



ENTREPRENEURSHIP AND REGIONAL GROWTH REGIMES IN THE UNITED STATES

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Introduction

Which types of firms drive growth in regional economies over time, and in particular, employment growth? Should policy makers interested in promoting jobs focus on enabling economic policies for start-ups, or should policy be focused on supporting large, established firms? These questions have been central research areas in public, industrial, and regional economics. Decker et al. (2014) emphasize the importance of young firms. They report that half of gross job creation in the United States is due to high-growth businesses, which are disproportionately young, and that start-ups account for a fifth of US gross job creation. Audretsch and Fritsch (2002) provide an important contribution to answering the questions posed above from a regional economics perspective by using data from 74 regions in Germany for the 1980s and 1990s. We follow the lead of this paper and take the regional analysis to data for the United States from 1980 to 2014.

There are at least two competing theories for engines of growth within an economy, as described already by Schumpeter (1942). First, there is the concept of creative destruction. In this model growth is created by new firms as they disrupt markets, grow new businesses and displace older, less innovative firms. In the second model established firms are able to leverage their size and expertise from producing to innovate, reduce cost and grow the economy. In this model producing goods allows firms to learn by doing and innovating.

It is possible for both models to be accurate in some circumstances depending on the agreement on value of an

idea between an innovator and a firm. For example, if both a firm and an innovator value an idea the same, then the firms' resources and scale will be deployed to develop the idea. Thus, innovation will be driven by large, established firms. However, a disagreement between innovators and firms as to the value of an innovation idea may induce the innovator to use this idea to start a new firm. If the large firm valued the idea appropriately, the new enterprise would fail. However, if the innovator is correct, the new enterprise will eventually disrupt the market and potentially displace the older firm (Audretsch, Fritsch, 2002). Large firms can contribute to the development of startup firms by the quality of the knowledge they transfer to spin-outs, the capital endowments they provide to start-up firms, and the number of innovative ideas they underutilized (Agarwal et al., 2004; 2007; Shane, Stuart, 2002).

If these models are extended to regions, then they pose several questions for policy makers. First, does the evidence support that employment growth can be accomplished through both models? If the answer is yes, then does one model versus another have larger impacts on labor in the region? The answers to these questions are key to policy makers interested in supporting economic development in their regions.

These research questions have been examined in several contexts. Some evidence suggests that both the type of region (urban versus rural) as well as the type of firm growth can impact job growth. For example, Mueller et al. (2007) find that the type of firm growth impacts job growth in lagging

periods. The impact varies based on characteristics of the region in which new firms are founded (van Stel, Suddle, 2007). Baptista et al. (2007) also find that new firm type is important in their study of growth dynamics in Portugal. Delfmann and Koster (2016) report that even in regions facing declining populations, new firm start-ups have a positive impact on employment growth.

The question of economic growth and regional development in the United States was examined by Acs and Armington (2004). They focus on the knowledge spillover effects in US cities and their surrounding labor market areas and find that a new firm's growth and knowledge spillover effects are important for employment growth rates.

Extending the model of innovation to regions as opposed to specific firms or industries requires the classification of regimes based on some characteristics of the economies being studied. Audretsch and Fritsch (2002) propose four regime classifications based on two primary criteria. First, they compare firm creation and destruction in an area to identify what type of innovation is happening (start-ups or established firm innovation). Second, they rank areas by their job growth¹.

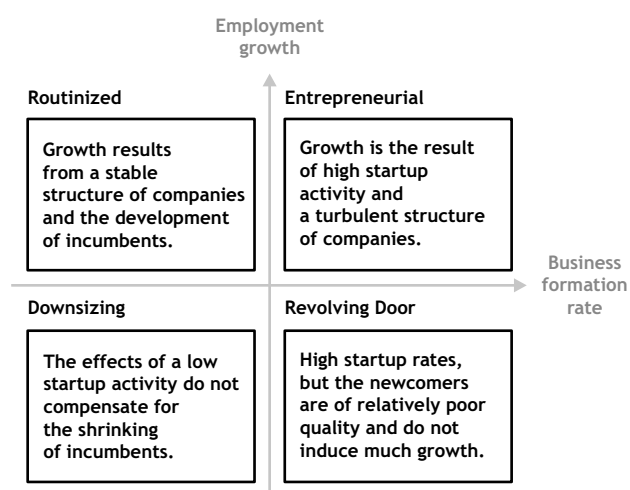


Figure 1. Regional growth regime characteristics

Figure 1 illustrates the concept. An entrepreneurial regime in a region is characterized by high business formation and employment growth rates. A routinized regime is characterized by a low business formation rate and a high employment growth rate. A region with a high business formation rate and a low employment growth rate exhibits a large amount of churn in the area's economy and finds itself in the revolving door regime. A downsizing regime characterizes a region experiencing low business formation and employment growth rates.

