Entrepreneurship, Small Businesses, and Economic Growth in Cities

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Abstract

Does entrepreneurship cause local employment and wage growth, and if so, how large is the impact? Empirical analysis of such question is difficult because of the joint determination of entrepreneurship and economic growth. This paper uses two different sets of variables – the homestead exemption levels in state bankruptcy laws from 1975 and the share of MSA overlaying aquifers - to instrument for entrepreneurship and examine urban employment and wage growth between 1993 and 2002. Despite using different sets of instrumental variables, the ranges of 2SLS estimates are surprisingly similar. A ten percent increase in the birth of small businesses increases MSA employment by 1.1 to 2.2%, annual payroll by 3.1 to 4.0%, and wages by 1.8 to 2.0% after ten years. Furthermore, an accounting exercise shows that the employment and payroll growth from entrepreneurship are not confined to the newly created businesses but spillover to the aggregate urban economy.

Keywords: Entrepreneurship, Homestead Exemption, Aquifers, Urban Growth, Agglomeration Benefits

JEL Codes: L26, K35, O18, R11

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1. Introduction

Policy makers and scholars frequently emphasize the importance of entrepreneurship for economic growth. However, surprisingly few research empirically examine and quantify entrepreneurship's impact on growth, and justifiably so - forces that drive economic growth also drive entrepreneurship, and exogenous changes in entrepreneurship are hard to find. Furthermore, randomized experiments on entrepreneurship, at scales large enough to examine economic growth, would be difficult to implement to say the least. The literature has had more success in identifying the determinants of entrepreneurship, which range from financing (Kerr and Nanda 2009, Samila and Sorenson 2011), housing collateral (Adelino et al. 2015, Bracke et al. 2013), families (Bertrand and Schoar 2006), and to peers (Lerner and Malmendier 2014). This paper, unlike the above studies which examine entrepreneurship as an outcome, empirically examines the impact of entrepreneurship on urban growth. Recently, Glaeser, Kerr, and Kerr (2015) examined entrepreneurship's impact on urban growth using proximity to mines in 1900 as instrumental variables for average establishment size, and found that cities with smaller average establishment size have higher employment growth. I add to this nascent literature by providing additional ways to measure and identify entrepreneurship's impact on growth.

Finding exogenous variation in entrepreneurship is challenging. I use two different sets of instrumental variables to generate plausibly exogenous variation in entrepreneurship across cities. The first set of instrumental variables is the homestead exemption levels set by state bankruptcy laws in 1975. States varied widely in the degree to which debtors could avoid paying creditors back when filing for personal bankruptcy and such variation dates back to the nineteenth century. Posner et al. (2001) point out that the variation in the state's desire to promote migration in the 19^{th} century and the legislative negotiation process, where negotiation starts based on initial exemption levels, caused state exemption levels to persist over a long period of time. The unobserved city growth potential in the 1990s, controlling for initial economic conditions and entrepreneurship, is unlikely to be correlated with the homestead exemption levels in 1975 which were influenced by events in the 19^{th} century. Despite the long historical lag of the homestead exemption variables, claiming instrument exogeneity with certainty is an inherent challenge when using instrumental variables. I alleviate such concern by introducing a very different instrumental variable - the share of the Metropolitan Statistical Area (MSA) overlaying aquifers - and show that the 2SLS estimates are quite similar in magnitude, whichever instrumental variable I use. Aquifers are major storehouses of underground water and facilitate agricultural production. Hornbeck and Keskin (2015) find that counties that overlay with aquifers see substantial increases in the agricultural labor force. If a large part of the MSA population expands in the agricultural sector, there would be less incentive and training for workers to venture out and start new businesses. Furthermore, the financial sector may be more prone to lend to the established agricultural sector. Glaeser, Kerr, and Kerr (2015) hypothesize and show that large resource-intensive activities like mining crowd out entrepreneurial activity. Similarly, I find that large water-intensive agricultural production decreases local entrepreneurship.

The literature has often used average establishment size to measure entrepreneurship in cities. Since most entrepreneurship is associated with small businesses, average establishment size serves as a reasonable proxy for entrepreneurship in cities. However, average establishment size likely contains other information, e.g., the degree of competition in an area. In measuring entrepreneurship, I focus on a more direct measure, i.e., small business births in cities, but also use average establishment size to measure entrepreneurship and compare results with the findings in the related literature. Recent research highlights the importance of new small businesses for economic growth. Haltwinger et al. (2013), using the Census Longitudinal Business Dynamics data, examine the universe of all firms and establishments in the US and find that once firm age is controlled for smaller businesses grow no faster than larger businesses. They find that the main source of employment growth is attributed to small and young businesses. Neumark et al. (2011) also find similar results using the National Establishment Time Series data. Even though only a subset of new small businesses survives, small businesses significantly contribute to the creation of jobs. I find that this pattern holds even at the aggregate city level. The creation of new small businesses drives urban growth rather than the expansion of larger firms.

I construct a panel of MSAs and examine the impact of entrepreneurship in 1993 on urban growth between 1993 and 2002. Given that many small firms die out and economic growth is assessed on longer intervals, I focus on the impact of entrepreneurship after 5 or 10 years. I first document that cities with unlimited or higher exemption levels in 1975 have significantly more business births in 1993 even when controlling for the initial conditions for growth, such as employment, population, income, housing price, and education. Using the homestead exemption levels in state bankruptcy laws from 1975 as instrumental variables, I find that a ten percent increase in small business births in 1993 increases urban employment by 1.1 to 2.2%, annual payroll by 3.1 to 4.0%, and wage by 1.8 to 2.0% after ten years. When I use the aquifer share variable as the instrumental variable, I find that the MSAs that overlay with aquifers more have significantly lower small business births and the 2SLS estimates indicate that a ten percent increase in small business birth increases urban employment by 1.8 to 2.1%, annual payroll by 4.0 to 4.7%, and wage by 1.9 to 2.9% after ten years. The fact that two different sets of instrumental variables return similar ranges of estimates further supports the statistically significant and economically meaningful impact of entrepreneurship on urban growth. These results are robust to additional controls of business environment, such as the minimum wage and the Right-to-work law, past population, and the industry composition of cities. The instrumental variable regression estimates are smaller than the OLS estimates, which confirm that unobserved city level growth potentials that increase entrepreneurial activity across cities are biasing the OLS estimates upward. Finally, I find that there are agglomeration benefits to entrepreneurship. An accounting exercise at the city level indicates that the employment and payroll growth from entrepreneurship are not confined to the newly created businesses but spillover to the aggregate urban economy.

2. Framework for Estimating the Impact of Entrepreneurship on Urban Growth

I introduce entrepreneurship to a standard model of urban growth (Glaeser et al. 1992, Henderson et al. 1995) to guide the empirical framework. Consider a representative firm in a city at time *t* where production is specified as $f(L_t) = A_t L_t^{\alpha},\ 0 < \alpha < 1$. A_t represents the level of technology and L_t the level of labor input at time *t*. The model abstracts away from other factors of production such as, capital and land, and hence will not be able to capture change in wage or employment due to labor substituting technological advances. I note that city subscripts are dropped in the description of the model for expositional brevity. Within this stylized framework, labor is paid the value of marginal product where output price is normalized to one, returning the labor demand function $w_t = f'(L_t) = \alpha A_t L_t^{\alpha-1}$. Putting this in a dynamic framework the growth of employment in a city can be represented as

$$(1-\alpha)\Delta \ln L_t = \Delta \ln A_t - \Delta \ln w_t \qquad (1)$$

where $\Delta \ln L_t = \ln L_{t+1} - \ln L_t$, and similarly for the other variables. I specify the growth of the technology as:

$$\Delta \ln A_t = \ln A_{t+1} - \ln A_t = g(e_t, N_t, ini_t, \rho) \qquad (2)$$

where e_t is aggregate entrepreneurship in the city at time *t*. N_t is the size of the city measured by population capturing traditional agglomeration externalities, and ini_t represents initial economic condition that might explain growth of technology in the city, such as, initial employment, income, cost of living, and education level. ρ is the national growth rate of technology that is constant across cities.

I assume an upward sloping labor supply curve $w(L) = w_0 L^{\sigma}$, $\sigma > 0$. The upward sloping labor supply relaxes the perfect labor mobility and the cross-city wage equalization assumptions often used in the literature and allows workers to have preferences for cities. Hence, wage growth is no longer constant at the national level but can vary across cities. Incorporating labor supply into (1) and (2) returns the reduced form equations:

$$\Delta \ln L_t = L(e_t, N_t, L_t, w_t, ini_t)$$
$$\Delta \ln w_t = w(e_t, N_t, L_t, w_t, ini_t) \qquad (3)$$

The main empirical test will be to examine whether entrepreneurship indeed promotes the growth of city employment and wages, i.e., whether

$$\partial \Delta \ln L_t / \partial e_t > 0 \text{ and } \partial \Delta \ln w_t / \partial e_t > 0.$$

A discussion of what I empirically refer to entrepreneurship in an MSA is warranted at this point. First, the terms *firm*, *establishment,* and *business* need clarification. As Neumark et al. (2011) point out, a *firm* is identified by a common owner and can own multiple *establishments*, and a *business* generally refers to either a *firm* or an *establishment*. A large firm opening a branch, e.g., Walmart opening a new branch in town, would show up as a new establishment in the data but we would not considered such expansion as entrepreneurship. An entrepreneur that starts a new business would appear as a new firm as well as a new establishment in the data. Hence, firm birth would be an ideal proxy. However, for firms, especially multi-establishment firms, the relation between geography and economic measures (employment, payroll) is more obscure, whereas for establishments, there is always a one to one matching between location and employment (or payroll). Hence, a common proxy used to measure entrepreneurship over a fixed geography (MSA or county) is average establishment size over that geography (Glaeser et al. 2010, 2012). Since most entrepreneurship is associated with small businesses, average establishment size serves as a reasonable proxy for entrepreneurship and the establishment level data links economic activity of businesses to a location in a straightforward way. One concern could be that average establishment size could contain other information, i.e., the degree of competition in an area. A more direct measure of entrepreneurship, the birth of businesses, has also been used in the literature but as the dependent variable rather than an independent variable (Rosenthal and Strange 2003, Samila and Sorenson 2011). This paper will use birth of small businesses in the metropolitan area as the main measure for entrepreneurship. I also use average establishment size as an alternative measure for entrepreneurship, and compare results with the existing literature.

