics. Each household will choose their location to maximize utility, which is a function of wages, which depend on human capital, prices of land, housing, and other non-traded goods, employment prospects, amenities, and other local characteristics. All else equal, workers prefer to live in high amenity locations and consequently require a wage premium to work

in low amenity areas (Roback et al., 1982; Graves et al., 2009). In high amenity areas, equilibrium conditions require that rent be relatively high to equalize utility and stabilize labor mobility across locations.

Changes in labor supply arise from utility-maximizing household location decisions. In long-run equilibrium, households' optimal location choices will equalize utility such that no household has incentive to relocate. In the medium-run, changes in the local labor supply will be an increasing function of relative local utility, net of personal and financial moving costs as formalized in (1)

$$\Delta \, Labor \, Supply_i = L_s(U_i - U - M_i) \tag{13}$$

where U_i is the utility from location I, U is utility from a different location and M_i is the amount of moving costs.

The location decision for firms is a function of relative wages and productivity factors. Each firm chooses a location to maximize expected profits, which are a function of local wages, the skill and supply of labor, the availability and cost of non-traded inputs such as land, market access, and productivity. Firms prefer to locate where land and labor are relatively inexpensive but where there is a reasonable source of labor. Land and labor preferences compete against each other, as workers generally prefer to live where there are high amenities, driving up rents.

The location and expansion choices of firms ultimately determine changes in labor demand. Capital is perfectly mobile and, in equilibrium, returns are equal across space such that there is no incentive to move the firm. In the long run, entry and relocation choices

equalize the expected profits across locations for identical firms. In the medium run, changes in local labor demand will be an increasing function of relative profits.

$$\Delta\, Labor\ Demand_i = L_d(\pi_i - \pi) \tag{14}$$

Following Stephens et al. (2013), equations 13 and 14 combine for a reduced-form equation that summarizes labor mobility dynamics. Labor market growth is the result of changes in labor supply and labor demand. The reduced form equation gives employment growth as a function of the factors that influence household utility and those that influence firms' profitability. Amenities, characteristics of the local labor market, as well as access to the social, cultural, and professional advantages available in metropolitan areas enter into household utility and determine labor supply. Firm profitability is sensitive to demand shocks that affect local industries, the skill level of the workforce, and the benefits of agglomeration economies.

$$Employment\,Growth_i = G(A_i,\ B_i,\ D_i,\ MA_i,\ E_i,\ HH_i,\ CC_i,\ M_i,\ F_i) \tag{15}$$

Equation 15 gives the reduced form equation. Employment growth depends on amenities valued by households (A_i), a measure of workforce education (E_i), the share of workers in high human capital occupational (HH_i), as well as those in creative occupations (CO_i), demand shocks (D_i), market access (MA_i), and entrepreneurial projects (B_i). We also include the densities of male-owned business (M_i) and female-owned businesses (F_i), where we focus the analysis.

The choice to include gender by using firm density is based on the literature that explores the extent to which pooled labor markets, supplier networks, and other positive externalities benefit firms and industries culminating in local economic growth. If we can either relax the assumption that these advantages are industry specific, or assume that there are similar advantages that exist for each gender segment of the economy, we can expect economic performance to increase with the densities of male and female-owned firms. Empirically, firm density has been linked both to firm births and growth. (Audretsch and Keilbach, 2004; Armington and Acs, 2002; Fleming and Goetz, 2011; Lowrey, 2005; Bunten et al., 2015). It could be that the advantages of density are channeled primarily through births. For purposes of this analysis the question is whether, controlling for births, firm density has positive effect on economic growth? Further, do the densities of male-owned firms and female-owned firms have equal effects?

If the men and women entrepreneurs contribute to the economy in a way that is consistent with entrepreneurs as a whole, then it is reasonable to expect a positive relationship between their separate entrepreneurial activity and economic performance. These firms likely create jobs both directly and indirectly (Stephens et al., 2013). Net of any displacement effects, jobs created by the firm in addition to those from input linkages and increased local competition should add to total employment. Further, positive externalities such as informational and/or knowledge spillover effects may benefit the immediate geographic region.

However, given the differences in the types of businesses male and female entrepreneurs own, it may be that the effect of the densities male- and female-owned firms are different. To the extent that male-owned firms correspond to businesses that employ many workers and control a large share of productive capital, it is reasonable to expect higher employment

growth in regions with a high density of male-owned firms. Female-owned firms, which tend be concentrated in low capital industries and have few if any employees, may have a weaker effect on employment growth. Regional economies that are relatively concentrated in low capital industries such as retail and services, the very industries that host a large share of women entrepreneurs, are less likely to have high employment growth compared to regional economies concentrated in industries with high earning large-employers such as technology. Thus, one would expect that the density of female-owned firms has a relatively small, if not negative effect on employment growth compared to the density of male-owned firms.

3.3.1. Endogeneity. Including births as an explanatory variable creates the potential for endogeneity. It could be that there are factors that lead to both a higher rate of firm births and employment growth making the causal relationship unclear. Following Chinitz (1961), Glaeser et al. (2012), and Bunten et al. (2015), we take advantage of historical mining as an instrument for firm births. The mining industry is generally characterized by oligopolisitic firms, large-scale production, and high factor prices that are antithetical to an entrepreneurial culture. If the historical presence of mining leads to a equilibrium with low rates of entrepreneurship then mining cannot be treated as exogenous to entrepreneurship. Further, mining is likely only related to future employment growth through entrepreneurship making mining activity an attractive instrument. Our method will use deeply lagged mining employment to instrument for births and address endogeneity.

3.4. Empirical Model and Data

The above reduced form equation can be translated into an empirical model that determines the local rate of employment growth. We regress the employment growth rate on

lags of the explanatory variables as initial conditions have an important role in determining regional growth (Deller et al., 2001). The base empirical model is as follows

$$Employment \quad Growth_i = \beta_0 + \beta_1 * Male - owned\, firms_i + \beta_2 * Female - owned\, firms_i$$

$$+\beta_3 * Births_i + \beta_4 * Creative\, Occupations_i + \beta_5 * High\, Human\, Capital\, Occupations_i$$

$$+\beta_6 * Employment_i + \beta_7 * Income_i + \beta_8 * Demand\, Shock_i + \beta_9 * Distance\, to\, Metro_i$$

$$+\beta_{10} * Density_i + \beta_{11} * Amenities_i$$

where employment growth in county i is a function of county-level economic conditions and characteristics previously discussed.

The control variables are derived from the reduced form model presented in the previous section and earlier literature including Bunten et al. (2015), Stephens et al. (2013), Stephens and Partridge (2011), Acs and Armington (2006), Huang et al. (2002), and Deller et al. (2001). The variables included describe initial economic conditions given by firm births, employment, and income. Specifically, the regressions include the birth rate, natural logs of income and employment, and previous employment growth. The measures of human capital include the share with a bachelor's degree in 2000 as well as the shares in high human capital occupations and in creative occupations. A measure based on the combination of initial county-level industry employment mix and the national-level industry trends proxies for local demand shocks. Additionally, the analysis includes population growth, population density, median age, and the distance from metropolitan areas. To incorporate gender we include the densities of male- and female-owned firms.

TABLE 3.1. Summary Statistics

	Metro Obs=747				Micro Obs=570				All Obs=1317			
Variable	**Mean**	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**
Emp Growth, 2000-2007	13.4499	15.6793	-35.3232	107.0808	5.6172	11.8346	-21.3723	96.3414	10.0599	14.6625	-35.3232	107.0808
Dens Female Firms, 1997	0.0193	0.0052	0.0074	0.0576	0.0176	0.0065	0.0049	0.0593	0.0186	0.0058	0.0049	0.0593
Dens Male Firms, 1997	0.0567	0.0123	0.0195	0.1262	0.0590	0.0173	0.0217	0.1938	0.0577	0.0147	0.0195	0.1938
Birth Rate, 1998	4.4553	1.2705	2.2308	10.4364	4.1156	1.2818	1.1494	11.9582	4.3083	1.2860	1.1494	11.9582
Death Rate, 1998	3.9954	0.9469	1.7035	8.5452	3.9464	1.0197	1.0834	8.7944	3.9742	0.9790	1.0834	8.7944
Dem Shock, 2000-07	5.9211	3.2316	-8.5996	19.7010	4.8413	4.2494	-15.1679	21.9023	5.4537	3.7435	-15.1679	21.9023
Emp Growth, 1990-2000	28.2984	23.9087	-12.2171	251.7026	19.0288	15.3577	-17.0408	96.9485	24.2865	21.1453	-17.0408	251.7026
Log Emp, 2000	11.2465	1.2455	7.6760	15.5126	9.9176	0.6175	7.4616	11.4514	10.6713	1.2158	7.4616	15.5126
Log Income, 2000	10.4023	0.2220	9.7076	11.3859	10.2305	0.1356	9.4032	10.7569	10.3279	0.2077	9.4032	11.3859
Density, 2000	2.5166	6.0608	0.0509	113.5345	0.6389	0.5288	0.0128	3.7911	1.7040	4.6701	0.0128	113.5345
HC Share, 2000	22.2819	6.2540	10.6736	52.9723	16.3400	3.5320	7.4714	29.4754	19.7102	6.0199	7.4714	52.9723
Arts Share, 2000	0.9612	0.4276	0.1362	6.0905	0.7063	0.4064	0.0000	3.4358	0.8509	0.4371	0.0000	6.0905
BA Share, 2000	22.4758	9.1710	5.7514	60.4820	16.2456	6.3605	6.2072	48.3064	19.7794	8.6433	5.7514	60.4820
Pop Growth 1950-1960	0.2877	0.3552	-0.1610	3.7112	0.0795	0.2534	-0.2640	3.4810	0.1976	0.3316	-0.2640	3.7112
Med Age, 2000	35.6190	3.2219	23.3000	54.3000	36.2421	3.8535	20.7000	52.6000	35.8887	3.5214	20.7000	54.3000
Amenity Score	0.3428	2.4432	-5.4000	11.1700	0.1283	2.4077	-5.1800	11.1500	0.2499	2.4293	-5.4000	11.1700
Dist to MSA	0.2610	0.2265	0.0000	1.2933	0.9096	0.5058	0.2354	3.8241	0.5417	0.4930	0.0000	3.8241
Marg Dist MSA $>$ 250k	0.5444	0.7150	0.0000	7.2761	1.3840	1.0637	0.3175	8.6222	0.9078	0.9758	0.0000	8.6222
Marg Dist MSA $>$ 500k	0.8465	0.9171	0.0000	7.3288	1.7431	1.1974	0.3912	8.7156	1.2346	1.1376	0.0000	8.7156
Marg Dist MSA $>$ 1M	1.1539	1.0728	0.0000	7.7291	2.1029	1.3283	0.4793	8.7156	1.5646	1.2793	0.0000	8.7156

The densities of male- and female-owned firms are calculated as the ratio of the number of firms owned by each gender to the population.[5] Business ownership data come from the Survey of Business Owners (SBO), which is administered by the U.S. Census Bureau every five years (specifically, years ending in 2 and 7). The U.S. Census Bureau compiles a list of all nonfarm firms with and without paid employees operating during the year of the survey with receipts greater than $1000 based on tax return data. A sample of those firms is questioned on their employment, payroll, and receipts. The resulting data are reviewed, edited, and tabulated, then made available to the public by geographic area.

The decision to use a firm-based measure to incorporate gender is partly a function of gender-disaggregated data availability but also has intuitive appeal. Firms are the interface between entrepreneurs and job creation. We can think of the density of firms as at least a coarse measure of the economic benefits generated by entrepreneurs of each gender and expect it to have an effect on the local economy. The densities of male-owned and female-owned firms likely have an important role in determining employment growth. Because we are interested in employment, it is likely that the employment power of firms also matters. In addition to testing the density of all male- and female- owned firms, we also disaggregate by each gender the density of employer and non-employer firms.

The data on female-owned firms is the most limiting factor in constructing the dataset. Data from the Survey of Business Owners is withheld for many counties because the estimates do not meet publication standards by having a relative standard error that is too high, for example. Other data is withheld to avoid disclosing information on individual companies. Given the criteria for excluding an observation, there may be certain counties that are

[5]Alternatively, densities are calculated as the ratio of the number of firms owned by each gender to the land area of each county. Those results can be found in the appendix.

systematically absent from the full sample. Rural and sparsely populated counties where there are fewer businesses are more likely missing because of a higher variance in the data and the risk of exposing specific firms. To avoid sample bias, we narrow the analysis to metropolitan and micropolitan counties. As shown in Table 3.1, the densities of male- and female-owned firms are higher on average in metro counties than in micro counties as of 1997. Overall across metro and micro counties there are roughly two female-owned firms for every 100 residents compared to six male-owned firms for every 100 residents.

The establishment data used for the birth and death rate are from the Business Information Tracking Series. We report births and deaths from the period 1998-1999 per thousand employees in Table 3.1. On average the birth rate was 4.3 establishments per 1000 employees and the death rate was nearly 4 establishments per 1000 employees. Both the birth rate and death rate were slightly higher in metro counties. All regressions include the birth rate, and others include the death rate and the product of births and deaths. Including the death rate and product allows us to measure both direct negative effect of firm closure and the indirect but positive information effect, respectively.

The natural log of income 2000, the natural log of employment 2000, and lagged employment growth are constructed using data from the Regional Economic Information System (REIS) by the Bureau of Economic Analysis of the U.S. Department of Commerce. The lag of employment is higher in metro counties as is the employment growth rate and the lag of income.

Human capital is an important determinant of growth in counties (Beeson et al., 2001) and labor market areas (Thompson et al., 2006). The empirical strategy includes three measures of human capital. The first variable measures human capital accumulation from

education with the share of the population having a bachelor's degree. The second and third variables measure human capital specific to certain occupations. The share of workers in high human capital occupations and the share in the artistic occupations are subsets of the creative class as defined by the Economic Research Service of the United States Department of Agriculture (USDA). High human capital occupations include engineers, architects, and other workers engaged in creative thinking. Artistic occupations include fine, performing, and applied artists among others.

Like Partridge et al. (2009) and Bunten et al. (2015), we include industry mix job growth to measure exogenous demand shocks. Derived from the shift-share model, the demand shock D_i is the sum of each county's initial industry shares s_{ij}, multiplied by its respective national growth rate for the period 2000-2007 G_j: $D_i = \sum_j G_j * s_{ji}$. Employment shares are calculated based on employment totals for three-digit NAICS codes using data from the REIS for government employment and County Business Patterns for industries. Suppressed values are estimated using a simplified version of the method described by Isserman (2006).

In densely populated areas, we expect ideas and knowledge flow freely and quickly. Metro counties are much more densely populated than the micropolitan counties as shown in Table 3.1. In a dense urban setting, inputs are easily accessible and complementary services more readily available (Glaeser, 2007). Information is generated faster and can be appropriated more easily by the incoming entrepreneurs. Hence, we include population density as an explanatory variable. Several variables based on the distance to metropolitan areas are also included to measure the potentially beneficial spillovers that radiate out from cities of various sizes. The proximity to urban areas is measured as done by Stephens and Partridge (2011) and the benefits are expected to decline with distance.

In addition to population density, population growth, and the median age of the population are included. Median age is taken from the 2000 Decennial Census. On average, the median age is slightly lower in metropolitan counties. We use population growth from 1950-1960 based on data from the decennial censuses. Generally, metro counties have higher population growth, possibly reflecting the rural exodus during the period (Carsey Institute).

Amenities play an important role in economic growth by attracting both firms and residents (Rappaport, 2007; Deller et al., 2001). Natural amenities are measured using an index constructed by the USDA's Economic Research Service. The measure is a composite of factors including weather and topography. A high natural amenity score for a county is associated with warm, sunny winters, low-humidity summers, and mountainous or otherwise scenic terrain. On average, metropolitan counties are more amenable than micropolitan counties.

The primary analysis uses the non-farm employment growth rate from 2000-2007 as the dependent variable. Using the period from 2000 to 2007 is advantageous first because it allows us to use data from the 2000 Decennial Census, and second, because it matches peak-to-peak with the business cycle. On average employment grew 10% from 2000 to 2007 for this sample of counties. The employment growth rate was more than twice as high at the mean in metro counties compared to micro counties and spans a wider range. In some counties the employment growth rate was close to 100%, but decreased as much as 35% in others.

As alternative dependent variables we also use employment growth in male-owned firms and employment growth in female-owned firms. A large share of employees work for publicly held firms and the government, so by considering employment growth in firms owned by

either gender we test the relevance of the growth model for smaller, gendered segments of the economy.

3.5. Results: Births

First, as an intermediate hypothesis, we test whether the densities of male- and female-owned firms lead to higher births. The regression uses the same list of explanatory variables from the base empirical model above to explain the 2005 birth rate. Higher density accelerates the exchange of ideas and knowledge, enhances supplier networks, and expands the labor pool, creating conditions that encourage future firms to enter the market. We also include firm births from an earlier period as past births generate information about market opportunities that lead to more births in the future Bunten et al. (2015). The results shown in the second, third and fourth columns also include firm deaths and the product of births and deaths in order to capture the positive information effect from deaths but control for the directly negative effect of a closure.

The results in Table 3.2 show that initial densities of both male- and female-owned firms is negative and significant in the first regression. The results persist in the second regression that includes births, deaths, and their product. In the third regression, with state fixed effects, only the density of female-owned firms is negative and significant. Last, with MSA fixed effects, neither the density of male- or female-owned firms is significant. Interestingly, past births and deaths are both positive, consistent with the hypothesis that both firm openings and closures have a positive information effect that leads to more future births.

The negative results for firm densities suggest that controlling for several other factors including births, neither a higher concentration of male-owned firms nor female-owned firms

leads to more subsequent births. An increase of one standard deviation in the density of male-owned firms would correspond to decrease in the birth rate of .12 points. Similarly, a one standard deviation increase in the density of female-owned firms corresponds to a decrease in the birth rate of .09 points. The implication that a county that begins with a greater number of firms relative to the population gains fewer new firms in the future compared to a county with a much lower density makes some intuitive sense but is contrary to the agglomeration literature. It seems that as the market becomes saturated with businesses the opportunities for new firms are few and births decline.

3.6. Results: Employment Growth

The main results are based on the reduced form of the theoretical framework presented previously. The dependent variable is the employment growth rate from 2000-2007. We test the effect of the densities of male- and female-owned firms on subsequent employment growth. Through positive externalities, density can enhance the productive capacity of firms or shift the cost curve in a way that enhances economic growth. Births are also included in the regression and are seen as generating useful market information. The measures of density and births may have separate, positive effects. However, density may simply have a positive causal relationship to births, in which case there may not be a separate positive effect of density once accounting for births.

