

DISSERTATION

THREE ESSAYS IN REGIONAL GROWTH, DISTRIBUTION, AND RESILIENCE

Submitted by

Nicholas J. Kacher

Department of Economics

In partial fulfillment of the requirements

For the Degree of Doctor of Philosophy

Colorado State University

Fort Collins, Colorado

Summer 2019

Doctoral Committee:

Advisor: Stephan Weiler

Alexandra Bernasek

Martin Shields

Dawn Thilmany

Copyright by Nicholas J. Kacher 2019

All Rights Reserved

## ABSTRACT

### THREE ESSAYS IN REGIONAL GROWTH, DISTRIBUTION, AND RESILIENCE

This work delves into two significant but less understood topics in regional labor economics. The first contribution is to growing literature examining the effects of business dynamism on regional resilience. Significant attention has, understandably, been paid to understanding why the impact of and recovery from the 2008 recession has varied across regions. Chapters 1 and 2 extend to the question of regional resilience a hypothesis that gross rates of local establishment openings, or “churn,” may affect local economic performance over a business cycle. In the US, higher-churn areas are found to experience faster average employment growth over the decade spanning the recession, but with more cyclical volatility. Churn is not positively correlated with median household income growth or poverty reduction at a county level. A novel cross-country analysis reveals that in the UK, local authorities with higher churn prior to the recession did weather the financial crisis slightly better, although data limitations restrict the direct comparability between the US and UK cases.

Chapter 3 turns to the growth of self-employment in the US, motivated by two observations: first, that growth in the self-employment share has been regionally heterogeneous; and second, that theory suggests workers in wage-and-salary occupations exert limited agency over their working hours. This paper investigates whether average local working hours influence subsequent changes in the county self-employment share. I find a U-shaped relationship between working hours and self-employment growth: counties with working hours furthest from the mean experienced the fastest growth in local self-employment share, adding a new wrinkle to the running debate over whether the “gig economy” is driven by opportunity or necessity.

## DEDICATION

It is a great privilege and sincere joy to dedicate my work to so many people who have supported, encouraged, and inspired me: Savannah, my whole family, Stephan, my committee, and all the teachers from whom I have learned so much.

## TABLE OF CONTENTS

ABSTRACT .....	ii
DEDICATION .....	iii
1. INTRODUCTION .....	1
2. THE MORE DYNAMIC THE BETTER? EFFECTS OF ENTREPRENEURSHIP ON LOCAL GROWTH, DISTRIBUTION, AND RESILIENCE .....	3
2.1 – Introduction .....	3
2.2 – Motivation and Background – Entrepreneurship and Growth .....	5
2.3 – Regional Schumpeterian Cycles .....	10
2.4 – Theory and Graphical Analysis .....	14
2.5 – Empirical Analysis .....	17
2.6 – Discussion and Conclusions .....	28
3. ENTREPRENEURSHIP AND RESILIENCE IN THE US AND UK: IMPLICATIONS FOR REGIONAL DEVELOPMENT .....	31
3.1 – Introduction .....	31
3.2 – Context – Macroeconomic and Labor Market Conditions in the US and UK .....	33
3.3 – Theory .....	38
3.4 – Preliminary Analysis .....	40
3.5 – Empirical Analysis .....	45
3.6 – Discussion: Dynamism and Resilience .....	55
4. ESCAPING THE PRISONER’S DILEMMA OF OVERWORK: SELF EMPLOYMENT AS AN ALTERNATIVE TO UNSATISFACTORY WORK HOURS .....	58
4.1 – Introduction .....	58
4.2 – Motivation and Background .....	60
4.3 – Theory and Empirical Model .....	68
4.4 – Results .....	72
4.5 – Discussion and Conclusions .....	76
5. CONCLUSIONS .....	78
REFERENCES .....	82
APPENDICES .....	86
Appendix 1 – Median Household Income Full Results .....	86
Appendix 2 – Poverty Rate Full Results .....	87
Appendix 3 – Robustness check, using 2004-2007 average product of establishment openings and closures per 1000 employees to measure pre-recession dynamism .....	88
Appendix 4: Alternative specification .....	90
Appendix 4: A game theoretical model of a prisoner’s dilemma in working hours.....	91

## 1. INTRODUCTION

Divergences in economic growth and labor market outcomes across regions of the US have emerged as pressing issues, especially during the 2008 recession and the uneven recovery that has followed. These papers address some under-recognized causes and consequences of stalled regional convergence, geographically heterogeneous growth, and the distributional impacts of recent labor market trends.

A burgeoning literature poses a causal relationship between entrepreneurial business dynamism and local employment growth. Consistent with this hypothesis, I find that US counties with higher rates annual openings and closures per existing business saw more rapid employment growth on average over a time period spanning the 2008 recession, but in an uneven fashion, with higher rates of openings and closures before the recession predicting worse initial employment losses followed by more robust recoveries. Strikingly, areas with higher rates of openings and closures during the 2004-2007 macroeconomic expansion performed no better in terms of median income growth during and after the recession, and worse in terms of poverty rates. Cumulatively these results suggest that while the average effect of dynamism on employment growth over longer time periods or during macroeconomic expansion appear to be positive, but with important caveats related to cyclical stability and income distribution.

The 2008 recession was not isolated to the US, causing significant disruption to economies around the world. A novel cross-country analysis of the time-varying effects of dynamism on growth across the recession and recovery for regions in the US and United Kingdom presents an informative comparison. The economies of these two countries share some commonalities – similar pre-recession trends in income and unemployment, for example – but notable structural differences including the foreign trade share of GDP, and health insurance

policies likely to have significant impacts on labor market decisions. I find the cyclical relationship between entrepreneurship and employment growth to be much less pronounced in UK local authorities than in US counties, providing evidence that institutions may interact with this effect in important ways.

Concurrent with these changes, US labor markets have also been shaped by rising self-employment. Self-employment may be seen on one hand as a strength, with single-worker enterprises nimbly filling market niches; or as a sign of insufficient opportunities in wage-and-salary labor markets. Empirical findings presented in Chapter 3 support a hypothesis that much of this growth in self-employment may be driven by necessity rather than entrepreneurship, but with a noteworthy feature not previously identified in empirical literature: US regions with especially long or short average work weeks in wage-and-salary employment saw the greatest gains in the share of self-employed workers, suggesting that self-employment may be a more attractive alternative in regions where workers are either unable to find sufficient working hours or are pushed to work excessively long hours.

These findings suggest important future work to untangle the implications of establishment churn and self-employment on local economic outcomes. Broadly, though, these results underscore the importance of a regional approach to the study of labor markets. Changes in employment, income, poverty, and self-employment vary substantially across the US and UK in ways masked by national statistics. Addressing persistent issues of poverty, inequality, and stagnation require a place-based approach.

## 2. THE MORE DYNAMIC THE BETTER? EFFECTS OF ENTREPRENEURSHIP ON LOCAL GROWTH, DISTRIBUTION, AND RESILIENCE

### 2.1 Introduction

Much has been written about the effects of entrepreneurship on economic outcomes. On the positive side of the ledger, young small businesses account for the majority of gross job creation in the US, generating direct benefits in terms employment and income. Entrepreneurship can be a source of innovation, driving growth-enhancing technological progress. Moreover, there is some evidence that even unsuccessful projects generate information spillovers that benefit other local producers. But entrepreneurship is also risky: fewer than half of all firms established in the US between 2008 and 2012 survived past five years. And if credit constraints limit entrepreneurial activity to the already-wealthy, or if local employment gains accrue largely to workers already in the upper end of income distributions, gains from even successful ventures are not guaranteed to be shared broadly.

This paper focuses on the impacts of entrepreneurship on *local* economic performance. Theoretical and empirical findings suggest that even as transportation and telecommunication technologies improve, place continues to matter, perhaps more than ever. Agglomeration economies in terms of amenities, pooled labor forces, and information spillovers (Glaeser 2010, Buntzen et al. 2014) play a crucial role in influencing the location decisions of firms and workers. Location also matters from a policy perspective. Consider for example a city or county faced with the decision of whether to offer \$10 million in incentives to try to attract a large, established firm that would create virtually guaranteed jobs, or spend that same \$10 million on developing a tech incubator, knowing that a large majority of ventures hatched there would likely fold before



ever hiring an employee. An informed decision requires an understanding of the effects of entrepreneurship on local economic outcomes.

I posit that the effects of entrepreneurship on county-level economic outcomes are likely to vary across a macroeconomic business cycle. The logic of Schumpeter's (1942) model of creative destruction suggests that during periods of macroeconomic expansion – during which any given local venture is more likely to succeed as a result of rising incomes and demand, exuberance in credit and financial markets, and other factors – counties with higher average rates of entrepreneurial activity will thrive. But when the macroeconomic business cycle peaks and declines, highly entrepreneurial areas will be hit hardest due to their concentrations of young establishments testing unproven business models and on unstable financial footing.

The question of how entrepreneurial activity impacts local economic performance, and how these effects vary over time, has become especially pertinent in recent years for two reasons. First, income convergence across regions within the US, famously observed from 1890 to 1988 by Barro and Sala-i-Martin (1991), appears to have stalled. Over the past thirty years, rising house prices have driven flows of low-skilled workers out of high-wage, high-productivity areas, leading to increased inter-regional inequality and potential labor misallocation (Ganong and Shoag 2017).

Secondly, the 2008 recession had regionally heterogeneous effects. Some of this variation can be explained by factors such as sectoral composition of local employment (Bartik 1991) and household leverage (Mian and Sufi 2009). Based on the well-established link between entrepreneurship and economic growth in general, this paper examines the extent to which variations in the composition and dynamism of an area's business ecosystem might help explain regionally divergent impacts of – and rates of recovery from – the Great Recession.

This paper measures the effects of entrepreneurial dynamism on local economic performance over a time period spanning the 2008 recession along a number of dimensions, using a county's rate of establishment openings and closures relative to existing establishments in the years prior to the recession as a proxy for structural entrepreneurial capacity. First, consistent with existing empirical work on entrepreneurship and grounded in growth theory, I examine the effects of entrepreneurial dynamism on employment growth using a panel of US counties. A second set of specifications evaluates the impacts of dynamism on county median household income, shedding light on the types of jobs created by entrepreneurial activity. The percent of Americans living below the federal poverty line spiked during the recession and has been slow to decline; to this end, I evaluate effects of dynamism on county poverty rates. In each case, particular attention is paid to how effects of entrepreneurship on relevant local outcomes vary across the business cycle.

Consistent with existing literature, dynamism is on average correlated with more rapid employment growth from 2004 to 2014. But these gains are uneven, with establishment turnover boosting job growth during the expansionary periods of 2003 to 2007 and 2012 to 2014, but correlated with more severe employment losses in 2008 and 2009. Beyond the employment effects, pre-recession dynamism has no positive effect on county median incomes during the 2008 recession and early recovery, and adverse effects on county poverty rates. This suggests that while entrepreneurship may correlate with net job growth, gains may not accrue evenly across the income distribution.

## **2.2 Motivation and Background – Entrepreneurship and Growth**

A recognition of the importance of entrepreneurship in the growth process dates back at least to Schumpeter's (1942) model of "creative destruction, later formalized by Aghion and Howitt (1990). Innovation in these models catalyzes endogenous growth by spurring

technological advancement. The extensive literature on human-capital-driven endogenous growth, typified by Krugman (1991), Lucas (1988), and Romer (1990), highlights the role of innovation in explaining differing economic outcomes across time and space. Measures of innovation and research networking (Strumsky and Thill, 2013) and entrepreneurial capital (Audretsch and Keilbach, 2004) have been shown empirically to boost local economic performance.

Entrepreneurial dynamism may provide additional benefits in the form of information spillovers, especially at a local level. Akerlof (1978) posits that information asymmetries can hinder economic activity in a range of markets. Lang and Nakamura (1993) extend the logic of information asymmetry to a local scale, modeling mortgage lending decisions as a function of information generated by past loans in the same neighborhood. Bunten et al. (2014) provide evidence that knowledge spillovers from entrepreneurship contribute to subsequent employment growth prior to the 2008 recession using an instrumental variable approach.

But entrepreneurship also carries risk, not just for individual enterprises but also for areas with high concentrations of young firms. In Schumpeter's (1942) business cycle model, entrepreneurial activity is responsible not only for the growth phase but also the decline, as the "bunching and swarming of imitators" drives up labor and capital prices, pushing late imitators out of business. Young ventures exhibit high attrition rates: according to BLS data, establishments opening in the US between 2008 and 2016 have an average one-year survival rate of 79%, while just under half survive for five years.

By most measures, entrepreneurial activity in the US has slowed markedly in recent years. Job creation from establishment births has been in decline since at least the early 2000s (Kacher and Weiler 2017). And as seen in figure 2.1 below, establishment openings and closures per 1000 employees have both fallen by about a fifth from their 1998 levels, and by more than a

quarter from their respective peaks. Recessions typically cause a temporary increase in closures with little impact on openings; this sustained decline in both openings and closures is unprecedented in the last half century (Kacher and Weiler 2017). Alon et al. (2017) find that the majority of firm productivity gains occur within its first five years of operation, meaning slowing rates of entry could have major negative implications for growth. As seen in figure 2.1 below, the rate of establishment openings and closures relative to existing establishments has fallen from a peak of 20.7% in 2001 to 17.5% in 2014.

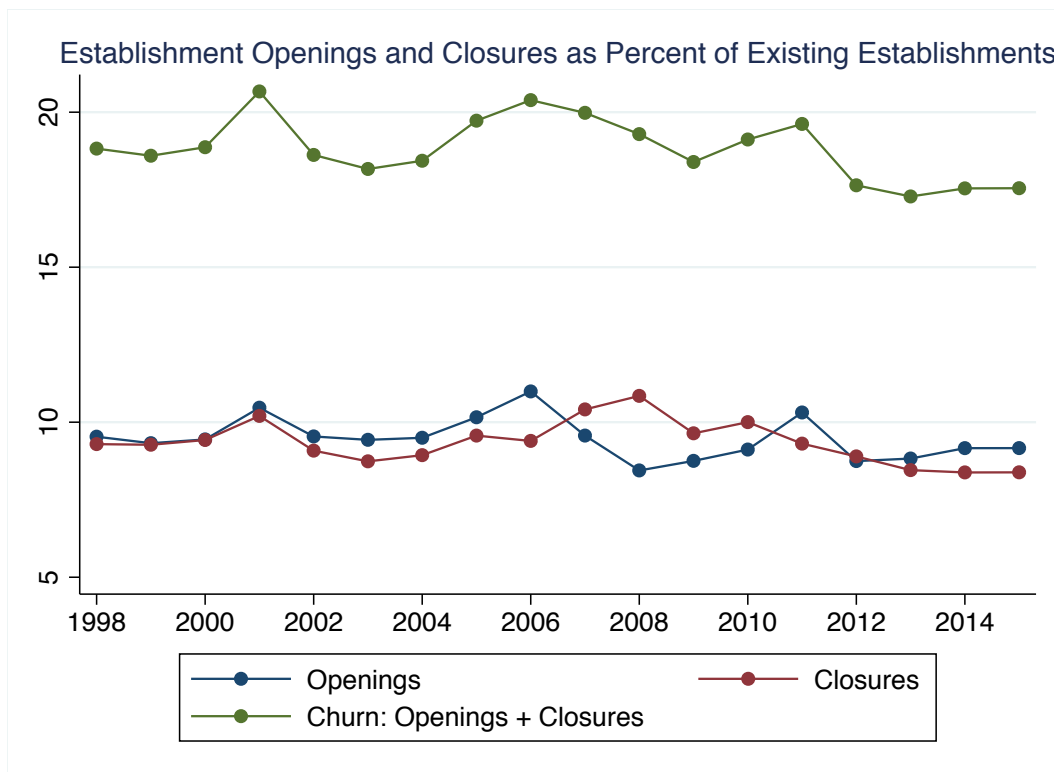


Figure 2.1

This trend is also part of a broader pattern of declining dynamism. Haltiwanger, Jarmin, and Miranda (2013) note that the number of startups, young firms, and jobs created by young firms are all declining. Interstate migration has fallen since 2000 or earlier across virtually all age and demographic groups (Frey 2009, Molloy et al. 2011). Meanwhile, average job tenure has increased, meaning workers switch jobs less frequently (Hyatt and Speltzer 2016).

There is some divergence within the existing literature as to how best to define and measure entrepreneurial activity. In some cases the ratio of small or young enterprises to total enterprises, or the rate of self-employment are used as proxies for entrepreneurship. These measures treat entrepreneurship as a *stock* variable, and operate under the assumption that smaller, sole-proprietor, and/or younger ventures are always more entrepreneurial, innovative, etc. than others. While this may be true on average (Haltiwanger, Jarmin, and Miranda 2013), it is at best an indirect measure.