In practice, I run regressions following the model:

$$\Delta \ln Y_{i,1993-2002} = \beta \ln e_{i,1993} + X_{i,1993} \cdot \gamma + \delta_d + \varepsilon_i \qquad (4)$$

for Metropolitan Statistical Areas (MSAs) in the United States for the years 1993 to 2002. I examine this ten year period primarily because the census definition of MSAs often change after each census cycle. By limiting my analysis to these years I am able to maintain a consistent geography for MSAs and examine the growth dynamics of cities in a consistent manner. Y denotes the dependent variable (employment, annual payroll, or wage) so that $\Delta \ln Y_{i,1993-2002}$ is the change in log employment or income between 1993 and 2002 for city i. Annual payroll includes all wages, salary, bonuses, and benefits paid to employees in the MSA. Wage is calculated as annual payroll divided by employment. $\ln e_{i,1993}$ is the log of entrepreneurship measured by small business births or average establishment size in 1993. $X_{i,1993}$ is the vector of base control variables, which include log employment in 1993, log median family income in 1990, log population in 1990, percent college educated and above in 1990, and the housing price index in 1993. δ_d is the set of census division dummy variables.

The fundamental difficulty in retrieving an unbiased estimate of β in equation (4) is the joint determination of urban entrepreneurial activity and urban economic growth. Cities with more growth potentials will likely see higher levels of entrepreneurial activity, which would render the estimate of β upward biased in equation (4). The challenge of generating a plausibly exogenous variation of entrepreneurship has hampered the development of the causal investigation of the impact of entrepreneurship on economic growth. Finding a plausibly exogenous variation in entrepreneurship is challenging. I use two different sets of instrumental variables - the homestead exemption levels set by state bankruptcy laws in 1975 and the share of the MSA overlaying aquifers - to generate plausibly exogenous variation in entrepreneurship across cities. I discuss the details of these instrumental variables in Section 4.

3. Data and Variables

To examine the impact of entrepreneurship on urban growth, I construct a city level panel of MSAs in the United States from 1993 to 2002. The information on the births of establishments comes from the publicly available Statistics of U.S. Businesses (SUSB) Employment Change Data. Birth of establishments is stratified into three categories based on the *firm's size*, i.e., firms with 19 or less employees, 20-499 employees, and 500 employees or above. Any establishment births that appear in the 20-499 or 500 or above category are expansions by existing firms. For instance, an opening of a small establishment that is part of a large firm (e.g., a new Starbucks store) will appear in the 500 or above category. Expansion by large firms will not be considered as entrepreneurship. Since a new firm starts with zero employee, all new firm creation appears only in the 19 or less category. New establishments created as an expansion by small firms (19 or less employees) are also included in this category. I denote this category *small business birth*. This birth measure will be my main proxy for entrepreneurship. The SUSB Employment Change Data also provides the number of initial establishments for each MSA. The SUSB Annual Data provides static accounts of each MSA, including employment, number of establishments by the three size categories, and annual payroll which includes all forms of compensations, such as salaries, wages, benefits, and bonuses. The population data comes from information collected from the Census Bureau. I use the Federal Housing Finance Agency's House Price Index (HPI) to control for MSA level housing price. HPI is a measure of single-family house prices based on the average price change in repeat sales or refinancing of the same properties. Among the 329 MSAs in the 1993 to 2002 census data, I drop Anchorage, Honolulu, and MSAs that have missing information.[1] I eventually end up with a balanced panel of 316 MSAs. All analysis is performed on this set of metropolitan areas.

The static variables in the SUSB data are for March or first quarter of each year. The birth variables count establishment births that occurred between March of the previous year and March of the reference year. Initial establishment level is the number of establishments in March of the previous year. For example, birth of establishment number for 1993 is the number of establishment births that occurred between March 1992 and March 1993. The initial establishment number for 1993 is the number of establishments that existed as of March 1992.

Table 1 presents the summary statistics of the main variables used in the analysis. Employment growth during the ten years period is about 16 percent, which translates to an annualized growth rate of about 1.5 percent. The descriptive statistics indicate that small businesses are responsible for 73% of urban establishments but only 19% of urban employment. On average each metropolitan area saw a birth of 1387 small establishments. Small businesses accounted for 83.6% of all establishment births. Average establishment size in 1993 was about 15 employees.

4. The Impact of Entrepreneurship on Urban Growth

4.1. OLS Results

I first visually examine the relationship between entrepreneurship and urban employment growth. Figure 1 presents a scatterplot between the change in log MSA employment between 1993 and 2002 and the log small business birth in 1993. Figure 2 and 3 present a similar plot for MSA payroll and wage growth. A general upward sloping trend is observed. A higher share of small establishment birth is positively correlated with urban growth. I examine this relationship more formally in an econometric framework. Table 2 presents the OLS results as specified in equation (4), where the dependent variables are employment, payroll, or wage growth in 1993-2002. Table 3 presents corresponding results for the 5 year windows of 1993-1998 and 1997-2002. Panel A examines MSA employment growth, Panel B total annual payroll growth, and Panel C wage growth, where wage is payroll divided by employment. All specifications in Table 2 control for initial employment, median family income, population, percent college educated and above, and the house price index. The main variable of interest is log small business birth, my main measure for entrepreneurship. In later tables I also use average establishment size to measure entrepreneurship.

[1] MSAs not included in the sample are Anchorage, AK, Honolulu, HI, Cumberland, MD-WV, Enid, OK, Flagstaff, UT-AZ, Grand Junction, CO, Hattiesburg, MS, Jamestown, NY, Johnstown, PA, Jonesboro, AR, Missoula, MT, Pocatello, ID, Steubenville-Weirton, OH-WV.

Column (1) indicates that a 10 percent increase in small business birth is associated with a 2 percent higher employment, 2.7 percent higher payroll, and 0.7 percent higher wages after 10 years. All coefficient estimates are statistically significant at the 1 percent level. Not only is there employment growth, there is also wage growth from entrepreneurship. In column (2) I include the log establishment births by medium (20 to 499 employees) and large (500 or more employees) firms as controls. The birth of establishments by the larger firms represents expansions from existing firms. The contribution of establishment births by the expansion of larger firms on employment growth is considerably smaller. In examining the impact of small business births, the number of births relative to the number of initial establishments in the city could matter for growth. Also, there could be mean reversion in the number of establishments within MSAs. Hence, in columns (3) and (4) I control for the log number of establishments in 1992 for the three employee size categories. The coefficient estimates on small business births increase and the coefficient estimates on the expansion of medium and large firms become smaller and insignificant. Despite the large number of control variables unobserved regional characteristics could explain the variation in city growth. In columns (5) and (6) I add the nine census division dummies as fixed effects. Focusing on column (5), a 10 percent increase in small business birth is associated with 2.7 percent higher employment and 3.6 percent higher payroll after 10 years. The larger coefficient estimates on entrepreneurship for payroll growth than those for employment growth imply that wage increases with entrepreneurship. Panel C confirms this pattern. A 10 percent increase in small business birth results in about 1 percent higher wages after 10 years. The coefficient estimates on the log initial number of small establishments and log employment in Panel A are negative and statistically significant, which is consistent with mean reversion in employment and small establishments.

Table 3 examines economic growth over five years. The coefficient estimates show similar patterns to those of Table 2, with the impact of entrepreneurship on 1997 to 2002 growth being larger than on 1993 to 1998 growth. Focusing on the small business birth results in column (1), a 10 percent increase in entrepreneurship is associated with an annualized employment growth rate of about 0.32 percent in Panel A, and 0.46 percent in Panel B. The 10 year growth result in Table 2 column (5) returns an annualized growth rate of about 0.26 percent. The fact that the annualized growth rates for the five year periods are higher than for the ten year period is consistent with faster growth of businesses when they are younger as documented by Haltwinger et al (2013). Similarly, the larger coefficient estimates on entrepreneurship for payroll growth than those for employment growth imply that wage would increase with entrepreneurship. Columns (7) to (9) indicate that a 10 percent increase in entrepreneurship is associated with 0.54 to 0.56 percent higher wages after five years.