Similar to the results from the first set of regressions using births as the dependent variable, the results of the simplest regressions in Table 4.5 show that the coefficients on both the densities of male- and female-owned firms are negative. With fixed effects, the coefficient on the density of female-owned firms is insignificant and only weakly significant for male-owned firms. The results from the regression in the first column indicate that, at

TABLE 3.2. Births

Density of Male-Owned Firms, 1997	-8.2308	***	0.0220	***	-2.6706		1.4659	
	(2.5463)		(2.4581)		(2.2533)		(5.3687)	
Density of Female-owned Firms, 1997	-15.4400	***	-15.8955	***	-17.8787	***	-14.5311	
	(5.9631)		(5.9743)		(5.3403)		(12.2246)	
Birth Rate, 1998	0.9554	***	0.7544	***	0.7423	***	0.6524	***
	(0.0319)		(0.0576)		(0.0498)		(0.1042)	
Death Rate, 1998			0.2548	***	0.2539	***	0.3892	***
			(0.0634)		(0.0579)		(0.1148)	
B*D, 1998			0.0413	*	0.0118		0.0224	
			(5.9743)		(5.3403)		(12.2246)	
Demand Shock, 2000-07	-0.0029		-0.0118		-0.0059		-0.0014	
	(0.0086)		(0.0085)		(0.0072)		(0.0213)	
Employment Growth, 1990-2000	0.0090	***	0.0116	***	0.0129	***	0.0112	***
	(0.0021)		(0.0016)		(0.0014)		(0.0027)	
Log Employment, 2000	0.1027	***	0.1162	***	0.0973	***	0.0659	
	(0.0309)		(0.0304)		(0.0264)		(0.0618)	
Log Income, 2000	-0.5685	***	-0.5780	***	-0.2730	*	-0.1752	
	(0.1927)		(0.1783)		(0.1490)		(0.3363)	
Density, 2000	0.0028		0.0023		-0.0041		0.0010	
	(0.0032)		(0.0031)		(0.0027)		(0.0055)	
HC Share, 2000	0.0225		0.0229		0.0310	***	0.0239	
	(0.0159)		(0.0135)		(0.0122)		(0.0296)	
Arts Share, 2000	0.1238		0.1279		0.1135		-0.0672	
	(0.0930)		(0.0901)		(0.0732)		(0.1665)	
BA Share, 2000	-0.0030		-0.0006		-0.0168	**	-0.0130	
	(0.0091)		(0.0083)		(0.0080)		(0.0192)	
Pop Growth 1950-1960	0.0391		0.0025		-0.1159	*	-0.2586	***
	(0.0628)		(0.0737)		(0.0707)		(0.0925)	
Median Age, 2000	0.0246	***	0.0173	*	-0.0066		-0.0073	
	(0.0091)		(0.0094)		(0.0098)		(0.0211)	
Amenity Score	0.0324	***	0.0329	***	0.0167		-0.0358	
	(0.0074)		(0.0081)		(0.0124)		(0.0335)	
Distance to MSA	0.1605	***	0.1826	***	0.1347	**	0.4490	
	(0.0591)		(0.0600)		(0.0600)		(0.8107)	
Marg dist MSA $>$ 250k	0.0096		0.0107		0.0240		-0.3304	
	(0.0561)		(0.0588)		(0.0433)		(0.8642)	
Marg dist MSA $>$ 500k	0.1393	***	0.1408	***	0.0230		0.0315	
	(0.0545)		(0.0565)		(0.0376)		(0.5604)	
Marg dist MSA $>$ 1M	-0.0702	***	-0.0768	***	-0.0358		0.3334	
	(0.0248)		(0.0249)		(0.0240)		(0.4311)	
constant	4.2912	**	4.2758	***				
	(1.8614)		(1.6986)					
N	1317		1317		1317		747	
R^2	0.8334		0.8414		0.8825		0.9475	
F (non-Fes	212.57		185.8					
Counties	Metro & Micro		Metro & Micro		Metro & Micro		Micro	
Fixed Effects	No		No		State		MSA	
Regression	OLS		OLS		OLS		OLS	

Dependent variable is the birth rate in 2005. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

the mean, a one standard deviation increase in the density of male-owned firms corresponds to a 1.6 percentage point decrease in the employment growth rate. Likewise, a one standard

TABLE 3.3. Employment Growth

Density of Male-Owned Firms, 1997	-105.5906	**	-114.1302	***	-174.5269	*
	(43.5572)		(43.3683)		(106.1745)	
Density of Female-owned Firms, 1997	-204.5657	**	-54.0030		-32.2843	
	(89.9959)		(95.5302)		(186.5255)	
Birth Rate, 1998	4.0783	***	3.9691	***	3.3197	***
	(0.4285)		(0.4460)		(0.9798)	
Demand Shock, 2000-07	0.6237	***	0.5684	***	0.2173	
	(0.1527)		(0.1359)		(0.2734)	
Employment Growth, 1990-2000	0.2765	***	0.3009	***	0.2538	***
	(0.0278)		(0.0293)		(0.0537)	
Log Employment, 2000	-0.1444		-0.0888		-2.0454	**
	(0.4870)		(0.4976)		(1.0184)	
Log Income, 2000	-12.0865	***	-13.1059	***	-11.4848	**
	-(12.0865)		(3.4645)		(5.5387)	
Density, 2000	0.1014	**	0.0383		0.0547	
	(0.0432)		(0.0376)		(0.0632)	
HC Share, 2000	0.5861	**	0.4308	**	0.9599	**
	(0.2711)		(0.2228)		(0.4744)	
Arts Share, 2000	0.3902		1.7933	*	1.6320	
	(1.1800)		(1.0538)		(2.1140)	
BA Share, 2000	-0.2118		-0.2425	*	-0.4118	
	(0.1561)		(0.1280)		(0.2757)	
Pop Growth 1950-1960	-0.0955		0.4668		-1.8620	
	(0.7334)		(0.6974)		(1.4713)	
Median Age, 2000	-0.1824		-0.4140	***	0.0365	
	(0.1310)		(0.1337)		(0.3064)	
Amenity Score	0.0695		-0.2971		0.4867	
	(0.1444)		(0.2655)		(0.5341)	
Distance to MSA	-0.1023		0.6071		-3.3711	
	(0.9488)		(0.9343)		(11.5166)	
Marg dist MSA $>$ 250k	0.0144		-1.2943	**	2.8062	
	0.4254		(0.5902)		(14.2155)	
Marg dist MSA $>$ 500k	-0.0729		0.2925		-1.8116	
	(0.3654)		(0.5006)		(15.2970)	
Marg dist MSA $>$ 1M	0.2591		0.3710		2.0494	
	(0.3191)		(0.3998)		(8.9747)	
N	1317		1317		747	
R^2	0.6348		0.7128		0.8492	
F (non-Fes	45.97					
Counties	Metro & Micro		Metro & Micro		Metro	
Fixed Effects	No		State		MSA	
Regression	OLS		OLS		OLS	

Dependent variable is non-farm employment growth 2000-2007. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

deviation increase in the density of female-owned firms corresponds to a 1.2 percentage point decrease in the employment growth rate. The birth rate is positive and strongly significant across all models, a result consistent with Bunten et al. (2015) and Audretsch and Keilbach

(2004). The negative effect of density combined with the positive effect of births, suggest that the primary benefit of density may be through increasing the rate of births.

The negative coefficient on the density of male-owned firms, which is at least weakly significant in all regressions, is comparable to a convergence term. If the density of firms corresponds to higher initial levels of employment, those counties with a higher density and thus a higher level of employment have lower growth in the following period. Even dropping the lagged value of employment growth, which could also be interpreted as a convergence term, the results for the gendered firm density variables remain largely unchanged. [6]

The addition of fixed effects eliminates the significant effects of the density of female-owned firms but not male-owned firms, suggesting that there are unobserved factors that relate to female but not male business ownership. Controlling for these factors with fixed effects addresses the bias that would otherwise lead to incorrect inference about female-owned businesses. It could be that there are specific industry effects that pertain primarily to female-owned firms such as trends in retail or certain services. There may even be gendered lending practices that are inconsequential for male entrepreneurs but relevant for females. Such factors affect employment growth and if not addressed bias the results, exaggerating the role of the density of female-owned firms.

3.6.1. Births and Deaths. Earlier work shows that both births and deaths increase future employment growth (Bunten et al., 2015). The following regressions still use non-farm employment growth from 2000 to 2007 as the dependent variable. The explanatory variables

[6]There is some evidence of non-linearity. Specifications including the density and density-squared for each of male- and female-owned firms generally show that all four variables are significant. The coefficient on the density of female-owned firms is positive, suggesting an inverted U-shape relationship with employment growth. The coefficient on the density of male-owned firms in negative, suggesting a simple U-shape relationship with employment growth. Future research should explore these non-linear relationships in greater detail.

include the density of male- and female-owned firms and the birth rate, as in the previous regression, as well as the death rate, and the interaction between births and deaths.

The results shown in Table 3.4 for the coefficients on the densities of male- and female-owned firms decrease in both magnitude and significance compared to the previous section but are still negative. Only in the basic regression without fixed effects is the density of female-owned firms significant. A one standard deviation increase in the density of female-owned firms corresponds to a 1.1 percentage point decrease in the employment growth rate. The density of male-owned firms is significant and negative in the basic regression and with state fixed effects. The results in the first column indicate that the employment growth would decrease by 1.4 percentage points with a one standard deviation increase in the density of male-owned firms. Unlike previous work the death rate is negative and insignificant with the addition of MSA fixed effects. Once the density of firms owned by each gender is accounted for, counties with a higher rate of firm deaths have lower employment growth.

3.7. Results: Employment Growth in Male- and Female-Owned Firms

Growth in total employment is an important measure of economic performance. While the independent variables considered in this growth model do well to explain total employment growth, it may be that they do not have an equal role in determining in employment in male-owned firms and employment in female-owned firms. Female-owned firms employ relatively few workers and if they are an underutilized resource for economic growth it is worth considering the specific factors that determine their employment. Unfortunately, the geographic data for examining such questions are extremely limited. The summary statistics in Table 3.5 and regression analysis in Tables 3.6 and 3.7 include all available metropolitan and micropolitan counties.

TABLE 3.4. Employment Growth with Births and Deaths

Density of Male-Owned Firms, 1997	-96.5294	**	-110.7982	***	-166.2273	
	(42.1498)		(43.1266)		(105.5341)	
Density of Female-owned Firms, 1997	-195.5429	**	-47.3599		-16.6589	
	(89.4560)		(94.9422)		(192.4915)	
Birth Rate, 1998	5.2667	***	4.8162	***	3.8941	***
	(0.6222)		(0.6199)		(1.3180)	
Death Rate, 1998	-2.0391	***	-1.4985	**	-1.4992	
	(0.6936)		(0.6560)		(1.3893)	
B*D, 1998	0.3340		0.1986		0.2975	
	(0.2561)		(0.2059)		(0.4240)	
Demand Shock, 2000-07	0.6855	***	0.6002	***	0.2381	
	(0.1550)		(0.1370)		(0.2678)	
Employment Growth, 1990-2000	0.2606	***	0.2877	***	0.2472	***
	(0.0284)		(0.0297)		(0.0589)	
Log Employment, 2000	-0.1627		-0.0537		-2.0780	**
	(0.4767)		(0.4903)		(1.0084)	
Log Income, 2000	-12.3357	***	-13.5726	***	-12.8680	**
	(3.7999)		(3.3774)		(5.6447)	
Density, 2000	0.1042	***	0.0465		0.0510	
	(0.0423)		(0.0374)		(0.0652)	
HC Share, 2000	0.6641	**	0.4754	**	0.9804	**
	(0.2774)		(0.2190)		(0.4721)	
Arts Share, 2000	0.2456		1.6565		1.6193	
	(1.1498)		(1.0512)		(2.1394)	
BA Share, 2000	-0.2740	*	-0.2707	**	-0.4303	
	(0.1589)		(0.1246)		(0.2762)	
Pop Growth 1950-1960	-0.1557		0.4547		-1.7271	
	(0.7594)		(0.6946)		(1.4632)	
Median Age, 2000	-0.1735		-0.3805	***	0.0797	
	(0.1290)		(0.1344)		(0.3057)	
Amenity Score	0.1161		-0.2531		0.5768	
	(0.1459)		(0.2596)		(0.5512)	
Distance to MSA	-0.1222		0.6114		-3.2788	
	(0.9358)		(0.9312)		(11.4334)	
Marg dist MSA > 250k	0.0692		-1.2028	**	2.3537	
	(0.4181)		(0.5848)		(14.4149)	
Marg dist MSA > 500k	-0.1076		0.3080		-1.6994	
	(0.3560)		(0.4895)		(15.4276)	
Marg dist MSA > 1M	0.3322		0.3753		1.5722	
	(0.3194)		(0.3931)		(9.0461)	
N	1317		1317		747	
R^2	0.6394		0.7145		0.85	
F (non-FEs)	47.08					
Counties	Metro & Micro		Metro & Micro		Metro	
Fixed Effects	No		State		MSA	
Regression	OLS		OLS		OLS	

Dependent variable is non-farm employment growth 2000-2007. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

Table 3.5 shows that the majority of employment is in male-owned firms. Male business owners employ well over 50% of non-farm workers on average across the counties available. Women business owners employed just 3.9% of workers in 2007, down slightly from 2002.

TABLE 3.5. Employment Summary Statistics in Male- and Female-Owned Firms

Variable	Obs	Mean	Std. Dev.	Min	Max
Share emp in male-owned firms, 2002	912	0.5837	0.1145	0.1995	1.6733
Share emp in male-owned firms, 2007	1094	0.5584	0.1175	0.1080	0.9756
Emp growth in male-owned firms, 2002-2007	827	6.8017	0.1490	-0.9599	0.8467
Share emp in female-owned firms, 2002	912	0.0419	0.0159	0.0050	0.1440
Share emp in female-owned firms, 2007	1099	0.0389	0.0165	0.0045	0.1785
Emp growth in female-owned firms, 2002-2007	829	4.0425	0.4442	-2.5190	2.0652

The shares in employment are calculated using total non-farm employment from the *Regional Economic Information System* of the Bureau of Census. Shares do not sum to 100% because some employees do not work in male-or female-owned firms and may be employees of publicly held firms, for example.

Either publicly held firms or government entities employ the remaining share of workers. On average, the employment in male-owned firms grew nearly 7% from 2002 to 2007. In female-owned firms, employment grew 4% during the same period.

The following models explain employment growth in male-owned firms and female-owned firms, shown in Tables 3.6 and 3.7 respectively. The models use the more parsimonious list of independent variables that include the density of firms owned by each gender and births, but not deaths or their product. See the appendix for results that exclude the gendered variables, using only the most basic specification.

First looking at employment growth in male-owned firms, the R^2 is relatively low compared to earlier specifications. The density of male-owned firms has no effect on employment in male-owned firms, but the density of female-owned firms has a significant effect except with MSA fixed effects. If the density of female-owned firms increased by 6 firms per 1000 people (.006), roughly one standard deviation, the employment growth rate in male-owned firms would fall by 2.5 percentage points at the mean. On average, recall employment in male-owned firms grew just 6%, so the effect of female-owned firms is relatively large.

Table 3.7 shows that this specification does little to explain employment growth in female-owned firms. The coefficient on the density of male-owned firms is negative and significant

TABLE 3.6. Employment Growth in Male-Owned Firms

Density of Male-Owned Firms, 1997	-29.2735		18.9997		-78.7692	
	(64.4711)		(60.1457)		(155.3564)	
Density of Female-owned Firms, 1997	-424.5784	***	-311.1291	**	-308.7928	
	(161.1047)		(157.6778)		(321.1045)	
Birth Rate, 1998	1.3323	**	1.1604	*	-0.5373	
	(0.6870)		(0.6859)		(1.8394)	
Demand Shock, 2000-07	0.4733	**	0.5740	***	0.2420	
	(0.1994)		(0.1918)		(0.4262)	
Employment Growth, 1990-2000	0.2145	***	0.2200	***	0.2163	***
	(0.0308)		(0.0328)		(0.0777)	
Log Employment, 2000	0.6051		0.1311		-0.4372	
	(0.6728)		(0.5641)		(1.5142)	
Log Income, 2000	-17.6506	***	-12.1447	***	-16.2853	*
	(4.6049)		(4.6566)		(9.7408)	
Density, 2000	0.1458	**	0.0466		0.1472	
	(0.0733)		(0.0548)		(0.1119)	
HC Share, 2000	0.8510	***	0.8780	***	0.6427	
	(0.3270)		(0.3359)		(0.6991)	
Arts Share, 2000	0.0825		1.1379		0.4235	
	(2.1558)		(1.5309)		(3.8983)	
BA Share, 2000	-0.2635		-0.4876	***	-0.1010	
	(0.2087)		(0.1880)		(0.3892)	
Pop Growth 1950-1960	-1.5863		-1.7187		-3.5511	
	(1.1175)		(1.3720)		(3.1626)	
Median Age, 2000	-0.0875		-0.4752		0.4928	
	(0.2247)		(0.2327)		(0.7407)	
Amenity Score	0.5876	***	0.0918		0.0558	
	(0.2012)		(0.3234)		(0.8391)	
Distance to MSA	-1.5112		-1.5073		-14.8720	
	(1.4474)		(1.5040)		(27.3013)	
Marg dist MSA $>$ 250k	0.7806		1.2640		43.1392	
	(0.8618)		(1.0531)		(28.0973)	
Marg dist MSA $>$ 500k	1.0944		0.3182		-30.1246	*
	(0.8656)		(1.0452)		(17.6373)	
Marg dist MSA $>$ 1M	0.0721		0.3970		7.7295	
	(0.5788)		(0.7986)		(8.9542)	
N	827		827		589	
R^2	0.3728		0.4955		0.7631	
F (Non-FEs)	17.64					
Counties	Metro & Micro		Metro & Micro		Metro	
Fixed Effects	No		MSA		State	
Regression	OLS		OLS		OLS	

Dependent variable is employment growth in male-owned firms 2002-2007. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

but only in the model without any fixed effects. The results from the first column indicate that if the density of male-owned firms increased by 15 firms per 1000 people (.015), roughly one standard deviation, the employment growth rate in female-owned firms would fall by

TABLE 3.7. Employment Growth in Female-Owned Firms

Density of Male-Owned Firms, 1997	-305.1433	**	-265.8817		-66.3406
	(138.3433)		(166.5761)		(425.0284)
Density of Female-owned Firms, 1997	194.1208		260.6104		-185.9421
	(411.6295)		(478.3659)		(972.5956)
Birth Rate, 1998	1.7346		0.1960		-0.1406
	(1.5641)		(2.1000)		(4.2162)
Demand Shock, 2000-07	0.2174		0.8774		1.0111
	(0.5066)		(0.5784)		(1.2592)
Employment Growth, 1990-2000	0.2797	***	0.3475	***	0.2316
	(0.0741)		(0.0996)		(0.1508)
Log Employment, 2000	2.2993		2.6198		1.7141
	(1.5625)		(1.9079)		(3.3902)
Log Income, 2000	-12.7626		-15.1882		-14.8785
	(10.3164)		(11.8231)		(21.3751)
Density, 2000	-0.2174	*	-0.2216		0.0636
	(0.1252)		(0.1482)		(0.2925)
HC Share, 2000	0.8751		1.2916		2.4232
	(0.7190)		(0.8816)		(1.7255)
Arts Share, 2000	5.7752		5.1472		-1.6440
	(3.5643)		(4.0224)		(9.0760)
BA Share, 2000	-0.5204		-1.0026	*	-1.5399
	(0.4518)		(0.5376)		(1.0538)
Pop Growth 1950-1960	-0.3874		1.7584		0.9552
	(2.2166)		(2.5419)		(5.5962)
Median Age, 2000	0.8484		0.7399		1.2306
	(0.5750)		(0.6747)		(1.9007)
Amenity Score	-0.6086		0.8829		0.4567
	(0.4660)		(1.3295)		(2.5240)
Distance to MSA	4.3811		4.8646		2.0749
	(4.1762)		(4.8802)		(63.3910)
Marg dist MSA $>$ 250k	3.9909	*	-0.1340		-38.9391
	(2.3636)		(3.2835)		(83.5431)
Marg dist MSA $>$ 500k	-2.6094		-1.6410		47.8531
	(2.0394)		(2.5876)		(80.3968)
Marg dist MSA $>$ 1M	0.4809		-0.4645		-12.5162
	(1.3728)		(1.8852)		(49.9275)
N	829		829		591
R^2	0.0828		0.1326		0.6354
F (Non-FEs)	6.49				
Counties	Metro & Micro		Metro & Micro		Metro
Fixed Effects	No		State		MSA
Regression	OLS		OLS		OLS

Dependent variable is employment growth in female-owned firms 2002-2007. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

four tenths of a percentage point at the mean. With MSA fixed effects, no explanatory variable is significant at the 10% level or better.