Instead, I measure entrepreneurship using annual establishment openings. Per the Census Statistics of US Businesses, an establishment “is a single physical location where business transactions take place and for which payroll and employment records are kept” which employs at least one person aside from the owner(s). Establishments may be companies (“single-unit enterprises”), or one location of a “multi-unit enterprise.”

The main measure of county-level dynamism used in this paper is gross establishment “churn,” measured as the annual percent of county establishment openings and closures relative to existing establishments. This definition is chosen first because the rates at which establishments enter and exit at a county level measures entrepreneurship as a *flow* measure, capturing dynamism rather than a *stock* of businesses fitting certain criteria. Second, counting establishment closures as well as openings captures the fact that entrepreneurship, especially in the Schumpeterian “creative destruction” sense, involves both the implementation of new ideas and the forcing out of less productive businesses.

This measure is similar in some ways to Bunten et al. (2014), who measure county-level dynamism by the product of establishment openings and closures per 1000 employees. Where the product of openings and closures applies a geometric fit to capture potential agglomeration

effects of dynamism, this paper uses a linear measure to avoid over-weighting counties with extreme values of openings and/or closures.

The measure used in this paper also differs from Bunten et al. (2014) in scaling openings and closures against existing establishments rather than employees. This is done partially for ease of interpretation; churn as the gross percentage of establishments opening and closing in a year is a conceptually simple measure, and easily replicable across different geographies. Measuring churn relative to existing establishments also adjusts for the fact that different counties may be home to smaller or larger establishments: on average, US counties over the time period studied here have roughly 25 employees per establishment, but with a standard deviation of 8.4.

To illustrate the implications of this, consider two hypothetical counties, each with 1000 residents. County A has 100 establishments (an employee-to-establishment ratio of 10:1) and County B has 10 establishments (an employee-to-establishment ratio of 100:1). Suppose one establishment opens in both of these counties. Weighting by 1000 employees, this change registers as an increase of 1 opening per 1000 employees in both counties. Weighting by existing establishments, this change is measured as 1% churn in County A and 10% churn in County B. This example is an extreme case, and in fact results are fairly similar using either definition. See Appendix 3 for a robustness check applying the definition of dynamism used in Bunten et al. (2014).

It should be noted that the measure of churn employed here does not differentiate between stand-alone, potentially innovative establishment and establishments that are part of larger companies, the latter of which may seem less entrepreneurial. But even the act of replicating a proven business model in a new location is a risky venture, given uncertainty about local demand and factor markets. So while establishment openings and closures relative to

incumbents captures entrepreneurship indirectly, it measures county-level churn in a way consistent with the questions and hypotheses of this study.

Figure 2.2 below depicts the geographic variation in average churn, measured from 2004-2014. Notably, churn is highest in the West, Mountain West and Gulf Coast, and lower through much of the Midwest and Rust Belt.

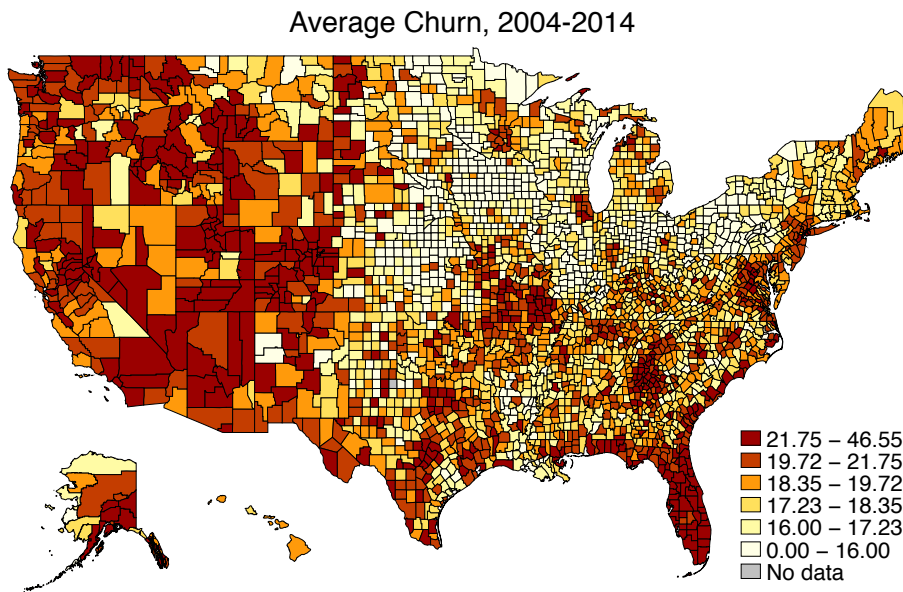


Figure 2.2

### 2.3 Regional Schumpeterian Cycles

Existing theoretical and empirical inquiries into the entrepreneurship-growth link tend to look either at the long run, as in the macro models of Krugman (1991), Lucas (1988), and Romer (1990), or over a medium-to-short-run period of macroeconomic expansion; Bunten et al. (2014), for example, uses a first difference approach covering a time period running from 1998 to 2007.

How might the 2008 recession have impacted the relationship between entrepreneurship and growth? The impact of the recession on employment growth generally was drastic, as seen in figure 1.3. But the recession may also have had conflicting effects on entrepreneurship. On one hand, the crisis clearly generated credit constraints, stymieing some potential business creation

and growth (Duygan-Bump et al. 2016, Greenstone et al. 2014). In contrast, Fairlie (2013) posits that business closures and layoffs during the Great Recession may have encouraged newly-unemployed workers to consider entrepreneurial ventures, and finds that higher local unemployment rates increase the chances of an individual starting a business.



Figure 2.3

This paper explicitly tests the *time-varying* effects of entrepreneurship on regional outcomes. The hypothesis that impacts of entrepreneurial activity vary over the course of a macroeconomic business cycle stems from a regional interpretation of Schumpeter’s (1942) model of entrepreneurship-driven cyclicalities. In Schumpeter’s seminal model, a (macroeconomic) expansion is spurred by “the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates.” A cluster of new innovations sparks imitation, flooding the market with new products. A surge of firm entries is likely to drive a surge in productivity growth (Alon et al. 2017). Competition among firms vying for market share during this expansionary phase benefits consumers in the form of lower prices, but ultimately drives out of business some firms who entered the market too late or misjudged their investments. The initial surge of growth recedes and the economy returns to a new



equilibrium characterized by incrementally greater output, productivity, and technological capacity.

The term “creative destruction” is an apt description for this process: innovation makes obsolete some existing products and production methods, and on top of this many innovative (or imitative) ventures themselves fail. This model predicts boom and bust cycles of potentially dramatic proportions.

Although not made explicit in Schumpeter (1942), such business cycles are also likely to generate distributional inequality. Successful entrepreneurs undoubtedly profit from their successes, as do those they employ. Conversely, owners and employees of businesses that are driven out of business by new innovations, or that fail in an innovative venture, suffer income losses. These gains and losses are unlikely to be distributed randomly. Schumpeter waxed poetic about an innovative spirit as the driving force behind the entrepreneurial decision, but would-be innovators may face credit constraints. Blanchflower and Oswald (1998), for example, find that individuals who receive inheritances are far more likely to become entrepreneurs than those who don't, suggesting that not everyone with innovative skill and passion has the opportunity to realize their vision.

Additionally, workers with high human capital are likely to be better equipped to navigate the tumult of creative destruction. Galor and Zeira (1993) find that like entrepreneurship, human capital acquisition is credit-constrained, with wealthier individuals more able to afford the implicit and explicit costs of acquiring education and skills. The existence of credit constraints in terms of both entrepreneurship and human capital acquisition suggest that to the extent that entrepreneurial activity boosts average local economic performance, those gain may be unevenly distributed. Moreover, creative destruction may have outsized impacts on those lower on the income distribution, especially if these processes result in

at least temporary structural unemployment for lower-skilled workers. For these reasons, I estimate the effects of entrepreneurial dynamism not only on local employment growth, but also on median household income and the percent of county residents below the poverty line.

Empirically, I apply this model on a regional scale, using county-level observations. While some innovations may be profound enough to have national ramifications, important components of the entrepreneurial process are inherently local. Entrepreneurs rely on location-specific information about markets for labor, inputs, and capital, as well as demand for final goods. Much of this information appears to come from observing the successes and failures of other ventures in close geographic proximity (Bunten et al. 2014). Agglomeration economies also allow nearby firms to benefit from pooled labor markets, consumers, and supply chains.

Macroeconomic forces also have disparate impacts of regional economies, due to factors such as local employment composition (Bartik 1991) and household debt (Mian and Sufi 2010). The regional impact of macroeconomic shocks can be dramatic, with long-lasting implications for employment and labor force participation, sometimes even stimulating industry restructuring (Blanchard and Katz 1992).

How might an area's degree of entrepreneurial dynamism impact its susceptibility to macroeconomic forces? On one hand, a dynamic local economy, in which struggling establishments are routinely replaced by new ones, might be well prepared to handle the tumult of a national recession. In contrast, Kitsos and Bishop (2018) find that in the UK, areas with more enterprise openings prior to the 2008 recession suffered larger employment declines during the crisis, presumably because such areas have more young firms that are vulnerable to recessions.

These two possibilities are not necessarily at odds with one another: in conjunction they suggest that areas with high entrepreneurial dynamism may suffer greater initial shocks at the

onset of a macroeconomic crisis, but subsequently recover more quickly and robustly.

Entrepreneurial dynamism is persistent over time at the county level, suggesting that areas with high dynamism prior to a recessionary period generally also exhibit high dynamism during recoveries. Thus local entrepreneurial activity might both expose an area to greater risk during a macroeconomic downturn, but also aid in recovery.

## **2.4 Theory and Graphical Analysis**

The above theoretical discussion can be distilled into the following hypotheses:

- 1) Entrepreneurial dynamism is generally growth-enhancing at a county level, with higher rates of establishment turnover sparking innovation, generating productivity-enhancing information spillovers, and attracting creative workers.
- 2) Gains from entrepreneurial dynamism may not be widely distributed, instead captured mainly by entrepreneurs themselves and by workers with high human capital. Both entrepreneurship and human capital acquisition are likely subject to credit constraints and therefore less available to less wealthy individuals.
- 3) Regional effects of entrepreneurial dynamism may vary across a business cycle. Specifically, in the case of the 2008 recession, more dynamic areas are expected to suffer worse initial downturns due to their higher concentrations of young establishments, but enjoy stronger recoveries due to the persistence of dynamism rates over time.

These hypotheses suggest that entrepreneurial dynamism may generate regional employment growth (at least during macroeconomic expansions) but might not boost local outcomes for those lower on the income distribution. To test this, I model three county-level dependent variables: employment growth, changes in median household income, and changes in the percent of residents below the poverty line.

Employment growth is a conventional measure used in much of the existing regional growth literature, as it captures both increases in the local employment and/or labor force participation rate as well as net in-migration. Employment measures are from the Bureau of Economic Analysis Total Employment data.

County median household income measures one element of the distribution of gains from entrepreneurship-led growth. Median income is unaffected by right-tail skewness, meaning that if entrepreneurship creates substantial benefits for a small group, e.g. venture capitalists, managers, or the entrepreneurs themselves, median wage will show little to no increase. Entrepreneurship-driven growth boosts median incomes at the county level only if ventures directly or indirectly boost incomes earned by households in the lower half of the income distribution.

Annual estimates of county-level poverty are obtained from the Small Area Income and Poverty Estimates (SAIPE), a Census program used to allocate federal education funding. While SAIPE poverty estimates are not a comprehensive survey, data is drawn from the American Community Survey and Current Population Survey, making this the most reliable annual county-level data on poverty.

Figure 2.4 below presents suggestive evidence of a relationship between dynamism that motivates this analysis. Counties are categorized into quartiles based on their average churn from 2007 to 2014. The figure plots unweighted county average employment relative to 1998, by dynamism quartile. Albeit without controls or an econometric structure suggesting identification, counties with higher rates of dynamism enjoy noticeably larger employment gains prior to 2008 and slightly faster growth from 2011 on, but more rapid employment declines in 2009.

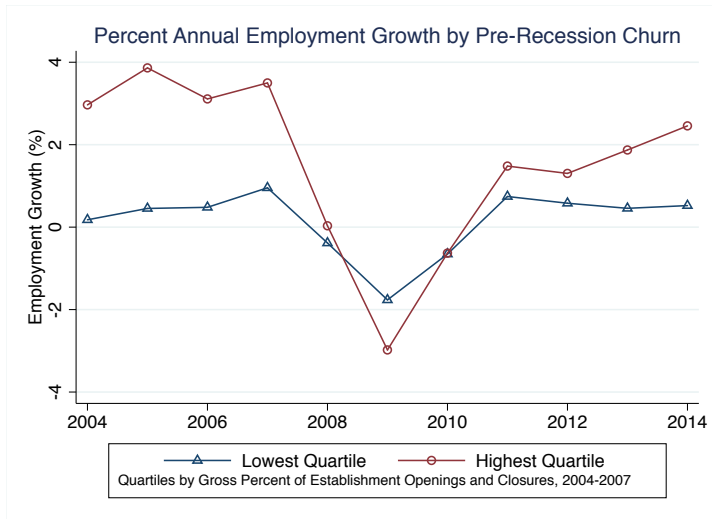


Figure 2.4

The median income growth trajectories of counties with high and low rates of pre-recession churn exhibit less divergence. Highly dynamic counties exhibit slightly more rapid income growth during the expansionary period from 2005 to 2007, and slower income gains during the recovery, but differences are less pronounced than in the case of employment growth.

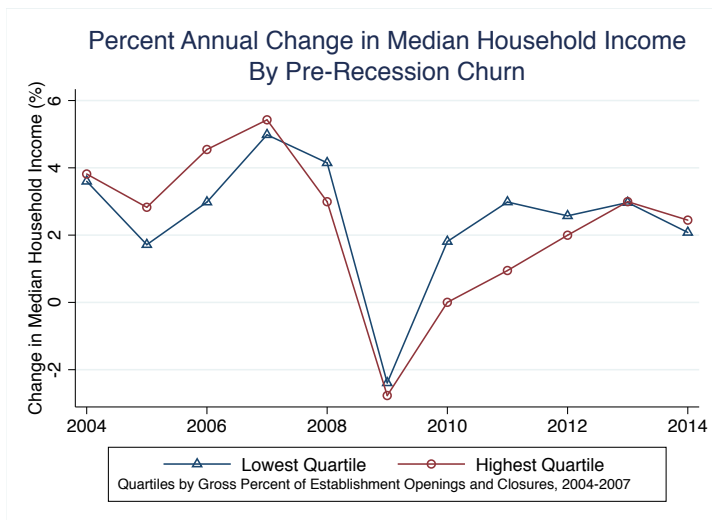


Figure 2.5

Similarly, counties with the highest rate of churn during the 2004-2007 expansion saw marginally better performance in terms of poverty rates prior to the recession, but experienced slightly faster increases in poverty rates from 2008-2012.

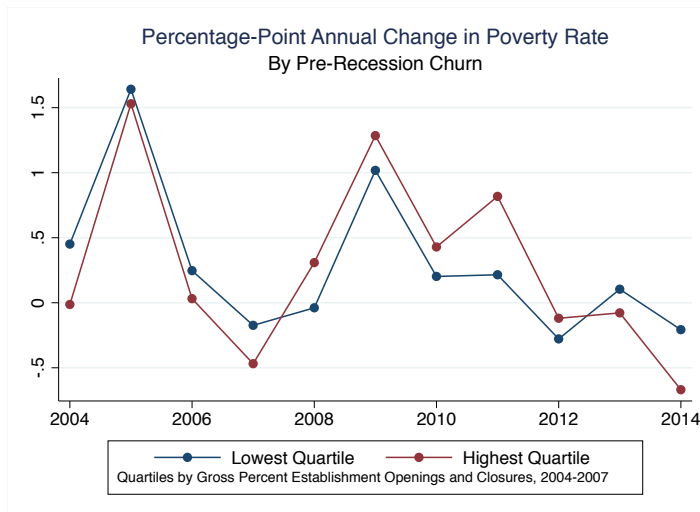


Figure 2.6

## 2.5 Empirical Analysis

While visual evidence of the effects of dynamism on regional outcomes is compelling, it should be noted that the figures above do not include controls, which are likely of great importance to regional changes in employment, median income, and poverty rates. The empirical analysis that follows incorporates a range of county-year controls. The ratio of nonemployer establishments to employees, the ratio of employees to total population, and the natural log of total employment help capture current labor market conditions. Nonemployer establishments, defined by the US Census as business ventures earning at least \$1000 per year but with no employees besides the owner/proprietor(s), signal potential future employment growth, as roughly 10% to 30% of nonemployer establishments eventually hire employees (Moore 2018, Acs et al. 2009, Davis et al. 2009), and even those that don't may still enhance local productivity by generating information spillovers, identifying and exploiting niches that other firms may capitalize on. The employment-to-population ratio captures slack in the labor market, in that an area with a lower employment-population ratio might have more workers ready to fill newly-created jobs in the short run. The log of lagged employment accounts for the possibility that the

effects of entrepreneurship on local economic outcomes might depend in part simply on the size of the local labor market.