Audretsch and Fritsch (2002) use six metrics for classification. These metrics are the start-up rate, the closure rate, the turbulence rate, the net entry rate, the volatility rate, and the employment change over the period. All rates are calculated by taking the number of start-ups etc. in a period and region and dividing by the total labor force in that region at the start of the period (Audretsch, Fritsch, 1994). The turbulence rate is calculated in a similar manner with the numerator defined as the number of start-ups plus the number of closures. The

volatility rate is defined as the turbulence minus net entry (Audretsch, Fritsch, 2002). It reflects the degree of turbulence when not taking into account the change in the number of firms. We calculate these metrics to compare the four regional growth regimes in the United States during three decades.

Comparing the classification of German regions over two time periods (the 1980s and 1990s), Audretsch and Fritsch (2002) find that entrepreneurial and downsizing regimes seem to be „attractor” states while routinized and revolving door regimes represent transitional states. Using a Markov chain model, they estimate steady state regime distributions as 37 percent entrepreneurial, 37 percent downsizing, 13 percent revolving door, and 13 percent routinized. The authors conclude that growth can be achieved through support of both established regimes and a more volatile growth regime focused on start-up creation. While both regimes can result in growth and positive employment change, there is some concern that the routinized regime is a transitional state and below a threshold for new start-ups growth is not seeded for future periods resulting in the region transitioning from high growth to a low growth downsizing regime.

In this paper, we investigate regional growth regimes in the fifty US states from 1980 through 2014 using similar methods like Audretsch and Fritsch (2002). We categorize states by their business formation rate and employment growth rate in a given period of time and distinguish between the four regimes depicted in Figure 1: the routinized, entrepreneurial, downsizing, and revolving door regimes. To analyze the associations between business formation rates and employment growth rates over space and time, we provide heat maps, scatter plots and results from regression analysis.

The remainder of this paper is organized as follows. In Section 2, we discuss the dataset we created using the Business Dynamics Statistics (US Census Bureau, 2020) and provide an overview of the methods used. We describe the growth regimes of each state from the 1980s through 2014 in Section 3. In Section 4, we analyze the relationship between start-up rates and employment growth using both cross-sectional and panel data analysis from 1980–2009. We summarize our results with our conclusion in the final section.

Data and research methods

We use the Business Dynamics Statistics (BDS) dataset published by the US Census Bureau (2020) for our analysis. This dataset covers state level as well as metro, nonmetro, and MSA data at an annual frequency from 1977 to 2014. The data is derived by the Federal Statistical Research Data Centers and based on the Longitudinal Business Database. Two key advantages of the BSD are particularly important for our analysis: first, it is precise because it is based on firms tracked by the Census Bureau's business registry in the United States, and second, we are able to observe three and a half decades of firm dynamics.

The dataset is organized by state and provides data on both firms and jobs by year. We utilize three full decades between 1980 and 2009 for our tables and regression analyses. Additionally, we present graphs based on the most recent years available in the data (2010–2014). Examples



of firm data are the rate of firm creation, firm deaths, and number of firms. Employment metrics such as job creation, job loss, and total number of jobs in the region are tracked.

We use the approach described by Audretsch and Fritsch (1994) for defining entry and exit variables as well as firm and job creation and destruction. Under this approach entry/exit rates are normalized by the size of employment in the region. The start-up rate is defined as new establishments divided by employment. The growth rate is defined as new jobs created, less jobs destroyed, normalized by employment. The closure rate is defined as firm deaths normalized by employment. The volatility rate is defined as the sum of new establishments and firm deaths less the absolute value of their difference, normalized by employment. Turbulence is defined as the sum of firm entries and deaths normalized by employment. The net entry rate is defined as new firm entries less firm deaths normalized by employment. Population estimates were obtained from the US Census Bureau and were used to calculate population density.

We define an entrepreneurial regime as a region with higher than the median start-up and employment growth rates. A routinized regime is characterized by a lower than median start-up rate with a higher than median employment growth rate. A region with a higher than median start-up rate and lower than median employment growth rate finds itself in the revolving door regime. A downsizing regime is identified as a region experiencing lower than median start-up and employment growth rates. Table 1 shows the median start-up and employment growth rates across states for each decade².

To analyze the associations between start-up rates and employment growth rates over states and decades, we provide heat maps and scatter plots of states by decades, descriptive statistics of states in each decade by the regional growth regime they are in, and transition matrices showing how states move between regional growth regimes. Finally, we apply OLS regression analysis in order to estimate the relationship between the regional start-up rate and employment growth rate controlling for other factors (see below for details). We use Stata version 15 and Python version 3.6 for the analysis.

Growth Regimes in US States, 1980-2014

Figures 2, 3, 4, and 5 show the categorization of each state into one of the four regional growth regimes defined above in the three and a half decades between 1980 and 2014.