Though the results must be interpreted with caution given the limited set of observations, the model performs much better when focused on employment growth in male- rather than

female-owned firms. This suggests that much of the existing knowledge of factors that drive regional employment growth pertains to employment in male-owned and publicly held firms, but not female-owned firms. Given that the current levels of employment in female-owned firms are very low, a better understanding of the driving factors could lead to employment growth in these firms and in total.

3.8. Results: Employer and Non-Employer Firms

It is important to consider whether business owners create jobs only for themselves or generate larger economic impacts by creating new wage-and-salary jobs. Though the majority of firms in the U.S. are non-employers, sole-proprietorships with no paid employees, the focus is often on quickly growing, large employers known as "gazelles". Policy discussions and development strategies often discount the role of non-employer firms. Intuitively, it is easy to see how non-employer firms might be the result of necessity entrepreneurship and thus contribute less to economic performance. If new businesses are motivated by weak job prospects in the traditional wage-and-salary employment, then they will not likely generate many jobs (Stephens and Partridge, 2011; Low and Weiler, 2012). Still, non-employer firms comprise a large and growing share of U.S. businesses and these firms may eventually graduate into having paid employees (Weiler et al., 2013). The next stage of analysis resumes using total employment growth as the dependent variable and separates the density of male- and female-owned firms into their respective employer and non-employer components.

Table 3.8 compares the characteristics of male- and female-owned firms by employer status in 1997. As discussed previously, the overall density of female-owned firms is roughly one-third of that for males. However, the table also shows that the majority of firms are non-employers and exposes significant gender differences. Across our sample of U.S. metro

TABLE 3.8. Employer Status Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Density of female-owned firms	1317	0.0186	0.0058	0.0049	0.0593
Density of female-owned nonemployer firms	1317	0.0156	0.0051	0.0038	0.0503
Density of female employer firms	1317	0.0030	0.0015	0.0002	0.0130
Employees Per Employer Firm	1317	7.8817	4.5748	0.5929	65.1926
Density of male-owned firms	1317	0.0577	0.0147	0.0195	0.1938
Density of male-owned nonemployer firms	1317	0.0396	0.0109	0.0124	0.1147
Density of male employer firms	1317	0.0181	0.0053	0.0066	0.0791
Employees Per Employer Firm	1317	16.7966	5.1084	3.2370	42.9956

and micro counties, on average 84% of female-owned firms are non-employers compared to 69% of male-owned firms. At the maximum, nearly all (98%) female-owned firms are non-employers, compared to 88% of male-owned firms. The density of male-owned non-employer firms is two and a half times the density of female owned non-employer firms, the density of male-owned employer firms is six times the density of female-owned employer firms, and last, the average size of a male-owned employer firm is more than twice the size of a female-owned employer firms. In 1997, the typical female-owned employer firm had 8 part- or full-time employees while the typical male-owned employer firm had 17 part- or full-time workers.

The large differences between male- and female-owned firms by employer status warrant further analysis. By decomposing the measures of male and female business ownership into their employer and non-employer components, we can at least take initial steps towards understanding how different types of business relate to employment growth. As pointed out by Stephens et al. (2013), when explaining employment growth it is straightforward to think of entrepreneurs who start job-generating firms as the most important. However, large employers make up a small share of male-owned businesses and an even smaller share of female-owned businesses. Because women tend to have much smaller economic presence, one would expect the marginal effect of an additional female-owned employer firm to be

smaller in absolute value than a male-owned employer firm and similarly for non-employer firms which likely have a small or negative effect in general.

The dependent variable in the models shown in Tables 3.9, 3.10, and 3.11 is employment growth from 2000 to 2007. The independent variables are those common to the previous sections, again excluding deaths as well as the product of births and deaths. Concern for multicollinearity precludes including all three or any combination of the employer, non-employer, or total density of firms in the same equation. See the appendix for results with the full set of explanatory variables.

TABLE 3.9. All Firms

Density of Male-Owned Firms, 1997	-105.5906	**	-114.1302	***	-174.5269	*
	(43.5572)		(43.3683)		(106.1745)	
Density of Female-owned Firms	-204.5657	**	-54.0030		-32.2843	
	(89.9959)		(95.5302)		(186.5255)	
N	1317		1317		747	
R^2	0.6348		0.7128		0.8492	
F (Non-FEs)	45.97		-		-	
Counties	Metro & Micro		Metro & Micro		Metro	
Fixed Effects	No		State		MSA	
Regression	OLS		OLS		OLS	

Dependent variable is non-farm employment growth 2000-2007. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

TABLE 3.10. Employer Firms

Density of Male-Owned Employer Firms, 1997	-513.4298	***	-457.5980	***	-428.4474	**
	(90.8224)		(94.2726)		(203.5664)	
Density of Female-owned Employer Firms	-415.0755		-461.2996		-522.7241	
	(307.1049)		(304.1481)		(706.2050)	
N	1317		1317		747	
R^2	0.6450		.		0.8503	
F (Non-FEs)	45.26		0.7214		-	
Counties	Metro & Micro		Metro & Micro		Metro	
Fixed Effects	No		State		MSA	
Regression	OLS		OLS		OLS	

Dependent variable is non-farm employment growth 2000-2007. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

TABLE 3.11. Non-Employer Firms

Density of Male-Owned Non-employer Firms, 1997	-56.4010		-63.9114	-178.9922
	(58.3352)		(58.2221)	(146.7363)
Density of Female-owned Non-employer Firms	-247.5658	***	-44.0492	-25.5922
	(95.6951)		(99.8212)	(206.7219)
N	1317		1317	747
R^2	0.6296		0.7093	0.8478
F (Non-FEs)	45.97			-
Counties	Metro & Micro		Metro & Micro	Metro
Fixed Effects	No		State	MSA
Regression	OLS		OLS	OLS

Dependent variable is non-farm employment growth 2000-2007. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

Table 3.9 summarizes the familiar results from previous employment growth regressions, showing that the coeffiencients on both the densities of male and female owned firms are negative and significant, but only the coefficient on the density of male-owned firms survives state and MSA fixed effects. Tables 3.10 and 3.11 show the results from disaggregating all firms into employers and non-employers. It does seem that the type of firm entrepreneurs eventually own matters in determining employment growth. Male-owned employer firms have a significant negative impact on subsequent employment growth that persists with fixed effects. Female-owned employer firms, however, have no significant effect on employment growth. Female-owned firms are largely non-employers, but Table 3.11 shows that the densities of non-employer firms do not generally have a significant effect on employment growth. Initially, the density of female-owned firms has a significant and negative effect on employment growth but after controlling for state and MSA fixed effects the variable is no longer significant.

The only gendered variable that is persistently significant across specifications with fixed effects is the density of male-owned employer firms. Perhaps not surprising given that most firms are male-owned and typically employ many more workers. At the mean, increasing

the density of male-owned employer firms by one standard deviation would correspond to a decrease in employment growth of 2.7 percentage points. The negative coefficient is again consistent with a convergence hypothesis, in that counties that begin with a higher initial density of male-owned firms, which are also relatively large employers on average, subsequently experience a lower rate of employment growth.

These results provide some evidence that the type of business matters when relating entrepreneurship to economic growth. There has been little empirical focus given to the employer/non-employer split in the current literature. Consequently, male entrepreneurs who own businesses with many employees may be driving the results and the knowledge we have about the effects of entrepreneurship on economic performance. Further, the insignificant effect of women-owned and non-employer firms should be considered carefully. While it appears that they have little effect on employment growth, there are likely positive economic effects not shown in this study. Haynes (2010) found that households that own a small business were more likely to attain high income and financial security that households overall. It is likely that women business-owners improve their own economic standing and that of their families.

3.9. Instrumental Variable Analysis

Firm births partly explain employment growth, but the potential for forward-looking entrepreneurs to create endogeneity requires further instrumental variable analysis. Without adequate sources of exogenous variation in births, it is impossible to be sure that the effect of births on employment growth actually captures a causal relationship or if there are other factors that lead counties to have higher employment growth and more establishment births. There may be unaccounted for county-level attributes that make both new firms and job

growth more likely. Easily local public policies or regional growth trends, for example, influence births and subsequent employment growth together.

The instrumental variable strategy we adopt is based partly on the work of Chinitz (1961). He argues that the supply of entrepreneurs is a function of culture, tradition, and conditions created by the social structure, all of which depend on past industrial specializations that can be adverse to entrepreneurship. The concentration of large firms in heavy industry such as coal mining, create oligopolistic market structures and large-scale production that crowds out incoming entrepreneurs (Chinitz, 1961). Regions that are home to extractive industries are also characterized by high wages and rents that, though fundamental to the local factor markets, can be an obstacle to an entrepreneurial culture(Graves et al., 2009).

Mining activity is a useful instrument because historical mining employment is likely to only have a relationship to employment growth through entrepreneurship. If the regional economic history features a large extractive industry like mining, which leads to a stable equilibrium with low rates of entrepreneurship, then the historical industry specialization is not exogenous to future entrepreneurship. Glaeser et al. (2012) use proximity to historical mineral and coal deposits in 1900 to instrument for their measure of entrepreneurship. Similarly, in our approach the primary instrumental variable analysis uses historical mining employment data from the 1974 County Business Patterns (CBP). The results in the first column include as instruments the natural log of deeply lagged employment in the mining industry and an indicator for employment greater than 100. The second column results use a larger group of instruments including the two from the simpler IV regression, an indicator for employment greater than 20, deeply lagged population density, the interaction of density with mining, and deeply lagged versions of the share and growth rate of proprietorship. The

model again keeps with the more parsimonious list of explanatory variables that excludes deaths and the product of births and deaths.

TABLE 3.12. IV Results

Density of Male-Owned Firms, 1997	-86.1778		-46.4669	
	(62.3391)		(53.9348)	
Density of Female-owned Firms	-203.5812	**	-201.5672	**
	(89.3169)		(90.7065)	
Birth Rate, 1998	3.4066	**	2.0325	**
	(1.5512)		(1.0506)	
Demand Shock, 2000-07	0.6778	***	0.7885	***
	(0.2110)		(0.1795)	
Employment Growth, 1990-2000	0.2858	***	0.3046	***
	(0.0361)		(0.0333)	
Log Employment, 2000	-0.0998		-0.0086	
	(0.4917)		(0.5005)	
Log Income, 2000	-13.2868	***	-15.7420	***
	(4.4248)		(4.3135)	
Density, 2000	0.1127	***	0.1356	***
	(0.0476)		(0.0464)	
HC Share, 2000	0.6233	***	0.6992	***
	(0.2738)		(0.2587)	
Arts Share, 2000	0.0752		-0.5692	
	(1.3823)		(1.3770)	
BA Share, 2000	-0.2266	*	-0.2569	
	(0.1559)		(0.1493)	
Pop Growth 1950-1960	0.0509		0.3504	
	(0.7885)		(0.8242)	
Median Age, 2000	-0.1442		-0.0661	
	(0.1394)		(0.1431)	
Amenity Score	0.1353		0.2697	
	(0.2036)		(0.1805)	
Distance to MSA	0.0710		0.4255	
	(1.0252)		(0.9783)	
Marg dist MSA $>$ 250k	-0.0252		-0.1062	
	(0.4298)		(0.4409)	
Marg dist MSA $>$ 500k	-0.0422		0.0205	
	(0.3744)		(0.3899)	
Marg dist MSA $>$ 1M	0.1637		-0.0313	
	(0.4152)		(0.3840)	
	test statistic	*p-value*	*test statistic*	*p-value*
Cragg-Donald Wald F	55.831		46.013	
Anderson-Wald F	2.180	0.118	1.610	0.1556
Hansen's J	0.595	0.4405	4.353	0.3604
GMM distance test	0.473	0.4917	3.246	0.0716
N	1317		1317	
R^2	0.6333		0.6206	
F	41.65		44.41	
Counties	Metro & Micro		Metro & Micro	
Fixed Effects	No		No	
Regression	IV		IV (Full)	

Dependent variable is non-farm employment growth 2000-2007. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

The results of the diagnostic tests for endogeneity and instrumentation are mixed. The Cragg-Donald Wald F statistic is the test for weak identification, which arises when an instrument is only weakly correlated with the endogenous regressor. If the instruments are weak, estimators may perform poorly. However, the statistics are 55.831 and 46.013 indicating that the instruments are strong for each of the specifications. Hansen's J statistic tests the endogeneity of the instruments. The test is not significant indicating that the instruments are exogenous to the estimating equation. The GMM distance measure provides the appropriate test for the endogeneity of births. In the first specification, the GMM distance measure does not reject the null hypothesis that the establishment birth rate is exogenous. In the second specification we reject the null only at the 10% level. The Anderson-Wald F test statistic and corresponding weak instrument-robust p-value provide inference for testing the significance of endogenous regressors in the estimated structural equation. We fail to reject the null hypothesis that the coefficient is equal to zero and that the orthogonality conditions are satisfied, indicating that the birth rate is not relevant in contrast to earlier results. The mix of results is ambiguous to the significance of the birth rate and its exogeneity indicating the need to consider a variant of the current specification or different instruments.

Diagnostic ambiguity aside, the results are generally similar to previous regressions. The densities of male- and female-owned firms are still negative, but only female-owned firms are significant. The coefficient for female-owned firms is also similar in magnitude to previous regressions. The coefficient on the birth rate, the endogenous variable, is positive, significant, and similar in magnitude to previous regressions. Still, the question of endogeneity requires further analysis in the future.

3.10. Conclusion

This study provides an initial understanding of how entrepreneur business owners of each gender contribute to local economic growth. The results show that higher firm density has a negative effect on future firm births and employment growth. The first set of results show that density has no additional positive effect on future births when past births are included. This suggests that births may be the main channel through which density leads to more new firms in the future. However, the negative effects of male- and female-owned densities are no longer significant with MSA fixed effects. Similarly, densities of both male- and female-owned firms have a negative and significant effect on employment growth that fades with the addition of fixed effects. The density variables are perhaps behaving as convergence terms in that counties with higher initial densities and associated employment have lower subsequent employment growth.

When employment growth is disaggregated into employment in male- and female-owned firms, the model performs better for employment growth in male-owned firms. The weak results for employment growth in female-owned firms indicate that perhaps the conventional understanding of regional growth is driven primarily by the behavior of male business owners. Consequently, past policies focused on enhancing proprietorship may have been primarily to the benefit of male entrepreneurs. Given the low level of female entrepreneurship and employment in female-owned firms, there is the potential for better utilization of this resource. With the better knowledge of the local factors that drive women entrepreneurs, there is an opportunity for policy adjustments that lead to higher rates of entrepreneurship nationally that are accompanied by higher employment growth.

The results also show, not surprisingly, that employer firms have stronger influence on employment growth than do non-employer firms. After controlling for State and MSA fixed effects only male-owned employer firms have a strong relationship to employment growth. The coefficient is negative as in all other regressions. Given that a large share of employees work in male-owned employer firms, the significant and negative coefficient gives further credence to the idea that the density of male-owned firms serves as a convergence term. Further, the results suggest that to the extent these employer and non-employer firms represent different types of entrepreneurs, it is necessary to consider carefully and specify more precisely studies of entrepreneurship and growth.

Male- and female-owned firms are not evenly distributed across industry, sales or employment, and further analysis that better accounts for these differences is necessary. Controlling for these different characteristics may show that the contributions of women and men entrepreneurs are not so different. The industrial detail may also be important for policy implications. Deskins et al. (2012) argue that that measuring business in aggregate across industries is problematic particularly when policy targeted at a broad swath of firms may impact firms in each industry very differently. Their state-level study shows that the effect of business activity on gross state product varies across industry, demonstrating the need for industry awareness in studies of entrepreneurship.

Overall, the results imply that the relationship between employment growth and male entrepreneurs who start businesses that have employees is far stronger and much better understood than that between employment growth and female-owned businesses. It is important to note that even if it is the case that accounting for industry eliminates differences

between male- and female-owned firms in relation to growth, the gender consideration remains. It leaves the questions of why male and female-owned firms are so different, what if anything should be done to reconcile the wide sales and employment differences or alter industrial concentrations at the regional level, and how those changes might affect local economies.

Table 3.13. Employer Firms Complete Results

Density of Male-Owned Employer Firms, 1997	-513.4298	***	-457.5980	***	-428.4474	**
	(90.8224)		(94.2726)		(203.5664)	
Density of Female-owned Employer Firms	-415.0755		-461.2996		-522.7241	
	(307.1049)		(304.1481)		(706.2050)	
Birth Rate, 1998	3.9646	***	3.7198	***	2.8599	***
	(0.4507)		(0.4404)		(0.9605)	
Demand Shock, 2000-07	0.6682	***	0.6419	***	0.3581	
	(0.1433)		(0.1301)		(0.2653)	
Employment Growth, 1990-2000	0.2744	***	0.2963	***	0.2417	***
	(0.0275)		(0.0291)		(0.0532)	
Log Employment, 2000	-0.4061		-0.2673		-2.0953	**
	(0.4893)		(0.4773)		(1.0141)	
Log Income, 2000	-8.9932	**	-10.7527	***	-9.1882	
	(3.7884)		(3.4617)		(5.6874)	
Density, 2000	0.1083	**	0.0445		0.0486	
	(0.0474)		(0.0403)		(0.0634)	
HC Share, 2000	0.4822	*	0.4248	**	1.1263	**
	(0.2663)		(0.2192)		(0.4820)	
Arts Share, 2000	1.1840		2.8696	***	2.1744	
	(1.0879)		(0.9532)		(2.0589)	
BA Share, 2000	-0.1897		-0.2444	**	-0.5440	**
	(0.1537)		(0.1255)		(0.2639)	
Pop Growth 1950-1960	0.1498		0.6805		-1.7072	
	(0.7114)		(0.6569)		(1.4340)	
Median Age, 2000	-0.1257		-0.3366	***	-0.0576	
	(0.1168)		(0.1245)		(0.2797)	
Amenity Score	-0.0771		-0.3989		0.3333	
	(0.1470)		(0.2601)		(0.5162)	
Distance to MSA	-0.1123		0.8056		-3.7950	
	(0.9088)		(0.9003)		(11.2948)	
Marg dist MSA > 250k	0.0215		-1.0942	**	3.9995	
	(0.3994)		(0.5708)		(13.6411)	
Marg dist MSA > 500k	0.0160		0.2205		-2.1707	
	(0.3630)		(0.5066)		(15.1295)	
Marg dist MSA > 1M	0.5612	*	0.6891	*	3.1131	
	(0.3240)		(0.4088)		(9.0211)	
N	1317		1317		747	
R^2	0.6450		.		0.8503	
F (Non-FEs)	45.26		0.7214		-	
Counties	Metro & Micro		Metro & Micro		Metro	
Fixed Effects	No		State		MSA	
Regression	OLS		OLS		OLS	

Dependent variable is non-farm employment growth 2000-2007. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively.