An annual measure of rent-to-median income serves as a proxy for affordability regional affordability. Housing costs are accounting for an increasingly large share of American incomes (Anthony 2018), which has two important implications for this model. First, high and/or rising housing costs are expected to impact workers' location decisions. If housing prices rise when dynamism increases, the employment gains of entrepreneurship will be diminished as lack of affordable housing slows the job match process. Secondly, high rents might directly inhibit entrepreneurship, with workers in high-rent areas left with less disposable income to start a venture, and more dire consequences if the venture fails.

Two measures of industry employment composition are also included. The first is a specialization index, which captures the concentration or dispersion of employment across sectors. Counties with higher concentrations face potentially wider cyclical variations, as a demand shock to a sectors that employs a large share of a county's population will result in a disproportionate employment effect.

The second employment measure is a demand shock variable modeled on Bartik (1991) that predicts county employment growth based on national employment growth rates by sector. Since regions have differing employment concentrations in different industries, a national demand shock for a particular good will have heterogeneous impacts on regional labor markets. Predicted annual employment growth in county  $i$  is calculated by scaling the number of workers in county  $i$  employed in sector  $j$  in time  $t$  by the national employment growth rate in sector  $j$  from  $t$  to  $t+1$ , where the  $j$  sectors are defined at the 6-digit NAICS level. The resulting demand shock can be interpreted as predicted annual employment growth in county  $i$  based on county  $i$ 's sectoral specialization in the current year.

Recognizing the likely correlation of unobserved county-specific factors over time, I apply a fixed-effects panel model, with standard errors clustered at the county level.

Additionally, I implement state-year fixed effects to account for state policy variations.

Variable descriptions, summary statistics, and correlations from 2004 to 2014 are displayed below.

Table 2.1: Summary Statistics

Variable Name	Description	Source	Obs.	Unweighted Mean, 2004-14	Std. Dev.
<b>Dependent Variables</b>					
Emp_grow	Percent change in total county employment	BEA	32,846	0.572	3.054
medHHinc_grow	Percent change in county median household income	SAIPE	32,763	2.197	5.05
Poverty_change	Percentage-point change in percent of residents below poverty line	SAIPE	32,763	0.316	1.838
<b>Independent Variables</b>					
Churn	Gross percent of establishment openings and closures, relative to existing establishments	SUSB	38,310	18.738	5.146
Nonemp	Nonemployer establishments per 1000 employees	Census Nonemployer Statistics	32,846	0.140	0.042
Emprate	Ratio of employees to total population	BEA	32,846	0.516	0.161
Emp	Natural log of total employment (thousands)	BEA	32,846	9.556	1.495
Rent_to_income	Ratio of median 2-bedroom rent to median income	HUD	32,071	0.187	0.037
Specialization	Employment concentration ratio	BEA, BLS	32,844	0.559	0.201
Dem	Bartik demand shock	BEA, BLS	32,558	0.993	0.043



Table 2.2: Correlations

	Emp_grow	MedHHinc_grow	Churn	Nonemp
Emp_grow	1			
MedHHinc_grow	0.211	1		
Churn	0.137	0.007	1	
Nonemp	0.019	0.008	0.29	1
Emprate	0.109	0.045	-0.075	-0.497
Emp	0.052	-0.009	0.096	-0.108
Rent to income	-0.058	-0.164	0.126	0.143
Specialization	-0.056	0.043	0.062	0.102
Dem	0.198	0.1661	0.067	-0.063

	Emprate	Emp	Rent to income	Specialization	Dem
Emp_grow					
MedHHinc_grow					
Churn					
Nonemp					
Emprate	1				
Emp	0.184	1			
Rent to income	-0.171	0.2	1		
Specialization	-0.015	-0.3	0.004	1	
Dem	0.058	0.023	-0.036	-0.017	1

As a baseline, the first set of specifications uses a cross-sectional regression of county averages of all variables from 2004 to 2014. Specifically, I estimate:

$$\bar{y}_i = \beta_0 + \beta_1 \overline{Dynamics} + \sum \beta \bar{X}_i + \varepsilon_i$$

‘Bars’ denote within-county averages from 2004 to 2014.  $y$  denotes the two outcome variables of interest: employment growth rates and changes in median household income. The vector of controls,  $X$ , denotes 2004 -2014 county averages of gross establishment openings and closures as a percentage of existing establishments, the number of nonemployer establishments per 1000 employees, the natural log of employment, the rent-to-income ratio, specialization index, and Bartik-style demand shock, as detailed in Table 2.1 above. Results can be interpreted as showing the average effect of churn and county-level controls on employment growth rates and changes in median household income over the full 2004 to 2014 time period. The impulse

response measures the percentage-point change in average annual growth of the dependent variable in response to a standard-deviation change in the independent variable.

Table 2.3: Results

<b>Dependent Variable: Average Annual Employment Growth Rate (2004-2014)</b>		
<b>Variable - Average 2004-2014</b>	<b>Coefficient Estimate (Standard Error)</b>	<b>Impulse Response to One Standard Deviation Change in Indep. Var.</b>
Churn	0.147*** (0.002)	0.500
Nonemp	6.452*** (0.204)	0.250
Emprate	1.228*** (0.042)	0.196
Ln_Emp	0.356*** (.006)	0.532
Rent_to_income	-7.707*** (0.177)	-0.259
Specialization	0.523*** (0.044)	0.102
Dem	24.079*** (0.704)	0.196
Constant	-30.080*** (0.703)	N/A
n: 2929		
R-Squared	0.382	

Note: \*, \*\*, and \*\*\* for significance at the 10%, 5%, and 1% levels.

Table 2.4: Results

<b>Dependent Variable: Average Annual Change in Median Household Income (2004-2014)</b>		
<b>Variable - Average 2004-2014</b>	<b>Coefficient Estimate (Standard Error)</b>	<b>Impulse Response to One Standard Deviation Change in Indep. Var.</b>
Churn	0.012*** (0.002)	0.041
Nonemp	-0.357** (0.153)	-0.014
Emprate	1.47*** (0.031)	0.237
Ln_Emp	-0.263*** (0.005)	-0.393
Rent_to_income	-2.023*** (0.134)	-0.068
Specialization	-0.051 (0.033)	-0.01
Dem	26.172*** (0.531)	0.213
Constant	-21.935 (0.53)	N/A
n: 2929		
R-Squared	0.295	

Note: \*, \*\*, and \*\*\* for significance at the 10%, 5%, and 1% levels.

Table 2.5: Results

<b>Dependent Variable: Average Annual Change in Poverty Rate (2004-2014)</b>		
<b>Variable - Average 2004-2014</b>	<b>Coefficient Estimate (Standard Error)</b>	<b>Impulse Response to One Standard Deviation Change in Indep. Var.</b>
Churn	-0.000225** (0.000097)	-0.00072
Nonemp	-0.0234*** (0.00883)	-0.0009
Emprate	-0.0161*** (0.00184)	-0.0026
Ln_Emp	0.0052*** (0.00026)	0.0078
Rent_to_income	-0.0024 (0.0077)	~0
Specialization	0.0102*** (0.00189)	0.0020
Dem	-0.272*** (0.0306)	-0.0022
Constant	0.242	N/A
n: 2929		
R-Squared	0.220	

Note: \*, \*\*, and \*\*\* for significance at the 10%, 5%, and 1% levels.

These results align with well-documented findings that more dynamic economies experience faster employment growth on average. Over this business cycle, a one-standard-deviation increase in gross churn predicts a one-half-percent higher average annual employment growth rate. Larger counties, counties with a higher density of nonemployer establishments, and counties with lower median rent to median income ratios also see faster job gains.

This effect is noticeably weaker in predicting changes in median income and poverty rates. As seen in table 2.4, while the effect of churn on median income growth is positive and statistically significant over this time period, the effect is not economically meaningful: all else equal, a county with churn one standard deviation above the mean sees median wages rise only 0.04% faster per year than a county with average churn. The most economically significant factors predicting median wage growth are tighter labor markets, i.e. higher employment-population ratios, and the Bartik demand measure, which predicts local demand growth based on local employment profiles and national sectoral job growth trends. Likewise, while average churn has a statistically significant negative correlation with changes in poverty rates over this time period, a standard deviation increase in churn predicts less than a thousandth-percentage point decrease in poverty rates.

These average effects of churn on employment growth over time are fairly well-established in existing literature, and say little about this paper’s main contribution, which is the *time-varying* relationship between churn and growth suggested by a regional interpretation of Schumpeter’s business cycle. To explicitly examine this time-varying effect, I use an annual fixed-effects panel of US counties spanning 2004 to 2014. The estimating equation takes the general form:

$$y_{i,t} = \beta_0 + \beta_1 Year + \beta_2 Year * Churn_{i,2004-2007} + \beta_3 State * Year + \sum \beta X_{i,t-1} + \delta_t + \eta_i + \varepsilon_{i,t}$$

The outcome variables,  $y_{it}$  are annual percentage changes in employment in the first set of specifications, median household income in the second, and poverty rates in the third. The independent variable of interest is the interaction between pre-recession churn and a year fixed effect. Because churn is strongly correlated within counties over time, I treat a county's average level of churn from 2004-2007 as a proxy for its pre-recession level of dynamism. (As a robustness check, I also employ a measure of average churn over the full 2004-2014 time period; these two measures have a correlation coefficient of 0.64, and the choice of measure does not significantly impact results. See Appendix 2) This interaction term shows the marginal effect of a percentage point increase in pre-recession churn in a particular year relative to 2004.

One-year-lagged county-specific controls  $X_{i,t-1}$  include all variables outlined in Table 1, as well as separate one-year-lagged measures of establishment openings and closures per 1000 workers, which adjust for the direct job creation and destruction effects of establishment creation and destruction. To capture state-level policy differences such as tax rates and business regulations, I employ state-year fixed effects.

Results are presented below in Table 2.6, and in a plot of churn-times-year marginal effects from specification II in figure 2.7.

Table 2.6: Results

<b>Dependent Variable: Annual Employment Growth</b>				
	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>
<b>Variable</b>	<b>Coeff. Est. (Std. Error)</b>	<b>Coeff. Est. (Std. Error)</b>	<b>Coeff. Est. (Std. Error)</b>	<b>Coeff. Est. (Std. Error)</b>
Churn * 2005	1.780*** (0.372)	4.004*** (0.618)	3.251*** (0.663)	2.27*** (0.407)
Churn * 2006	1.089*** (0.358)	2.487*** (0.702)	2.427*** (0.607)	2.316*** (0.458)
Churn * 2007	1.299*** (0.482)	3.179*** (0.882)	2.78*** (0.834)	2.337*** (0.558)
Churn * 2008	-2.07***	-4.635***	-2.269**	-0.877

	(0.559)	(1.064)	(0.908)	(0.664)
Churn * 2009	-3.129*** (0.535)	-6.137*** (1.088)	0.372 (0.904)	-2.106*** (0.687)
Churn * 2010	-2.093*** (0.622)	-4.426*** (0.995)	-0.674 (0.941)	-1.949*** (0.591)
Churn * 2011	-1.272** (0.551)	-0.833 (1.038)	1.317 (0.983)	-1.028 (0.629)
Churn * 2012	-0.976* (0.59)	0.115 (1.143)	2.014* (0.952)	-0.654 (0.632)
Churn * 2013	0.078 (0.578)	3.526*** (1.148)	5.29*** (0.984)	1.219** (0.58)
Churn * 2014	1.31** (0.629)	5.122*** (1.604)	5.241*** (1.091)	2.68*** (0.994)
Lagged openings	0.156*** (0.024)	0.150*** (0.026)	0.195*** (0.068)	0.134*** (0.024)
Lagged closures	-0.088*** (0.019)	-0.081*** (0.020)	-0.244*** (0.064)	-0.079*** (0.021)
Self Employment Rate	14.544*** (3.085)	24.522*** (4.697)	23.213 (7.609)	15.548*** (4.554)
Median Rent / Median Income	-4.809*** (1.291)	-3.049** (1.326)	-1.365 (2.001)	-0.819 (1.74)
Employment	-12.858*** (1.091)	-14.621*** (1.160)	-15.981*** (1.265)	-16.351*** (1.625)
Bartik Instrument	6.298*** (1.104)	4.875*** (1.013)	3.236* (1.655)	6.236*** (1.035)
Specialization Index	2.715*** (0.526)	2.722*** (0.489)	2.817*** (0.737)	2.12*** (.616)
Constant	114.045*** (10.733)	162.317 (127.812)	537.204*** (49.025)	200.694*** (145.524)
State-Year Fixed Effects	N	Y	Y	Y
Counties	All	All	Metro	Nonmetro
Obs.	31,577	31,577	8,124	19,101
Adj. R-Squared	0.28	0.422	0.594	0.321

Note: \*, \*\*, and \*\*\* for significance at the 10%, 5%, and 1% levels. Robust standard errors clustered at the county level. Year and state-year fixed effects coefficient estimates suppressed. Metropolitan and nonmetropolitan classifications based on 2010 Census designations.

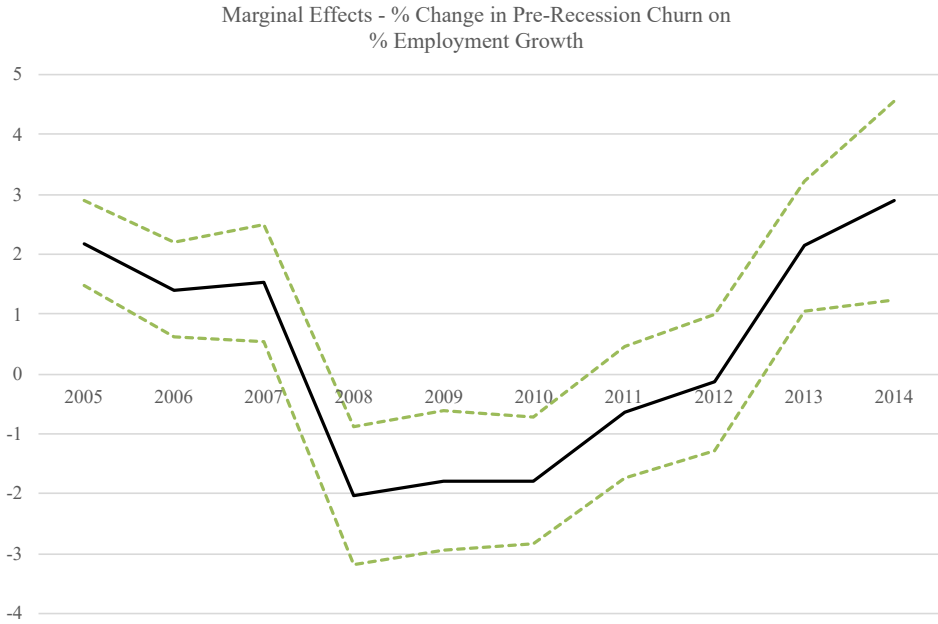


Figure 2.7

The above results support the hypothesis that higher rates of establishment dynamism predict stronger employment growth rates during times of macroeconomic expansion, with negative impacts during the 2008 recession. This aligns with the theoretical framework of regional Schumpeterian cycles: during the macroeconomic boom prior to 2007, when credit was freely available and incomes, both actual and expected, were rising, highly dynamic counties reaped the greatest benefits. During this expansionary macroeconomic climate, risky ventures were more likely to succeed – nationally, establishments born in 2002 enjoyed a 60% three-year survival rate, compared to 56.5% for those that opened in 2008. Counties with higher churn in the years prior to the 2008 recession saw more severe job growth slowdowns in 2008 and 2009. But by about 2013, higher rates of pre-recession establishment churn again predicted more rapid employment gains.

The relationship between pre-recession churn and growth in local median incomes is similar during the early-2000s boom and the onset of the crisis, with more dynamic counties experiencing faster income growth prior to 2008 and more severe income losses during the

macroeconomic downturn. But whereas counties with higher pre-recession churn saw more rapid employment growth during the recovery, a parallel trend does not emerge for median income growth; instead, higher pre-recession churn predicts slightly slower median income growth in 2012 and 2014.