We find that regimes in the United States are spatially clustered. In the 1980s large sections of the Southwest including California are in an entrepreneurial state while there is a band running from Texas through Montana that is revolving door. The Midwest states including Illinois, Indiana, Michigan, Missouri, and Ohio, are in a downsizing regime, while most of the East Coast is in a routinized regime. Leading into the 1990s, we see the expansion of the entrepreneurial states to most of the western half of the US while more of the eastern US and Midwest transition into downsizing regimes. By the 2000s, we observe a similar clustering, despite South Carolina, Georgia, and New York transition to a revolving door regime. In 2010–2014, North Carolina, home of the Research Triangle, moves from the downsizing regime to the revolving door one, and New York transitions from the revolving door to the entrepreneurial, while some of the entrepreneurial states of the western half of the United States move to the revolving door regime.

Figures 6, 7, 8, and 9 represent scatterplots that show the employment growth and start-up growth for each state in each decade. We also show fitted regression lines. Interestingly, there was no association between start-up growth and employment growth in the 1980s, but a clear positive relationship between start-up growth and employment growth in the 1990s and 2000s. This suggests that start-up growth has become more relevant for job growth over time, consistent with a transition from a managed society to a more entrepreneurial society (Audretsch, 2009). However, in 2010–2014, after the Great Recession, the slope becomes less steep, and it remains to be seen how the strength of the association continues to develop.

It is interesting to compare California and Massachusetts, as Silicon Valley and Route 128 have been two of the leading innovative regions in the United States. California moved from the entrepreneurial regime in the 1980s to the revolving door regime in the 1990s and then back to the entrepreneurial regime in 2000–2014. Massachusetts transitioned from the routinized regime in the 1980s to the downsizing regime in the 1990s and 2000s and then back to the routinized regime in 2000–2014. Saxenian (1994) describes a policy difference between the states that might have contributed to the different developments: California implemented policies that allowed high competition among firms, whereas Massachusetts relied on policies that allowed firms to protect their innovations from spilling over³. The observation that California was in the revolving door regime in the 1990s could be explained by this decade being a seeding time in the state, as older chip and hardware companies began to give way to the growth in software businesses that dominated the Californian economy in both the late 1990s and 2000s.

Table 1. Median Start-up and Employment Growth Rate

Decade	1980s	1990s	2000s	2010-2014
Start-up Rate	0.86%	0.72%	0.64%	0.54%
Employment Growth Rate	1.89%	2.31%	0.82%	1.18%

Notes: The start-up rate is defined as the number of new establishments divided by employment. The employment growth rate is measured as the net change in jobs (new jobs less job destruction) divided by employment in each state, following Audretsch and Fritsch (1994)

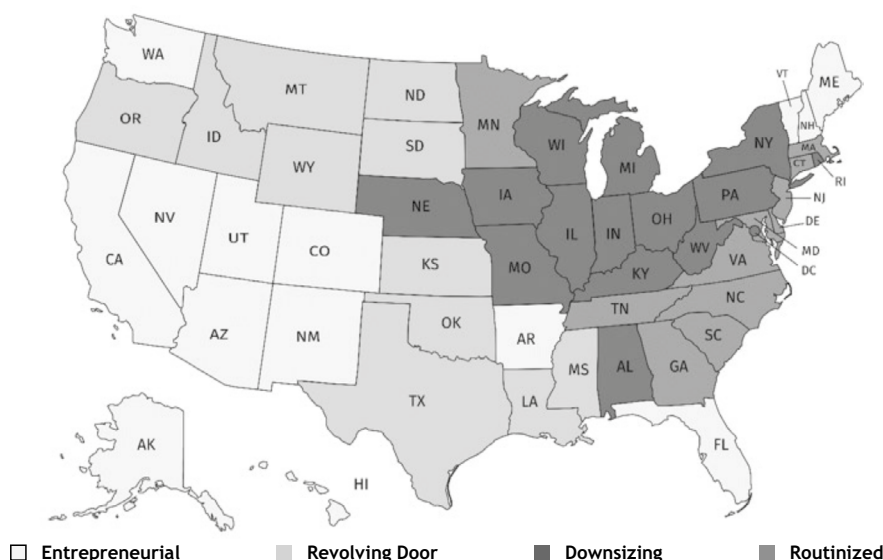


Figure 2. Growth Regimes in 1980s

Source: own calculations based on the Business Dynamics Statistics (US Census Bureau, 2020)