Tables 2 and 3 depict an equilibrium relation rather than the causal impact of entrepreneurship on urban growth. Unobserved factors that increase a city's growth potential would increase urban entrepreneurial activity as well as actual growth. Such omitted variable would render the OLS coefficient estimates on entrepreneurship biased. To alleviate some of the concerns that arise in the cross-sectional analysis, I present first-difference estimates in Table 4 based on the following specification:

$$\Delta \ln Y_{i,1997-2002} - \Delta \ln Y_{i,1993-1998} = \beta \Delta \ln e_{i,1993-1997} + \Delta \ln X_{i,1993-1997} \cdot \gamma + \varepsilon_{i,1993-1997}. \quad (5)$$

This specification essentially takes the difference between the specifications in Table 3 Panels A and B and runs an OLS estimation. The first differencing would deal with unobserved MSA fixed effects, such as static metropolitan area growth potentials. However, first differencing a dynamic framework mechanically introduces endogeneity if the error terms are correlated over time, a very likely scenario. Hence, one should examine Table 4 with such caveat in mind.

The coefficient estimates are considerably smaller than those observed in Table 3. For instance, the coefficient estimate on employment growth in Table 4 column (1) is 0.12 compared to 0.16 and 0.23 in Table 3 column (1). Similarly, the coefficient estimates are smaller for payroll growth and wage growth. Dealing with unobserved MSA level static growth potential by first differencing seems to have mitigated the omitted variable bias in the cross sectional analyses of Tables 2 and 3. The establishment births by existing medium and large firms are small and not significant for employment and payroll growth. I also separately examine the impact of firm expansion by existing medium and large firms on urban economic growth in Appendix Table 1. I run regressions where log establishment births by medium and large firms in 1993 are the main covariate of interest. As in previous tables, I run both OLS regressions and first-difference regressions. The coefficient estimates on firm expansion are nearly three folds smaller than the estimates on small business births. Furthermore, the coefficient estimates in the first-differenced regression are no longer statistically different from zero at the 5 percent level for employment and payroll growth, regardless of firm size. Though new business birth and existing firm expansion are correlated within cities, new business birth is the driving force behind the five year and ten year urban growth results.

I use average establishment size to proxy for entrepreneurship in Table 5 and present the ten year growth, five year growth, and first-difference growth results. In Panel A, a 10 percent decrease in average establishment size in 1993 is associated with 1.8 percent higher employment, 2.3 percent higher payroll, and 0.4 percent higher wages after 10 years. The employment and payroll effects are statistically significant at the one percent level. The 5 years growth results in Panels B and C show significant average establishment size effects on employment growth. The first-difference estimates in Panel D are larger in magnitude, with a 10 percent decrease in average establishment size in 1993 resulting in 0.4 percent higher employment after 10 years. Table 5 confirms that cities with smaller establishments on average have higher economic growth as previously found in the literature.

4.2 Homestead Exemption Levels as Instrumental Variables and 2SLS Results

If there are unobserved time varying MSA level growth potentials that are correlated with entrepreneurship, then dealing with MSA fixed effects by first-differencing would not be sufficient for obtaining unbiased estimates. For example, if potential entrepreneurs perceive that a city will be increasingly favorable for future growth and start businesses, then the endogeneity concern remains. To further deal with such possibility, I estimate the impact of entrepreneurship on urban growth using the homestead exemption levels in 1975 as instrumental variables. When a non-incorporated business is no longer financially viable, the debt of the business becomes personal liability of the business owner and he or she can file for personal bankruptcy.[2] However, in these unfortunate instances property exemption laws in the US have protected a part of the debtor's assets. Such property exemption has existed in the US since 1845 when Texas became a US state, and by 1898 people could file for bankruptcy under federal bankruptcy law and receive protection according to each state's homestead exemption level (Posner et al. 2001). Homestead exemption protects ownership on real property, such as house or land, up to the specified level. If an entrepreneur owns \$50,000 equity in a house and files for bankruptcy in a state where the homestead exemption level is \$20,000, the entrepreneur would keep \$20,000 and the rest would go to the (unsecured) creditors.

Appendix Table 2 shows that the homestead exemption levels in 1975 varied significantly across states. The exemption levels ranged from zero in Connecticut, Delaware, Maryland, New jersey, Ohio, Pennsylvania, Rhode Island, and West Virginia to unlimited in Arkansas, Florida, Iowa, Kansas, Minnesota, Oklahoma, South Dakota and Texas. An entrepreneur filing for bankruptcy in Iowa could keep his or her home and land in entirety, whereas someone in Ohio would have lost his house if his debt was greater than the equity in his house. Given that there are unlimited exemption levels, I cannot simply use the continuous exemption level as the instrumental variable. Hence, I first construct two state exemption level variables: UN_s, a dummy equal to one if the state has unlimited exemption and equal to zero if the state has limited or no exemption, and EX_s, the state exemption level. EX_s is set to zero for states with unlimited exemption. For MSAs not contained entirely within one state, I average each variable across the states each MSA overlaps with. Hence, the final set of MSA level instrumental variables are:

$$UN_i = \frac{1}{N[s\in i\}}\sum_{s\in i} UN_s,\ \ lnEX_i = \log(\frac{1}{N[s\in i\}}\sum_{s\in i} EX_s + 1). \qquad (6)$$

[2] Over 70% of small businesses are sole proprietors. Partnerships are also unincorporated and hence are eligible for personal bankruptcy procedures. Limited liability companies and corporations limit the financial liability of the owner or shareholder.
http://www.sba.gov/community/blogs/top-10-questions-about-small-business-incorporation-answered

where *i* indexes for MSAs and *s* for states. Two conditions are needed for the above set of homestead exemption level variables to serve as a valid instrument for entrepreneurship. The first is that exemption levels need to impact entrepreneurship. The literature provides direct evidence on this relationship. Fan and White (2003) discuss how higher exemption levels serve as a wealth insurance and induce risk averse potential entrepreneurs to start a business. They empirically confirm this using household level data. Rohlin and Ross (2015) uses the discontinuity in exemption levels across state borders and find that states with higher exemption levels attract more new businesses and also have positive effects on existing businesses. Similarly, I will find strong evidence that more generous homestead exemption increases small business births in MSA's.[3]

The second condition, that conditional on city economic conditions in 1993, the 1975 homestead exemption level impacts 1993-2002 urban growth only through its impact on entrepreneurship warrants further understanding of the variance in exemption levels across states. What explains the astonishingly wide variance in exemption levels? As Posner et al. (2001) point out, hypotheses relating to the difference in the demand for insurance, or in altruism are unlikely to explain the wide variance. They examine the cross sectional variation in homestead exemption level in a regression framework by including multiple variables, such as income, charitable giving, population density, farm proprietors share, and find that only the historical exemption levels in 1920 predict current exemption levels. Their argument that (1) initially sparsely populated states in the 1800s set high homestead exemption levels to compete for migrants and that (2) whenever state lawmakers would negotiate the exemption level the bargaining point would be the then current levels provides a convincing explanation of the persistent variation of exemption levels across states. The assumption of instrument exogeneity holds if unobserved MSA level static and dynamic growth potential between 1993-2002, controlling for 1993 economic conditions and entrepreneurship, is not correlated with the homestead exemption levels in 1975. Despite the long historical lag, one can not perfectly rule out the possibility that certain unobserved city characteristic that drive growth in the 1990s may be related to the 1975 exemption levels. In addition to various robustness tests, I will also use another instrumental variable, the share of the MSA that overlays aquifers. I discuss this instrumental variable in the next section and present and compare results from 2SLS estimates that use these very different instrumental variables.

Table 6 presents the instrumental variable regression results. The estimation in practice is identical to equation (4) with the homestead exemption variables in equation (6) used as instruments. Panel A presents the first stage of the 2SLS estimation. Columns (1) to (3) examine the impact of the

[3] Higher exemption levels could potentially make banks less willing to lend to entrepreneurs as pointed out by Berkowitz and White (2004). If this is the case, I am finding a positive net effect of homestead exemption on entrepreneurship at the aggregate level.

unlimited exemption variable on small business births. Focusing on the specification that includes the initial establishment controls and census division fixed effects in column (3), small business births are eleven percent higher in metropolitan areas with unlimited exemption versus not. Columns (4) to (6) add the continuous log exemption level variable. In column (6) the coefficient estimates on both instruments are positive and statistically significant at the 5 percent level. A doubling of the exemption level increases small business birth by about 0.6%. The first stage F-statistics are above 10 in all specifications.[4]

Table 6 Panels B through D present the 2SLS results on employment, payroll, and wage growth. Columns (1) through (3) use the unlimited exemption variable as the instrument and Columns (4) through (6) use both variables in the instrument set. Focusing on the specification with the full set of control variables and fixed effects in column (3), a 10% increase in small business birth in 1993 leads to 2.2% more employment, 4% higher total annual payroll, and 1.8% higher wages after 10 years. When both instrumental variables are used in column (6), a 10% increase in small business birth leads to 1.1% more employment, 3.1% higher total annual payroll, and 2% higher wages after 10 years. The employment effect drops a bit in column (6) and loses statistical significance. The 2SLS estimates are generally smaller in magnitude than the OLS estimates with the same specifications. The positive bias in the OLS estimates indicates that unobserved MSA growth potential is positively correlated with small business births.