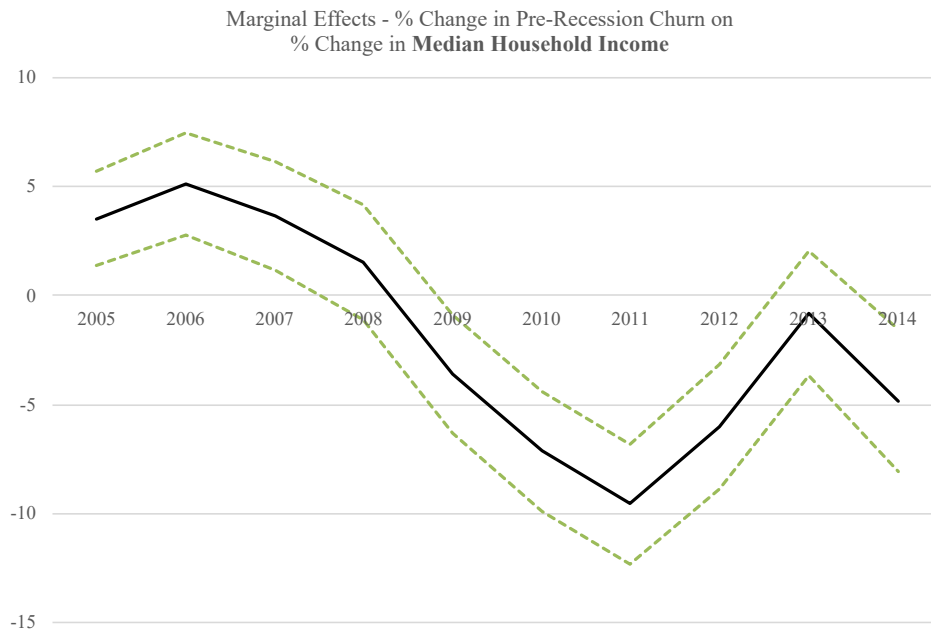


Figure 2.8. Full results reported in Column II of Table 1.7.

Results are less optimistic in terms of poverty rates. Counties with higher pre-recession churn experience statistically- and economically-significantly larger increases in poverty rates during the recession.



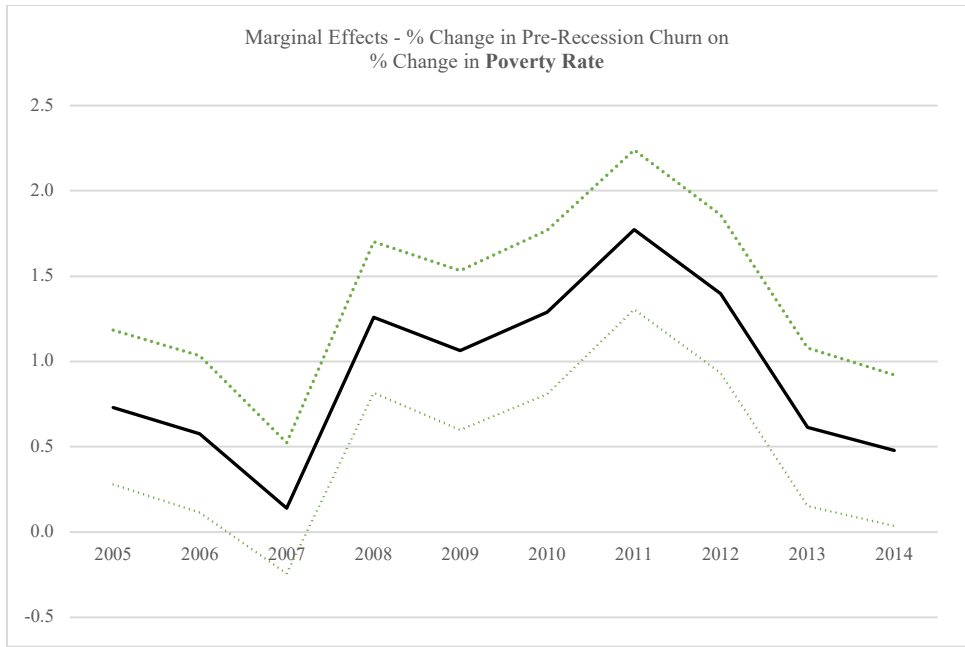


Figure 2.9. Full results reported in Column II of Table 2.7.

**2.6 Discussion and Conclusions**

This paper seeks to shed light on the relationship between entrepreneurial activity and growth at a regional level. I find a positive relationship between average dynamism and average employment growth over a 16-year period that spans the recessions of 2001 and 2008, in line with existing literature. The novel finding presented here is that effects of entrepreneurship on growth appear to vary across the business cycle. Since the early 2000’s counties in the US with high rates of entrepreneurship, measured by the rate of establishment turnover, enjoy more rapid employment growth during periods of macroeconomic expansion and suffer more severe ill effects of recessions. Further, pre-recession rates of establishment churn appear to have negative ramifications for median incomes and poverty during the recession.

These results can be better understood through a regional interpretation of the Schumpeterian growth cycle. In Schumpeter’s model, risky, innovative activity sets off a boom-and-bust cycle with a general upwards trend. If such cycles occur locally as well as nationally, it follows that regions with higher rates of entrepreneurial activity should see more pronounced

business cycles. The finding that higher establishment turnover rate – whether measured on an annual basis or as an average across a longer period – correlates with better faster employment growth during macroeconomic expansions and slower growth during recessions aligns with this prediction. The negative effects of pre-recession churn on median incomes and poverty rates during the recession strongly suggest that the impacts of “creative destruction” are not felt evenly across the income distribution. While higher churn does correlate with more rapid average employment growth over the course of a business cycle, the bulk of the negative effects of the recession seem to be felt by those at or below the middle of the income distribution.

From a policy perspective, the findings in this paper might be interpreted as providing a mixed endorsement of entrepreneurship-promotion as a development strategy. On one hand, the positive medium-run relationship between dynamism and employment growth is hard to ignore, and the faster and more robust employment recovery from the 2008 recession experienced by the most dynamic quartile of counties is undoubtedly a feat many local areas would like to replicate. At a minimum, the above results should help allay fears that low survival rates among young establishments means entrepreneurship is too risky to be feasibly promoted at a local level.

Yet volatility in employment growth across the business cycle is the antithesis of the steady, sustained job gains that best allow local policy-makers to make accurate longer-range projections about revenue and expenditures. Moreover, the positive effects of average pre-recession churn on median income growth evident before the crisis have yet to re-emerge, and at no point over this business cycle does churn correlate with decreased poverty rates, raising questions about the distributional impacts of churn-driven local growth.

What this work does suggest is that local decision-makers may benefit from considering how best to distribute potential net gains from entrepreneurial activity, both across time and across the income distribution. Temporal smoothing may entail using tax revenues generated

during boom periods to mitigate ill-effects of future recessions, while ex-post income redistribution measures or poverty-reduction programs might complement policies supporting entrepreneurship.

This paper also raises a number of important questions. Perhaps the most pressing is the extent to which different kinds of entrepreneurial activity generate different regional effects. I use a broad measure of entrepreneurship that captures openings and closures of any business establishment. Does dynamism in particular sectors have distinct effects? Even more pertinent to matters of distribution: does the race, gender, or socio-economic status of the entrepreneur matter? Each of these topics merits future work to better understand the complex relationship between entrepreneurial dynamism and sustainable, equitable regional well-being.

### 3. ENTREPRENEURSHIP AND RESILIENCE IN THE US AND UK: IMPLICATIONS FOR REGIONAL DEVELOPMENT

#### 3.1 Introduction

Much has been written about the effects of entrepreneurship on local economic outcomes. On the positive side of the ledger, young small businesses account for substantial portions of gross job creation, creating direct benefits in terms employment and income. Moreover, there is some evidence that even unsuccessful projects generate information spillovers that benefit other local producers. But entrepreneurship is also risky. Fewer than half of all firms established in the US between 2008 and 2012 survived past five years. In the UK, 44% of enterprises established in 2011 were still in operation in 2016 (Office for National Statistics 2017).

This paper focuses on a particular aspect of the relationship between entrepreneurship<sup>1</sup> and local economic performance: resilience to macroeconomic recessions. It has been well-documented that the Great Recession of 2008 had regionally heterogeneous effects within and between areas in affected countries (Faggian et al., 2018; Kitsos & Bishop, 2018). Some of this

---

<sup>1</sup> A Note on Terminology: For the purposes of this paper, entrepreneurship in the US is measured using establishment openings and closures, as used in Bunten et al. (2014). Per the Census Statistics of US Businesses, an establishment “is a single physical location where business transactions take place and for which payroll and employment records are kept” which employs at least one person aside from the owner(s). Establishments may be companies (“single-unit enterprises”), or one location of a “multi-unit enterprise.” Although many establishments are part of larger companies, we feel that establishment openings and closures reflect entrepreneurial activity because even the act of replicating a proven business model in a new location is a risky venture.

For the UK, Office for National Statistics Business Demography data are used to derive the firm opening and closure information for local authority regions. The data comes from the Inter-Departmental Business Register and identifies companies that are register and de-register for Value Added Tax (VAT) and/or Pay As You Earn (PAYE). A comparison of observation entries and exits between periods leads to the formation of the Business Demography dataset. Since VAT and PAYE are registered at the enterprise level, the UK model captures entrepreneurial activity at the level of the firm rather than the establishment.

variation can be explained by factors such as sectoral composition of local employment and household leverage (Mian and Sufi 2009).

However, little attention has been paid on the role of entrepreneurship on economic resilience. The limited studies so far (Kitsos & Bishop, 2018; Rocchetta & Mina, 2017) do not find any of the positive employment effects associated to entrepreneurship during a period of turbulence such as the 2008 crisis. These studies predominantly use firm births and consider the entirety of the 2008 downturn as one period.

This study introduces two novelties in this sense. Our key measure of entrepreneurial activity is “dynamism,” which captures the gross rate at which business ventures turn over. We separate the post-2008 period into individual years that can better reflect the downturn and recovery period. Consequently, we examine whether a locality’s rate of entrepreneurial “dynamism” in the years prior to 2008 impacts its performance during the crisis and recovery in a different manner.

Additionally, we conduct analyses using both counties in the US and local authorities in the UK. Although data differences between the two countries impose some limitations on comparability between the US and UK cases, this approach extends existing national-level literature by offering insights into international variation in the effects of the Great Recession.

Our results support the broad finding, well established in both theoretical and empirical literature, that entrepreneurial dynamism contributes to local economic growth on average. However, our findings highlight some important nuances in this relationship. Theory suggests that areas with high levels of pre-recession entrepreneurial activity may have a greater density of young establishments on unstable footing and thus suffer harsher downturns, but that high entrepreneurial capacity might allow these areas to recover more quickly. Consistent with theoretical predictions, in both the US and UK, areas with high pre-recession entrepreneurial

activity recover from the crisis more quickly and robustly, experiencing significantly higher rates of employment growth in 2013 and 2014. During the recession years of 2009 to 2011, however, US counties with high pre-recession dynamism suffer more severe growth slowdowns, while in the UK, pre-recession entrepreneurial activity has little bearing on the severity of the initial shock.

**3.2 Context – Macroeconomic and Labor Market Conditions in the US and UK**

In some respects the 2008 recession had similar macroeconomic implications for the two countries in this analysis. In both the US and UK, GDP growth averaged roughly 3% during 2002-2007 expansion, then declined precipitously in 2008 and 2009 before returning to roughly 2% by 2012. UK GDP decreased slightly more than the US during the recession. Unemployment rates rose in both countries. US unemployment peaked at a higher level, just shy of 10% compared to 8% in the UK.

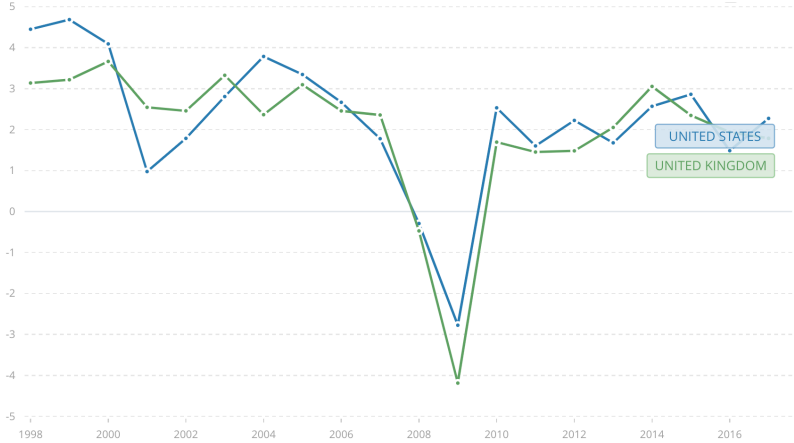


Figure 3.1: GDP growth in the US and UK. Source: World Bank

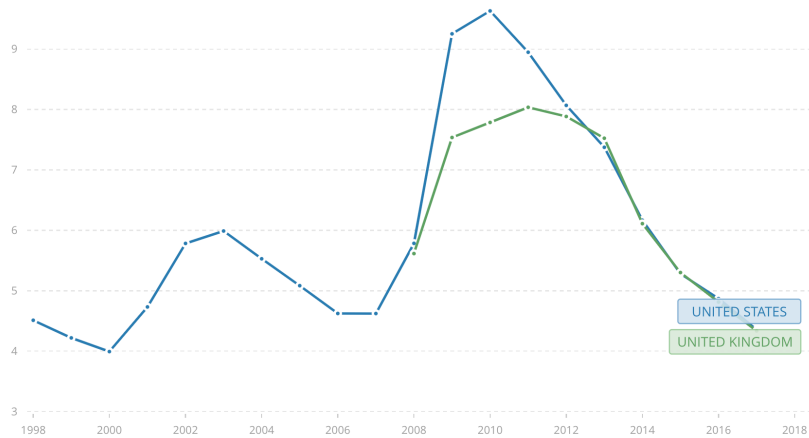


Figure 3.2: unemployment rates in the US and UK. Source: World Bank

Several structural differences between the US and UK economies should be noted. Institutions related to health care and health insurance differ starkly between the two countries, with American health insurance tied largely to employment status, while the UK National Health System provides comprehensive tax-payer-funded health services at little to no cost to users. Employer-provided health insurance has been identified as a source of “job lock” among US workers (Madrian 1994), and could significantly impact decisions related to entrepreneurial activity.

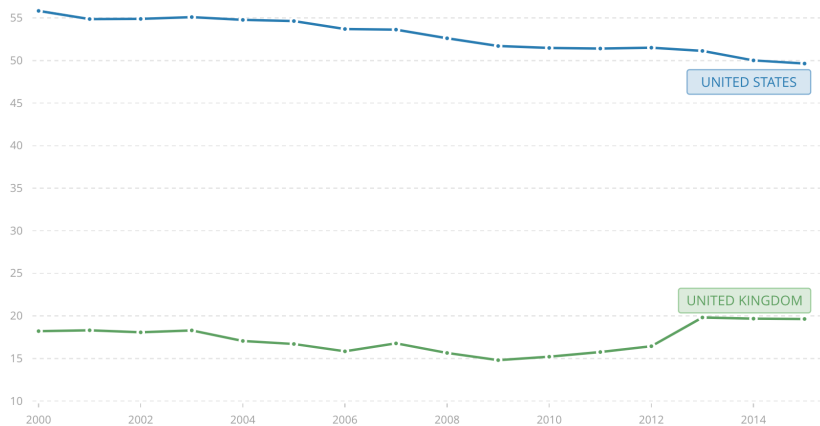


Figure 3.3: domestic private health expenditure, percent of current health expenditure, in the US and UK. Source: World Bank

Pertinent to the present research question, rates of and trends in business openings and closures also differ between the two countries, as well as the ways in which openings and closures are measured. Entrepreneurship in the US is measured using establishment openings and closures, as used in Bunten et al. (2014). Per the Census Statistics of US Businesses, an establishment “is a single physical location where business transactions take place and for which payroll and employment records are kept” which employs at least one person aside from the owner(s). Establishments may be companies (“single-unit enterprises”), or one location of a “multi-unit enterprise.” Although many establishments are part of larger companies, we feel that establishment openings and closures reflect entrepreneurial activity because even the act of replicating a proven business model in a new location is a risky venture.

For the UK, Office for National Statistics Business Demography data are used to derive the firm opening and closure information for local authority regions. The data comes from the Inter-Departmental Business Register and identifies companies that are register and de-register for Value Added Tax (VAT) and/or Pay As You Earn (PAYE). A comparison of observation entries and exits between periods leads to the formation of the Business Demography dataset. Since VAT and PAYE are registered at the enterprise level, the UK model captures entrepreneurial activity at the level of the firm rather than the establishment.

These data sources provide an imperfect comparative measure of entrepreneurial activity between the US and UK for two reasons. First, US measures are at the establishment level, while UK figures capture openings and closures of *enterprises*. Secondly, UK data has important limitations. Per the Office of National Statistics:

“VAT registrations and de-registrations are the best official guide to the pattern of business start-ups and closures... These figures do not, however, give the complete picture of start-up and closure activity in the economy. Some VAT exempt sectors and businesses



operating below the threshold for VAT registration are not covered. At the start of 2006, the VAT threshold was an annual turnover of £60,000 [roughly US\$76,000 by current exchange rates], and 1.9 million of the estimated 4.5 million enterprises in the UK were VAT-registered. However, some businesses do voluntarily register for VAT even though their turnover is below the threshold. Data for 2006 shows that around a fifth of all registrations have turnover below the VAT threshold.” The threshold for VAT registration had increased to £81,000, approximately US\$103,000 by 2014.