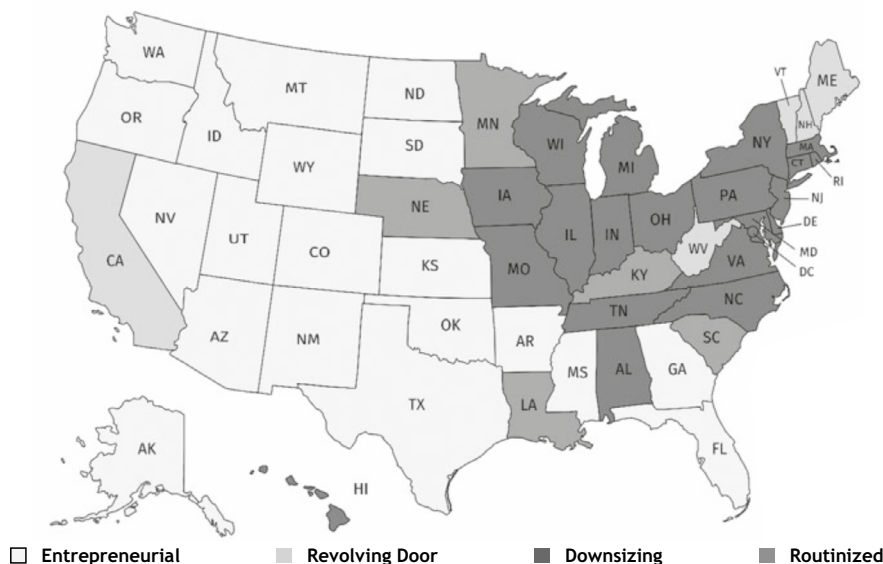


Figure 3. Growth Regimes in 1990s

Source: own calculations based on the Business Dynamics Statistics (US Census Bureau, 2020)

New York’s high-tech job growth in the 2000s might be the reason for the state’s transition into the revolving door regime from being in the downsizing regime before, and then on to the entrepreneurial regime in 2010–2014 (Marr et al., 2012). During the 2000s, tech companies advanced, and several older industries, including finance, were severely disrupted by technology (electronic exchanges, high-frequency trading, etc.). The Midwest, the center of industrial production in the United States, shows a consistent downsizing regime throughout the three and a half decades.

Notably, many of the rural areas transitioned to entrepreneurial regimes over the 35-year period. Audretsch and Fritsch (2002) found a similar result for Germany during the 1980s and 1990s. We cannot control our data for industry type due to lack of industry class start-up data at the state level which makes it difficult to isolate the cause for this transition. Many of these regions experienced booms in natural resource

mining (both precious metals and fracking for oil) during this period which may have driven the growth of new establishments. This could be related to the downsizing experienced in locations like Pennsylvania and West Virginia as cheap natural gas displaced coal as a preferred fuel source for power plants.

In Table 2 we show some of the mean characteristics of each of the four regional growth regimes in each decade. Notably we find that neither high start-up rates nor high turbulence rates are sufficient to generate growth individually in US states, consistent with the results of Audretsch and Fritsch (2002) for Germany. This is significant, as it shows that Schumpeter’s model of creative destruction cannot solely predict high growth in employment. We find that the converse is true as well. Low start-up rates or low turbulence also do not guarantee high employment growth. These points indicate that both of Schumpeter’s models of growth

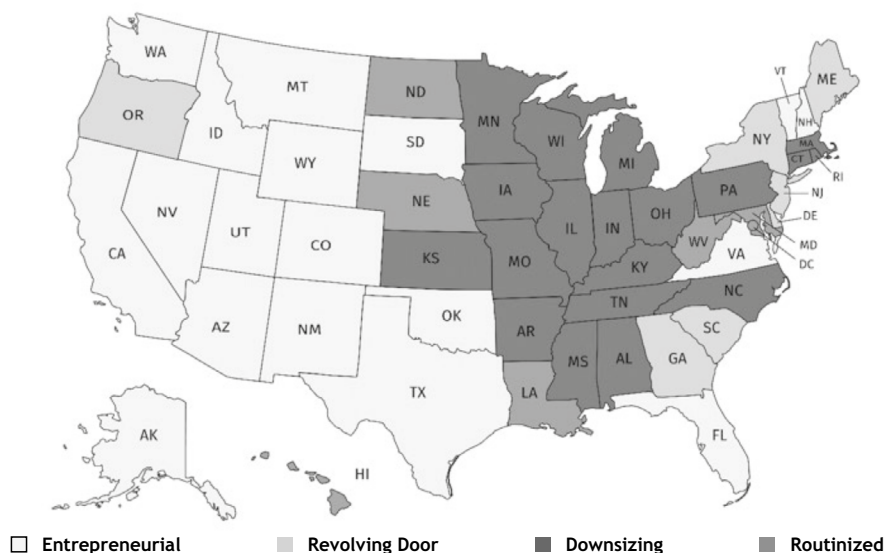


Figure 4. Growth Regimes in 2000s
Source: own calculations based on the Business Dynamics Statistics (US Census Bureau, 2020)