Table 3.14. Non-employer Firms Complete Results

Density of Male-Owned Non-employer Firms, 1997	-56.4010		-63.9114		-178.9922	
	(58.3352)		(58.2221)		(146.7363)	
Density of Female-owned Non-employer Firms	-247.5658	***	-44.0492		-25.5922	
	(95.6951)		(99.8212)		(206.7219)	
Birth Rate, 1998	3.8621	***	3.7727	***	3.3071	***
	(0.4104)		(0.4406)		(1.0126)	
Demand Shock, 2000-07	0.6355	***	0.5852	***	0.2177	
	(0.1520)		(0.1379)		(0.2845)	
Employment Growth, 1990-2000	0.2711	***	0.2967	***	0.2551	***
	(0.0287)		(0.0293)		(0.0532)	
Log Employment, 2000	-0.0603		-0.0222		-1.9570	**
	(0.4802)		(0.4983)		(1.0119)	
Log Income, 2000	-13.0461	***	-13.9099	***	-13.1092	**
	(3.7848)		(3.4371)		(5.6128)	
Density, 2000	0.1087	***	0.0440		0.0641	
	(0.0413)		(0.0364)		(0.0634)	
HC Share, 2000	0.6275	**	0.4665	**	0.9144	*
	(0.2773)		(0.2244)		(0.4825)	
Arts Share, 2000	-0.6516		0.6288		0.5353	
	(1.1570)		(1.0243)		(1.9900)	
BA Share, 2000	-0.2546		-0.2938	**	-0.3986	
	(0.1568)		(0.1281)		(0.2887)	
Pop Growth 1950-1960	-0.2416		0.1677		-2.2955	
	(0.7572)		(0.7303)		(1.5060)	
Median Age, 2000	-0.2507	**	-0.5158	***	-0.0163	
	(0.1297)		(0.1310)		(0.3151)	
Amenity Score	0.1291		-0.2448		0.5580	
	(0.1443)		(0.2652)		(0.5401)	
Distance to MSA	-0.2996		0.3016		-2.9634	
	(0.9648)		(0.9401)		(11.5566)	
Marg dist MSA $>$ 250k	-0.1636		-1.4183	**	2.7212	
	(0.4267)		(0.5838)		(14.3280)	
Marg dist MSA $>$ 500k	-0.0947		0.2307		-2.2866	
	(0.3640)		(0.4915)		(15.4883)	
Marg dist MSA $>$ 1M	0.1312		0.2567		1.5049	
	(0.3153)		(0.3885)		(9.0682)	
N	1317		1317		747	
R^2	0.6296		0.7093		0.8478	
F (Non-FEs)	45.97				-	
Counties	Metro & Micro		Metro & Micro		Metro	
Fixed Effects	No		State		MSA	
Regression	OLS		OLS		OLS	

Dependent variable is non-farm employment growth 2000-2007. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively.

TABLE 3.15. Employment Growth in Male-Owned Firms (Alternative Specification)

Birth Rate, 1998	0.9574		1.0453		-1.0146	
	(0.6216)		(0.6832)		(1.6475)	
Demand Shock, 2000-07	0.5123	***	0.5905	***	0.3415	
	(0.2004)		(0.2021)		(0.4679)	
Employment Growth, 1990-2000	0.2007	***	0.2169	***	0.2119	***
	(0.0365)		(0.0342)		(0.0789)	
Log Employment, 2000	0.8393		0.3463		-0.3017	
	(0.6433)		(0.5421)		(1.4787)	
Log Income, 2000	-17.8230	***	-12.0605	***	-16.8636	*
	(4.9403)		(4.8539)		(9.1087)	
Density, 2000	0.1686	**	0.0565		0.1702	
	(0.0703)		(0.0567)		(0.1198)	
HC Share, 2000	0.8659	***	0.9050	***	0.6878	
	(0.3398)		(0.3478)		(0.7012)	
Arts Share, 2000	-2.4923		-0.2183		-2.5912	
	(1.5548)		(1.1489)		(2.9678)	
BA Share, 2000	-0.4018	*	-0.5781	***	-0.2373	
	(0.2089)		(0.1882)		(0.4004)	
Pop Growth 1950-1960	-1.8940	*	-1.9684		-4.7856	*
	(1.1544)		(1.3895)		(2.7012)	
Median Age, 2000	-0.2300		-0.6023	***	0.2471	
	(0.2035)		(0.1932)		(0.6539)	
Amenity Score	0.6158	***	0.1584		0.1807	
	(0.2052)		(0.3360)		(0.8543)	
Distance to MSA	-1.5387		-1.4879		-14.4656	
	(1.4749)		(1.5056)		(28.6687)	
Marg dist MSA $>$ 250k	0.3832		1.1966		42.4295	
	(0.8253)		(1.0379)		(29.4904)	
Marg dist MSA $>$ 500k	1.0599		0.3178		-30.1157	*
	(0.8388)		(1.0177)		(17.6652)	
Marg dist MSA $>$ 1M	0.0106		0.4883		7.5819	
	(0.5782)		(0.7976)		(8.9932)	
N	827		827		589	
R^2	0.3601		0.4918		0.7601	
F (Non-FEs)	18.30		-		-	
Counties	Metro & Micro		Metro & Micro		Metro	
Fixed Effects	No		State		MSA	
Regression	OLS		OLS		OLS	

Dependent variable is employment growth male-owned 2002-2007. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively.

TABLE 3.16. Employment Growth in Female-Owned Firms (Alternative Specification)

Birth Rate, 1998	0.6539		-0.6305		-0.4899
	(1.5617)		(2.0582)		(4.0113)
Demand Shock, 2000-07	0.3220		0.9540	*	1.0867
	(0.5078)		(0.5795)		(1.2709)
Employment Growth, 1990-2000	0.2631	***	0.3351	***	0.2284
	(0.0721)		(0.0976)		(0.1492)
Log Employment, 2000	2.4270		2.5558		1.8150
	(1.5001)		(1.8535)		(3.3879)
Log Income, 2000	-15.5893		-17.5171		-15.5042
	(10.5600)		(11.8747)		(20.2252)
Density, 2000	-0.1855		-0.2041		0.0804
	(0.1298)		(0.1508)		(0.2991)
HC Share, 2000	1.0044		1.4395	*	2.4549
	(0.7162)		(0.8821)		(1.7294)
Arts Share, 2000	2.4969		2.6963		-3.7429
	(2.8844)		(2.9529)		(6.9483)
BA Share, 2000	-0.6671		-1.1320	**	-1.6319
	(0.4412)		(0.5076)		(1.0294)
Pop Growth 1950-1960	-0.7284		0.9249		0.0822
	(2.1804)		(2.4592)		(4.8522)
Median Age, 2000	0.6505		0.5306		1.0564
	(0.5520)		(0.6095)		(1.6036)
Amenity Score	-0.4177		0.9776		0.5331
	(0.4590)		(1.3288)		(2.4604)
Distance to MSA	3.6928		3.8712		2.5473
	(4.1390)		(4.7947)		(62.9179)
Marg dist MSA $>$ 250k	3.3083		-0.4214		-39.4399
	(2.3241)		(3.3100)		(82.9403)
Marg dist MSA $>$ 500k	-2.7884		-1.9619		47.6992
	(2.0276)		(2.5795)		(79.5654)
Marg dist MSA $>$ 1M	0.1041		-0.8416		-12.6233
	(1.3808)		(1.8294)		(49.7517)
N	829		829		591
R^2	0.0772		0.1297		0.6351
F (Non-FEs)	5.6		-		-
Counties	Metro & Micro		Metro & Micro		Metro
Fixed Effects	No		No		No
Regression	OLS		OLS		OLS

Dependent variable is employment growth female-owned 2002-2007. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively.

Table 3.17. Births Using Alternative Measure of Density

Birth Rate, 1998	0.0015		0.0018	*	0.0028	**	0.0016	
	(0.0011)		(0.0011)		(0.0012)		(0.0017)	
Deaths, 1998			-0.0054	*	-0.0079	**	-0.0042	
			(0.0030)		(0.0032)		(0.0048)	
B*D			0.7053	***	0.7101	***	0.6302	***
			(0.0551)		(0.0475)		(0.1012)	
Density of Male-Owned Firms, 1997	-0.0049		0.2205	***	0.2293	***	0.3950	***
	(0.0031)		(0.0641)		(0.0546)		(0.1173)	
Density of Female-owned Firms	0.8815	***	0.0446	**	0.0109		0.0314	
	(0.0338)		(0.0232)		(0.0218)		(0.0291)	
Demand Shock, 2000-07	0.0021		-0.0057		-0.0018		-0.0009	
	(0.0087)		(0.0088)		(0.0069)		(0.0210)	
Employment Growth, 1990-2000	0.0088	***	0.0109	***	0.0123	***	0.0109	***
	(0.0020)		(0.0016)		(0.0014)		(0.0029)	
Log Employment, 2000	0.0763	**	0.0980	***	0.0867	***	0.0800	
	(0.0341)		(0.0347)		(0.0268)		(0.0637)	
Log Income, 2000	-0.6268	***	-0.6527	***	-0.3308	**	-0.2345	
	(0.1994)		(0.1911)		(0.1420)		(0.3218)	
Density, 2000	0.0167	***	0.0121	**	0.0000		-0.0035	
	(0.0057)		(0.0054)		(0.0039)		(0.0079)	
HC Share, 2000	0.0362	***	0.0360	***	0.0399	***	0.0244	
	(0.0143)		(0.0124)		(0.0114)		(0.0294)	
Arts Share, 2000	0.0682		0.0370		0.0533		-0.1816	
	(0.0843)		(0.0877)		(0.0681)		(0.1458)	
BA Share, 2000	-0.0193	***	-0.0164	**	-0.0267	**	-0.0134	
	(0.0078)		(0.0072)		(0.0069)		(0.0185)	
Pop Growth 1950-1960	0.0498		0.0037		-0.1350	**	-0.3109	***
	(0.0664)		(0.0761)		(0.0699)		(0.0894)	
Median Age, 2000	0.0164	**	0.0084		-0.0127		-0.0130	
	(0.0085)		(0.0090)		(0.0094)		(0.0204)	
Amenity Score	0.0314	***	0.0353	***	0.0180		-0.0201	
	(0.0080)		(0.0086)		(0.0129)		(0.0342)	
Distance to MSA	0.1419	**	0.1610	***	0.1337	**	0.4829	
	(0.0601)		(0.0619)		(0.0610)		(0.8006)	
Marg dist MSA > 250k	-0.0247		-0.0234		0.0181		-0.3374	
	(0.0523)		(0.0550)		(0.0424)		(0.8617)	
Marg dist MSA > 500k	0.1293	***	0.1325	***	0.0073		0.0480	
	(0.0518)		(0.0534)		(0.0364)		(0.5542)	
Marg dist MSA > 1M	-0.0680	***	-0.0775	***	-0.0293		0.3081	
	(0.0243)		(0.0241)		(0.0234)		(0.4211)	
N	1317		1317		1317		747	
R^2	0.8319		0.8386		0.8826		0.9478	
F (non-Fes	203.47		185.45					
Counties	Metro & Micro		Metro & Micro		Metro & Micro		Micro	
Fixed Effects	No		No		State		MSA	
Regression	OLS		OLS		OLS		OLS	

Dependent variable is birth rate 2005. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Densities of male- and female-owned firms is calculated using land area.

TABLE 3.18. Employment Growth with Alternative Measure of Density

Density of Male-Owned Firms, 1997	-0.0142		-0.0067		-0.0229	
	(0.0257)		(0.0107)		(0.0155)	
Density of Female-owned Firms	0.0425		0.0236		0.0641	
	(0.0683)		(0.0291)		(0.0424)	
Birth Rate, 1998	3.8348	***	3.8232	***	2.9278	***
	(0.4180)		(0.4119)		(0.9847)	
Demand Shock, 2000-07	0.6777	***	0.6092	***	0.3618	
	(0.1387)		(0.1296)		(0.2695)	
Employment Growth, 1990-2000	0.2566	***	0.2883	***	0.2510	***
	(0.0296)		(0.0285)		(0.0531)	
Log Employment, 2000	0.2483		0.2532		-1.9314	*
	(0.5412)		(0.5207)		(1.0060)	
Log Income, 2000	-12.7273	***	-13.9469	***	-13.4761	**
	(3.8171)		(3.3148)		(5.9745)	
Density, 2000	0.0653		-0.0447		0.0532	
	(0.0910)		(0.0610)		(0.0928)	
HC Share, 2000	0.5442	**	0.4263	*	0.9441	*
	(0.2761)		(0.2323)		(0.4937)	
Arts Share, 2000	-2.8592	**	-1.1009		-1.5014	
	(1.3164)		(1.1204)		(1.9836)	
BA Share, 2000	-0.2833	*	-0.2962	**	-0.5003	*
	(0.1592)		(0.1280)		(0.2611)	
Pop Growth 1950-1960	-0.4983		-0.3017		-3.0589	*
	(0.7804)		(0.7730)		(1.6235)	
Median Age, 2000	-0.3584	***	-0.6398	***	-0.2681	
	(0.1167)		(0.1146)		(0.2861)	
Amenity Score	0.1623		-0.1089		0.5541	
	(0.1487)		(0.2561)		(0.5514)	
Distance to MSA	-0.4033		-0.0995		-4.0879	
	(0.9540)		(0.8969)		(11.3051)	
Marg dist MSA $>$ 250k	-0.4703		-1.4625	***	2.6273	
	(0.4064)		(0.5667)		(14.0875)	
Marg dist MSA $>$ 500k	-0.0714		0.2655		-3.6404	
	(0.3665)		(0.4833)		(15.3265)	
Marg dist MSA $>$ 1M	0.0642		0.1195		2.0990	
	(0.3167)		(0.3753)		(9.0377)	
N	1317		1317		747	
R^2	0.6265		0.7101		0.8471	
F (non-Fes	62.45					
Counties	Metro & Micro		Metro & Micro		Metro	
Fixed Effects	No		State		MSA	
Regression	OLS		OLS		OLS	

Dependent variable employment growth 2000-2007. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Densities of male- and female-owned firms is calculated using land area.

CHAPTER 4

The Impact of Small Business Lending: Establishment Births, Employment Growth, and Business Ownership by Gender

4.1. Introduction

Chapter one highlighted some of the regional influences on men and women business owners. The results indicate that human capital is an important factor driving the densities of male and female-owned firms. Likely, men and women also consider the availability of financing. The U.S. Department of Commerce reports that, in 2007, 70% of women business owners and 80% of male business owners utilized some source of start-up capital. After personal and family savings, business loans were the most common source of capital for both men and women (SBA, 2011). Even after start-up, adequate capital is necessary for survival and growth. According to the Small Business Administration 13% of businesses use a loan for start-up financing, and 10% use a business loans for expansion and capital improvements. The numbers are even higher for high-sales firms with close to 28% using loan financing for start-up and another 28% for expansion and improvements (Blank, 2010).

In response to potential credit market failure, several government interventions have been focused on aiding small businesses by increasing the availability of loan financing. Information asymmetries in the market for external financial may lead banks to ration credit resulting in a systematic disadvantage for small businesses. To rectify market inefficiencies, the Small Business Administration (SBA) has the authority to target small business finance with both the 504(c) and 7(a) loan programs, for example. The Community Reinvestment

Act reenforced the obligation of banks allocate funds in their communities, including underserved areas, and further accelerated small business lending. The efficacy of these programs is relatively under-researched. While there is a large literature focused on the importance of capital, the entrepreneurship literature focused on small business lending specifically is relatively sparse. Recent regional studies of the determinants of entrepreneurship typically acknowledge the importance of financing, but are limited empirically. The variables used to capture access to capital are typically a function of local deposits as opposed to the number or volume of small business loans (Goetz and Rupasingha, 2009; Low and Weiler, 2012).

Compared to the regional importance of small business lending for entrepreneurship, even less is known in relation to regional entrepreneurship patterns for each gender. The potential for gendered lending preferences and practices may lead to regional variations in the male- and female-owned firms. Women use small business loans for start-up at half the rate of men and are generally undercapitalized at all stages. Yet, previous studies are inconclusive as to why the discrepancy exists. Women may be systemically disadvantaged by their ability to accumulate wealth and assets that could finance their business or be used as collateral to secure a loan. Women-owned businesses tend to start and stay small and concentrate in low-growth industries, making them less attractive candidates to both bankers and venture capitalists. Women-owned firms may also be more informationally opaque because there are fewer of them and fewer still use formal financing, making them appear as risky loan applicants and reducing their chances for bank financing.

This paper explains county-level variation in births, employment growth, and business ownership by gender in terms of small business banks loans and other community-level characteristics as control variables. Specifically, this study focuses on small business loans

reported under the authority of the Community Reinvestment Act (CRA). In studying the effect of CRA loans on births and economic performance, we consider the long-term effect of small business lending and focus on establishing the appropriate lag structure. The potential for an endogenous relationship between lending and births further requires instrumental variable analysis using shocks to money demand following (Driscoll, 2004). The results indicate that CRA lending per capita has a positive effect on births. The effect on economic performance as measured by employment growth is weakly negative. The gendered analysis shows that CRA lending has no effect on changes in the propensity for either male- or female-owned firms.

4.2. Background and Motivation

The microeconomic literature makes clear the importance of adequate capital in the entrepreneurial process (Evans and Jovanovic, 1989; Evans and Leighton, 1995; Blanchflower and Oswald, 1998; Holtz-Eakin et al., 1994). Yet, there are relatively few studies that focus explicitly on bank loans in either the microeconomic or regional entrepreneurship literatures. Still, the studies that are available give credence to the importance of bank loans as a particular source of capital that affects establishment entry, survival, and expansion, as well as overall economic performance.

4.2.1. Births. Personal resources are most commonly used for start-up capital, which is consistent with the empirical literature that highlights the importance of wealth, income, and inheritance for entrepreneurship (Evans and Jovanovic, 1989; Evans and Leighton, 1995; Blanchflower and Oswald, 1998; Holtz-Eakin et al., 1994). Greater internal means of financing facilitates both the start-up and survival of new business ventures (Holtz-Eakin et al., 1994). Not surprisingly, many would-be entrepreneurs claim the reason they didn't start an

enterprise is precisely because of a lack of capital (Blanchflower and Oswald, 1998). When personal finance is inadequate for startup, entrepreneurs must turn to external financing such as business loans. Behind personal sources of financing, bank loans are the largest source of start-up capital. In 2007, just over 11% of men used a business loan to start their business and 5.5% of women (SBA, 2011).

Yet, studies of lending in relationship to entrepreneurship are rare, particularly those using U.S. data. In their review of the literature, Gu et al. (2008) identifiy only two econometric studies of small business assistance programs that focus on small business lending. Most related to this study, recent work by Rupasingha and Wang (2013) uses panel analysis of lending to measure the effect of CRA loans on births. They analyze births by both establishment and loan size class. Their results show that the entry rate of small businesses increases with higher amounts of CRA loans across loan size categories.