UK openings and closures may, accordingly, capture some larger nonemployer ventures, which are not included in the US data – for reference, the average US nonemployer establishment earned roughly US\$47,000 in receipts over the time period in this study - and may fail to capture some small employer enterprises. To maintain the greatest consistency possible between US and UK data, two measures of dynamism are employed: the product of openings and closures per 1000 workers, following Bunten et al. (2014), and the gross percent of establishment or enterprise openings and closures relative to existing businesses. The latter is featured in main results for two reasons: first, it employs a linear rather than quadratic fit, putting less weight on localities with extreme values. Second, it allows for greater comparability between the business dynamics of the two countries. Figures 3.4 and 3.5 below show that in both the US and UK, between 8 and 14% of existing businesses close annually, and are roughly replaced by a new opening, although with cyclical variation – openings outpace closures during expansions, and the inverse is true during the Great Recession.

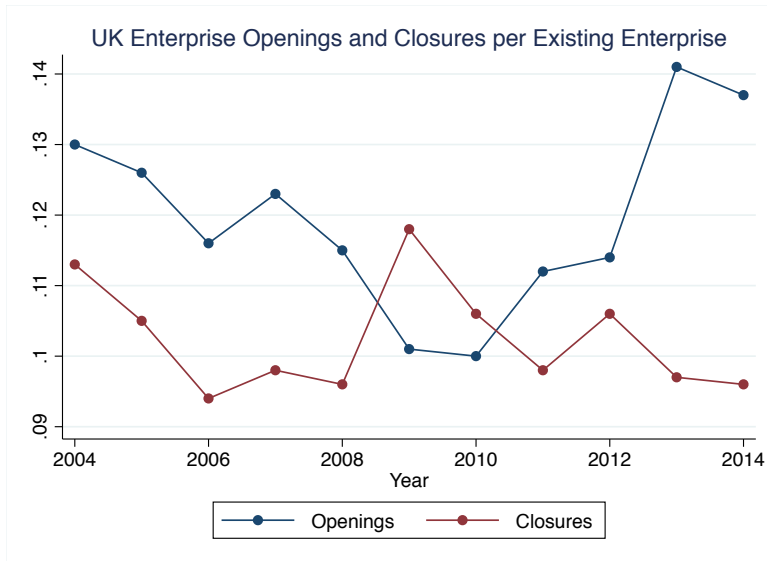


Figure 3.4

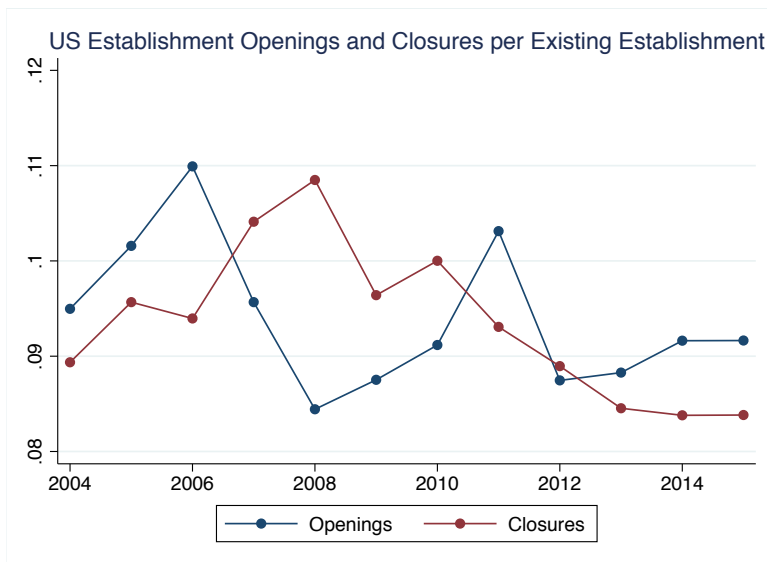


Figure 3.5

Geographic units are chosen for comparability between the two countries. The unit of analysis in the US is the county, of which there are roughly 3000, with the largest constituting 3.1% of the US population. UK data is reported at the Local Authority District level. There are 379 Local Authorities, the largest of which – Birmingham - is home to 1.8% of the UK population. London, home to roughly 1/6 of the UK population, is divided into 33 Local Authorities; the City of London Local Authority – the smallest of the 33 districts in the greater

London metro area and home to Parliament but very few residents – is excluded from UK analyses.

### **3.3 Theory**

A recognition of the importance of entrepreneurship in the growth process dates back at least to Schumpeter's (1942) model of "creative destruction," later formalized by Aghion and Howitt (1990). Innovation in these models catalyzes endogenous growth by spurring technological advancement. The extensive literature on human-capital-driven endogenous growth, typified by Krugman (1991), Lucas (1988), and Romer (1990), highlights the role of innovation in explaining differing economic outcomes across time and space. Measures of innovation and research networking (Strumsky and Thill, 2013) and entrepreneurial capital (Audretsch and Keilbach, 2004) have been shown empirically to boost local economic performance. And recent data shows that young firms are major drivers of productivity gains (Alon et al. 2018, Foster et al. 2018), suggesting an additional mechanism by which entrepreneurial activity contributes to regional growth.

Entrepreneurship may provide additional benefits in the form of information spillovers. Akerlof (1978) posits that information asymmetries can hinder economic activity in a range of markets. Lang and Nakamura (1993) extend the logic of information asymmetry to a local scale, modeling mortgage lending decisions as a function of information generated by past loans in the same neighborhood. Buntin et al. (2014) provide evidence that knowledge spillovers from entrepreneurship contribute to subsequent employment growth prior to the 2008 recession using an instrumental variable approach.

Most existing literature examines the relationship between entrepreneurship and local performance either over the long run, or over a short enough time horizon so as *not* to include a significant recession. However, post the 2008 recession and with the departure of the UK from

the European Union, there is increased interest on whether the effect of attributes such as entrepreneurial activity will vary according to different stages (i.e. recession and recovery stage) of macroeconomic fluctuations. At the theoretical level, an emerging literature on “resilience” suggests that entrepreneurship might help local areas mitigate the negative impacts of a shock either through diversification (and the relevant arguments of portfolio diversification) (Williams et al. 2017) or through the generation of employment and the replacement of the local business stock with new, more dynamic enterprises (Kitsos & Bishop, 2018).

But entrepreneurship also carries risk, not just for individual enterprises but also for areas with high concentrations of young firms. In Schumpeter’s (1942) business cycle model, entrepreneurial activity is responsible not only for the growth phase but also the decline, as the “bunching and swarming of imitators” drives up labor and capital prices, pushing some firms out of business. Young ventures exhibit high attrition rates: according to BLS data, establishments opening in the US between 2008 and 2016 have an average one-year survival rate of 79%, while just under half survive for five years. Haltiwanger, Jarmin, and Miranda (2013) note that the number of startups, young firms, and jobs created by young firms are all declining. Kitsos and Bishop (2018) find that in the UK, areas with more enterprise openings prior to the 2008 recession suffered larger employment declines during the crisis, presumably because such areas have more young firms that are vulnerable to recessions.

We contribute to this literature in a number of ways. Conceptually, this work offers a nuanced take on the burgeoning topic of “economic resilience,” looking not only at a region’s ability to mitigate the negative effects of an initial shock, but also to recover robustly. (See Kitsos and Bishop 2018 for a detailed summary of different conceptions of ‘resilience’ in economics literature.) Methodologically, our use of the product of openings and closures per 1000 employees – or “dynamism” – reflects a view of entrepreneurship that is more holistic than most

of the existing literature, which typically measures entrepreneurship by starts only, either in the form of firm or establishment births, or other indicators such as patents. Lastly, our comparative analysis of the US and UK offers valuable insights into ways in which country-specific factors might influence the relationship between entrepreneurship and resilience.

### **3.4 Preliminary Analyses**

As surveyed above, prior literature suggests that at least in certain cases, entrepreneurial activity encourages local economic growth. This could occur directly if this activity creates jobs, spurs technological advances, or acts as an amenity that attracts young and creative individuals. Entrepreneurship could also generate growth indirectly through productivity-enhancing information spillovers.

But theory and evidence also suggest that areas with high levels of entrepreneurial dynamism immediately prior to a macroeconomic downturn may suffer greater employment losses. Higher rates of openings and closures suggest a younger average age of local businesses at any given time. Historically, younger businesses exhibit lower survival rates than older ones, due perhaps to constraints in credit and cash-on-hand, or from not yet having established a dedicated consumer base.

Reconciling these two findings, we theorize that the effect of entrepreneurial activity on employment growth might vary throughout a business cycle. Specifically, we expect pre-recession entrepreneurial dynamism to negatively impact local employment growth during the macroeconomic downturn, or at least to see a diminution of the positive effect of dynamism on growth, as highly turbulent areas experience higher rates of closures among their disproportionately young business ecosystem. But higher pre-recession dynamism is expected to speed recovery, as the lending networks, infrastructure, consumer base, and physical, social, and

financial capital that supported high rates of entrepreneurial activity boost new openings as the national economy rebounds.

In both the US and UK, entrepreneurial activity is persistent within areas over time. Table 1 below summarizes the correlation between measures of entrepreneurial activity from one year to the next. This is especially true in the UK and echoes the findings of Fotopoulos (2014) on the spatial stickiness of entrepreneurship activity.

Table 3.1

	<b>Openings</b>	<b>Closures</b>	<b>Dynamism (Openings* Closures)</b>
<b>US</b>	0.674	0.609	0.780
<b>UK</b>	0.965	0.833	0.838

Specific to our main research question, entrepreneurial activity prior to the recession tends to persist throughout the business cycle. To measure this, we calculate average pre-recession dynamism, defined as the average product of openings and closures per 1000 employees in an area from 2004 to 2007. The figures below group US counties and UK local authorities into quartiles by pre-recession dynamism, and plot annual dynamism through the recession and recovery. In both the US and UK, areas with high dynamism during the macroeconomic expansion of 2004-2007 continued to exhibit higher than average turnover during the recession and recovery. The top quartile of most dynamic areas in the US and UK are consistently about four times as dynamic as the quartile with the lowest turnover.

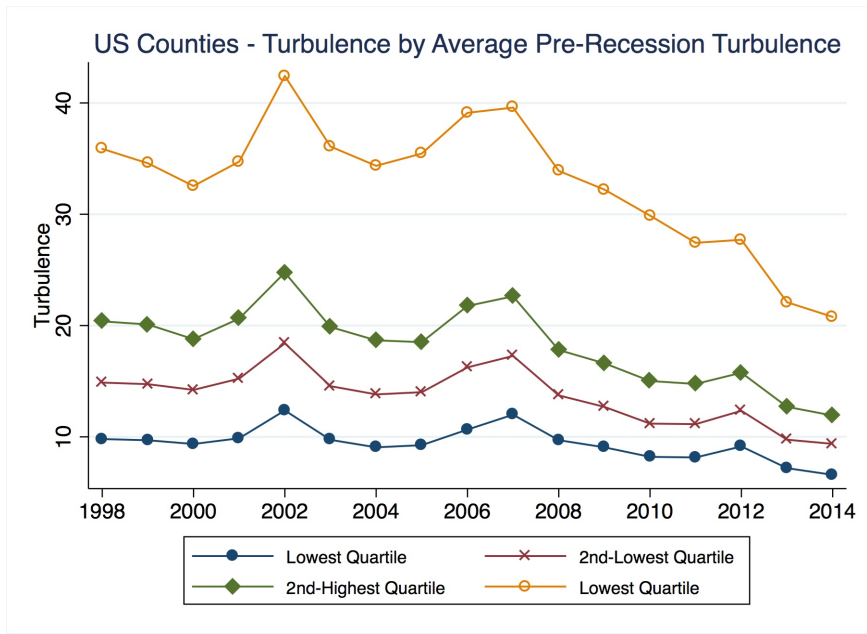


Figure 3.6

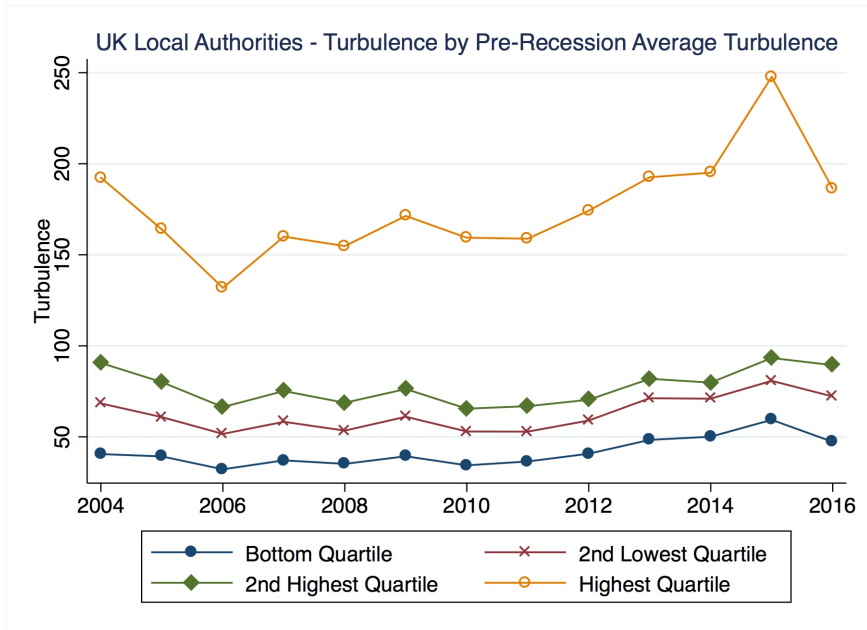


Figure 3.7

But comparing areas *within* each county, entrepreneurial activity varies considerably. The variation in pre-recession dynamism across US counties and UK local authorities is captured in the density plots below. Both samples are unimodal, but with considerably dispersion.

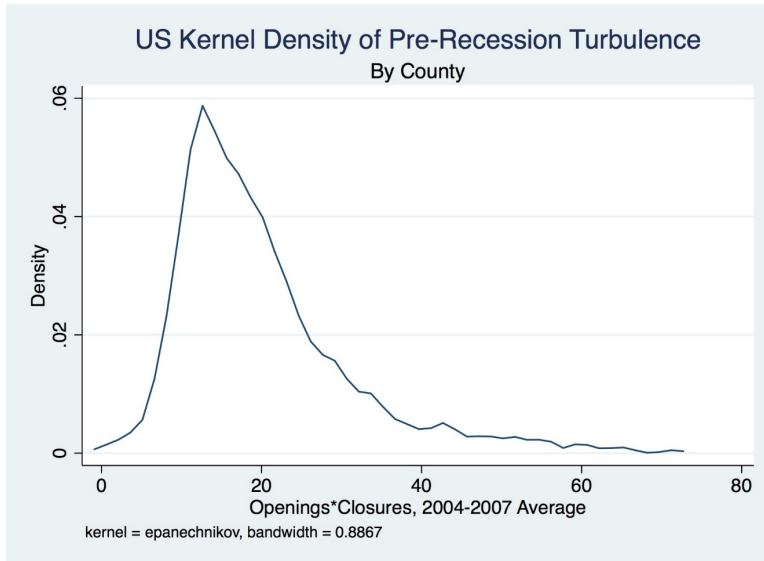


Figure 3.8

Table 3.2

Observations (Counties)	Median	Mean	Std. Dev
2,946	17.45	20.94	16.68

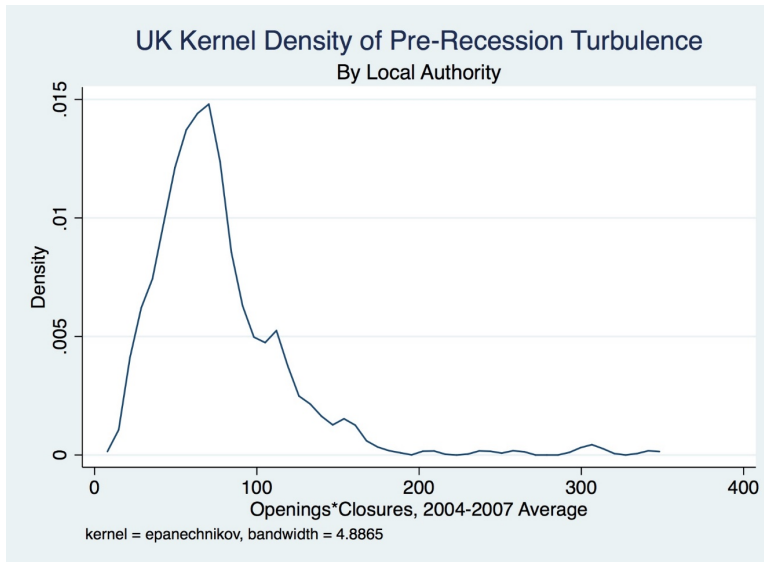


Figure 3.9



Table 3.3

Obs. (Local authorities, excluding City of London)	Median	Mean	Std. Dev
379	68.28	84.06	134.79

This leads to our key research question: is an area’s performance during the recession and recovery affected by its pre-recession level of dynamism? For a graphical analysis, we again group regions into quartiles by pre-recession dynamism, and plot annual employment growth rates across the business cycle.