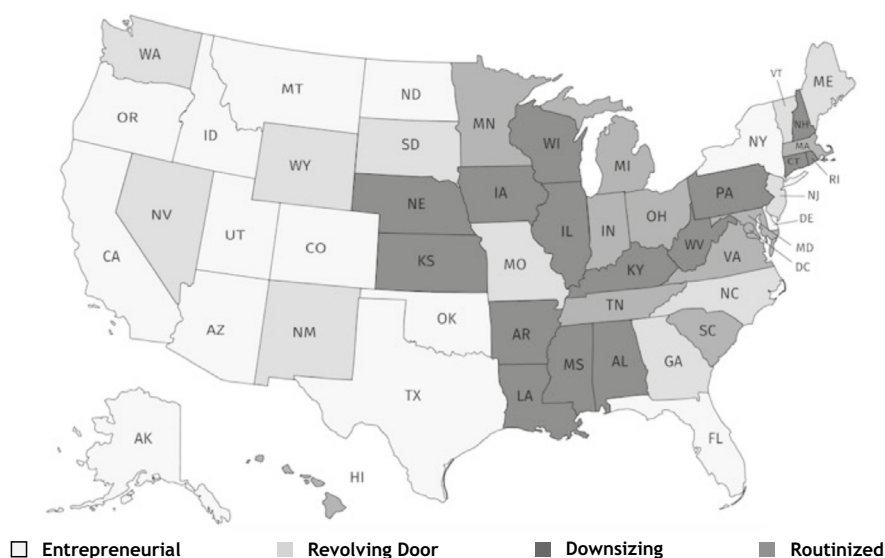


Figure 5. Growth Regimes in 2010-2014
Source: own calculations based on the Business Dynamics Statistics (US Census Bureau, 2020)

and innovation may be applicable; growth can be driven by established enterprises and by start-ups through creative destruction.

Changes of Growth Regimes in the United States over Time

Table 3 provides the numbers of US states that transition from one growth regime to another between the 1980s and 1990s (left panel) and between the 1990s and 2000s (right panel). We find that there are transition states and attractor states in the growth regimes, in line with Audretsch and Fritsch (2002). The downsizing and entrepreneurial regimes both appear to be attractor states, meaning that when a state moves into this type of regime it has a tendency to stay there. The routinized and revolving door regimes both appear to be transition states, as indicated by large shares of the states in these regimes transitioning out. Interestingly,

this dynamics appears to hold across both decade-to-decade transitions we measure.

While both routinized and revolving door regimes are transitional, they appear to lead to different steady state regimes. The destination regimes that the states in the transitional regime move to are shown in Table 4. States in the routinized regime transition to the downsizing regime over 80 percent of the time (conditional on transitioning), whereas states in the revolving door regime overwhelmingly transition to the entrepreneurial regime. Thus, a region in the routinized regime is at risk of transitioning to the downsizing regime from one decade to the next. This gives grounds for concern as once an area is in the downsizing regime it does not seem to transition back out of it.

In Table 5, we show the estimates for the association of start-up rates and the employment growth rate using regression analysis. Like Audretsch and Fritsch (2002), we add a control variable for population density. The purpose of

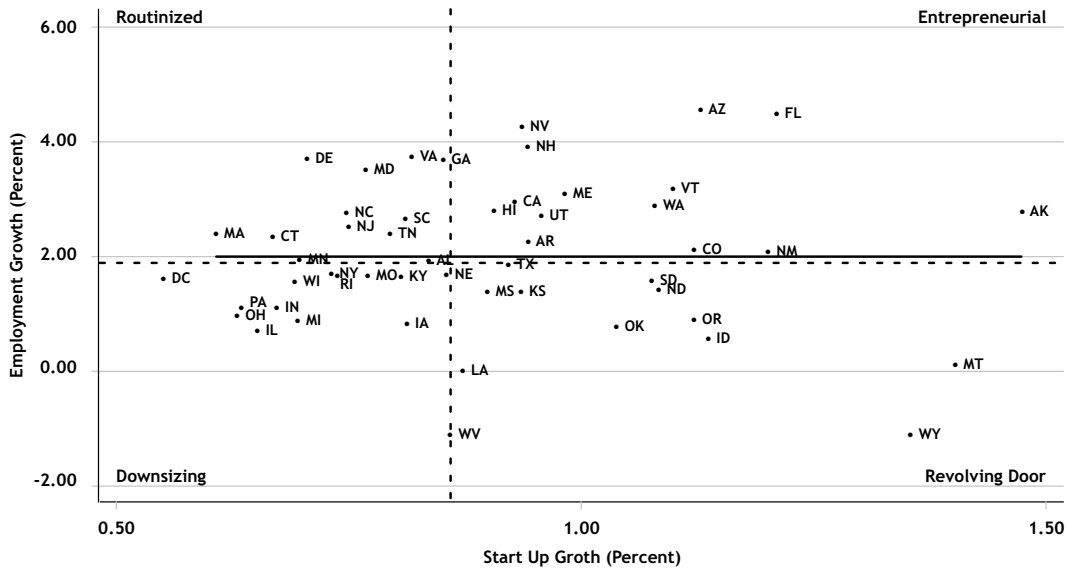


Figure 6. State Regime Measures 1980s
 Source: own calculations based on the Business Dynamics Statistics (US Census Bureau, 2020)