Note that the 2SLS estimates implicitly assume that the variation in the homestead exemption levels impacts the number of births but not the average entrepreneurial ability in each MSA. However, it is unlikely to be the case. Consider a distribution of entrepreneurial ability in a city. If homestead exemption serves as a wealth insurance as in Fan and White (2003), cities with higher exemption will see more new businesses. Depending on whether the marginal entrepreneur's entrepreneurial ability is greater or lower than the existing average entrepreneurial ability in the city, the 2SLS estimate on the number of entrepreneurship may over or understate the true impact. If higher homestead exemption renders the marginal entrepreneur to be of lower ability than the average, the 2SLS estimates in Table 6 is likely a lower bound. On the other hand, if higher homestead exemption renders the marginal entrepreneur to be of higher ability than the average, the 2SLS estimates in Table 6 are likely greater than the true impact.[5] I do not have data to test which situation holds in this case. However, if we assume a model where the

[4] Appendix Table 3 examines the impact of the homestead exemption variables on expansions by medium and large firms. Given that small business births and existing firm expansion are correlated within cities, I do find positive correlation between the instrumental variables and firm expansion. However, once I control for small business birth the impact of the homestead exemption variables on firm expansion goes away.

[5] Note that this argument assumes a closed city or that all cities are identical. If entrepreneurs of different ability sort across cities to take advantage of higher homestead exemption, one would need to consider whether there is positive or negative selection across cities as well. I abstract away from this discussion. However, there is evidence that entrepreneurs disproportionately start their businesses in their hometowns (Michelacci and Silva, 2007).

decision to become an entrepreneur is non-decreasing in wealth and entrepreneurial ability, and that the additional wealth insurance from higher homestead exemption levels mostly impacts the contribution of wealth on start-up decision, then the marginal entrepreneur's ability would be lower than the average.[6] This would imply that the 2SLS estimates in Table 6 are lower bounds.

4.3 Aquifer Share as Instrumental Variable and 2SLS Results

The comprehensive set of OLS, first-difference, and 2SLS estimates provide convincing evidence that entrepreneurship indeed promotes urban growth. However, some may still worry that certain unobserved local attributes not included in the model may be related to both the 1975 homestead exemption variables and urban growth between 1993 and 2002. I further tackle this concern by using a different instrumental variable - the share of MSA that overlays aquifers. Aquifers are major storehouses of underground water and facilitate agricultural production. Why might the share of MSA overlaying aquifers impact small business births? Hornbeck and Keskin (forthcoming) find that counties that overlay with the Ogalla Aquifer saw substantial increases in the agricultural labor force but the expansion of agriculture due to aquifers did not have an overall positive spillover to other industries. If a large part of the MSA population continues to engage in where the agricultural sector, there will be less incentive and training for workers to venture out and start new businesses. The financial sector may also be more prone to lend to the established agricultural sector. Glaeser, Kerr, and Kerr (2015) hypothesize and show that large resource-intensive activities like mining can crowd out entrepreneurial activity. Similarly, large water-intensive agricultural production could crowd out local entrepreneurship. I take this idea and test whether the share of MSA overlaying aquifers is significantly related to small business births. Data on the US aquifers was originally developed by the United States Geological Service in *Principal Aquifers of the*

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[6] Suppose a potential entrepreneur's decision to start a business depends on the individual's wealth w and entrepreneurial ability a. Further assume that wealth w and entrepreneurial ability a are uniformly distributed across a two-dimensional space. I assume that the decision to become an entrepreneur is non-decreasing in wealth w and entrepreneurial ability a. Wealth captures both collateral used to start a business, as well as risk preference, so that higher w will imply a higher propensity to start a business. Higher entrepreneurial ability will also imply a higher propensity to start a business. Given w and a there will be an expected payoff for entrepreneurship and working for others. If the expected payoff of entrepreneurship is greater than the wage earnings, one will start a business. In other words, one can think of a simple decision rule that can be expressed as below:

$$D_{entrepreneur} = 1, \qquad if\ \tau w + \varphi a \geq c$$
$$D_{entrepreneur} = 0, \qquad if\ \tau w + \varphi a < c$$

for some parameters τ and φ and cutoff c. $D_{entrepreneur}$ equals one for an entrepreneur and zero if one works for another. Depending on how higher exemption level might impact the relative importance of the two factors, i.e., the ratio τ/φ, the average ability of observed entrepreneurs in the metropolitan area will differ. If higher exemption serves as a wealth insurance and increases the relative importance of wealth, i.e., τ/φ increases, then average ability *E(a)* in the city will decrease.

48 Conterminous Unites States.[7] I use the data constructed by Burchfield et al. (2006) for the analysis. The share of MSA overlaying aquifers range from 0 to 1 with a mean value of around 0.3.

Table 7 Panel A examines how the aquifer share variable impacts small business births in MSAs. Column (1) implies that a 10% increase in the aquifer share decreases small business births by 1.3%. When I include the census division fixed effects in column (2), the impact drops to 0.8%. Both estimates are statistically significant at the 1 percent level. Glaeser, Kerr, and Kerr's hypothesis that natural resource intensive regions crowd-out entrepreneurship is validated with ground water as well, in addition to mineral deposits. The 2SLS results using aquifer share as the instrumental variable is presented in Panels B through D. A 10 percent increase in small business birth increases employment by 2.1% after 10 years in column (1) and by 1.8% in column (2). The estimate is statistically significant in column (1). Note that these estimates are quite similar to the 2SLS estimates that use homestead exemption as instrumental variables. Despite the two being very different instrumental variables the estimates are surprisingly similar.

The subsequent columns in Table 7 use both the aquifer share variable and homestead exemption variables as instrumental variables. In Panel A the negative impact of aquifer share on small business birth remains strong and significant. The homestead exemption variables positively impact small business births and the F-statistic is greater than 10 other than in column (6). The 2SLS estimates on employment growth in Panel B range from 0.13 to 0.26, and are quite similar in range to the estimates in Table 6. Payroll results in Panel C are larger in magnitude than the employment estimates like before, and are all statistically significant. The range of estimates is also similar to the payroll results in Table 6 Panel B.

The fact that two very different sets of instrumental variables, the homestead exemption variables and the aquifer variable, return statistically significant results similar in magnitude is quite reassuring. The consistency of the 2SLS results in Tables 6 and 7 further support the causal impact of small business births on urban economic growth.

4.4. Average Establishment Size Results

Table 8 presents results when average establishment size is used to proxy for entrepreneurship. Column (1) uses the unlimited exemption in 1975 as the instrumental variable, column (2) adds the log exemption level in 1975, and column (3) additionally adds the aquifer share variable to the instrument set. All specifications include the full set of base control variables and the census division fixed effects. Panel A presents the first-stage of the 2SLS estimation and Panel B to D presents the 2SLS results on employment, payroll, and wage growth. In Panel A unlimited exemption in 1975 is the only variable that significantly impacts average establishment size in 1993 and the first-stage F statistics is largest and

[7] The GIS data can be accessed at http://water.usgs.gov/GIS/metadata/usgswrd/XML/aquifers_us.xml#stdorder

greater than 10 in column (1). The employment growth results in Panel B are tightly distributed around -0.26 to -0.27. Similarly, the payroll and wage results are quite similar across all three specifications. Focusing on column (1), a 10 percent decrease in average establishment size in 1993 is associated with 2.7 percent higher employment, 4.9 percent higher payroll, and 2.2 percent higher wages after 10 years. These 2SLS estimates on average establishment size are larger in magnitude compared to the OLS estimates in Table 5 where a 10 percent decrease in average establishment size was associated with 1.8 percent higher employment, 2.3 percent higher payroll, and 0.4 percent higher wages after 10 years. Recall that the 2SLS estimates on small business births were smaller in magnitude than the OLS estimates. The fact that the 2SLS estimates change relative to the OLS estimates in opposite directions depending on which entrepreneurship variable is used is actually intuitive. The main omitted variable, unobserved MSA growth potential, is likely positively correlated with small business births, and thus negatively correlated with average establishment size.

Glaeser, Kerr and Kerr's 2SLS estimates for the impact of average establishment size on employment growth range from -0.87 to -0.96. These are substantially larger than mine, but they examine the 21 year period of 1982 to 2002, whereas I examine a ten year period. In terms of annualized growth rates, their results imply about a 0.03 per annum growth rate and mine a 0.024 per annum growth rate. The fact that two different studies that use two different instrumental variables show similar results further illustrates the causal impact of entrepreneurship on urban growth.

4.5 Robustness Checks

Lastly, I further explore the robustness of the 2SLS estimates to various inclusions of state or MSA characteristics. One concern is whether other unobserved state business environment is driving the results. In Table 9, I add variables that proxy for state business environment to the 2SLS regressions. I use the specification that uses two instrumental variables - the share of MSA with unlimited exemption level in 1975 and the share of MSA overlaying aquifers. Panel A adds the minimum wage for each MSA. For MSAs that cross state borders, I use the population weighted average minimum wage. The minimum wage level could potentially impact an entrepreneur's decision to start a business. However, the coefficient estimates on small business births actually becomes larger and is still statistically significant at the 5 percent level. Panel B controls for state Right-to-work laws. I add a variable that captures the population share of MSA subject to Right-to-work laws. Similarly, the employment growth estimates do not change much but rather becomes slightly larger. In Panel C, I control for past population patterns by additionally including log population in 1985 as a control. The coefficient estimates on entrepreneurship barely changes. Panel D controls for industry composition by including the employment share in manufacturing, retail, and services. The coefficient estimates show similar patterns as before but standard errors are slightly larger.