Some evidence of the relationship between lending and firm births exist based on cross-country analysis. Using firm-level data from OECD countries, Aghion et al. (2007) test a stylized model of the entry decision and post-entry expansion. They find that higher financial development enhances new firm entry especially in sectors that rely heavily on external finance and that entry of the smallest firms benefits the most from higher financial development. Studying the European Union, Guiso et al. (2004) find that a greater degree of financial development is positively associated with many indicators of entrepreneurship including entry.

4.2.2. Survival and Growth. Capital does not only have a role in start-up; business survival and growth also require adequate financing. Though the second most common financing strategy after personal sources, relatively few businesses are started with bank loans.

More likely firms seek formal financing from a bank after they have been established and proven viable. Hence, access to bank financing is perhaps more relevant for businesses in later stages as they focus on sustaining themselves and expanding production. The empirical evidence suggests that entrepreneurs with greater personal wealth, measured by an inheritance, are more likely to stay in business (Holtz-Eakin et al., 1994), and conversely, that undercapitalization during the life of the business leads to underperformance (Rosa and Carter, 1998; Marlow and Patton, 2005).

Inadequate or poor quality financing can stifle the growth of new firms and ultimately hurt their chances for survival. When bank loans are inaccessible, businesses may be forced to use short term and more expensive debt such as credit cards. Blanchflower and Evans (2004) found that credit constrained firms, either because they were denied credit or didn't apply for fear of being denied, were more likely to borrow using credit cards. The high risk associated with bootstrap-financing may also prevent firms from pursuing new projects, expanding production, or investing in R&D, all of which may make them less competitive and reduce their chance for survival. Such strategies and associated costs may also leave them vulnerable to shocks in their cash flow, and in turn, put them at a greater risk for failure (Keasey and Watson, 1991).

As evidence of the consequences of inadequate credit, Mach and Wolken (2011), using data from roughly 4,000 firms, find that credit constrained firms were significantly more likely to go out of business than non-constrained firms. Further, they find that even when controlling for a broad list of firm, owner, and market characteristics, credit constraint and credit access variables are among the most important factors for predicting which small firms closed during the period from 2004-2008. In an overview of cross-country studies, Beck

and Demirguc-Kunt (2006) find that financing obstacles are more growth constraining for small firms and prevent all firms from reaching their optimal size. Guiso et al. (2004) find a positive effect of financial development on firm growth. Similarly, Aghion et al. (2007) find that financial development enhances growth of firms located in OECD countries but specifically in sectors that depend more on external finance.

4.2.3. Economic Performance. The ability of potential entrepreneurs to access adequate financing has immediate consequences for their business, and by extension, overall local economic activity. Arguably, adequate finance is important not just because of how critical it is for the success of businesses, but because those businesses create income and jobs benefiting their local communities. So far as we expect access to finance to increase firm entry, survivability, and growth we should also expect corresponding increases in economic performance.

Stiglitz and Weiss (1981) formalize the link between lending and economic performance. They provide the rationale for government intervention through lending by showing that credit market imperfections can result in credit rationing. In their model private lending institutions allocate funds inefficiently as a result of information asymmetries that systematically disadvantage small firms and other informationally opaque businesses. If government-lending programs do reduce rationing in the market for small business loans, then there should be a relationship between measures of government lending and economic performance.

Previous empirical studies that consider the impact of lending on economic performance using U.S. data generally focus on income growth and produce mixed results. Driscoll (2004) completes a state level panel analysis of the effect of changes in bank loan supply on output. He finds that the supply of loans has an insignificant effect on state personal income. In her

state level analysis, Samolyk (1994) uses lagged financial sector conditions to explain income growth. She finds that the health of the local financial sector, measured by the lagged share of non-performing loans, explains more of real income growth in states where loan quality has been poor. She argues that localized information costs suggest that banking-sector problems may constrain economic activity in distressed regions causing a negative effect on income, whereas no such relationship need be evident in financially healthy regions. Most recently, Bassett et al. (2014) use changes in lending standards to measure shifts in the supply of bank loans to businesses and households. They find that adverse credit supply shocks have a significant, negative effect on real GDP and the ability of businesses and households to borrow from banks.

Few studies focus on alternative measures of economic performance such as employment, but those that do generally find a positive or insignificant effect. Most related to this study, Hicks (2004) uses CRA data to determine the effect of CRA loans on employment for West Virginia's 55 counties. He finds that small loans under $100,000 had a positive and significant effect but only for firms in the size class with 5-9 employees. Cortes (2010) does a state-level analysis of SBA loans spanning 1986-2008 that considers several different measures of dependent variables. She finds that SBA lending had no effect on per capita income growth but positive effect on both growth in small firms and the number of workers employed in small firms. Craig et al. (2008) analyze SBA loans from 1991 to 2002 at the county-level and find that the level of SBA lending has a positive and significant effect on the level of annual average employment but only in low-income areas.

4.3. Theoretical Framework and Hypothesis

The theoretical framework that follows extends the model developed in chapter three. Recall that the location decision for firms is a function of relative wages and productivity factors. Each firm chooses a location to maximize expected profits, which are a function of local wages, the skill and supply of labor, as well as the availability and cost of non-traded inputs such as land, market access, and productivity.

Firms also likely consider the relative availability of credit as it varies across locations. Going forward, we relax the assumption that capital is perfectly mobile and incorporate small business loans per capita as a location decision factor. In the long run, entry and relocation choices equalize the expected profits across locations for identical firms. In the medium run, changes in local labor demand will be an increasing function of relative profits as shown in Equation 16, which now depend on lending.

$$\Delta \, Labor \, Demand_i = L_d(\pi_i - \pi) \tag{16}$$

As before, the following reduced form equation summarizes labor mobility dynamics. The reduced form gives employment growth as a function of the factors that influence household utility and those that influence firms' profitability, which now include the availability of credit. Employment growth depends on amenities valued by households (A_i), a measure of workforce education (E_i), the share of workers in high human capital occupational (HH_i), as well as those in creative occupations (CO_i), demand shocks (D_i), market access (MA_i), and entrepreneurial projects (B_i). We also include the value of small business loans per capita (L_i).

$$(17) \qquad Employment\,Growth_i = G(A_i,\, B_i,\, D_i,\, MA_i,\, E_i,\, HH_i,\, CO_i,\, L_i)$$

4.3.1. Hypotheses. Equation 17 implies several hypotheses. In general, we expect to find that loans have a statistically significant and positive effect on economic performance. First, we expect increases in lending to correspond to subsequent increases in the birth rate. With greater access to adequate financing, the decision to start a new business should become more probable. The effect of lending should also extend to the entire life-span of businesses, enhancing both survival and growth. The role of lending in births, survival, and growth should have a cumulative positive effect on the local economy. Hence, our second hypothesis tests the positive effect of lending on employment growth. Third, as an extension of chapter one, we consider whether lending has a different effect on men and women business owners by using loans per capita to explain changes in the propensity for male- and female-owned firms.

4.3.2. Empirical Model. The above reduced form equation can be translated into an empirical model that determines the local rate of employment growth or births, the primary focus of the analyses. We regress the employment growth rate and the birth rate on lags of the explanatory variables including a deep lag of births and other initial conditions such as levels of human capital, income, and employment. To test the effect of lending we include small business loans per capita. The base empirical model is as follows

$$Employment\ Growth_i = \beta_0 + \beta_1 * Lending$$

$$+\beta_2 * Deeply\ Lagged\ Births_i + \beta_3 * Creative\ Occupations_i + \beta_4 * High\ Human\ Capital$$

$$Occupations_i + \beta_5 * Employment_i + \beta_6 * Income_i + \beta_7 * Demand\ Shock_i +$$

$$\beta_8 * Distance\ to\ Metro_i + \beta_9 * Density_i + \beta_{10} * Amenities_i$$

where the employment growth rate in county i is a function of county-level economic conditions and characteristics previously discussed. The empirical analysis is effectively cross-sectional where there is only one observation per county, but with several lags of the lending variable. To address the potential endogeneity between births and lending, we use money demand shocks in an instrumental variable strategy that follows Driscoll (2004) and Rupasingha and Wang (2013).

4.4. Data

The critical lending data for this analysis are loans reported under the Community Reinvestment Act (CRA). It may be best to study the impact of CRA loans using establishment level data in relation to specific loans. However, establishment data including employment dynamics and financing strategies with the necessary geographic detail are not available at this time. This study instead takes advantage of the spatial detail of the CRA lending data and focuses the analysis on U.S. counties.

The data are collected from depository institutions that face mandatory reporting regulations. Under the 1995 revisions to the CRA, the reporting requirements made it possible to analyze trends of the loans reported under the act and the impact on economic performance.

Lending institutions covered by the CRA report the number and value of small business loans. The data are then aggregated into three size categories: $100,000 or less, $100,001-$250,000, and $250,000-$1,000,000. There is no information available on the borrower such as race, gender, ethnicity, education, or income level. The data does not include all small business loans made by commercial banks and other lending institutions as only large banks with assets above a certain threshold ($1.186 billion in recent years) are required to collect and report on their loans. However, there is evidence that CRA data include the majority of small business loans. Bostic and Canner (1998) report that institutions included in the CRA data extended about two-thirds of all small business loans in 1996. Another more recent study reports that 70% of all regulated financial institutions in the U.S. submitted CRA information in 2012.[7]

CRA data is advantageous for spatial analysis because loans are associated with the location of the borrower instead of the lender. This distinction is important because there can be significant differences in both the value and number of loans when identified with the issuing bank versus the receiving business. The location factor also has consequences for how the data is most appropriately used in research. When loans are identified by the location of the bank, data is well suited for measuring local banking activity, but without knowing the location of the businesses that get loans, the data may not accurately measure the accessibility of financing for local businesses. This is particularly problematic when loans are associated with the headquarter offices of large banks, skewing the data toward headquarter

[7]The CRA data is limited to lending by large institutions with assets above a certain threshold, $ 1.186 billion in recent years. As a rough complement to the CRA data, the Federal Reserve system collects data on community banks via quarterly call reports. The definition of a community bank is multifaceted, but generally for purposes of research, these banks are defined as those with less than $1 billion in assets. The June call reports detail the small business lending activity of community banks. Potentially, by marrying the data available from the CRA and call reports, it is possible to roughly determine the sum of small business lending in each county.

locations and away from rural areas. Because the CRA data determines the location of the loans based on the borrower rather than the lender we can more realistically measure the availability of loans for businesses in a particular community. It is also important to reiterate that the CRA data includes only large financial institutions implying that community banks are largely absent from the data. The lack of small bank data and the geographic association with the borrower make the data particularly ill-suited for questions abou local banking activity and local information asymmetries, but particularly good for our purpose of studying available financing (regardless of where it originates) in relation to economic outcomes.

The level of lending over time describes an important condition of the local business climate. It is a measure of the ability of bank-dependent borrowers to obtain external finance. Given a relatively high level of lending we might expect a relatively high level of entrepreneurial activity. Yet, fluctuations in lending activity are perhaps more influential in determining changes in entrepreneurial activity. Entrepreneurs likely anchor their perception of available financing to historical lending levels but respond to relative changes, adjusting their propensity for entrepreneurship. Hence, for this analysis we include discussion of levels but focus on year-over-year changes in CRA loans under $1 million dollars from the period 1999-2007.

This analysis takes advantage of the cross-sectional and longitudinal variation in CRA loans. We built a balanced panel of the lending data covering U.S. counties from 1996 to 2012, but use only the subset from 1999 to 2007 for this analysis. We group all loan size categories into one aggregate measure of loans of $1,000,000 or less. As shown in Figure 4.1, CRA loans per capita increased consistently from 1999 to 2004 decreased slightly in 2005 and

resumed an upward trend thereafter, reaching roughly $1,000 per resident. Annual changes are shown in Figure 4.2.

All other data used for the primary analysis are borrowed from the previous chapters. Descriptions of the data used in the primary analysis can be found in chapter two. Descriptions of the data used for the gendered analysis are available in chapter one. Because the subset of counties varies slightly from the previous chapters, summary statistics for the relevant samples of counties are reported in the appendix.

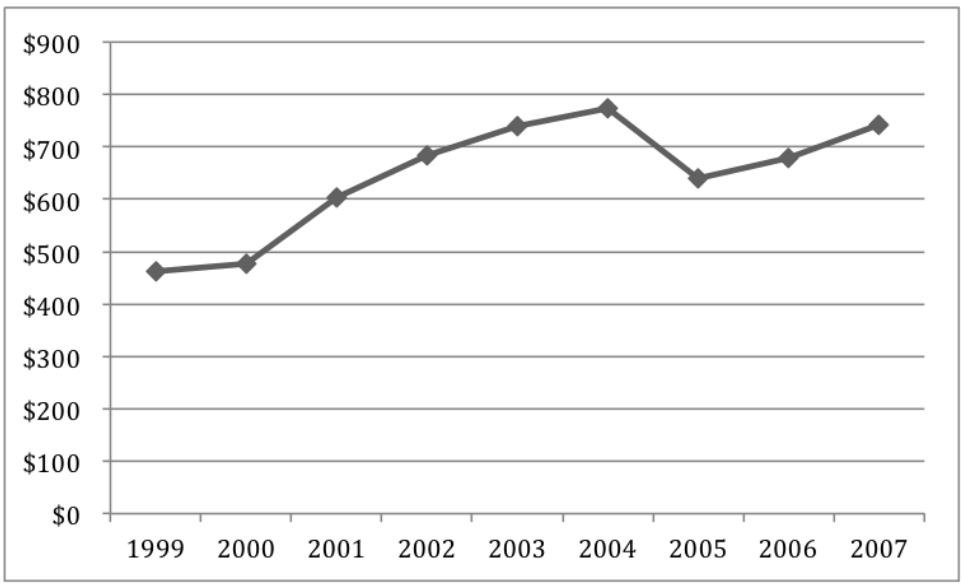

FIGURE 4.1. CRA Loans Per Capita ($ 1 M or less)

4.5. METHODS

Anecdotally, it is evident that the relationship between lending and establishment births is not contemporaneous. Given the time it takes to secure a loan and then eventually start a business, we assume that births respond to changes in lending after some lapse of time. Empirically, we incorporate lags using a dynamic model. A dynamic model considers not only the size of the effect of lending on entrepreneurship but when it has the effect. It could

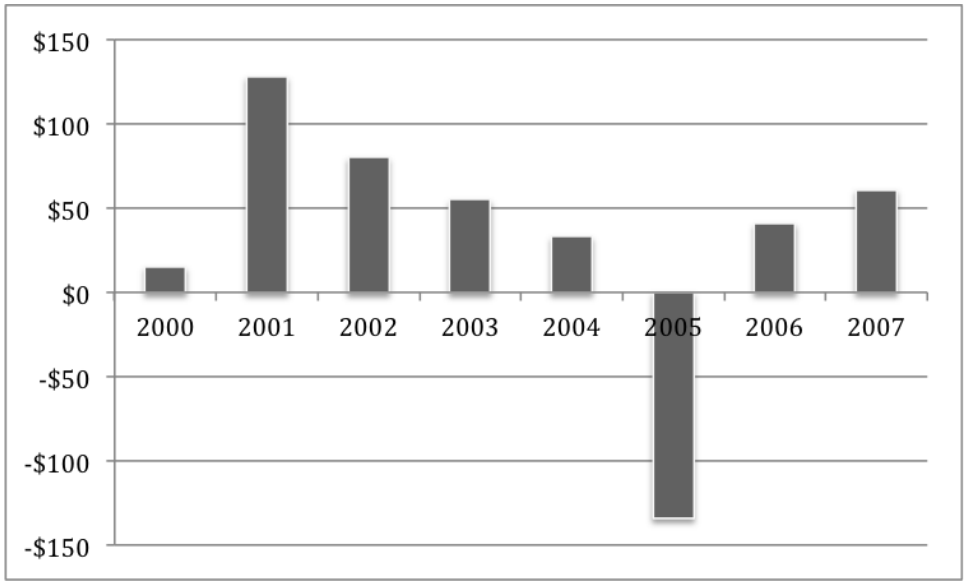

FIGURE 4.2. Annual Change in CRA Loans Per Capita ($1 M or less)

be that lending has a near immediate effect or it may emerge slowly and then dissipate after a few years. In order to establish the temporal relationship, we estimate the lag distribution of entrepreneurship to lending using a finite distributed lag model.

The finite distributed lag model is most appropriate for this study where the lag weights presumably decline to zero quickly. For this study, multicollinearity is the primary disadvantage of the distributed lag model. The level of lending may be highly correlated across the lags, leading to unreliable coefficient estimates with large standard errors. Often when the regressors are strongly correlated, the estimated coefficients on the lag distribution alternate between large and small and/or negative and positive, in which case in may be necessary to restrict the estimated β coefficients resulting in a smoother distribution. However, without theory or any a priori evidence that describes the lag function for loans, restricting the lags would impose an arbitrary structure. Alternatively, we can avoid the multicollinearity by first differencing. For this reason, we choose to estimate the equation using first differences of

the lending variables and not to impose a lag formulation. Hence, we regress the dependent variables on year-over-year changes in lending and the remaining explanatory variables.

Choosing the lag length is the common difficulty of distributed-lag models. Economic theory gives little information about the appropriate lag length for the lending variable, so it is necessary to rely on empirical strategies. As is conventional in dynamic analysis, if q is the appropriate lag length then the specification includes all lags between 0 and q. Including a complete sequence of lags implies that even if the coefficient on a lag between 0 and q is not statistically significant it is still included.

For this analysis, we consider several methods for choosing the appropriate lag length. The most common test relies on statistical tests of significance beginning with a very short lag and successively adding lag terms until the coefficient on the marginal lag is not significant and/or the coefficient of at least one of the variable changes signs. The second test is simply the first test in reverse, beginning with the longest lag and systematically shortening the lag by one period if the longest lag is statistically insignificant. The next set of tests includes the Akaike information criterion (AIC) and the Schwartz/Bayesian information criterion (SBIC). The model with the smallest AIC or SBIC value is the most desirable. Using these tests requires that set of models under consideration all cover exactly the same sample. As there is usually more data available for models with shorter lags. It isn't unusual for the number of observations to vary with the number of lags requiring that we adjust to create a uniform sample.

In the cases where the optimal lag length varies across tests, we choose the most parsimonious of the set. By design of the criterion function, the BIC is more likely than the AIC to choose the most parsimonious model. However, Stock and Watson (2007) recommend

choosing the model suggested by the AIC rather than BIC, arguing that it is better to err on the side of including more parameters than to omit significant parameters. Still, we report the most parsimonious model in the main results with any other relevant specifications available either in the appendix or from the author.

4.6. Establishment Births and Employment Growth

4.6.1. Results: Births. The first method for choosing the correct lag length by beginning with the shortest lag and successively adding lags until the marginal lag is not significant was not informative for this analysis. In most cases, the contemporaneous effect at time t is not significant, suggesting that we should not include any further lags. Yet, given the time it takes to start a business, it may be that there is no contemporaneous effect of lending on establishment births. Rather, the most relevant changes in lending may occur much earlier. We apply the method of beginning with a long lag and successively shorten the distribution until the marginal lag is significant. We also consider the AIC and BIC results to choose the appropriate lag structure.