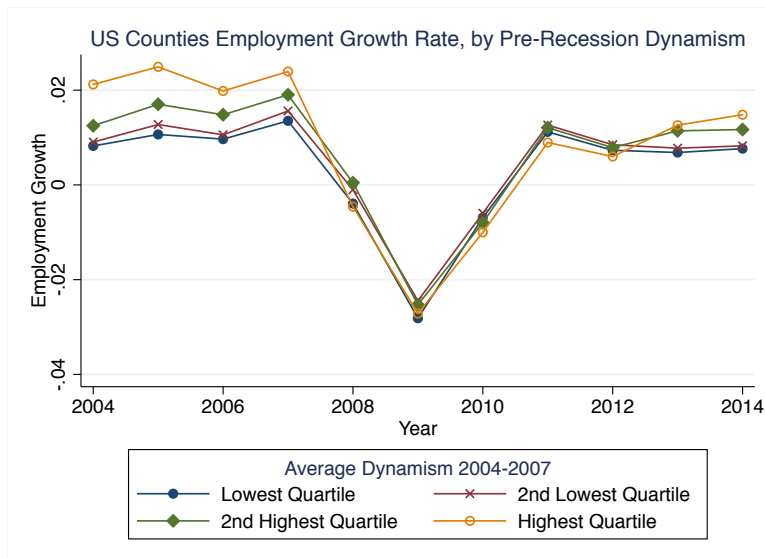


Figure 3.10

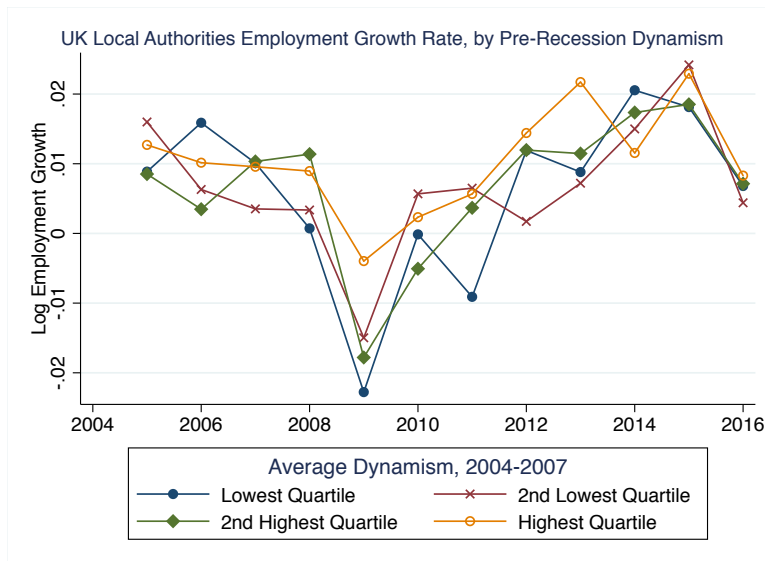


Figure 3.11

In the US, the relationship between pre-recession dynamism and growth over the course of the recession and recovery aligns with theory. Counties with high rates of establishment openings and closures prior to the recession see the largest drop in employment growth rates during the onset of the recession, from 2007 to 2009. But by 2013 and 2014, those counties with high pre-recession dynamism are again experiencing faster employment growth than other counties.

Notably different results arise in the UK. For one, local authorities with the highest pre-recession dynamism don't experience consistently higher pre-recession growth. And strikingly, local authorities in the highest quartile of pre-recession dynamism actually experience the *smallest* decline in employment growth rates from 2007 to 2009.

### 3.5 Empirical Analysis

Graphical evidence without controls suggests that higher pre-recession dynamism might have detrimental employment effects during the recession but positive effects during the recovery. To test this hypothesis empirically, we implement a fixed-effects panel model of the following form:

$$EmpGrow_{i,t} = \beta_0 + \beta_1 Year + \beta_2 Dynamism_i + \beta_3 Year * Dynamism_i + \sum \beta X_{i,t-1} + \delta_t + \eta_i + \varepsilon_{i,t}$$

The dependent variable, *EmpGrow*, is the natural log of the change in formal-sector employment (not including self-employment in the US) by local area. The independent variable of interest is the interaction of year and dynamism, measured by the average product of local openings and closures per 1000 employees from 2004 to 2007. It should be noted that this pre-recession dynamism term is time-invariant for each region across the panel; thus the interaction of pre-recession dynamism and a year dummy gives the marginal effect of pre-recession dynamism on employment growth for each year in our sample. Recall that theory, built on existing literature and graphical evidence, suggests that pre-recession dynamism should have a positive effect on recovery as areas tend back towards their pre-recession levels of employment growth rates, but may have detrimental effects during the downturn as younger businesses fail at higher rates.

A number of additional controls are implemented. For the US, the ratio of nonemployer establishments to employees, the ratio of employees to total population, and the natural log of total employment help capture current labor market conditions. Nonemployer establishments – defined by the US Census as business ventures earning at least \$1000 per year but without any paid employees aside from the proprietor – signal potential future growth, as some nonemployers eventually transition to employer status, while others might generate information spillovers that boost employment growth among other firms. The employment-population rate captures excess capacity in local labor markets. And the natural log of population accounts for the possibility that the relationship between dynamism and employment growth might vary across local authority areas of different sizes.

Affordability, especially of housing, might constrain regional employment growth. To account for this, we include as a control in both the US and UK models a measure of the average share of income spent on housing. For the UK, this comes from the ONS Housing Affordability Index which calculates average housing costs as a share of average earnings; in the US, we calculate the ratio of median household income to median two-bedroom rent.

We also include two measures of industry employment composition. The first is a specialization index, which captures the concentration or dispersion of employment across sectors; the second is a demand shock variable modeled on Bartik (1991) that predicts county employment growth based on national employment growth rates by sector. These two measures help account for the likelihood that the recession's impact on a particular county depends in part on degree to which that county's employment is concentrated in hard-hit sectors. Predicted annual employment growth in county  $i$  is calculated by scaling the number of workers in county  $i$  employed in sector  $j$  in time  $t$  by the national employment growth rate in sector  $j$  from  $t$  to  $t+1$ , where the  $j$  sectors are defined at the 6-digit NAICS level. The resulting demand shock can be interpreted as predicted annual employment growth in county  $i$  based on county  $i$ 's sectoral specialization in the current year.

Recognizing the likely correlation of unobserved county-specific factors over time, we apply a fixed-effects panel model, with standard errors clustered at the county level. Additionally, we implement state-year fixed effects to account for state policy variations. In both the US and UK models, we also control for one-year-lagged openings and closures to adjust for direct job creation and destruction effects of unbalanced establishment dynamism.

Table 3.4

Variable Name	Description	Source	Obs.	Mean	Std. Dev.
Emp_grow	Percent change in total employment	BEA	32,846	.00572	.0305
Dynamism	Natural log of average 2004-2007 establishment openings*closures per 1000 employees	SUSB	32,812	2.881	.557
Nonemp	Nonemployer establishments per 1000 employees	Census Nonemployer Statistics	32,846	.140	.0421
Emprate	Ratio of employees to total population	BEA	32,846	.516	.162
Emp	Natural log of total employment	BEA	32,846	9.557	1.495
HPI*	Change in house price index, base year 2000	FHFA	25,094	1.676	8.710
Rent_to_income	Ratio of median 2-bedroom rent to median income	HUD	32,071	.1878	.0375
Specialization	Employment concentration ratio	BEA, BLS	32,844	.559	.201
Dem	Bartik demand shock	BEA, BLS	32,558	.994	.0431

Note: because the house price index is not available for all counties, this variable is excluded in some specifications.

Similar measures, sourced from the Office for National Statistics, are implemented for the UK model. Similar to the US measure of rent to income, the ONS affordability index compares average home prices to average incomes of local residents.

Table 3.5

Variable Name	Description	Source	Obs.	Mean	Std. Dev.
Emp_grow	Percent change in total employment	ONS	379	0.733	0.820
Dynamism	Natural log of average 2004-2007 enterprise registrations*de-registrations per 1000 employees	ONS	379	4.263	0.664
Emprate	Ratio of employees to total population	ONS	379	0.476	0.033
Emp	Natural log of total employment	ONS	379	11.073	0.567
Affordability	Affordability Index	ONS	347	7.616	2.658

Dem	Bartik demand shock	ONS	379	0.959	0.013
-----	---------------------	-----	-----	-------	-------

Numerous other characteristics, such as natural amenities, the presence of universities, local regulatory and tax policies, and the human capital of local residents are consistently shown in existing literature to be important contributors to regional growth. However, measures of these factors often display relatively little variation over time, and are not commonly available at an annual level. Instead, these factors are captured primarily in the region fixed effect term of our county- or local-authority-level panel model.

Table 3.6 summarizes US results for our preferred specification, which estimates equation 1 implementing controls for one-year-lagged openings, closures, employment, population, affordability, and a Bartik demand shock in a fixed-effects framework.

Table 3.6: US Counties

	I	II
Year * Natural Log of Pre-Recession Dynamism: 2004	0.970** (0.378)	0.143 (0.128)
“ ” 2005	0.202 (0.413)	0.632*** (0.142)
2006	0.499 (0.461)	0.521*** (.162)
2007	0.992** (0.466)	0.632*** (0.165)
2008	-1.662*** (0.469)	-.223 (0.167)
2009	-0.00290*** (0.529)	-0.305* (0.176)
2010	-1.530*** (0.473)	-0.305* (0.162)
2011	-2.526*** (0.436)	-0.095 (0.157)
2012	-2.437*** (0.508)	0.061 (0.181)
2013	0.901* (0.470)	0.437** (0.186)
2014	0.870** (0.426)	0.578*** (0.174)
Openings	0.147*** (0.0219)	0.123*** (0.020)
Closures	-.0703*** (0.0178)	-0.063*** (.017)
Log Employment	-16.739***	-17.243***

	(0.720)	(0.745)
Population (1000s)	8.78*** (2.07)	7.854*** (2.069)
Employment Rate	11.051*** (1.894)	6.641*** (1.979)
Rent-to-Income Ratio	-4.118*** (1.240)	-1.895 (1.234)
Demand Shock	6.035*** (1.000)	6.028*** (0.984)
County Fixed Effects	Y	Y
State-Year Fixed Effects	N	Y
Constant	146.616	349.725
Observations	34572	34572

Robust standard errors in parentheses, clustered at the county level. \*, \*\*, and \*\*\* for significance at the 10, 5, and 1% levels. Year fixed effects coefficient estimates suppressed.

The dynamism-year interaction terms measure the marginal effects of a one-percent change in average county pre-recession dynamism on employment growth performance, in percentage point terms, by year over the course of the business cycle. With year fixed effects, higher pre-recession dynamism predicts roughly one-half-percentage-point faster local employment growth in 2005, 2006, and 2007; one-half-percentage-point *slower* local employment growth from 2008 to 2010; and slightly better employment growth performance by 2014. These effects from column II are plotted in figure 9, with 95% confidence intervals, showing a clear cyclical trend.

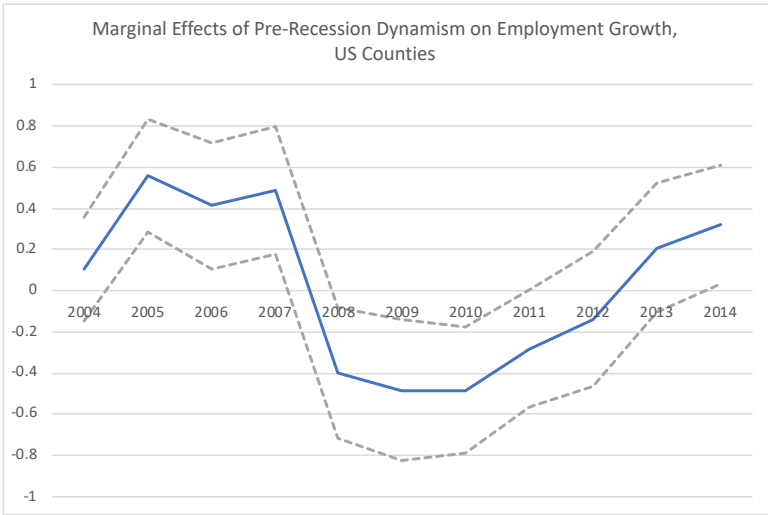


Figure 3.12

Additional insights can be gleaned by examining individually the time-varying effects of pre-recession rates of openings and closures, using the following specification including identical controls to those above:

$$EmpGrow_{i,t} = \beta_0 + \beta_1 Year + \beta_2 Year * PreRecessionOpenings_i + \beta_3 Year * PreRecessionClosures_i + \sum \beta X_{i,t-1} + \delta_t + \eta_i + \varepsilon_{i,t}$$

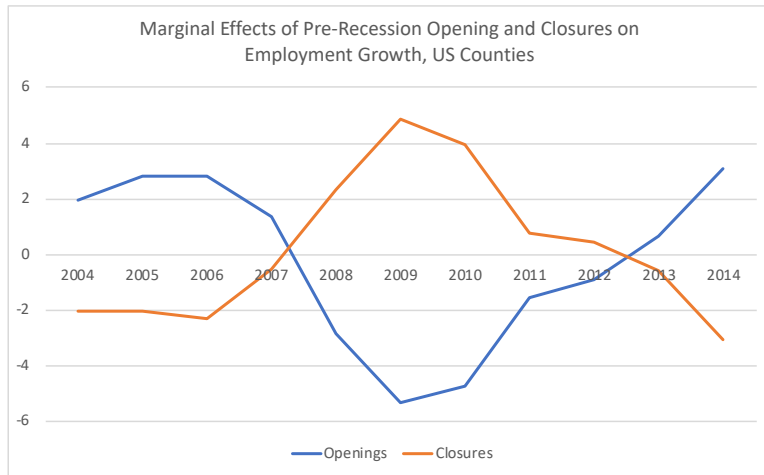


Figure 3.13

Figure 3.13 plots coefficient estimates of interactions between year terms and average pre-recession (2004-2007) rates of establishment openings and closures in US counties. Full controls are included. Higher rates of local pre-recession openings, not surprisingly, predict faster employment growth before the recession, while the opposite is true of higher rates of pre-recession closures. But during the recession and early recovery, areas with more pre-recession closures experience better employment growth performance, while higher pre-recession rates of establishment openings predict worse employment losses from 2008 to 2011. This aligns with the finding in Kitos and Bishop (2018) that higher pre-recession enterprise birth rates predicts more job losses during the recession, and has an intuitive interpretation: areas with more pre-



recession openings are likely to have more young businesses on potentially unstable financial footing, while in areas with high rates of pre-2007 closures – perhaps those hit hardest by the 2001 recession – the surviving businesses are likely to be more resilient.

A linear combination of the coefficient estimates obtained from estimating equation 2 shows a familiar pattern: the net effect of higher rates of pre-recession openings and closures is positive prior to 2008, negative during the recession, then dissipates over the course of the recovery.

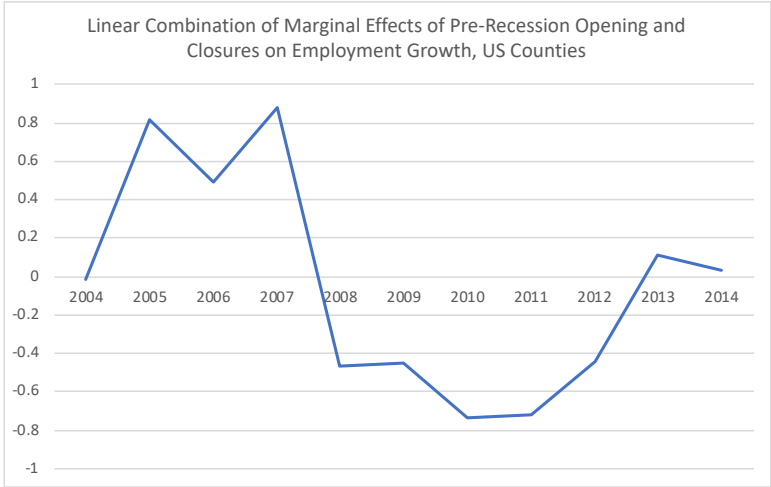


Figure 3.14

Results across UK Local Authority Districts show a similar pattern, although with a less pronounced cyclical component. In our preferred specification with full controls and year fixed effects, reports in column II below, pre-recession dynamism has a minimal impact on employment growth during the early years of the crisis, but at least some evidence emerges of a positive effect from 2011 onward.