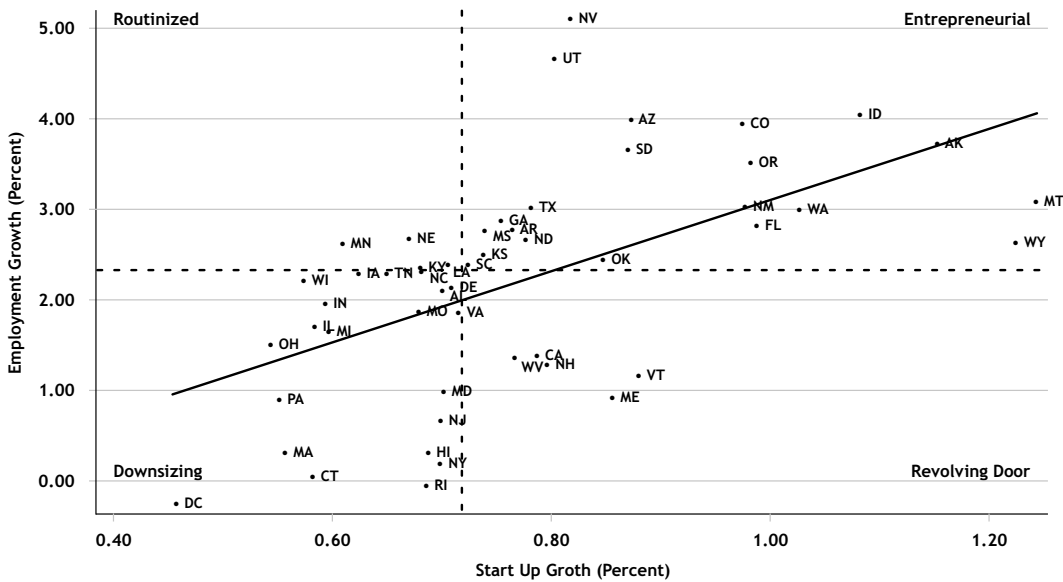


Figure 7. State Regime Measures 1990s
 Source: own calculations based on the Business Dynamics Statistics (US Census Bureau, 2020)

this variable is to account for several factors such as wages, knowledge spillover effects, and housing costs. We also include year fixed effects to control for the business cycle and other time-varying factors that affect all states.

First, we run three cross-sectional regressions: one for each decade. In these regressions, we use the decade average of the annual employment growth rates (job creation minus job destruction normalized by employment) for each state as our dependent variable and the average start-up rate in the decade and population density as the regressors. Population density is measured using the starting population for the decade in thousands of people per square mile in each state. We find the results for the United States to be similar to the Audretsch and Fritsch (2002) report for Germany. In the 1980s, the association of the start-up rate with employment growth is not significantly different from zero. However, in the 1990s and 2000s there is a positive and significant rela-

tionship between the start-up rate and growth, confirming our finding from the scatter plots above⁴.

Finally, we pool annual data from the three decades and estimate a regression including both state and year fixed effects (with standard errors clustered at the state level). In this regression, we use the annual log difference in employment as our dependent variable. In this estimation, we use indicator variables for each decade and interact those variables with the annual start-up rate. We find similar results to the cross-sectional regressions with a significantly larger positive association of the start-up rate with employment growth (last column of the Table 5).

Despite including both state and year fixed effects, we cannot infer causality from these regressions due to potential endogeneity between start-up rates and employment growth. Employment growth could lead to start-up opportunities as a regional economy grows. Moreover,