Table 4.1 shows the results for the lending lags from two different regressions with full results presented in the appendix.[8] The basic regression is shown in the first column and the second column includes state fixed effects. First, without any fixed effects, the results in the first column show that changes in loans per capita as far as three years back have an effect on the birth rate of establishments. The four-year lag is not significant when included and results in a higher AIC and BIC suggesting that the appropriate lag structure includes three lags. The three year lag structure also produces the lowest AIC and BIC scores of specifications including one, two, three, and four lags. With state fixed effects the

[8]The full set of lag structures considered for each specification are available from the author.

appropriate lag structure is also three years. If the AIC and BIC score corresponds to the lowest score of the neighboring lag structures it is reported in bold.

Figure 4.3 shows the coefficients on the lag distribution of changes in lending for all counties. The graphical representation nicely shows the gradient of the lending effect over time. Increases in lending at time *t-1* and *t-2* have the largest effect on births at time *t* with the smallest effect occurring contemporaneously. Specifically, the change in lending that occurred between 2002 and 2003 had the largest effect on the birth rate in 2005. To get a sense of the magnitude, the impulse response for each lag is useful. At the mean, a one standard deviation increase in a contemporaneous (between 2004 and 2005) change in lending corresponds to an increase from 4.68 to 4.78 births per 1,000 employees, based on the coefficient in the second column with state fixed effects. The typical county had roughly 56,000 employees in 2005, so the increase in the birth rate corresponds to approximately six additional births. A one standard deviation increase in the change in lending one period earlier (between 2003 and 2004) corresponds to an increase in the birth rate from 4.68 to 4.77, or five additional establishments in a county with average employment levels. Similarly, the effect of a one standard deviation increase in lending between in the second and third lag is roughly one tenth of a point. The cumulative effect of a static one standard deviation increase across each of the four lags would correspond to an increase from 4.68 to 5.03 births per 1,000 employees, or roughly 20 establishments in a county with typical employment levels.[9]

[9]Often in distributed lag models the cumulative effect of a change in lending L at the *kth* lag is calculated as the sum of coefficients through the kth lag multiplied by the change: $\sum_{k=1}^{K} \beta_k L$. Because of the crosssectional nature of the data, for each k, we multiply the change in year k by the coefficient on only the kth lag, then sum across k: $\sum_{k=1}^{K} \beta_k L_k$.

TABLE 4.1. Births: All Counties

Change Loans t	0.0003	***	0.0004	***
	(0.0001)		(0.0001)	
Change Loans t-1	0.0003	**	0.0004	***
	(0.0001)		(0.0001)	
Change Loans t-2	0.0004	***	0.0005	***
	(0.0001)		(0.0001)	
Change Loans t-3	0.0003	***	0.0002	**
	(0.0001)		(0.0001)	
Counties	All		All	
N	3071		3071	
R^2	0.7815		0.8216	
F	220.63		460.23	
Fixed Effects	No		State	
AIC	**5858.696**		**5329.336**	
BIC	**5985.321**		5739.359	

Dependent variable is the birth rate in 2005. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

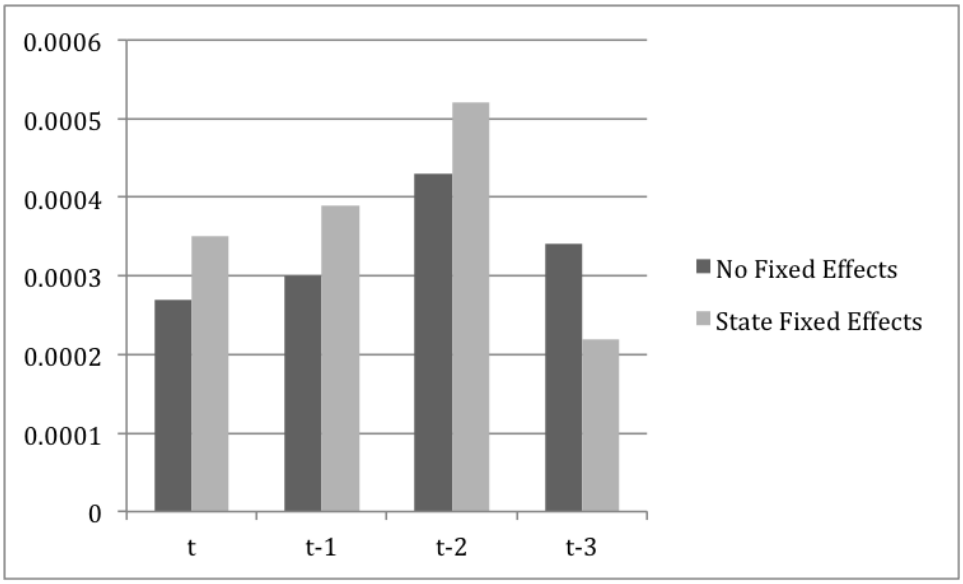

FIGURE 4.3. Births Lag Distribution Coefficients

4.6.2. METRO, MICRO, AND RURAL COUNTIES. The previous results show that changes in lending have a significant effect on the birth rate when all counties are pooled together. For the following analysis we divide the observations into metropolitan, micropolitan, rural subsets and repeat the analysis from the prior section. In tables 4.2, 4.3, and 4.4, the first column shows the results for the basic specification, then with state fixed effects in the second

column. For metropolitan counties we also include a third specification with fixed effects for each metropolitan statistical area (MSA).

The results indicate that the role of lending varies across each subset of counties. The results on the full set of explanatory variables are available in the appendix. The lending results for micropolitan and rural counties are much stronger than for metropolitan counties with and without fixed effects. The lag structure indicates that, in rural counties, increases in lending as far as three years past correspond to higher birth rates. The AIC and BIC also converge on the three year lag structure in both the basic specification and with state fixed effects. As in the first specification with all counties, the strongest effect both in terms of magnitude and statistical significance occur with the one and two year lag. A one standard deviation increase in the two-year lag of the change in lending would cause an increase in the mean rural birth rate from 4.74 to 4.93. Increasing the one-year lag by one standard deviation would result in a similar increase in the birth rate from 4.74 to 4.91. [10]

For micropolitan counties, the lending coefficients are at least weakly significant across all four lending lags in the first specification and produce the lowest AIC score as shown in Table 4.3. The strongest results occur one and two years prior to the measure of the birth rate. Even with state fixed effects the one and two year lending lags are significant at the 95% level and result in the lowest AIC score compared to neighboring lag structures. To get a sense of the size of the effect, increasing the one and two year lag of the change in loans in micropolitan counties each by one standard deviation corresponds to an increase the birth

[10]Rural areas are often include a farming sector not considered in this analysis. As shown by Huang et al. (2002), the farm and nonfarm sectors interact in ways that have economic consequences for both sectors. Future analysis would benefit from considering the role of the farming sector by including farming income, expenses, employment, or value-added, for example.

rate of one tenth of a point for each lag. Cumulatively, the metro birth rate would increase from 4.31 to 4.52 on average.

Isolating metropolitan counties shows weak effects of changes in lending reported in Table 4.2. None of the lending lags are significant in the most basic regression, and with state fixed effects, only the three-year lag is significant. None of the lending variables are significant with MSA fixed effects. Possibly, metro areas benefit from alternative financing that can substitute for bank loans whereas rural areas likely offer fewer options. In that respect, the early 2000s are a unique time period. Keeping in mind that most entrepreneurial capital comes from self-financing, the profusion of home equity loans in metro housing markets featuring bubble growth probably made small business bank loans less interesting for metro-area entrepreneurs. Rural and micropolitan areas had much less appreciation suggesting entrepreneurs in those areas were less able to substitute away from small business bank loans.

TABLE 4.2. Births: Metro Counties

Change Loans t	0.00010	0.00026		0.00006
	(0.0001)	(0.0001)		(0.0003)
Change Loans t-1		0.00012		
		(0.0002)		
Change Loans t-2		0.00035	**	
		(0.0002)		
Fixed Effects	No	State		MSA
N	825	825		825
R^2	0.8548	0.9023		0.9402
F	205.01	.		.
AIC	1128.512	901.5388		704.0938
BIC	1213.389	1222.185		1515.14

Dependent variable is the birth rate in 2005. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

4.6.3. RESULTS: EMPLOYMENT GROWTH. Financing is fundamental to the entrepreneurial process and small business loans are an important component of start-up financing. However, access to financing is just as critical if not more so to the survival and expansion of

Table 4.3. Births: Micropolitan Counties

Change Loans t	0.00021	**	0.00013	
	(0.0001)		(0.0001)	
Change Loans t-1	0.00067	***	0.00045	**
	(0.0002)		(0.0002)	
Change Loans t-2	0.00064	***	0.00051	**
	(0.0003)		(0.0002)	
Change Loans t-3	0.00038	**		
	(0.0002)			
Fixed Effects	No		State	
N	636		636	
R^2	0.7063		0.7615	
F	36.82		.	
AIC	**1585.187**		**1536.771**	
BIC	1678.746		1817.449	

Dependent variable is the birth rate in 2005. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

Table 4.4. Births: Rural Counties

Change Loans t	0.00038	**	0.00029	*
	(0.0002)		(0.0002)	
Change Loans t-1	0.00084	***	0.00068	***
	(0.0002)		(0.0002)	
Change Loans t-2	0.00069	***	0.00073	***
	(0.0002)		(0.0002)	
Change Loans t-3	0.00053	***	0.00031	**
	(0.0002)		(0.0002)	
Fixed Effects	No		State	
N	1610		1610	
R^2	0.6054		0.6459	
F	52.07		.	
AIC	**5206.838**		**5116.409**	
BIC	**5319.902**		**5455.6**	

Dependent variable is the birth rate in 2005. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

Table 4.5. Results: Employment Growth

Change Loans t	-0.00444		-0.00441	
	-(0.0033)		(0.0029)	
Change Loans t-1	-0.00374	***	-0.00252	*
	-(0.0012)		(0.0014)	
Fixed Effects	No		State	
N	861		861	
R^2	0.6434		0.6402	
F	36.07		.	
AIC	5750.61		5560.398	
BIC	5841.014		5855.4	

Dependent variable is the birth rate in 2005. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

firms over time. As far as available credit has an effect across births, survival, and expansion, we also expect a cumulative positive effect on regional employment. The results presented in Table 4.5 use employment growth from 2000-2007 as the dependent variable and the same explanatory variables as the prior section including lags of the lending variable.

Identifying the appropriate lag structure for lending in relation to employment growth across the relatively long period from 2000-2007 is not straightforward, particularly because the CRA lending data is missing so many observations prior to 2000. Data for lending variables are available for only 861 counties, limiting the empirical analysis to mostly metro and micro areas where the results from the previous section suggest that bank loans may have a weaker effect. Despite testing for a variety of lag structures including annual changes during the period from 2000-2007 and annual changes prior to 2000, the coefficients are generally negative and insignificant.

The strongest results are presented in Table 4.5 for lending variables. The one-year lag is the only significant lending variable and only weakly so once accounting for state fixed effects. The effect is negative indicating that increases in lending correspond to lower employment growth during the subsequent period. It seems that once controlling for establishment births, and a number of other regional control variables, the volume of loans per capita have no separate positive effect on employment growth. This could be because firms use the loans to buy equipment that reduces the need for labor. If the capital intensity of production increases and with it employment falls, then there would be a negative effect of lending on employment growth as observed in our results.

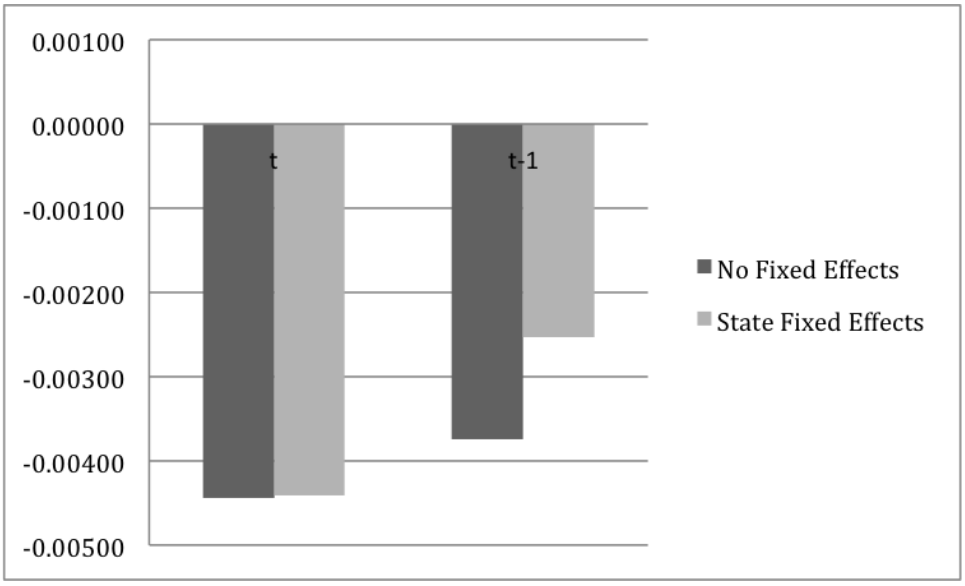

FIGURE 4.4. Employment Growth Lag Distribution Coefficients

4.7. GENDER

Women's accrual of financial capital may be especially limited, at least in part, by implication of their gender (Carter et al., 2001). Women generally earn less and accumulate less savings putting them at a disadvantage to finance their businesses through personal wealth (Marlow and Patton, 2005). Compounded with the fact that women business owners are concentrated in low capital industries, they may not have collateral required to secure a loan (Carter et al., 2001; Cavalluzzo and Wolken, 2005). In addition to having systematically different financial situations, women may exhibit different preferences from men, suffer social disadvantages, and face potentially discriminatory lending practices, all of which warrant analysis of lending by gender. Carter et al. (2001) review the extant literature and find that women-owned firms suffer from undercapitalization at all stages leading to underperformance in comparison to their male counterparts. The systematic disadvantage facing women with respect to financing, may prevent them from realizing their full entrepreneurial potential and contributing to their communities.

Financing strategies depend on the the size, industry, and growth pattern of firms. On average women-owned firms are far smaller than men-owned firms and coed partnerships. Women-owned businesses generate only 4% of sales and only 12% have employees. Of firms that do have employees, those owned by women are half of the size of those owned by men. Typically, small firms are less likely to use bank loans for start-up capital and are too small to attract external equity capital (Coleman and Robb, 2012). These firms are commonly capitalized through internal sources. Indeed, women are more likely than men to use personal or family savings, assets, or credit for start-up capital (SBA, 2011).

In addition to size, the industry in which entrepreneurs start their businesses is tied to their financing strategy. Women are more likely to own businesses in the retail and service industries. Men-owned businesses are more common in construction, manufacturing, and transportation. The industry concentrations of men and women business owners are important because they are related to firms' ability to acquire adequate financing. The industries with higher female representation tend to consist of small firms with few assets that could be used as collateral for loans (Coleman and Robb, 2012). They also have limited growth potential making them less attractive candidates for equity financing (ibid.). However, men-owned firms, which are concentrated in manufacturing, construction, and transportation, tend to be larger and more growth-oriented. They more likely have assets such as vehicles, equipment, and buildings that can be used as collateral for loans, and the growth potential that attracts external equity financing.

Women-owned firms may be more informationally opaque than men-owned firms making them less attractive loan candidates. There is some evidence that women are less likely to establish credibility through a personal bank account or credit history (Marlow and Patton,

2005). Women-owned businesses also tend to be concentrated in the industries that generally require less financing. Consequently, lenders have disproportionately less information about the market and performance of comparable businesses. If it is the case that women-owned firms are at an information disadvantage, then lenders may see their business prospects as more uncertain, making them appear as risky candidates for financing.

Relationship lending, wherein lenders rely on "soft information" that comes from near and personal access to the business owner and their venture can be an important mechanism to overcome information asymmetry. Yet, due to their inferior social and professional networks women may have limited access to relationship lending. Rosenthal and Strange (2012) point out that if women are less networked, then they will benefit less from agglomerated locations. The effect of a weaker network is exaggerated if it impairs relationships with lenders and limits access to credit. As evidence of these network disadvantages, they find that women locate in areas with less overall business activity, less activity in their own industry, and most relevant for this research, less banking activity. It is then possible that credit constraints are more likely to bind for female entrepreneurs. Ammatucci and Sohl (2004) find evidence that women do in fact face more severe credit constraints and review a substantial literature that draws a similar conclusion.

Discrimination in credit markets may also disadvantage women, but the evidence is. Coate and Tennyson (1992) show that a group facing discrimination in the labor market may also face statistical discrimination from lenders. This suggests that if women face discrimination in the competitive labor market that manifests as either a wage discount or a glass ceiling, there will be an echo of statistical discrimination in the credit market making it more difficult to secure a loan and finance a new business. Buttner and Rosen

(1988) providing further evidence of financial adversity for women, find that bank loan officers perceive females as having less endurance and risk-taking propensity than males and successful entrepreneurs. Coleman (2000) shows that controlling for credit worthiness women pay higher interest rates relative to men. However, more recently there is more evidence against discrimination. Blanchard et al. (2005) and Blanchflower et al. (2003) find no evidence of discrimination against women as measured by denial rates and interest rates. Rather,Blanchard et al. (2005) find women actually pay an interest rate discount of nearly one percentage point. Mijid and Bernasek (2013) find that women seem to be rationing themselves in the credit market rather than facing discrimination from banks.

4.7.1. Results: Gender. The following analysis extends the research of chapter 1 by incorporating the changes in small business lending into models of the change in the propensity for male- and female-owned businesses. For each county, the dependent variable is the change between 2002 and 2007 in the ratio of male- (female-) owned businesses to the male (female) labor force. The explanatory variables include a number of characteristics of the male (female) population such as education attainment and the number of children per adult, as well as several characteristics of the county such as the natural amenities, industry shares, and income growth. Tables 4.6 and 4.7 report the results for the lending variables from the female and male equations, respectively. Complete results are reported in the appendix.

Tables 4.6 and 4.7 show that none of the lending variables are significant parsed all the way to the contemporaneous effect. In general, across lag structures the coefficients are negative but insignificant. It seems that increases in lending have no subsequent effect on the propensity for business ownership. Further, these results show that there is no difference

between the effects of lending for each gender, giving at least superficial evidence against gender biases in lending practices.

TABLE 4.6. Results: Change in the Propensity for Female-Owned Firms

Change in Loans t	-0.00001	**	0.00000	0.00001
	(0.0000)		(0.0000)	(0.0000)
N	648		648	553
R^2	0.2322		0.4193	0.78
F	8.05		.	.
Fixed Effect	No		State	Metro
Regression	OLS		OLS	OLS
AIC	-3988.609		-4079.591	-3945.11
BIC	-3899.131		-3788.788	-3491.993

Dependent variable is the birth rate in 2005. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

TABLE 4.7. Results: Change in the Propensity for Male-Owned Firms

Change in Loans t	-0.00001	-0.00002	0.00001
	(0.00001)	(0.00002)	(0.00002)
N	648	648	553
R^2	0.141	0.2839	0.7319
F	3.78	.	.
Fixed Effect	No	State	Metro
Regression	OLS	OLS	OLS
AIC	-3263.688	-3291.654	-3265.719
BIC	-3174.21	-3000.851	-2812.606

Dependent variable is the birth rate in 2005. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

4.8. ENDOGENEITY

The previous analyses show that lending has a strong effect on the establishment birth rate. Yet, concern for endogeneity created by forward looking bankers gives cause for further instrumental variable analysis. Banks may respond to the profit-earning potential of entrepreneurs on the horizon. So, rather than entrepreneurs responding to available credit, the availability of credit responds to the prospect of an increasingly entrepreneurial business climate. Financial institutions may in fact begin lending more in places that have seen an

increase in the establishment births. The instrumental variable strategy we use to address this endogeneity takes an advantage of the relationship between monetary shocks and banks loans.