Table 3.7: UK Local Authority Districts, Excluding the City of London Local Authority

	I	II
Year * Natural Log of Pre-Recession Dynamism: 2006	.249 (.180)	-.333 (.436)
“ ” 2007	.255 (.176)	-.056 (.468)
2008	.155 (.162)	.341 (.490)
2009	-.051 (.181)	.803* (.481)
2010	-.227 (.176)	.469 (.633)
2011	-.362** (.171)	1.348** (.556)
2012	-.311* (.170)	.825* (.483)
2013	-.183 (.170)	1.302*** (.471)
2014	-.091 (.169)	.672 (.531)
2015	.137 (.175)	.701 (.630)
2016	-.057 (.175)	.904* (.516)
Openings	.125** (.051)	.100** (.048)
Closures	-.036 (.080)	-.002 (.083)
Log Employment	-7.800 (7.675)	-8.135 (7.553)
Population	.101*** (.031)	.101*** (.031)
Employment Rate	-141.603*** (17.003)	-142.29*** (16.86)
Affordability Index	.419*** (.112)	.304** (.124)
Demand Shock	1.467 (.956)	.440 (1.702)
Local Authority Fixed Effects	Y	Y
Region-Year Fixed Effects	N	Y
Constant	133.42	143.88
Observations	4,119	4,119

Robust standard errors in parentheses, clustered at the Local Authority District level. \*, \*\*, and \*\*\* for significance at the 10, 5, and 1% levels. Year fixed effects coefficient estimates suppressed. All controls lagged one year.

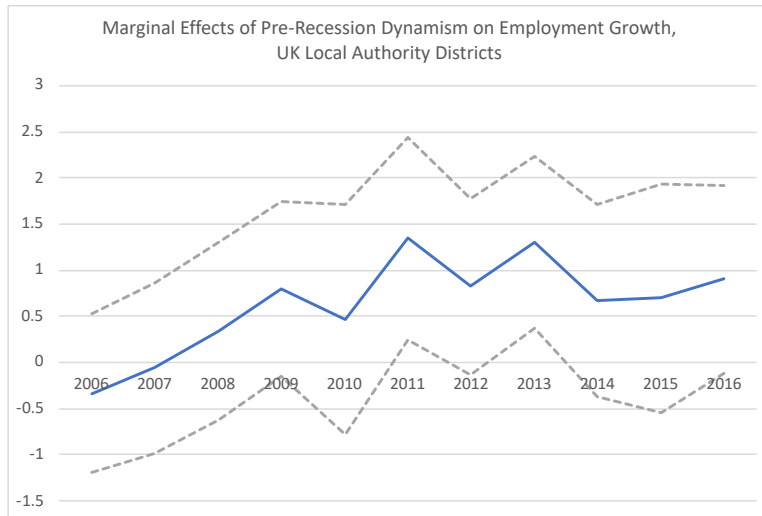


Figure 3.15

Noteworthy differences emerge when considering separately the marginal effects of pre-recession openings and closures on employment growth across the crisis and recovery. Recall from Figure 10 that US counties with higher rates of closures prior to the crisis saw less severe employment losses from 2008 to 2010. In contrast, UK Local Authorities with higher enterprise birth rates before 2007 continued to see more rapid employment growth over the subsequent decade, while higher pre-recession closure rates predict weakly worse employment growth performance during the crisis and recovery.

One possible explanation for this divergence is that local enterprise birth and death rates are more persistent in the UK than in the US: among UK Local Authorities, correlation between successive year's birth and death rates are 0.97 and 0.83, respectively; among US counties, these correlations are 0.67 and 0.61. Moreover, while dynamism in the US is measured by openings and closures of establishments – single business branches or locations – the ONS metrics used in the UK measures enterprises. Establishments may be more prone than enterprises to open or close in response to business cycle effects, exaggerating the cyclicity of dynamism effects in the US relative to the UK.

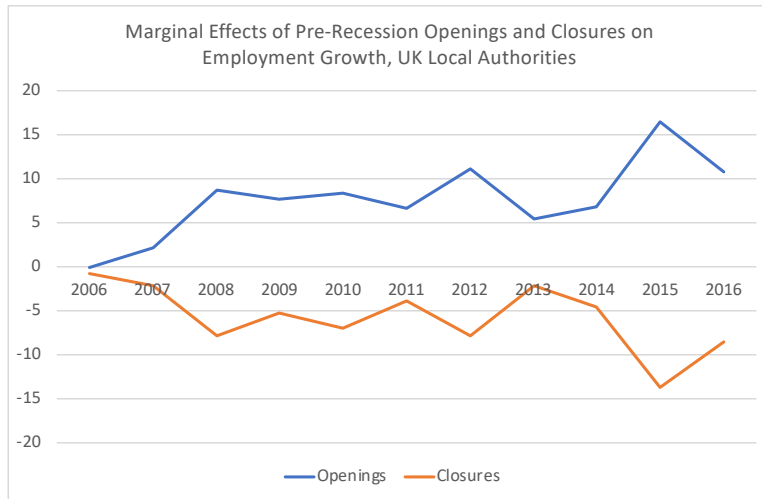


Figure 3.16

However, as seen in figure 3.17 below, a linear combination of the effects of pre-crisis enterprise birth and death rates shows a generally positive impact of local dynamism on employment growth that becomes stronger during the recovery.

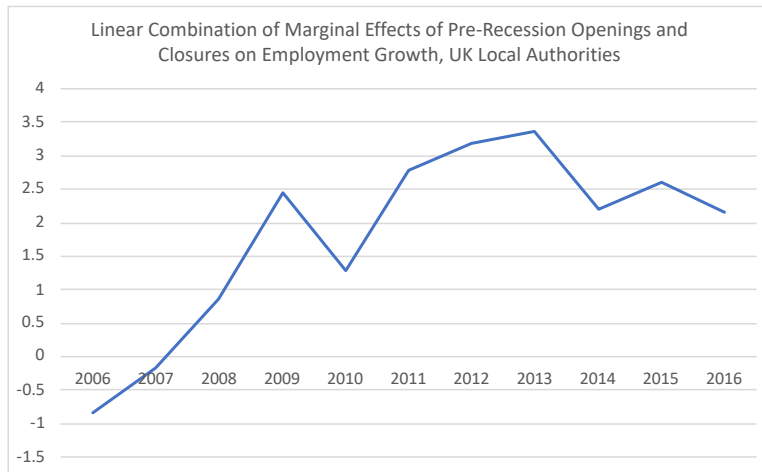


Figure 3.17

### 3.6 Discussion: Dynamism and Resilience

Does entrepreneurial dynamism contribute to local resilience to macroeconomic recessions? This analysis suggests that high rates of openings and closures prior to the 2008 recession did little to mitigate employment losses from the initial shock; instead, among US counties, more dynamic areas lost more jobs than their less entrepreneurial counterparts, while

among UK local authorities, pre-recession dynamism has no measurable impact on employment growth during the recession. But if resilience is defined not only by resistance to negative macroeconomic shocks but also as the ability to recovery quickly and completely, entrepreneurial activity does appear to have a beneficial role. In both the US and UK, areas with more dynamic economies measured by higher rates of pre-crisis openings and closures fared better from about 2013 onwards.

From a policy perspective, this analysis begs the question, is the high dynamism that almost necessarily accompanies entrepreneurial activity a risk, or a driver of growth? The preceding analysis suggests that both may be true, at least among US counties: high entrepreneurial dynamism seems to make areas more susceptible to deeper downturns, but also aids in rapid and robust recovery, particularly in metropolitan counties. This mechanism resembles a *regional* Schumpeterian business cycle as posited by Martin et al. (2015), with innovation driving growth, but also making downturns more painful. The practicality of entrepreneurship-led regional growth may depend, then, on the patience and risk attitudes of officials and voters, and on the ability of a local economy to save during periods of growth in order to soften the blow of a recession.

Additional structural differences between the two countries may also be at play and explain part of the US-UK differences. International trade comprises a larger portion of GDP in the UK than in the US, potentially diminishing the effect of the domestic business cycle on UK establishments. The systemic nature of the 2008 crisis makes this explanation less likely in justifying the observed differences. Another explanation could be related to cultural differences, in the sense that self-employment in the UK is viewed as a means to increasing job satisfaction and improving work-life balance, more than professional success (US case). This could be the case especially since the so-called low-end gig-economy is not registered either for VAT or for

PAYE). As a result, the US data contain more profit maximizing firms in a more competitive environment and considering it preferable to close than continue operation at the margin. Evidence to this is the more than double incidence of firms per worker which suggests a more supportive environment in opening a business.

Finally, a further explanation could be the support UK firms have received either via targeted attempts to keep enterprises open, or through low interest rates. The low interest rates are considered responsible for keeping alive enterprises that were largely unproductive and are considered partly responsible for the UK's post 2008 productivity problem. Besides the differences between the datasets though, these explanations remain to be examined in future research utilizing more granular datasets.

The policy implications of the research are derived from the finding that the positive effects of entrepreneurial dynamism on employment growth are not monotonic. Places with higher entrepreneurial activity need to develop further support programs for employment if they are to mitigate the crisis impact and reap the rewards at the recovery period. These programs could range from credit support which is a significant constraint for newly formed firms to projects allowing labor hoarding rather than redundancies.

A number of limitations and potential extensions should be noted. The 2008 recession may have been unique in its causes and in the scope and nature of its consequences. As such, our results are not currently generalizable. Subject to data availability, extending our empirical approach backwards to span earlier recessions may be insightful. Nonetheless, this analysis depicts a nuanced relationship between entrepreneurial dynamism and local economic performance, with dynamism playing an important but time-varying role in regional resilience.

## 4. ESCAPING THE PRISONER'S DILEMMA OF OVERWORK: SELF EMPLOYMENT AS AN ALTERNATIVE TO UNSATISFACTORY WORK HOURS

### 4.1 Introduction

This paper explores theoretical and empirical links between two important labor market phenomena: lack of worker agency in determining the length of the workweek and growth in self-employment. Much of the discussion on self-employment has centered on microeconomic questions of necessity versus opportunity entrepreneurship; this paper examines whether excessively long or short average working hours at a regional level constitute an additional push factor out of wage-and-salary employment into self-employment, helping to explain geographic variation in growth of the self-employment rate.

Self-employment is on the rise in the US. Nonemployer establishments – ventures earning annual revenues in excess of \$1000 without any paid employees, which we use as a proxy for self-employment – have grown by over 50% since 1998 (US Census Nonemployer Statistics data), outstripping growth in employer establishments and in conventional wage-and-salary employment. This national trend also displays considerable regional variation, with the median county experiencing a roughly two percentage-point increase in the share of self-employed workers, but with a standard deviation of 15 percentage points.

There are a number of possible explanations for this rise of nonemployers. The Internet and smartphones have undoubtedly increased opportunities for self-employment; for example, drivers using app-based ride sharing programs qualify as nonemployer establishments if they earn at least \$1000 per year. Additionally, layoffs from the recessions of 2001 and 2008 may have pushed some workers into self-employment. Demographic changes might also play a role, with Baby Boomers searching for flexible work arrangements later in their careers. Finally, part

of this change is likely driven by industrial organization phenomena, with firms preferring to contract with “temporary help supply” self-employers rather than hire traditional workers (Autor 2003) who would be eligible for benefits. We evaluate an additional possibility: that workers in conventional employment who are unhappy with their working hours might turn to self-employment as an alternative.

The recovery from the 2008 recession has been marked by persistently high rates of involuntary part time work – workers employed in paid jobs, but reporting that they are working “part time for economic reasons.” The number of involuntarily unemployed workers more than doubled between 2007 and 2009, and has yet to return to its pre-recession level. Involuntary part time work is also regionally heterogeneous across the US: 1.9% of the workforce in Delaware works part time for economic reasons, compared to 3.6% in Oregon.

There is also evidence to suggest that conventional wage or salary employment might generate ‘overwork.’ For one, survey data finds a significant number of Americans report feeling overworked. Additionally, a range of theoretical literature suggests that workers likely have little control over the number of hours they work. The unifying feature of these models is that social interactions – among worker-consumers, or between workers and firms – may result in workweeks that do not align with the labor hours workers would choose if faced with a continuous neoclassical labor-leisure tradeoff. Especially in the wake of the 2008 recession, many workers face the opposite problem, struggling to secure enough working hours. In contrast, self-employment gives proprietors significantly more control over their working hours.

To examine the possible link between self-employment and unsatisfactory working hours in traditional employment at a regional level, this paper evaluates whether county-level self-employment increases more rapidly when the average length of the local workweek is exceptionally high or low compared to the national average. Results show that the self-



employment share grew fastest from 2010 to 2014 in counties in which weekly hours worked in 2010 were furthest from the mean. In context, this suggests that a local labor market characterized by overwork or underwork may ‘push’ more workers towards self-employment

## **4.2 Motivation and Background**

There exists a broad array of theories explain the number of hours an employee work.<sup>2</sup> A Walrasian or Marshallian neoclassical approach might model a continuous labor supply curve grounded in the assumption that a worker weighs the marginal utility of an incremental increase in purchasing power against the marginal disutility of work. This approach has been developed by Mincer (1962) and others, and dominates microeconomic textbooks through the introductory graduate level. The result of this model is a Pareto optimal equilibrium in which, taking the equilibrium wage as a given, no worker can increase her utility by changing the number of hours she works in a week.

The existence of “underwork” is well documented. The Bureau of Labor Statistics uses Current Population Survey responses to calculate “Alternative Measures of Labor Underutilization” at the state level. Relevant to this question, the BLS records the number of workers employed part time for “non-economic reasons” – i.e. voluntary part time workers, and workers employed part time for “economic reasons;” that is, workers who would prefer full-time employment. As of 2016, more than 3% of the US labor force worked part time for economic reasons. The number of workers employed part time for economic reasons is highly cyclical, but has declined especially slowly since the 2008 recession (Canon et al. 2014). Even during times of economic growth, a substantial number of workers face involuntary part time work.

---

<sup>2</sup>There is some debate in the literature as to what time period should be considered when measuring hours worked. Maume and Bellas (2001) note that measures can vary substantially depending on whether hours are measured per typical week versus by year, and by worker versus by job. This paper looks primarily at usual hours worked per week, by worker, following the US Census definition.

Number of people employed part time for economic and noneconomic reasons, seasonally adjusted, June 2006 to June 2016

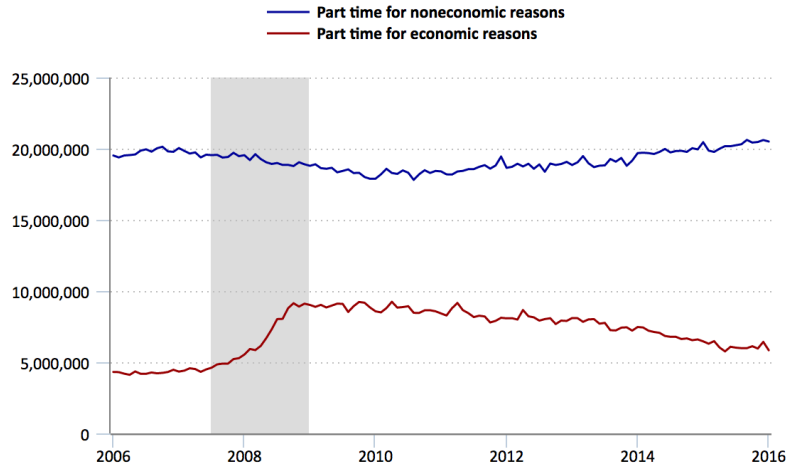


Figure 4.1. Bureau of Labor Statistics

A plausible explanation for this phenomenon comes from Michl’s (1999) response to the famous Card and Kreuger (1993) minimum wage case study. Michl proposes that firms can attain a given quantity of labor to produce a target level of output through various combinations of numbers of employees and average hours per employee. The optimal mix of number of workers and hours scheduled per worker depends on the wage and the fixed costs of hiring. In the case of a minimum wage increase, labor demand is theorized to have decreased, but rather than laying off workers, firms responded by cutting per-worker hours.

Classical political economy, similarly, depicts workers (or more accurately, the working class) as having virtually no control over labor supply. But in Classical models, the result is usually *overwork*. For Marx (1867), surplus labor - the amount by which labor exceeds labor power - constitutes profits that capitalists wrest from labor, e.g. “getting 18 hours’ work out of their men for 12 hours’ wages.” With their bargaining power strengthened by the existence of the “surplus reserve army,” capitalists in Marx’s analysis had a clear upper hand, giving workers little control over their marginal labor supply.

Smith (1776) and Mill (1848) likewise hoped for a future characterized by shorter work weeks, but foresaw such a change as a social rather than individualistic one, and discussed worktime reductions in the context of the stationary state, not under capitalist growth.