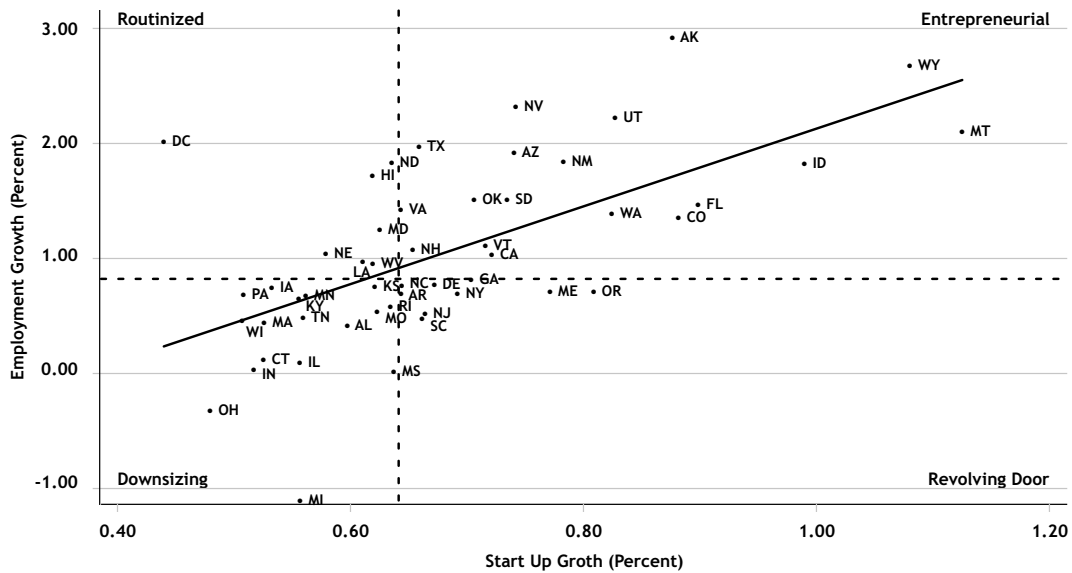


Figure 8. State Regime Measures 2000s
 Source: own calculations based on the Business Dynamics Statistics (US Census Bureau, 2020)

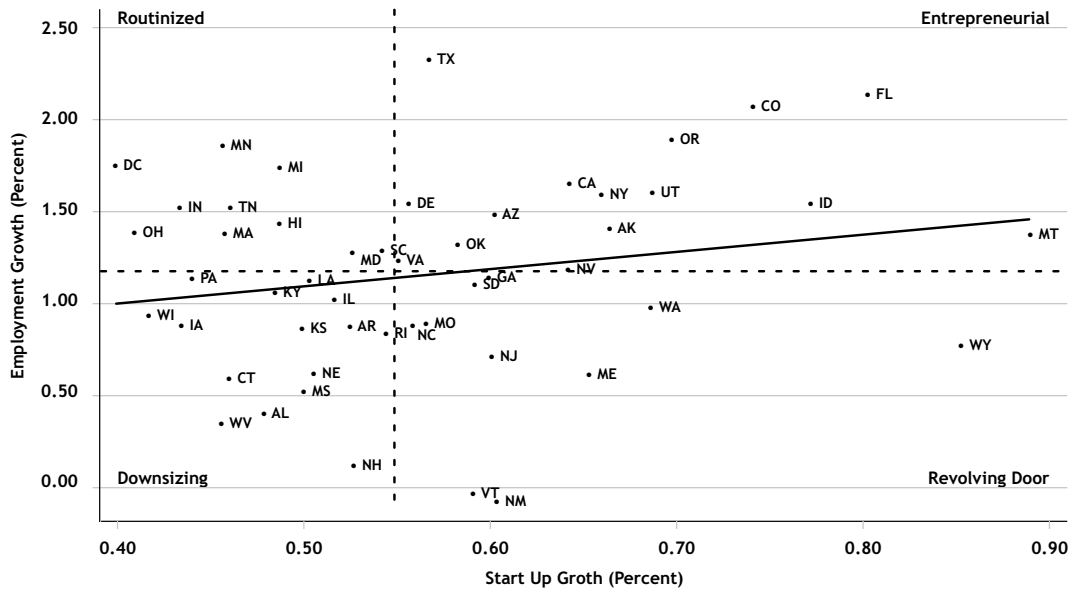


Figure 9. State Regime Measures 2010-2014
 Source: own calculations based on the Business Dynamics Statistics (US Census Bureau, 2020)

unobserved state-specific time-variant factors could impact both start-up rates and employment growth. That said, the finding that the association between start-up rates and employment growth became stronger over time, while controlling for state and time fixed effects, points to an increasingly important role of business formation that deserves further research.

Conclusions

We investigate growth regimes in the fifty US states from 1980 through 2014 using methods proposed by Audretsch and Fritsch (2002). We find that the association of the start-up rate with employment growth changed over the time periods. There was no apparent link between start-up rates and employment growth in the 1980s but a positive relationship between start-up

rates and employment growth in the 1990s, 2000s, and 2010–2014. Our results for the United States parallel the results reported by Audretsch and Fritsch (2002) for Germany in the 1980s and 1990s.

We document growth regime distributions for the US states in all four periods. We find strong spatial clustering of regime types in the states during all periods. We also observe that the downsizing and entrepreneurial regimes appear to be attractor states, whereas the routinized and revolving door regimes appear to be transitional states, consistent with Audretsch and Fritsch (2002). The attractor regimes are characterized by the relatively long periods of time that many states remain in those regimes. In contrast, about half of the states in the transitional regimes transition to a different regime by the next decade. The revolving door regime is a transitional state that mostly leads to the entrepreneurial regime, which is one of the attractor states.