Similar to Driscoll (2004), Rupasingha and Wang (2013) address endogeneity by using money demand shocks as an instrumental variable for the supply of CRA loans. If U.S. counties can be treated as small open economies with fixed exchange rates and exogenous interest rates, then local shocks to money demand should lead to increases in loan supply, which could ultimately lead to changes in economic performance. As a simple example outlined first by Driscoll (2004), suppose there is a local money demand shock in a specific county such that local residents prefer to hold more money, given a level of output and the interest rate. The national interest rate is exogenous from the perspective of the local residents. Because the "exchange rate" across regions of the U.S. must remain constant, there must be an adjustment wherein real balances rise locally and fall elsewhere to accommodate the change in preferences. If there is a lending channel, the increase in real deposits will produce an increase in bank loans. Hence, money demand likely has no relationship to our measures of firm births but through lending, making it an attractive instrument.

Money demand shocks are estimated using standard equilibrium conditions for money supply and money demand. Money supply is measured by per capita bank deposits for each county. We then regress money supply on per capita income and the interest rate. The interest rate is determined for each county as the ratio of interest expense to total deposits. Hence, using detailed data from Call Reports available from the Federal Reserve of Chicago, we first estimate the following equation

$$(18) \qquad Deposits\,Per\,Capita_{it} = \beta_0 + \beta_1 Income\,per\,capita_{it} + \beta_2 Interest\,rate_{it} + \epsilon_{it}$$

where the resulting residualsϵ_{it} measure county-specific shocks to money demand for county i in year t.[11] The data for deposits and interest expense for each year from 1996-2010 at the state level are obtained from Call Report data. Call reports are submitted by banks each quarter. The ongoing consolidation of the banking industry and lack of financial institutions in rural areas leave some counties completely absent from the call report data, making it impossible to estimate the instrumental variable for some places. Consequently, we cannot test the instrument on the full set of 3072 counties. However, we proceed as in the first section of analysis by first pooling all available counties together and then separating into metro, micro, and rural subsets.

4.8.1. Results. The following results use instrument for lending using money demand shocks as described in the previous section. The lag structure for all available counties pooled together, as well as the metro, micro, and rural subsets is that determined in the first section of results.

None of the lending variables are significant in the IV analysis reported in Table 4.8 and the diagnostic tests are mixed. First, the money demand instruments are generally weak in all four specifications as indicated by the low Cragg-Donald Wald F statistics. Yet, the lending variables generally remain significant with the exception of micropolitan counties, using the Anderson-Rubin Wald F test which is robust to weak instruments. Hansen's J statistic is not significant for all counties pooled together and for micropolitan counties,

[11]The instrumental variable is the combined residual of the fixed effect and error term $\epsilon_{it} = v_{it} + e_{it}$.

TABLE 4.8. IV Results

Change Loans t	-0.0004	0.0017	0.0007	-0.0004
	(0.0017)	(0.0012)	(0.0006)	(0.0026)
Change Loans t-1	-0.0032		0.0032	0.0043
	(0.0025)		(0.0029)	(0.0075)
Change Loans t-2	-0.0038		0.0015	0.0036
	(0.0027)		(0.0034)	(0.0031)
Change Loans t-3	0.0010		0.0005	0.0016
	(0.0036)		(0.0018)	(0.0033)
N	2443	726	510	1207
Centered R^2	0.6227	0.8297	0.6205	0.3673
F	Pooled	165.52	26.02	23.65
Counties	Pooled	Metro	Micro	Rural
Regression	IV	IV	IV	IV
Weak IV-Robust p-value (Anderson-Wald F test)	0.0003	0.0022	0.5498	0.0001
Endog of instrument Hansen's J p-value	0.1982	0.001	0.7302	0.0527
Test of Weak ID (Cragg-Donald Wald F)	1.722	2.452	0.263	0.154
Endog of Lending p-value (GMM distance measure)	0.001	0.291	0.7561	0.2454

Dependent variable is the birth rate in 2005. Significance at the 1%, 5%, and 10% levels using a two-tailed test are shown by ***, **, and *, respectively. Robust standard errors are reported throughout.

suggesting that the instruments are exogenous to the estimating equation. However, for metro and rural counties, Hansen's J statistic is significant suggesting that the instrument is not exogenous. Last, the GMM distance measure is significant only when all counties all pooled together. For each, of the metro, micro, and rural subsets the test does not reject the null hyothesis that lending is exogenous.

4.8.2. ROBUSTNESS AND EXTENSIONS. A disadvantage of using counties for studying the effects of lending on establishment births is that establishments may easily borrow from banks in other counties. Driscoll (2004) argues that this is the case even at the state level. He eliminates "money center banks" which may be responsible for much out-of-state lending by removing California, Illinois, and New York, from his state-level analysis. Rupasingha and Wang (2013) remove states with a Federal Reserve Bank. Future analysis at the county-level could remove entire states with banks responsible for significant out-of-state lending, or more precisely, the relevant metro counties in those states. Experimental analyses also indicate

that money demand shocks are a better instrument for levels of lending rather than changes. Despite some disadvantages of using lagged levels discussed previously, future research could consider using the level of lending as an explanatory variable for births and then proceed with the IV analysis.

4.9. Conclusion

The combined results for births and employment growth suggest a local employment trajectory visually described in Figure 4.5. The figure is a useful tool for graphically simplifying and stylizing the effects of lending. First, assume that a county is on a particular employment growth path and the growth rate is captured by the slope g. g is effectively tied to the interplay between lending, births, and employment growth. The analysis focused on establishment births suggests that increases in lending during the four years prior to time t effectively raise the birth rate in year t. If births correspond to increases in employment, and they likely do (Weiler and Conroy, 2014), then the increase in births can be represented as an upward shift in the employment growth function. The shift in the line implies a level increase in employment that results from more births spurred by increased lending.

However, the results focused on employment growth suggest that early increases in lending have a slightly negative effect on the employment growth rate during the subsequent period. Based on our data, positive changes in lending in the late 1990s correspond to lower employment growth from 2000-2007. The negative effect of the change in lending is captured by the slope g' where $g'<g$. So, employment growth is slower though the level of employment is higher. Further, the graph implies that the net effect on employment is uncertain in the long run because it depends on relative size of the effects of lending on births and employment growth.

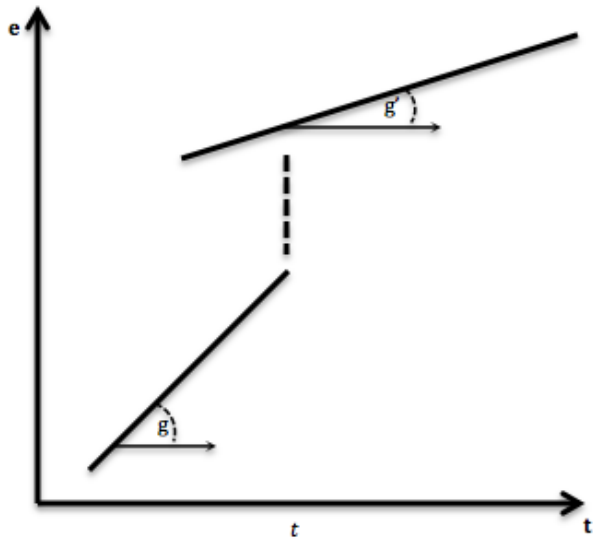

FIGURE 4.5. Employment Growth

The analysis of lending by gender shows no significant county-level effects, which further implies that there are not gendered lending practices that affect the propensity for business ownership. However, the dependent variable is a static measure of entrepreneurship. Going forward, gendered research would benefit from a dynamic measure such as establishment births. Micro data would also provide several advantages for gendered analysis of lending such as the size, age, and industry of firms.

Summary Statistics

Table 4.9. Summary Statistics: All Counties

Variable	Obs	Mean	Std. Dev.	Min	Max
Change Loans Per Capita 2000	3069	15.50	191.53	-1163.49	3894.90
Change Loans Per Capita 2001	3071	127.62	240.93	-4292.25	2405.06
Change Loans Per Capita 2002	3071	80.50	217.41	-1378.30	1464.87
Change Loans Per Capita 2003	3071	55.13	222.98	-1820.16	3329.90
Change Loans Per Capita 2004	3071	33.43	225.85	-2264.53	1920.01
Change Loans Per Capita 2005	3071	-134.20	290.43	-3633.35	950.97
Change Loans Per Capita 2006	3071	40.84	184.24	-1161.16	2575.05
Change Loans Per Capita 2007	3071	61.45	178.41	-2702.36	1965.49
Employment Growth, 2000-2007	3071	6.57	14.55	-35.32	168.51
Birth Rate, 2005	3071	4.68	1.88	0.00	23.08
Birth Rate, 1998	3071	4.29	1.50	0.00	12.62
Demand Shock, 2000-07	3071	5.36	4.79	-16.47	86.39
Employment Growth, 1990-2000	3071	20.65	26.47	-39.37	767.20
Log Employment, 2000	3071	9.55	1.46	4.55	15.51
Log Income, 2000	3071	10.19	0.25	8.03	11.39
Density, 2000	3071	0.85	3.17	0.00	113.53
HC Share, 2000	3071	16.48	5.63	0.00	52.97
Arts Share, 2000	3071	0.69	0.45	0.00	6.67
BA Share, 2000	3071	16.43	7.67	4.92	60.48
Pop Growth 1950-1960	3071	0.06	0.29	-0.42	3.71
Median Age, 2000	3071	37.40	3.93	20.60	54.30
Amenity Score	3071	0.05	2.28	-6.40	11.17
Distance to MSA	3071	0.81	0.65	0.00	4.34
Marg dist MSA $250k$	3071	1.39	1.37	0.00	8.92
Marg dist MSA $500k$	3071	1.75	1.49	0.00	9.34
Marg dist MSA $1M$	3071	2.10	1.58	0.00	9.34

TABLE 4.10. Summary Statistics: Metropolitan Counties

Variable	Obs	Mean	Std. Dev.	Min	Max
Change Loans Per Capita 2000	825	2.12	117.98	-703.49	538.00
Change Loans Per Capita 2001	825	174.99	174.75	-388.70	970.36
Change Loans Per Capita 2002	825	87.03	139.16	-346.48	784.26
Change Loans Per Capita 2003	825	66.44	134.95	-422.33	721.55
Change Loans Per Capita 2004	825	35.59	154.65	-642.38	948.08
Change Loans Per Capita 2005	825	-111.98	212.71	-1434.59	420.73
Change Loans Per Capita 2006	825	59.88	141.95	-927.53	1040.72
Change Loans Per Capita 2007	825	62.17	113.66	-453.95	647.32
Employment Growth, 2000-2007	825	13.38	16.20	-35.32	135.81
Birth Rate, 2005	825	4.84	1.62	0.95	14.67
Birth Rate, 1998	825	4.45	1.28	0.49	10.44
Demand Shock, 2000-07	825	5.94	3.27	-8.60	19.73
Employment Growth, 1990-2000	825	28.16	23.73	-13.35	251.70
Log Employment, 2000	825	11.15	1.29	7.64	15.51
Log Income, 2000	825	10.39	0.22	9.70	11.39
Density, 2000	825	2.40	5.80	0.01	113.53
HC Share, 2000	825	22.00	6.26	9.43	52.97
Arts Share, 2000	825	0.94	0.42	0.00	6.09
BA Share, 2000	825	22.15	9.20	5.43	60.48
Pop Growth 1950-1960	825	0.28	0.35	-0.16	3.71
Median Age, 2000	825	35.65	3.25	23.20	54.30
Amenity Score	825	0.28	2.39	-5.40	11.17
Distance to MSA	825	0.26	0.23	0.00	1.74
Marg dist MSA $250k$	825	0.59	0.78	0.00	7.42
Marg dist MSA $500k$	825	0.88	0.95	0.00	7.50
Marg dist MSA $1M$	825	1.20	1.11	0.00	7.99

TABLE 4.11. Summary Statistics: Micropolitan Counties

Variable	Obs	Mean	Std. Dev.	Min	Max
Change Loans Per Capita 2000	636	14.01	185.04	-724.51	1524.29
Change Loans Per Capita 2001	636	147.40	236.22	-483.14	1657.65
Change Loans Per Capita 2002	636	82.34	200.76	-830.78	1289.61
Change Loans Per Capita 2003	636	52.43	205.91	-537.55	1425.07
Change Loans Per Capita 2004	636	27.76	204.66	-1321.47	1310.59
Change Loans Per Capita 2005	636	-189.99	347.28	-3633.35	421.65
Change Loans Per Capita 2006	636	27.60	175.07	-1161.16	1240.13
Change Loans Per Capita 2007	636	61.64	169.43	-670.50	1614.70
Employment Growth, 2000-2007	636	5.42	12.05	-24.80	96.34
Birth Rate, 2005	636	4.32	1.74	0.75	23.08
Birth Rate, 1998	636	4.07	1.32	0.00	11.96
Demand Shock, 2000-07	636	4.80	4.41	-15.17	21.90
Employment Growth, 1990-2000	636	18.79	16.34	-17.04	119.27
Log Employment, 2000	636	9.73	0.87	5.62	11.45
Log Income, 2000	636	10.21	0.18	8.48	11.12
Density, 2000	636	0.58	0.53	0.00	3.79
HC Share, 2000	636	15.99	3.63	6.61	29.48
Arts Share, 2000	636	0.68	0.40	0.00	3.44
BA Share, 2000	636	15.90	6.30	6.15	48.31
Pop Growth 1950-1960	636	0.06	0.25	-0.31	3.48
Median Age, 2000	636	36.44	3.84	20.70	52.60
Amenity Score	636	0.06	2.38	-6.10	11.15
Distance to MSA	636	0.94	0.55	0.24	3.82
Marg dist MSA $250k$	636	1.44	1.17	0.32	8.92
Marg dist MSA $500k$	636	1.80	1.28	0.39	9.18
Marg dist MSA $1M$	636	2.17	1.40	0.48	9.18

TABLE 4.12. Summary Statistics: Rural Counties

Variable	Obs	Mean	Std. Dev.	Min	Max
Change Loans Per Capita 2000	1608	22.95	221.86	-1163.49	3894.90
Change Loans Per Capita 2001	1610	95.53	266.01	-4292.25	2405.06
Change Loans Per Capita 2002	1610	76.42	253.62	-1378.30	1464.87
Change Loans Per Capita 2003	1610	50.40	262.14	-1820.16	3329.90
Change Loans Per Capita 2004	1610	34.56	261.79	-2264.53	1920.01
Change Loans Per Capita 2005	1610	-123.55	297.62	-1942.08	950.97
Change Loans Per Capita 2006	1610	36.31	205.12	-1156.49	2575.05
Change Loans Per Capita 2007	1610	61.01	206.85	-2702.36	1965.49
Employment Growth, 2000-2007	1610	3.54	13.36	-34.34	168.51
Birth Rate, 2005	1610	4.74	2.04	0.00	18.38
Birth Rate, 1998	1610	4.30	1.65	0.00	12.62
Demand Shock, 2000-07	1610	5.29	5.51	-16.47	86.39
Employment Growth, 1990-2000	1610	17.54	30.05	-39.37	767.20
Log Employment, 2000	1610	8.67	0.91	4.55	11.41
Log Income, 2000	1610	10.08	0.22	8.03	10.97
Density, 2000	1610	0.15	0.30	0.00	3.04
HC Share, 2000	1610	13.84	3.54	0.00	35.69
Arts Share, 2000	1610	0.57	0.43	0.00	6.67
BA Share, 2000	1610	13.71	5.38	4.92	57.11
Pop Growth 1950-1960	1610	-0.05	0.18	-0.42	2.33
Median Age, 2000	1610	38.67	3.83	20.60	53.00
Amenity Score	1610	-0.07	2.18	-6.40	8.27
Distance to MSA	1610	1.03	0.67	0.25	4.34
Marg dist MSA $250k$	1610	1.78	1.50	0.25	8.69
Marg dist MSA $500k$	1610	2.18	1.59	0.26	9.34
Marg dist MSA $1M$	1610	2.54	1.66	0.27	9.34

Table 4.13. Births: All Counties

Change Loans t	0.0003	***	0.0004	***
	(0.0001)		(0.0001)	
Change Loans t-1	0.0003	**	0.0004	***
	(0.0001)		(0.0001)	
Change Loans t-2	0.0004	***	0.0005	***
	(0.0001)		(0.0001)	
Change Loans t-3	0.0003	***	0.0002	**
	(0.0001)		(0.0001)	
Birth Rate, 1998	0.8655	***	0.8301	***
	(0.0253)		(0.0263)	
Demand Shock, 2000-07	0.0062		0.0091	
	(0.0065)		(0.0057)	
Employment Growth, 1990-2000	0.0072	***	0.0082	***
	(0.0015)		(0.0017)	
Log Employment, 2000	0.0945	***	0.0734	***
	(0.0281)		(0.0250)	
Log Income, 2000	-0.7945	***	-0.5819	***
	(0.1609)		(0.1416)	
Density, 2000	0.004		-0.0026	
	(0.0036)		(0.0032)	
HC Share, 2000	0.0294	**	0.04	***
	(0.0126)		(0.0120)	
Arts Share, 2000	-0.0383		0.012	
	(0.0790)		(0.0712)	
BA Share, 2000	-0.0121		-0.0245	***
	(0.0076)		(0.0073)	
Pop Growth 1950-1960	0.045		-0.1011	**
	(0.0615)		(0.0524)	
Median Age, 2000	0.0141	**	-0.0002	
	(0.0070)		(0.0070)	
Amenity Score	0.0399	***	0.0314	**
	(0.0076)		(0.0123)	
Distance to MSA	0.218	***	0.2162	***
	(0.0512)		(0.0502)	
Marg dist MSA $250k$	-0.0469		-0.0054	
	(0.0439)		(0.0383)	
Marg dist MSA $500k$	0.1523	***	0.0324	
	(0.0451)		(0.0351)	
Marg dist MSA $1M$	-0.0815	***	-0.0528	**
	(0.0218)		(0.0229)	
Counties	All		All	
N	3071		3071	
R^2	0.7815		0.8216	
F	220.63		460.23	
Fixed Effects	No		State	
AIC	**5858.696**		**5329.336**	
BIC	**5985.321**		5739.359	