Lastly, before examining the agglomeration benefits of entrepreneurship, I examine other mechanisms that might explain the growth impact of entrepreneurship. One is the mechanical channel. If there is a subset of entrepreneurs that survive and grow, then more entrepreneurship across cities would imply higher number of surviving entrepreneurs and establishments down the road. Panel E column (1) examines how small business births in 1993 impact total number of establishments in 2002. Ideally, I would directly examine surviving businesses but I do not have that data. The impact is strong and significant. A 10 percent increase in small business birth results in 3.3% more establishments 10 years later. Given that there were 16,212 establishments and 1,387 small business births in 1993, this result potentially suggests a large externality benefit of entrepreneurship to other firm creation. Another channel relates to the idea of creative destruction. Creative destruction suggests that new entrepreneurship generates growth by promoting the obsolete firms to exit. In Panel E column (2), I examine how small business birth impacts establishment death the next period. I find a statistically significant birth to death elasticity of 0.73. A 10 percent increase in entrepreneurship generates a 7.3% increase in establishment death the next year.

5. The Agglomeration Benefits of Entrepreneurship

The OLS, first difference, and instrumental variable estimates all indicate that entrepreneurship contributes to urban growth. In this section, I examine whether the growth impact of entrepreneurship is simply due to the growth in the newly created businesses or whether there are agglomeration benefits, i.e., growth associated with other firms in the economy. A 10 percent increase in small establishment birth in 1993 translates to about 139 more births at the mean. Using the preferred 2SLS estimates from Table 6 column (3) and Table 7 column (2), i.e., the specifications with the full set of variables and fixed effects and strong first-stages, this would generate about 1.3 to 2.2% more employment ten years later, which amounts to 3,277 to 5,546 more jobs. The Bureau of Labor Statistics reports that about a third of new establishments survive after 10 years.[8] If I assume all of the employment increase came from the new businesses created in 1993 it would imply that on average each surviving business increased employment by 71 to 120. Unfortunately, I do not know the average employment growth of new businesses that survive after 10 years and hence cannot make a direct comparison. However, in the 1992-1993 period, there were 564,504 firm births in the less than 20 employee category, which in aggregate created 3,438,106 jobs in the U.S. This returns on average 6.1 employees per new small business created in 1993.

[8] http://www.sba.gov/advocacy/7495/29581

If the average new business that survives after ten years is unlikely to grow from 6.1 employees to 77 to 126 employees, the results here imply substantial agglomeration benefits from entrepreneurship.

Examining payroll growth provides another evidence of the agglomeration benefits of entrepreneurship. A 10 percent increase in entrepreneurship causes 2.4 to 4.0% higher annual payroll after 10 years, which translates to $157,296,000 to $262,149,600 in 1993 dollars. If this increase were distributed solely to the newly created employment (using the average of 4,412) each employee would get an annual pay of around $48,000 in 1993 dollars. Given that the average pay for employees working in small establishments in 2002 was $30,004 ($617,583,597,000/20,583,371 employees) in 2002 dollars or $24,100 in 1993 dollars, there seems to be substantial spill over effects of entrepreneurship to other firms in the economy. This simple accounting exercise suggests that there indeed are agglomeration benefits to urban entrepreneurship.

6. Conclusion

Entrepreneurship is widely believed to be a main source of economic growth. This paper estimates the impact of entrepreneurship measured by small business births on urban employment and income growth. The study of entrepreneurship and urban growth has been hampered by the joint determination of the two. I use the variation in entrepreneurship generated by the homestead exemption levels in state bankruptcy laws and the share of MSA overlaying aquifers to examine urban growth between 1993 and 2002. I find that a ten percent increase in the birth of small businesses increases MSA employment by 1.1 to 2.2%, annual payroll by 3.1 to 4.0%, and wage by 1.8 to 2.0% after ten years. The fact that two very different sets of instrumental variables, the homestead exemption variables and the aquifer variable, return statistically significant results similar in magnitude provide convincing evidence of entrepreneurship's causal impact on urban growth. Furthermore, the impact of average establishment size on urban employment growth are similar to the annualized growth rate estimates from Glaeser, Kerr, and Kerr (2015), who examine a longer time frame and use different set of instrumental variables. A simple accounting exercise illustrates that the employment and payroll growth effects from entrepreneurship likely spilled over to other firms in the urban economy. Overall, this paper shows that the creation of small businesses indeed causes substantial employment and payroll growth in cities.

Hurst and Pugsley (2011) find that many become entrepreneurs for the flexible lifestyle and do not have the desire to grow their businesses. It would be helpful to know which entrepreneurs are driving urban growth. Is it the Silicon Valley type technology firms that are driving urban growth or are the various small businesses, from retail to services, doing their share in promoting growth? Coming up with plausibly exogenous variation in the specific types of entrepreneurship would be challenging but future work on these questions would add to our understanding of entrepreneurship's role in urban growth. Governments around the world have been implementing various policies to promote entrepreneurship. Research that performs well-identified policy evaluations would also be valuable to the literature and policy makers. There has been constant debate on whether government guaranteed small business loans divert credit away from the entrepreneurs with high growth potentials. In addition to guaranteed loans, governments around the world are providing matching grants to start-ups, establishing start-up incubators, and providing office space for entrepreneurs. Analyzing whether these have economically meaningful and statistically significant impact on economic growth would be valuable.

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Figure 1. Scatterplot of MSA employment growth (1993-2002) and small business births (1993).

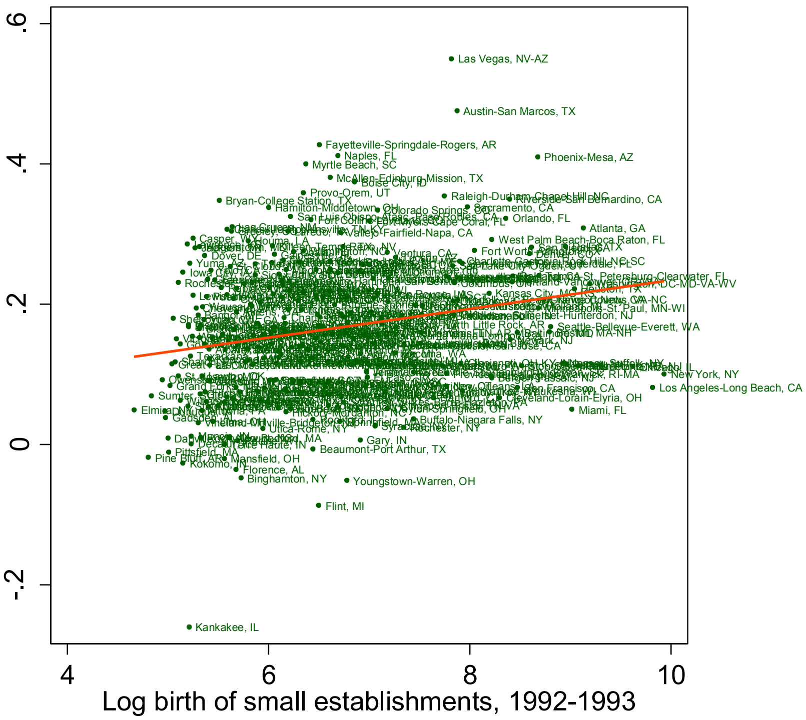

Figure 2. Scatterplot of MSA payroll growth (1993-2002) and small business births (1993).

Figure 3. Scatterplot of MSA wage growth (1993-2002) and small business births (1993).