Table 2. Characteristics of Growth Regimes

Region Type	Start-up	Closure	Volatility	Turbulence	Growth	Number
A:1980s						
Entrepreneurial	0.103	0.056	0.112	0.158	0.294	14
Revolving	0.107	0.063	0.126	0.171	0.093	11
Routinized	0.075	0.037	0.074	0.112	0.267	11
Downsizing	0.073	0.041	0.082	0.114	0.157	15
B:1990s						
Entrepreneurial	0.087	0.047	0.095	0.134	0.301	20
Revolving	0.079	0.047	0.095	0.127	0.128	5
Routinized	0.068	0.038	0.076	0.106	0.238	5
Downsizing	0.065	0.035	0.071	0.101	0.165	21
C:2000s						
Entrepreneurial	0.076	0.041	0.083	0.117	0.166	18
Revolving	0.069	0.040	0.081	0.108	0.071	7
Routinized	0.061	0.033	0.067	0.096	0.126	7
Downsizing	0.055	0.032	0.065	0.088	0.04	19

Notes: States in each decade are categorized into the four regional growth regimes by determining whether the start-up rate and the employment growth rate were above or below the median (see text). The start-up rate is defined as the number of new establishments divided by employment. The closure rate is firm deaths divided by employment. The volatility rate is new establishments plus firm deaths less the absolute difference between new establishments and firm deaths, normalized by employment. The turbulence rate is new establishments plus firm deaths normalized by employment. Growth is the employment growth rate, defined as job creation minus job destruction normalized by employment. Number is the number of states (+ Washington, DC) in the decade classified into each regional growth regime

Table 3. Transitions Over Time by Regime Type

	1980s-1990s		1990s-2000s	
	Number	Transition	Number	Transition
Downsizing	15	3	21	7
Entrepreneurial	14	5	20	6
Routinized	11	9	5	3
Revolving	11	11	5	4

Table 4. Transitional Regimes to Steady State Probabilities

Regime	Entrepreneurial	Downsizing	Revolving	Routinized
Routinized	8.33%	83.33%	8.33%	N/A
Revolving	86.67%	0	N/A	13.33%

The routinized regime is a transitional state as well, but primarily leads to the downsizing regime, the other attractor state.

This suggests important policy implications. If policy makers focus their development efforts on supporting existing establishments, the state may see strong employment growth for several years only to transition to a downsizing regime thereafter. While existing firms may generate employment growth over the medium term, there may be a lack of innovation, which puts the routinized regime at risk of moving to downsizing in the long run with negative effects on employment growth. This could imply incentive problems from a political economy perspective. If regional policy makers

support economic development with existing establishments, they may experience growth in the short-term. They will be incentivized to do so due to the electoral cycle. However, it appears that there may be long-term negative growth impacts to pursuing this path to job growth in an area. Overall, the results support the view that policy makers should consider programs that enable and promote regional start-up activity, which may support employment growth in the region in the long run. There is an opportunity to refine this research avenue in the future by adding information on the regional policy and business environment such as data on taxes, labor market regulation, unionization, competition policy, and institutions of higher education.

Table 5. Regression analysis

	1980s	1990s	2000s	Fixed Effects
Start-up rate	0.3683 (1.0424)	2.1692 (0.7473)***	3.5780 (0.5773)**	3.6356 (0.9607)***
Population density	0.0812 (0.0972)	-0.0276 (0.0054)***	-0.0049 (0.0033)	-0.2457 (0.0519)***
1990s				-0.0076 (0.0080)
2000s				-0.0295 (0.8194)***
Start-up rate x 1990s				4.4109 (0.8194)***
Start-up rate x 2000s				4.2459 (1.060)***
Constant	0.1565 (0.1048)	0.0100 (0.0063)	-0.0132 (0.0042)***	0.0169 (0.0085)**
Observations	50	50	50	1500
Groups				50
R ²	0.0148	0.53	0.49	0.10
R ² within				0.54
R ² between				0.19
Standard errors are in parentheses. Stars (***/**/*) indicate significance at the 1%/5%/10% levels. The dependent variable for the first three rows is the decade average of the employment growth rate for each state, and the annual log difference in employment in the last column.				

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Endnotes

- 1) This concept of regional growth regimes, focusing on innovation and employment growth, is different from growth regimes in developing countries (Kar et al., 2013) and the model of the city as a growth machine (Logan et al., 1997).
- 2) We obtain these medians by first calculating the decade averages within each state and then the median across states.
- 3) As a result, according to Saxenian (1994), the total market value of firms rose by \$25 billion in California but only \$1 billion in Massachusetts from 1986 to 1990.
- 4) The difference is that we control for population density and year fixed effects here.

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Entrepreneurship and Regional Growth Regimes in the United States

Summary

We investigate regional growth regimes in the US states from 1980 to 2014. Based on start-up rates and employment growth as suggested by Audretsch and Fritsch (2002), we classify states into routinized, entrepreneurial, revolving door, and downsizing regimes. The results indicate that there was no significant association between start-up rates and employment growth in the 1980s, but a positive relationship in the 1990s, 2000s, and 2010s. Further, we document that the entrepreneurial and the downsizing regimes are attractor regimes that tend to stick, whereas the routinized and revolving door regimes are transitional regimes. Importantly, states in the routinized regime predominantly move to the downsizing regime, suggesting that an over-reliance on established companies relative to start-ups in the state may threaten employment growth in the long run.

Keywords

entrepreneurship, employment growth, region