TABLE 4.14. Births: Metropolitan Counties

Change Loans t	0.00010		0.00026		0.00006	
	(0.0001)		(0.0001)		(0.0003)	
Change Loans t-1			0.00012			
			(0.0002)			
Change Loans t-2			0.00035	**		
			(0.0002)			
Birth Rate, 1998	0.91533	***	0.89595	***	0.86240	***
	(0.0328)		(0.0349)		(0.0627)	
Demand Shock, 2000-07	-0.00437		-0.00024		0.00931	
	(0.0110)		(0.0095)		(0.0210)	
Employment Growth, 1990-2000	0.00726	***	0.00919	***	0.00867	***
	(0.0018)		(0.0015)		(0.0024)	
Log Employment, 2000	0.09581	***	0.07688	***	0.04490	
	(0.0350)		(0.0298)		(0.0533)	
Log Income, 2000	-0.67022	***	-0.29938	*	-0.46369	
	(0.2078)		(0.1578)		(0.2975)	
Density, 2000	0.00516		-0.00174		0.00046	
	(0.0037)		(0.0034)		(0.0054)	
HC Share, 2000	0.02835	*	0.03697	***	0.02820	
	(0.0152)		(0.0143)		(0.0270)	
Arts Share, 2000	-0.06820		-0.03423		-0.08942	
	(0.0877)		(0.0805)		(0.1253)	
BA Share, 2000	-0.01490	*	-0.02687	***	-0.02091	
	(0.0090)		(0.0090)		(0.0182)	
Pop Growth 1950-1960	0.00391		-0.15570	**	-0.21253	
	(0.0639)		(0.0639)		(0.0692)	
Median Age, 2000	0.01056		-0.01431		0.00172	
	(0.0096)		(0.0107)		(0.0194)	
Amenity Score	0.03724	***	0.03101	**	-0.00700	
	(0.0084)		(0.0144)		(0.0350)	
Distance to MSA	0.30150	***	0.26762	***	0.68234	
	(0.1020)		(0.0968)		(0.6032)	
Marg dist MSA $>$ 250k	-0.05860	**	0.04508		-0.79988	
	(0.0568)		(0.0429)		(0.6796)	
Marg dist MSA $>$ 500k	0.12979	***	0.01150		-0.18025	
	(0.0581)		(0.0390)		(0.5188)	
Marg dist MSA $>$ 1M	-0.07495	***	-0.03833		0.50578	
	(0.0269)		(0.0265)		(0.3784)	
Fixed Effects	No		State		MSA	
N	825		825		825	
R^2	0.8548		0.9023		0.9402	
F	205.01		.		.	
AIC	1128.512		901.5388		704.0938	
BIC	1213.389		1222.185		1515.14	

TABLE 4.15. Births: Micropolitan Counties

Change Loans t	0.00021	**	0.00013	
	(0.0001)		(0.0001)	
Change Loans t-1	0.00067	***	0.00045	**
	(0.0002)		(0.0002)	
Change Loans t-2	0.00064	***	0.00051	**
	(0.0003)		(0.0002)	
Change Loans t-3	0.00038	**		
	(0.0002)			
Birth Rate, 1998	0.73532	***	0.62875	***
	(0.0591)		(0.0614)	
Demand Shock, 2000-07	0.00353		0.01513	
	(0.0105)		(0.0115)	
Employment Growth, 1990-2000	0.01360	***	0.00998	***
	(0.0035)		(0.0032)	
Log Employment, 2000	0.03406		0.00433	
	(0.0859)		(0.0782)	
Log Income, 2000	-0.45365		-0.75064	**
	(0.3465)		(0.3534)	
Density, 2000	-0.11838		-0.15937	*
	(0.0815)		(0.0881)	
HC Share, 2000	-0.00984		-0.00485	
	(0.0226)		(0.0251)	
Arts Share, 2000	0.19656		0.29198	*
	(0.1487)		(0.1551)	
BA Share, 2000	0.01636		0.01263	
	(0.0142)		(0.0156)	
Pop Growth 1950-1960	0.41851	***	0.33267	***
	(0.1255)		(0.1312)	
Median Age, 2000	0.03389	***	0.03868	***
	(0.0122)		(0.0123)	
Amenity Score	0.04971	***	-0.00704	
	(0.0198)		(0.0305)	
Distance to MSA	-0.05177		0.00709	
	(0.0977)		(0.1171)	
Marg dist MSA $250k$	0.08546		0.12920	
	(0.1067)		(0.1284)	
Marg dist MSA $500k$	0.18070		-0.01891	
	(0.1126)		(0.1208)	
Marg dist MSA $1M$	-0.09746	**	-0.05392	
	(0.0501)		(0.0705)	
Fixed Effects	No		State	
N	636		636	
R^2	0.7063		0.7615	
F	36.82		.	
AIC	**1585.187**		**1536.771**	
BIC	1678.746		1817.449	

TABLE 4.16. Births: Rural Counties

Change Loans t	0.00038	**	0.00029	*
	(0.0002)		(0.0002)	
Change Loans t-1	0.00084	***	0.00068	***
	(0.0002)		(0.0002)	
Change Loans t-2	0.00069	***	0.00073	***
	(0.0002)		(0.0002)	
Change Loans t-3	0.00053	***	0.00031	**
	(0.0002)		(0.0002)	
Birth Rate, 1998	0.61220	***	0.56259	***
	(0.0372)		(0.0357)	
Demand Shock, 2000-07	0.00708		0.01420	*
	(0.0068)		(0.0074)	
Employment Growth, 1990-2000	0.00232		0.00031	
	(0.0022)		(0.0017)	
Log Employment, 2000	0.02233		0.04034	
	(0.0792)		(0.0731)	
Log Income, 2000	-0.97441	***	-0.84966	***
	(0.2336)		(0.2344)	
Density, 2000	-0.22904	**	-0.30660	***
	(0.1024)		(0.1086)	
HC Share, 2000	0.07275	***	0.07512	***
	(0.0212)		(0.0220)	
Arts Share, 2000	0.18416		0.24585	*
	(0.1234)		(0.1293)	
BA Share, 2000	-0.00766		-0.02137	
	(0.0142)		(0.0159)	
Pop Growth 1950-1960	0.47019	***	0.41497	**
	(0.1853)		(0.1849)	
Median Age, 2000	0.03072	**	0.04301	***
	(0.0134)		(0.0126)	
Amenity Score	0.13321	***	0.13807	***
	(0.0204)		(0.0314)	
Distance to MSA	0.27226	**	0.16069	
	(0.1196)		(0.1022)	
Marg dist MSA $250k$	-0.16774	**	-0.15040	**
	(0.0698)		(0.0761)	
Marg dist MSA $500k$	0.31624	***	0.12454	
	(0.0748)		(0.0821)	
Marg dist MSA $1M$	-0.09643	*	-0.06322	
	(0.0547)		(0.0670)	
Fixed Effects	No		State	
N	1610		1610	
R^2	0.6054		0.6459	
F	52.07		.	
AIC	**5206.838**		**5116.409**	
BIC	**5319.902**		**5455.6**	

TABLE 4.17. Results: Employment Growth

Change Loans t	-0.00444		-0.00441	
	-(0.0033)		(0.0029)	
Change Loans t-1	-0.00374	***	-0.00252	*
	-(0.0012)		(0.0014)	
Birth Rate, 1998	3.79401	***	3.67995	***
	-(0.5182)		(0.5128)	
Demand Shock, 2000-07	0.69026	***	0.71920	***
	-(0.1862)		(0.1646)	
Employment Growth, 1990-2000	0.24824	***	0.29653	**
	-(0.0365)		(0.0395)	
Log Employment, 2000	0.84366		0.37364	
	-(0.5223)		(0.5492)	
Log Income, 2000	-15.95134	***	-15.57437	***
	-(4.0471)		(3.6683)	
Density, 2000	0.01804		-0.06859	
	-(0.0524)		(0.0514)	
HC Share, 2000	0.34470		0.31773	
	-(0.3043)		(0.2651)	
Arts Share, 2000	-3.35525	**	-0.15477	
	-(1.3928)		(1.1253)	
BA Share, 2000	-0.04466		-0.17365	
	-(0.1720)		(0.1449)	
Pop Growth 1950-1960	-0.90648		0.09796	
	-(0.8423)		(0.8363)	
Median Age, 2000	-0.42552	***	-0.74763	***
	-(0.1493)		(0.1565)	
Amenity Score	0.17306		-0.02849	
	-(0.1436)		(0.2990)	
Distance to MSA	1.67160		0.64511	
	-(1.3706)		(1.3789)	
Marg dist MSA $250k$	-0.59874		-1.70777	**
	-(0.7358)		(0.8776)	
Marg dist MSA $500k$	-0.14696		0.41670	
	-(0.6822)		(0.7438)	
Marg dist MSA $1M$	0.54069		-0.06258	
	-(0.4246)		(0.4182)	
Fixed Effects	No		State	
N	861		861	
R^2	0.6434		0.6402	
F	36.07		.	
AIC	5750.61		5560.398	
BIC	5841.014		5855.4	

TABLE 4.18. Results: Change in the Propensity for Female-Owned Firms

Change in Loans t	-0.00001	**	0.00000		0.00001
	(0.0000)		(0.0000)		(0.0000)
Propensity for female-owned business, 2002	-0.11198	**	-0.27422	***	-0.31253
	(0.0568)		(0.0610)		(0.0941)
Female high school graduates as % of female adult population, 2000	-0.08226	***	-0.07341	*	-0.15120
	(0.0200)		(0.0416)		(0.0825)
Female college graduates as % of female adult population, 2000	0.01036		0.01639		-0.08862
	(0.0319)		(0.0457)		(0.0761)
Females with master's degree as % of female adult population, 2000	0.03321		0.14733	*	0.14186
	(0.0548)		(0.0874)		(0.1293)
Females with doctorate degree as % of female adult population, 2000	-0.50540	**	-0.52826	**	-0.05325
	(0.2334)		(0.2458)		(0.4567)
Median female age, 2000	-0.00158	***	-0.00054		-0.000005
	(0.0004)		(0.0005)		(0.0010)
Female employment population ratio, 2000	-0.05830	***	-0.05410	**	-0.01762
	(0.0183)		(0.0238)		(0.0530)
Married females as a share of the adult female population, 2000	0.01645		-0.02623		-0.02024
	(0.0271)		(0.0292)		(0.0676)
Children per female over 16, 2000	-0.07801	***	-0.01895		-0.02396
	(0.0166)		(0.0204)		(0.0373)
Proprietor Income Per Job, 2000	-0.00009	*	-0.00011	*	-0.00007
	(0.0001)		(0.0001)		(0.0001)
Wage-and-Salary Income per job, 2000	0.00002		-0.00006		-0.00018
	(0.0001)		(0.0001)		(0.0002)
Median Housing Value, 2000	-0.000000004		0.00000002	**	0.00000002
	(0.0000)		(0.0000)		(0.00000002)
Owner-Occupied Homes as % Total, 2000	0.01927		0.00047		0.01471
	(0.0143)		(0.0156)		(0.0255)
Growth Rate of Income Per Capita, 1997-2002	0.00004		0.00022		0.00024
	(0.0001)		(0.0002)		(0.0003)
Service Establishments as % Total, 2000	-0.00044		-0.04489		-0.10243
	(0.0264)		(0.0280)		(0.0597)
Retail Trade Establishments as % Total, 2000	-0.03269		-0.04599		-0.01562
	(0.0342)		(0.0314)		(0.0642)
Construction Establishments as % Total, 2000	-0.03983		-0.02935		-0.08266
	(0.0314)		(0.0323)		(0.0727)
Natural Amenity Scale	-0.00030		0.00094		0.00099
	(0.0003)		(0.0004)		(0.0010)
N	648		648		553
R^2	0.2322		0.4193		0.78
F	8.05		.		.
Fixed Effect	No		State		Metro
Regression	OLS		OLS		OLS
AIC	-3988.609		-4079.591		-3945.11
BIC	-3899.131		-3788.788		-3491.993

TABLE 4.19. Results: Change in the Propensity for Male-Owned Firms

Change in Loans t	-0.00001		-0.00002		0.00001
	(0.00001)		(0.00002)		(0.00002)
Propensity for male-owned firms, 2002	-0.0385		-0.0331		-0.0755
	(0.0377)		(0.0577)		(0.0850)
Males high school graduates as % of female adult population, 2000	0.0633		0.0292		-0.1991
	(0.0687)		(0.0774)		(0.1142)
Male college graduates as % of female adult population, 2000	0.0142		-0.0681		-0.1168
	(0.0628)		(0.0597)		(0.1130)
Males with master's degree as % of female adult population, 2000	-0.0155		0.1178		0.1363
	(0.1061)		(0.1154)		(0.1994)
Males with doctorate degree as % of female adult population, 2000	-0.1922		-0.1253		-0.0327
	(0.1449)		(0.1444)		(0.2467)
Median male age, 2000	-0.0022	***	-0.0016	*	-0.0013
	(0.0007)		(0.0009)		(0.0017)
Male employment population ratio, 2000	-0.0063		0.0092		0.0386
	(0.0262)		(0.0290)		(0.0639)
Married males as a share of the adult male population, 2000	-0.0094		0.0000		0.0496
	(0.0400)		(0.0417)		(0.0868)
Children per male over 16, 2000	-0.0998	***	-0.0537	**	-0.0489
	(0.0231)		(0.0247)		(0.0409)
Proprietor Income Per Job, 2000	-0.0002	*	-0.0002	*	0.0001
	(0.0001)		(0.0001)		(0.0002)
Wage-and-Salary Income per job, 2000	-0.00002		-0.0001		-0.0004
	(0.0001)		(0.0001)		(0.0003)
Median Housing Value, 2000	0.00000000		0.00000003		0.00000001
	(0.0000)		(0.0000)		(0.0000)
Owner-Occupied Homes as % Total, 2000	0.0537	**	0.0295		0.0249
	(0.0243)		(0.0232)		(0.0471)
Growth Rate of Income Per Capita, 1997-2002	0.0002		0.0006	***	0.0007
	(0.0002)		(0.0002)		(0.0004)
Service Establishments as % Total, 2000	-0.0527		-0.0752		-0.1394
	(0.0486)		(0.0476)		(0.1115)
Retail Trade Establishments as % Total, 2000	-0.0139		0.0059		0.1792
	(0.0614)		(0.0557)		(0.1128)
Construction Establishments as % Total, 2000	-0.1643	***	-0.1853	***	-0.1951
	(0.0624)		(0.0663)		(0.1314)
Natural Amenity Scale	-0.0006		0.0020	*	0.0012
	(0.0005)		(0.0011)		(0.0020)
N	648		648		553
R^2	0.141		0.2839		0.7319
F	3.78		.		.
Fixed Effect	No		State		Metro
Regression	OLS		OLS		OLS
AIC	-3263.688		-3291.654		-3265.719
BIC	-3174.21		-3000.851		-2812.606

Table 4.20. IV Results

Change Loans t	-0.0004		0.0017		0.0007		-0.0004	
	(0.0017)		(0.0012)		(0.0006)		(0.0026)	
Change Loans t-1	-0.0032				0.0032		0.0043	
	(0.0025)				(0.0029)		(0.0075)	
Change Loans t-2	-0.0038				0.0015		0.0036	
	(0.0027)				(0.0034)		(0.0031)	
Change Loans t-3	0.0010				0.0005		0.0016	
	(0.0036)				(0.0018)		(0.0033)	
Birth Rate, 1998	0.8604	***	0.9029	***	0.7507	***	0.5109	***
	(0.0534)		(0.0345)		(0.0793)		(0.0936)	
Demand Shock, 2000-07	-0.0016		-0.0137		0.0039		0.0039	
	(0.0131)		(0.0137)		(0.0166)		(0.0132)	
Employment Growth, 1990-2000	0.0117	***	0.0084	**	0.0174	***	0.0040	
	(0.0024)		(0.0019)		(0.0055)		(0.0118)	
Log Employment, 2000	0.1645		0.0857	**	0.0915		-0.1557	
	(0.1075)		(0.0370)		(0.1172)		(0.1721)	
Log Income, 2000	-0.5424	*	-0.7517	***	0.1398		-0.6220	*
	(0.2913)		(0.2171)		(0.8779)		(0.3455)	
Density, 2000	0.0076		0.0028		-0.1618		-0.0817	
	(0.0076)		(0.0038)		(0.1840)		(0.2454)	
HC Share, 2000	0.0425		0.0274	*	-0.0024		0.0342	
	(0.0230)		(0.0164)		(0.0488)		(0.0462)	
Arts Share, 2000	0.1065		0.0169		0.0986		0.4821	**
	(0.1088)		(0.0998)		(0.2037)		(0.2422)	
BA Share, 2000	-0.0244		-0.0133		0.0029		-0.0112	
	(0.0156)		(0.0100)		(0.0211)		(0.0223)	
Pop Growth 1950-1960	0.0915		-0.0100		0.5192	**	0.5078	
	(0.0782)		(0.0658)		(0.2277)		(0.3406)	
Median Age, 2000	0.0213		0.00819		0.0338	*	0.0327	
	(0.0157)		(0.0105)		(0.0184)		(0.0304)	
Amenity Score	0.0312		0.0116		0.0155		0.1381	***
	(0.0348)		(0.0185)		(0.0407)		(0.0522)	
Distance to MSA	0.2609	**	0.1305		-0.0070		0.3011	*
	(0.1290)		(0.1421)		(0.1553)		(0.1812)	
Marg dist MSA $250k$	0.0076		-0.0169		-0.0659		-0.0376	
	(0.1042)		(0.0751)		(0.1692)		(0.1714)	
Marg dist MSA $500k$	0.1403		0.1665		0.2905	*	0.1517	
	(0.1831)		(0.0815)		(0.1774)		(0.2129)	
Marg dist MSA $1M$	-0.0125		-0.0429		-0.0867		-0.1154	
	(0.0670)		(0.0371)		(0.0688)		(0.1610)	
N	2443		726		510		1207	
Centered R^2	0.6227		0.8297		0.6205		0.3673	
F	Pooled		165.52		26.02		23.65	
Counties	Pooled		Metro		Micro		Rural	
Regression	IV		IV		IV		IV	
Weak IV-Robust p-value (Anderson-Wald F test)	0.0003		0.0022		0.5498		0.0001	
Endog of instrument Hansen's J p-value	3.237		0.001		0.7302		0.0527	
Test of Weak ID (Cragg-Donald Wald F)	1.722		2.452		0.263		0.154	
Endog of Lending p-value (GMM distance measure)	0.001		0.291		0.7561		0.2454	

CHAPTER 5

Conclusion

Together the analyses of the determinants of entrepreneurship by gender, the effect of male and female business owners on employment growth, and the focus on small business lending provide a multifaceted regional study of men and women entrepreneurs. Chapter one identifies and compares the factors that determine the propensity for businesses owned by either gender. Chapter two then uses male and female entrepreneurship as explanatory variables in a model of employment growth. Chapter three, partly as an extension of chapter one, focuses on the small business lending as an important input to male and female entrepreneurship and more generally as an input to establishment births and employment growth.

In general, the results of chapters one and two suggest that, at the county level, there are important gender issues in entrepreneurship. Most interestingly, the shares of college educated men and women have strong positive effects on their respective measures of entrepreneurship, but the effect is roughly twice as strong for men. Additionally, female entrepreneurship is weaker in counties with a large shares of women with low and very high education attainment. As explanatory variables, the density of male-owned businesses has a stronger negative effect on employment growth than female-owned businesses, particularly male-owned employer firms. Last, lending seems to have no gendered effect based on our measure of entrepreneurship for men and women. There is, however, a large positive effect of lending on establishment births and weak negative effect on employment growth.

The studies show there are some significant gender differences in entrepreneurship at the county-level and also make clear that further regional analysis of entrepreneurship by gender

would benefit greatly from micro level data. The advantage of establishment data with detail about the owners would allow more specific questions on the role of education attainment and financing strategies, for example. Detail on the size and age of establishments also may be particularly important for better understanding how male and female business owners affect local economic performance. More thorough analysis of gender would also control for the industry concentrations of men and women business owners. Going forward there are many possible research questions that would benefit our understanding of the separate issues facing men and women and inform local economic development policy.

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