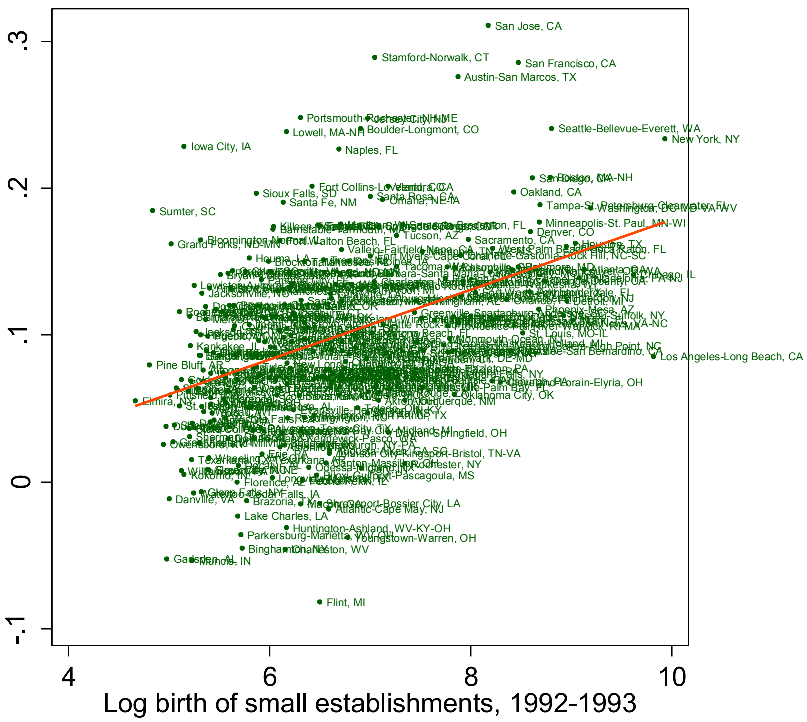

Table 1. Summary statistics

Variable	Mean	Std. Dev.	Min	Max
Establishment births by new firms or firms with less than 20 employees, 1992.3-1993.3	1387	2390.85	105	20602
Establishment births by existing firms with 20 to 499 employees, 1992.3-1993.3	119	201.29	6	1771
Establishment births by existing firms with more than 499 employees, 1992.3-1993.3	153	254.10	8	1866
Change in log employment, 1993-2002	0.163	0.100	-0.261	0.550
Change in log annual payroll, 1993-2002	0.258	0.139	-0.169	0.752
Employment, 1993	252130	439654	20957	3495130
Annual payroll ($1,000,000), 1993	6554	13300	336	123000
Average establishment size, 1993	14.85	2.53	8.29	24.13
Employment of establishments with less than 20 employees, 1993.3	48003	79320.2	5317	644273
Employment of establishments with 20 to 499 employees, 1993.3	82163	144312.4	6868	1203297
Employment of establishments with more than 499 employees, 1993.3	121963	217507.3	6870	1666884
Number of establishments with less than 20 employees, 1993.3	11856	20298.56	1234	180540
Number of establishments with 20 to 499 employees, 1993.3	2357	3774.05	245	31251
Number of establishments with more than 499 employees, 1993.3	1999	3107.24	213	22605

Notes: Unit of analysis is the Metropolitan Statistical Area (MSA) and the number of MSAs in the data is 316.

Table 2. Impact of entrepreneurship on urban growth (10 year growth): OLS estimates

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Dependent variable:	*Change in log employment, 1993-2002*					
Log small business births in 1992-93	0.200***	0.154***	0.285***	0.254***	0.267***	0.241***
	(0.0213)	(0.0251)	(0.0298)	(0.0289)	(0.0311)	(0.0311)
Log establishment births by existing medium firms in 1992-93		0.0508**		0.0346		0.0264
		(0.0205)		(0.0221)		(0.0228)
Log establishment births by existing large firms in 1992-93		0.0444**		0.0267		0.0292
		(0.0187)		(0.0222)		(0.0223)
Log employment in 1993	-0.134***	-0.189***	-0.256***	-0.268***	-0.215***	-0.224***
	(0.0252)	(0.0260)	(0.0487)	(0.0474)	(0.0600)	(0.0587)
Log median family income in 1990	-0.0699	-0.0334	0.0247	0.0346	0.0890*	0.0907*
	(0.0434)	(0.0453)	(0.0444)	(0.0446)	(0.0492)	(0.0486)
Log population in 1990	-0.0520*	-0.0473	-0.00498	-0.00122	0.0111	0.0130
	(0.0300)	(0.0293)	(0.0310)	(0.0308)	(0.0332)	(0.0327)
Log housing price index 1993	-0.0900	-0.131	-0.0351	-0.0573	0.0642	0.0438
	(0.0883)	(0.0874)	(0.0888)	(0.0873)	(0.126)	(0.120)
Percent college and above in 1990	0.00245**	0.00216*	0.00158	0.00138	0.000257	0.000122
	(0.00114)	(0.00114)	(0.00105)	(0.00107)	(0.00102)	(0.00103)
Log establishments with less than 20 employees in 1992			-0.255***	-0.241***	-0.286***	-0.275***
			(0.0497)	(0.0475)	(0.0512)	(0.0497)
Log establishments with 20 to 499 employees in 1992			0.180***	0.174***	0.202***	0.197***
			(0.0472)	(0.0498)	(0.0578)	(0.0604)
Log establishments with 500 or above employees in 1992			0.0633**	0.0324	0.0295	-0.000338
			(0.0316)	(0.0411)	(0.0354)	(0.0434)
Census division fixed effects					Y	Y
R squared	0.379	0.423	0.446	0.43	0.504	0.498
Panel B: Dependent variable:	*Change in log payroll, 1993-2002*					
Log small business births in 1992-93	0.270***	0.216***	0.394***	0.342***	0.362***	0.317***
	(0.0278)	(0.0333)	(0.0365)	(0.0385)	(0.0391)	(0.0419)
Log establishment births by existing medium firms in 1992-93		0.0764***		0.0642**		0.0546**
		(0.0261)		(0.0263)		(0.0269)
Log establishment births by existing large firms in 1992-93		0.0324		0.0392		0.0436
		(0.0244)		(0.0274)		(0.0282)
Panel C: Dependent variable:	*Change in log wages 1993-2002*					
Log small business births in 1992-93	0.0698***	0.0621***	0.110***	0.0879***	0.0951***	0.0755***
	(0.0117)	(0.0139)	(0.0162)	(0.0188)	(0.0185)	(0.0204)
Log establishment births by existing medium firms in 1992-93		0.0256*		0.0296**		0.0282**
		(0.0139)		(0.0129)		(0.0139)
Log establishment births by existing large firms in 1992-93		-0.0120		0.0125		0.0144
		(0.0125)		(0.0147)		(0.0151)
Base controls	Y	Y	Y	Y	Y	Y
Initial establishment controls			Y	Y	Y	Y
Census division fixed effects					Y	Y

Notes: The unit of analysis is the MSA and the number of observations is 316. Establishment births for 1993 are counted between March 1992 and March 1993. The "small business births" variable includes all new firm creation and expansions by firms with less than 20 employees. The "establishment birth by existing medium firms" variable refers to expansion by firms with 20-499 employees. The "establishment birth by existing large firms" variable refers expansion by firms with over 500 employees. Base controls are the initial period employment, income, population, education, and house price variables. Initial establishment controls are the three initial period numbers of establishments by size variables. There are nine census division fixed effects variables. The dependent variable is the change in log total MSA employment between 1993 and 2002 in Panel A, the change in log total annual payroll, which includes all wages, salary, bonuses, and benefits between 1993 and 2002 in Panel B, and the change in wage, which is payroll divided by employment, in Panel C. * p<0.1, ** p<0.05, *** p<0.01. Robust standard errors are in parentheses.

Table 3. Impact of entrepreneurship on urban growth (5 year growth): OLS Estimates

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: 1993 to 1998 change in	*log employment*		*log payroll*		*log wage*	
Log small business births in 1992-93	0.164***	0.137***	0.218***	0.180***	0.0539***	0.0429**
	(0.0220)	(0.0219)	(0.0285)	(0.0297)	(0.0176)	(0.0185)
Log establishment births by existing medium firms in 1992-93		0.0390***		0.0472***		0.00823
		(0.0125)		(0.0156)		(0.00976)
Log establishment births by existing large firms in 1992-93		0.0182		0.0337*		0.0155
		(0.0154)		(0.0192)		(0.0113)
R-squared	0.469	0.487	0.466	0.483	0.339	0.345
Base controls	Y	Y	Y	Y	Y	Y
Initial establishment controls	Y	Y	Y	Y	Y	Y
Census division fixed effects	Y	Y	Y	Y	Y	Y
Panel B: 1997 to 2002 change in	*log employment*		*log payroll*		*log wage*	
Log small business births in 1996-97	0.234***	0.216***	0.291***	0.285***	0.0566***	0.0690***
	(0.0292)	(0.0318)	(0.0378)	(0.0415)	(0.0213)	(0.0228)
Log establishment births by existing medium firms in 1996-97		0.0373		0.0168		-0.0206
		(0.0252)		(0.0323)		(0.0143)
Log establishment births by existing large firms in 1996-97		-0.00205		-0.0102		-0.00817
		(0.0153)		(0.0193)		(0.0101)
R-squared	0.479	0.486	0.528	0.529	0.393	0.399
Base controls	Y	Y	Y	Y	Y	Y
Initial establishment controls	Y	Y	Y	Y	Y	Y
Census division fixed effects	Y	Y	Y	Y	Y	Y

Notes: The unit of analysis is the MSA and the number of observations is 316. Establishment births for year t are counted between March of year t-1 and March of year t. The "small business births" variable includes all new firm creation and expansions by firms with less than 20 employees. The "establishment birth by existing medium firms" variable refers to expansion by firms with 20-499 employees. The "establishment birth by existing large firms" variable refers expansion by firms with over 500 employees. Base controls are the initial period employment, income, population, education, and house price variables. Initial establishment controls are the three initial period numbers of establishments by size variables. The nine census divisions are used in the fixed effects. Panel A examines the five years growth between 1993 and 1998. Panel B examines the five years growth between 1997 and 2002. The dependent variables are the change in log total MSA employment, the change in log total annual payroll, which includes all wages, salary, bonuses, and benefits, and the change in wage, which is payroll divided by employment. * p<0.1, ** p<0.05, *** p<0.01. Robust standard errors are in parentheses.

Table 4. Impact of entrepreneurship on urban economic growth: first-difference estimates

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	*Change in 5 year growth, i.e., (1997 to 2002 change) - (1993 to 1998 change)*					
	log employment		*log payroll*		*log wage*	
ΔLog small business births between 1993 and 1997	0.122***	0.116***	0.115***	0.114***	-0.00723	-0.00230
	(0.0325)	(0.0310)	(0.0420)	(0.0421)	(0.0230)	(0.0232)
ΔLog establishment births by existing medium firms between 1993 and 1997		0.0359		0.0146		-0.0214***
		(0.0221)		(0.0236)		(0.00785)
ΔLog establishment births by existing large firms between 1993 and 1997		-0.00115		-0.00761		-0.00647
		(0.0115)		(0.0163)		(0.00838)
Change in base controls	Y	Y	Y	Y	Y	Y
Change in initial establishment controls	Y	Y	Y	Y	Y	Y
R-squared	0.585	0.598	0.581	0.582	0.559	0.571

Notes: The unit of analysis is the MSA and the number of observations is 316. The dependent variables are the change in employment, payroll, and wage growth. Establishment births for year t are counted between March of year t-1 and March of year t. Establishment per employee is the number of establishments divided by the number of employees in the MSA. The "small business births" variable includes all new firm creation and expansions by firms with less than 20 employees. The "establishment birth by existing medium firms" variable refers to expansion by firms with 20-499 employees. The "establishment birth by existing large firms" variable refers expansion by firms with over 500 employees. Base controls include the change in log employment, payroll, population, and house price index, and the 1990 percent college educated and log median family income. Initial establishment controls are the change in the three initial establishment variables. * p<0.1, ** p<0.05, *** p<0.01. Robust standard errors are in parentheses.

Table 5. OLS results using average establishment size to proxy for entrepreneurship

	(1)	(2)	(3)
Panel A: 1993 to 2002 Change in	*log employment*	*log payroll*	*log wage*
Log average establishment size in 1993	-0.183***	-0.225***	-0.0420
	(0.0447)	(0.0581)	(0.0271)
R-squared	0.379	0.426	0.392
Panel B: 1993 to 1998 Change in	*log employment*	*log payroll*	*log wage*
Log average establishment size in 1993	-0.0729**	-0.0612	0.0118
	(0.0330)	(0.0436)	(0.0213)
R-squared	0.365	0.359	0.272
Panel C: 1997 to 2002 Change in	*log employment*	*log payroll*	*log wage*
Log average establishment size in 1997	-0.142***	-0.194***	-0.0519***
	(0.0309)	(0.0357)	(0.0194)
R-squared	0.361	0.447	0.368
Panel D: (1997 to 2002 change) - (1993 to 1998 change) in	*log employment*	*log payroll*	*log wage*
ΔLog average establishment size between 1993 and 1997	-0.406***	-0.347**	0.0593
	(0.117)	(0.143)	(0.0737)
R-squared	0.576	0.576	0.552

Notes: The unit of analysis is the MSA and the number of observations is 316. Average establishment size is the number of employees divided by the number of establishments in the MSA. Panel A examines the 10 years growth in employment, payroll, an wages. Panels B and C examines the 5 years growth. Panel D examines the change in the 5 years growths. Panels A, B, and C include the initial period employment, income, population, education, house price variables, and the census division fixed effects. Panel D includes the change in employment, income, population, education, and house price variables. * p<0.1, ** p<0.05, *** p<0.01. Robust standard errors are in parentheses.

Table 6. 2SLS results using the 1975 homestead exemption variables as instrumental variables

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A - Dependent variable:			*Log small business births in 1992-1993*			
Unlimited exemption in 1975	0.147***	0.0774***	0.111***	0.0804*	0.00263	0.0819***
	(0.0402)	(0.0226)	(0.0264)	(0.0426)	(0.0247)	(0.0281)
Log homestead exemption level in 1975				0.0184***	0.0200***	0.00834**
				(0.00353)	(0.00269)	(0.00336)
1st stage F-statistic	13.37	11.73	17.75	22.45	37.86	11.77
Base controls	Y	Y	Y	Y	Y	Y
Initial establishment size controls		Y	Y		Y	Y
Census division fixed effects			Y			Y
Panel B - 2SLS : Dependent variable:			*Change in log employment, 1993-2002*			
Log small business births in 1992-93	0.273***	0.390***	0.218*	0.262***	0.257***	0.106
	(0.0836)	(0.148)	(0.119)	(0.0548)	(0.0607)	(0.106)
Hansen J-statistic p-value				0.86	0.34	0.14
Panel C - 2SLS : Dependent variable:			*Change in log payroll, 1993-2002*			
Log small business births in 1992-93	0.376***	0.586***	0.399**	0.417***	0.443***	0.309**
	(0.117)	(0.205)	(0.170)	(0.0800)	(0.0850)	(0.146)
Hansen J-statistic p-value				0.63	0.44	0.38
Panel D - 2SLS : Dependent variable:			*Change in log wage, 1993-2002*			
Log small business births in 1992-93	0.104**	0.195**	0.180*	0.155***	0.186***	0.203***
	(0.0519)	(0.0945)	(0.0956)	(0.0389)	(0.0424)	(0.0784)
Hansen J-statistic p-value				0.18	0.91	0.66
Instrumental variables:		*Unlimited exemption in 1975*			*Unlimited exemption in 1975, Log homestead exemption level, 1975*	
Base controls	Y	Y	Y	Y	Y	Y
Initial establishment controls		Y	Y		Y	Y
Census division fixed effects			Y			Y

Notes: Panel A presents the first stage of the 2SLS regression and Panel B present the 2SLS estimates. The unit of analysis is the MSA and the number of observations is 316. Small business births for 1993 are counted between March 1992 and March 1993. The "small business births" variable includes all new firm creation and expansions by firms with less than 20 employees. Base controls are initial employment, median family income, population, percent college degree and above, and the house price index. Initial establishment controls are the three log number of establishment variables. The nine census divisions are used in the fixed effects. The Kleibergen-Paap rk Wald F statistics are reported as the 1st stage F-statistics. * p<0.1, ** p<0.05, *** p<0.01. Robust standard errors are in parentheses.

Table 7. 2SLS results using aquifer share in MSA as instrumental variable

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A - Dependent variable:	*Log small business births in 1992-1993*					
Aquifer share	-0.128***	-0.0821***	-0.118***	-0.0717***	-0.0652**	-0.0587**
	(0.0261)	(0.0250)	(0.0262)	(0.0244)	(0.0253)	(0.0247)
Unlimited exemption in 1975			0.0626***	0.101***	0.00389	0.0803***
			(0.0222)	(0.0258)	(0.0243)	(0.0277)
Log homestead exemption level in 1975					0.0175***	0.00646*
					(0.00285)	(0.00344)
1st stage F-statistic	23.92	10.79	16.3	13.84	27.97	8.81
Base controls	Y	Y	Y	Y	Y	Y
Initial establishment size controls	Y	Y	Y	Y	Y	Y
Census division fixed effects		Y		Y		Y
Panel B - 2SLS : Dependent variable:	*Change in log employment, 1993-2002*					
Log small business births in 1992-93	0.207**	0.176	0.258***	0.126**	0.247***	0.136
	(0.0937)	(0.149)	(0.0772)	(0.0574)	(0.0586)	(0.0910)
Hansen J-statistic p-value			0.3	0.6	0.58	0.28
Panel C - 2SLS : Dependent variable:	*Change in log payroll, 1993-2002*					
Log small business births in 1992-93	0.400***	0.470**	0.452***	0.241***	0.435***	0.363***
	(0.121)	(0.204)	(0.106)	(0.0808)	(0.0813)	(0.126)
Hansen J-statistic p-value			0.42	0.28	0.72	0.47
Panel D - 2SLS : Dependent variable:	*Change in log wage, 1993-2002*					
Log small business births in 1992-93	0.193***	0.294***	0.194***	0.115***	0.188***	0.227***
	(0.0580)	(0.114)	(0.0525)	(0.0438)	(0.0406)	(0.0708)
Hansen J-statistic p-value			0.98	0.16	0.98	0.71
Instrumental variables:	*Aquifer share*		*Aquifer share Unlimited exemption in 1975*		*Aquifer share, Unlimited exemption in 1975, Log homestead exemption level, 1975*	
Base controls	Y	Y	Y	Y	Y	Y
Initial establishment controls	Y	Y	Y	Y	Y	Y
Census division fixed effects		Y		Y		Y

Notes: Panel A presents the first stage of the 2SLS regression and Panel B present the 2SLS estimates. The unit of analysis is the MSA and the number of observations is 316. Small business births for 1993 are counted between March 1992 and March 1993. The "small business births" variable includes all new firm creation and expansions by firms with less than 20 employees. Base controls are initial employment, median family income, population, percent college degree and above, and the house price index. Initial establishment controls are the three log number of establishment variables. The nine census divisions are used in the fixed effects. The Kleibergen-Paap rk Wald F statistics are reported as the 1st stage F-statistics. * p<0.1, ** p<0.05, *** p<0.01. Robust standard errors are in parentheses.

Table 8. 2SLS results using average establishment size to proxy for entrepreneurship

	(1)	(2)	(3)
Panel A - First stage : Dependent variable:	*Log average establishment size in 1993*		
Unlimited exemption in 1975	-0.0982***	-0.0969***	-0.0968***
	(0.0250)	(0.0263)	(0.0265)
Log homestead exemption level in 1975		-0.000380	-0.000199
		(0.00220)	(0.00224)
Aquifer share			0.00609
			(0.0215)
R-squared	0.610	0.610	0.610
1st stage F-statistic	15.44	7.8	5.5
Base controls	Y	Y	Y
Census division fixed effects	Y	Y	Y
Panel B - 2SLS : Dependent variable:	*Change in log employment, 1993-2002*		
Log average establishment size in 1993	-0.267*	-0.263*	-0.275*
	(0.146)	(0.147)	(0.144)
Hansen J-statistic p-value		0.43	0.42
Panel C - 2SLS : Dependent variable:	*Change in log payroll, 1993-2002*		
Log average establishment size in 1993	-0.489**	-0.493**	-0.516**
	(0.210)	(0.210)	(0.206)
Hansen J-statistic p-value		0.71	0.33
Panel D - 2SLS : Dependent variable:	*Change in log wage, 1993-2002*		
Log average establishment size in 1993	-0.222**	-0.230**	-0.241**
	(0.112)	(0.112)	(0.111)
Hansen J-statistic p-value		0.063	0.1
Base controls	Y	Y	Y
Census division fixed effects	Y	Y	Y

Notes: Panel A presents the first stage of the 2SLS regression and Panel B present the 2SLS estimates. The unit of analysis is the MSA and the number of observations is 316. Average establishment size is the number of employees divided by the number of establishments in the MSA. Base controls are initial employment, median family income, population, percent college degree and above, and the house price index. The nine census divisions are used in the fixed effects. The Kleibergen-Paap rk Wald F statistics are reported as the 1st stage F-statistics. * p<0.1, ** p<0.05, *** p<0.01. Robust standard errors are in parentheses.

Table 9. Robustness Tests

	(1)	(2)	(3)
		1993 to 2002 change in	
	log employment	*log payroll*	*log wage*
Panel A: Control for minimum wage			
Log small business births in 1992-93	0.197**	0.423***	0.226***
	(0.0951)	(0.131)	(0.0753)
1st stage F-statistic =11.59			
Panel B: Control for Right-to-work			
Log small business births in 1992-93	0.183*	0.425***	0.242***
	(0.102)	(0.142)	(0.0804)
1st stage F-statistic=10.34			
Panel C: Control for past population			
Log small business births in 1992-93	0.190*	0.438***	0.248***
	(0.109)	(0.151)	(0.0855)
1st stage F-statistic=9.28			
Panel D: Control for industry composition			
Log small business births in 1992-93	0.157	0.387**	0.231**
	(0.132)	(0.177)	(0.103)
1st stage F-statistic=6.4			
Panel E: Other outcome variables:	*Log total establishment in 2002*	*Log establishment death in 1994*	
Log small business births in 1992-93	0.328***	0.732***	
	(0.0916)	(0.103)	
1st stage F-statistic=11.61			
Base controls	Y	Y	Y
Initial establishment controls	Y	Y	Y
Census division fixed effects	Y	Y	Y

Notes: All results are 2SLS estimates using the unlimited exemption in 1975 and aquifer share as instrumental variables. The unit of analysis is the MSA. Each panel adds additional controls to the specifications in Table 8 column (4). The MSA average minimum wage is added in Panel A, the Right-to-work status in Panel B, log population in 1985 in Panel C, and the employment shares of manufacturing, service, and retail in Panel D. The number of observations is 316 except for Panel D which is 306. Base controls are initial employment, median family income, population, percent college degree and above, and the house price index. Initial establishment controls are the three number of establishment variables. The nine census division dummies are included as fixed effects. The Kleibergen-Paap rk Wald F statistics are reported as the 1st stage F-statistics. * p<0.1, ** p<0.05, *** p<0.01. Robust standard errors are in parentheses.

Appendix Table 1. Impact of firm expansion on urban growth

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Dependent variable:	*Change in log employment, 1993-2002*		*Change in log payroll, 1993-2002*		*Change in log wage, 1993-2002*	
Log establishment births by existing medium firms in 1992-93	0.0721***		0.115***		0.0431***	
	(0.0238)		(0.0288)		(0.0141)	
Log establishment births by existing large firms in 1992-93		0.0814***		0.115***		0.0332**
		(0.0249)		(0.0312)		(0.0146)
Panel B: Dependent variable:	*Change in log employment, 1993-1998*		*Change in log payroll, 1993-1998*		*Change in log wage, 1993-1998*	
Log establishment births by existing medium firms in 1992-93	0.0653***		0.0828***		0.0175*	
	(0.0139)		(0.0171)		(0.00940)	
Log establishment births by existing large firms in 1992-93		0.0509***		0.0761***		0.0252**
		(0.0157)		(0.0197)		(0.0113)
Panel C: Dependent variable:	*Change in log employment, 1997-2002*		*Change in log payroll, 1997-2002*		*Change in log wage, 1997-2002*	
Log establishment births by existing medium firms in 1996-97	0.0849***		0.0781**		-0.00676	
	(0.0254)		(0.0320)		(0.0132)	
Log establishment births by existing large firms in 1996-97		0.0215		0.0170		-0.00451
		(0.0184)		(0.0222)		(0.00999)
Panel D: Dependent variable:	*Change in 5 year employment growth, (1997 to 2002 growth) - (1993 to 1998 growth)*		*Change in 5 year payroll growth, (1997 to 2002 growth) - (1993 to 1998 growth)*		*Change in 5 year wage growth, (1997 to 2002 growth) - (1993 to 1998 growth)*	
ΔLog establishment births by medium firms between 1993 and 1997	0.0382*		0.0166		-0.0216***	
	(0.0227)		(0.0239)		(0.00775)	
ΔLog establishment births by large firms between 1993 and 1997		0.00232		-0.00462		-0.00694
		(0.0118)		(0.0164)		(0.00836)

Notes: The unit of analysis is the MSA and the number of observations is 316. Establishment births for 1993 are counted between March 1992 and March 1993. The "establishment birth by existing medium firms" variable refers to expansion by firms with 20-499 employees. The "establishment birth by existing large firms" variable refers expansion by firms with over 500 employees. The initial employment, median family income, population, percent college degree and above, the house price index, the three log number of establishment variables and the nine census division dummies are included as controls in Panels A through C. The change in log employment, payroll, population, and house price index, the 1990 percent college educated and log median family income, and the change in the three establishment number variables are included as controls in Panel D. * p<0.1, ** p<0.05, *** p<0.01. Robust standard errors are in parentheses.

Appendix Table 2. Homestead exemption in 1975 by state

State	Homestead exemption level in 1975	State	Homestead exemption level in 1975	State	Homestead exemption level in 1975
AK	19,000	KY	2,000	NY	4,000
AL	4,000	LA	15,000	OH	0
AR	U	MA	24,000	OK	U
AZ	15,000	MD	0	OR	12,000
CA	20,000	ME	6,000	PA	0
CO	15,000	MI	7,000	RI	0
CT	0	MN	U	SC	2,000
DE	0	MO	2,000	SD	U
DC	N/A	MS	30,000	TN	7,500
FL	U	MT	40,000	TX	U
GA	1,000	NC	2,000	UT	11,000
HI	50,000	ND	80,000	VA	10,000
IA	U	NE	8,000	VT	10,000
ID	14,000	NH	5,000	WA	20,000
IL	10,000	NJ	0	WI	25,000
IN	1,400	NM	20,000	WV	0
KS	U	NV	25,000	WY	20,000

Notes: Exemption amounts are nominal and were collected from Posner et al. (2001). U denotes unlimited exemption. Exemption amount was not available for DC.

Appendix Table 3. Homestead exemption and firm expansion

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	*Log establishment births by medium firms in 1992-1993*	*Log establishment births by large firms in 1992-1993*	*Log establishment births by medium firms in 1992-1993*	*Log establishment births by large firms in 1992-1993*	*Log establishment births by medium firms in 1992-1993*	*Log establishment births by large firms in 1992-1993*	*Log establishment births by medium firms in 1992-1993*	*Log establishment births by large firms in 1992-1993*
Log homestead exemption level in 1975					0.0106**	0.0147***	0.00718	0.0113**
					(0.00537)	(0.00496)	(0.00505)	(0.00516)
Unlimited exemption in 1975	0.106**	0.107**	0.0584	0.0578	0.0691	0.0555	0.0353	0.0215
	(0.0449)	(0.0414)	(0.0437)	(0.0407)	(0.0473)	(0.0454)	(0.0457)	(0.0441)
Log small business births in 1992-1993			0.432***	0.445***			0.412***	0.415***
			(0.101)	(0.0878)			(0.101)	(0.0898)
Base controls	Y	Y	Y	Y	Y	Y	Y	Y
Initial establishment controls	Y	Y	Y	Y	Y	Y	Y	Y
Census division fixed effects	Y	Y	Y	Y	Y	Y	Y	Y

Notes: The unit of analysis is the MSA and the number of observations is 316. Small business births for 1993 are counted between March 1992 and March 1993. The “small business births” variable includes all new firm creation and expansions by firms with less than 20 employees. The “establishment birth by existing medium firms” variable refers to expansion by firms with 20-499 employees. The “establishment birth by existing large firms” variable refers expansion by firms with over 500 employees. Base controls are initial employment, median family income, population, percent college degree and above, and the house price index. Initial establishment controls are the three log number of establishment variables. The nine census division dummies are included as controls. * p<0.1, ** p<0.05, *** p<0.01. Robust standard errors are in parentheses.