An additional strand of literature posits that workers are prone to overworking as a result of emulative consumption. The roots of this notion can be traced back to Smith's (1759) *Theory of Moral Sentiments*, in which Smith argues that the desire to appear well off and to avoid the shame of visible poverty is a "perversion of our moral sentiments," but is nonetheless deeply rooted in our natural human tendency to empathize. One is likely to sleep just as well in a cottage as in a palace, he posits, and yet we desire palaces. Veblen (1899) argues that at least a portion of the consumption undertaken by the "leisure class" aims not to satisfy actual needs, but to display status. Galbraith's (1952) depiction of the "affluent society" can be thought of as one in which all members of modern capitalist economies aspire towards membership in something akin to Veblen's leisure class. Advertising and social pressures, Galbraith argues, manufacture wants, which, once fulfilled, are replaced with new wants. Schor (1992) frames this notion in labor supply terms as a "work-and-spend" cycle.

There is some empirical support for this theory. Clark and Oswald's (1996) survey of British civil servants shows that self-reported worker satisfaction depends not only on one's own wage but also the wages of co-workers. Bell and Freeman (2000) observe that Americans on average work longer hours than their German counterparts, and using longitudinal and cross-sectional analyses find evidence that greater wage inequality leads to longer working hours. Bowles and Park (2005) find similar effects across a broader sample of OECD countries, which they attribute to "social comparisons ... upwards to a richer reference group."

Alternatively, overwork may be induced by the desire of employers to maximize effort from workers in cases of incomplete contracts. This is perhaps best illustrated in Lazear and Rosen (1979), who show that by compensating workers based on their relative effort or performance within the firm, employers can create “tournaments” of inter-worker competition. This competition incentivizes effort and human capital investments beyond what would be expected if workers were simply paid a wage equal to their marginal productivity. Similarly, Akerlof’s (1976) model of “the rat race” of working conditions shows that employees overwork when workers are grouped by effort and paid according to the average productivity of the group.

Lazear and Rosen discuss effort in terms the terms of the conventional incomplete contracts where employees spend a portion of their day actually working and a portion of the day “shirking” labor – that is, not avoiding and hoping not to be caught doing so, and Akerlof equates effort with the speed of work. But especially in many modern white collar or salaried jobs, one can imagine hours spent in the office as an easily observable signal of effort, in keeping with Spence’s (1973) framework of job market signaling. Especially if the payoffs for ‘winning’ or ‘losing’ this tournament vary widely – for example, if the worker who spends the most time in the office earns a massive promotion while the worker putting in the fewest hours is fired – such a tournament can easily devolve into a Prisoner’s Dilemma in which the dominant strategy for each worker is to try to work marginally more hours than their coworker. Appendix 1 presents a game theory model to this end.

Relatedly, models of endogenous unemployment help explain working hours that differ from the neoclassical equilibrium. In Akerlof and Yellen’s (1990) fair wage-effort model, pay determines worker effort rather than vice versa. If firms find it advantageous to pay above the market-clearing level in order to induce effort or reduce turnover, i.e. an efficiency wage, and if hours spent in the office constitutes a signal of effort among salaried workers, then workers will

supply more labor hours than they would under standard marginal-productivity wage structures. This structure, like that of Lazear and Rosen, opens the possibility of a prisoner's dilemma scenario of escalating hours worked.

Perhaps most important for our purposes is survey data indicating that a substantial number of American workers *feel* overworked, as these subjective evaluations of working hours likely play a role in workers' labor market choices. Much of this survey research is summarized in Schor's (1992) popular book *The Overworked American: The Unexpected Decline of Leisure*. Galinsky et al. (2004) surveyed roughly 1000 American workers and found that over one in four reported feeling "overworked often or very often in the last month." In a survey of 3500 Americans by the American Psychological Association (2017), 61% report feeling stress related to work, although not all of this stress is necessarily related to overwork. A survey by workforce firm Paychex (2017) reports that 81% of workers wish they could spend more time with their families.

Research specifically examining regional variation in working hours across the US is scarce. The lack of scholarship on regional labor hours may be due to a variety of factors. First, the magnitude of divergence in average weekly hours across US counties is relatively small, with a mean in 2010 of 39.5 and a standard deviation of 1.9. The difference between the 90<sup>th</sup> and 10<sup>th</sup> percentile counties by average weekly working hours is 4.3 hours, which at just under one hour per day in a five-day workweek is not inconsequential, but is still only 11% of the mean. Second, average working hours appear, as seen in figure 2, to have an easily explained geographic pattern, with the Midwest and western plains exhibiting nearly uniformly longer average hours than the rest of the country, potentially driven by longer work days in agricultural and extractive industries. Two-digit location quotients explain roughly 33% of cross-county variation in average weekly hours worked.

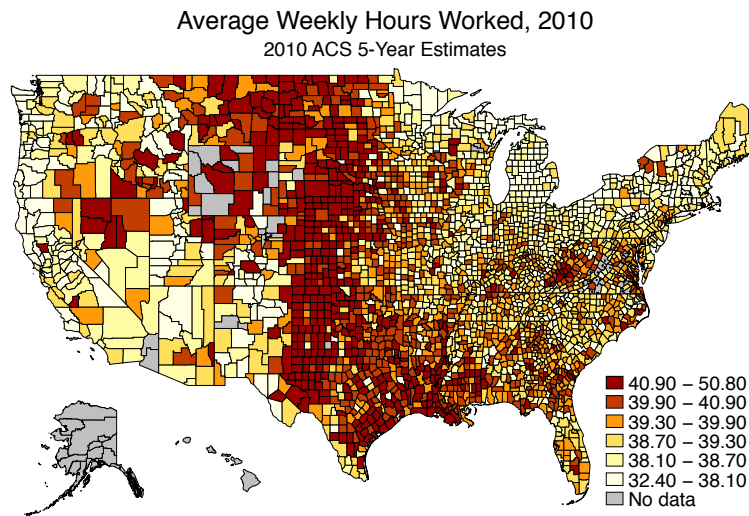


Figure 4.2

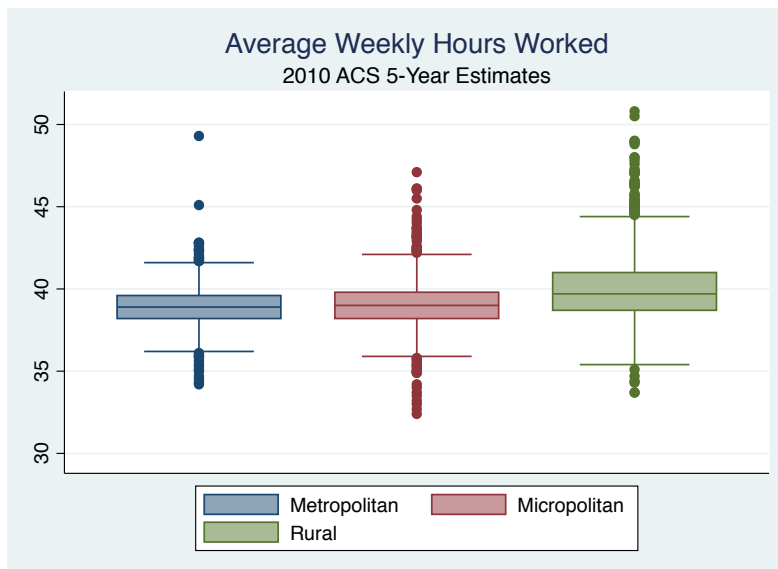


Figure 4.3

Similarly, self-employment growth has been discussed largely in a national and industry-level context. However, a regional analysis of the link between working hours and self-employment growth may be fruitful for a number of reasons. Regionally differences broadly are increasingly being recognized as an important and often overlooked facet of economic performance. Convergence in incomes across US states, famously observed by Barro and Sala-i-Martin (1991) has stalled, contributing to rising income inequality. And while this analysis does

not examine income divergences specifically, both working hours and self-employment may serve as significant indicators of regional labor market functioning.

Methodologically, this work builds on local employment portfolio theory approaches highlighted in Low and Weiler (2012) in highlighting the interplay between local labor market conditions and the relative returns to entrepreneurship compared to conventional wage-and-salary employment. If workers are spatially limited in their job prospects, then average weekly working hours of other workers in geographic proximity may give workers considering entering the labor force or changing jobs an estimate of the hours *they* might be expected to work. If these hours are unsatisfactory, either because they are too long or too short, workers may seek alternatives. One such alternative is self-employment, either in place of or to complement conventional wage or salary employment.

While measuring self-employment presents some difficulties, quality data is available through the US Census Nonemployer Statistics data series, which defines a nonemployer establishment as a business that “has no paid employees, has annual business receipts of \$1000 or more... and is subject to federal income taxes.” Many nonemployers are unestablished enterprises, consisting simply of an individual reporting taxable income of at least \$1000 from a source other than wages or salary paid by an employer. This could comprise anything from a contractor working with but not directly employed by a company, to an independent artist, photographer, web designer, or freelance writer. For the purposes of the following analysis, nonemployer establishments will be treated as a proxy for self-employment.

Figure 4.4 shows that the growth of nonemployer establishments has significantly outpaced employer establishments in recent years. This is part of a longer-term trend: the number of nonemployer establishments has increased by over 50% since 1997, when the Census began tracking nonemployers.

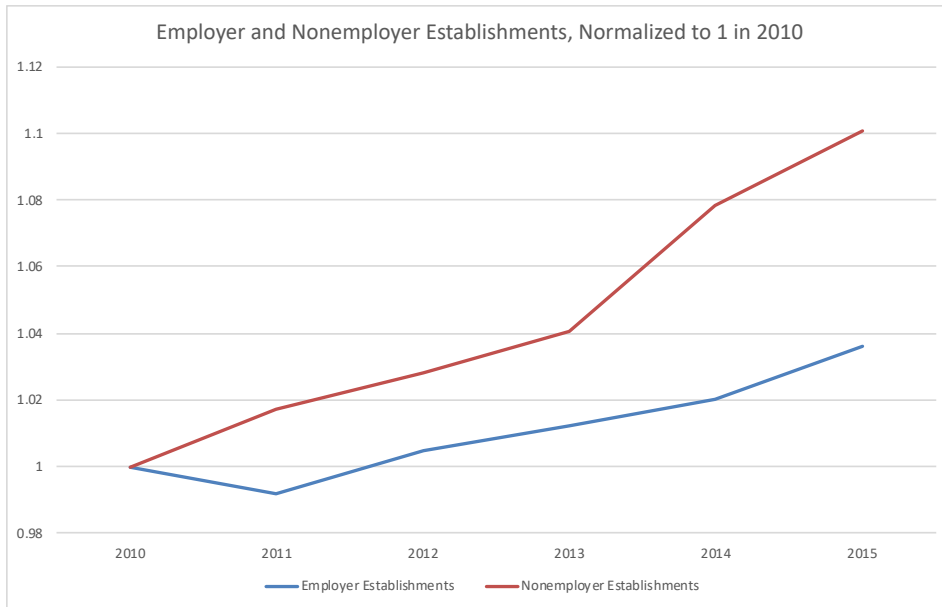


Figure 4.4. Data from the US Census Nonemployer Statistics.

There is also notable inter-regional differences in the rate of growth in self-employment share, as seen in figure 5 below.

Percent Increase in Ratio of Nonemployer Establishments to Wage-and-Salary Employees 2010-2014, using Census Nonemployer Data

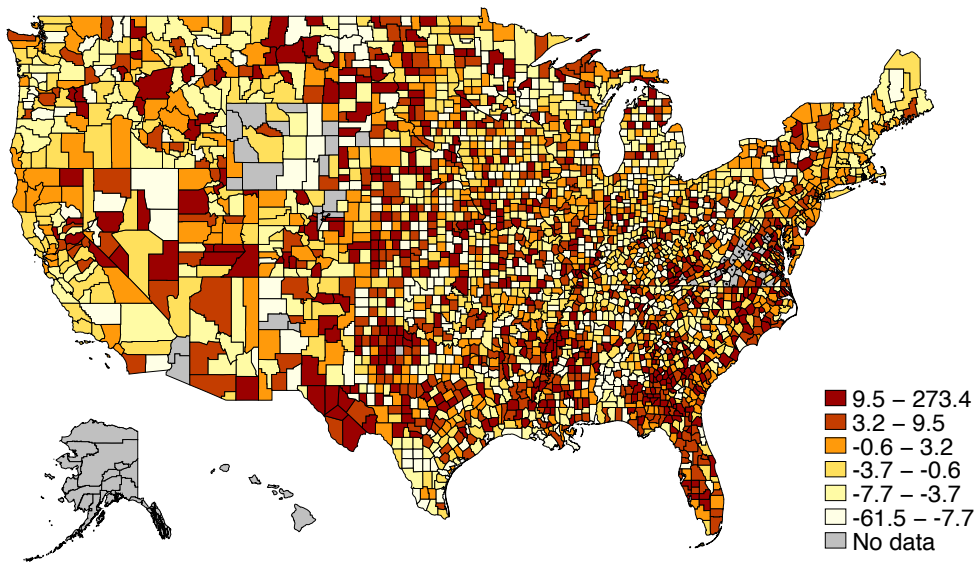


Figure 4.5



### 4.3 Theory and Empirical Model

If self-employment serves as an alternative to conventional employment when hours worked in the local labor market don't align with worker preferences, we hypothesize that self-employment might grow fastest in counties characterized by especially long or short workweeks. Formally, denote worker  $i$ 's utility  $u_i$  as a function of her weekly working hours  $h_i$  such that utility is given by

$$u_i = u(h_i)$$

Suppose worker  $i$  has an optimal number of weekly hours that maximizes her utility function, equating the marginal utility of consumption made possible by an additional hour's pay against the opportunity cost of work, denoted by

$$h_i^* = \operatorname{argmax} (u_i)$$

If  $h_i^*$  is nonzero and finite, then utility diminishes if a worker's hours either exceed or fall short of  $h_i^*$ .

A worker considering entering the wage-and-salary labor force may be able to observe local average local average hours weekly working hours  $h_j$ , and if, as suggested above, workers have limited agency to select hours, may take  $h_j$  as a proxy for the number of hours she could expect to work in wage-and-salary employment. Correspondingly, her expected utility upon entering the labor market is

$$\bar{u}_i = u(h_j)$$

Alternatively, workers may be able to obtain a certain level of utility from self-employment. Denote this level of utility as  $u_s$ , assumed to be independent of local labor market conditions. A worker choosing between self-employment and wage-and-salary employment without agency over working hours in wage-and-salary employment then compares  $u_s$  against

$\bar{u}_i = u(h_j)$ , and chooses self-employment if  $u_s > u(h_j)$ , and wage-and-salary employment if  $u_s > u(h_j)$ .

The greater the discrepancy between  $h_j$ , the local average working hours, and the average of  $h_i^*$  across all workers in a region, the greater the likelihood a given worker will prefer self-employment to wage-and-salary employment. If the national average workweek typifies the average  $h_i^*$ , then regions with exceptionally high or low  $h_j$  are hypothesized to experience more growth in self-employment. Empirically, the predicted relationship between local working hours and growth in the self-employment rate at the county level is U-shaped. In labor markets in which average working hours are low, workers might choose self-employment at higher rates out of necessity; in labor markets characterized by longer average hours, workers might pursue self-employment either out of opportunity, with longer hours signaling robust demand and a booming local economy, or as an escape from pressure to work excessively long hours in wage and salary employment.

Using the county as a unit of analysis is designed to reflect the fact that workers' choices between conventional and self-employment may depend not only on their own current job, but also on other local jobs available to them. To test this hypothesis, we analyze whether average weekly hours worked by county in 2010, as reported by the American Community Survey, correlates with increased growth in the ratio of nonemployer establishments to wage-and-salary employees from 2010 to 2014. Using the ratio of nonemployers to employees, which we define as the "self-employment rate," is important because longer working hours in a county could signal a tight local labor market, leading to in-migration of both conventional wage-and-salary and self-employed workers. This time period is selected to capture a time period during which both conventional employment and self-employment had largely recovered from a dip following the 2008 recession. In interpreting results, it is worth keeping in mind that these analyses do look

specifically at a time of macroeconomic growth, although one characterized by a number of features unusual to an expansion, including tepid wage growth.

To test the relationship between working hours and changes in the self-employment rate, we estimate the following empirical specification:

$$SER\_Change_{2010-2014\ i} = \beta_0 + \beta_1 Hours_{2010,\ i} + \beta_2 Hours_{2010,\ i}^2 + \beta_3 \mathbf{X}_{2010,\ i} + \varepsilon_i$$

Hours enters as both a level and a squared term. Based on the hypothesis that excessively long or short average county working hours might provide a push towards self-employment, a negative coefficient on the level and a positive coefficient on the squared term is expected.  $\mathbf{X}$  is the complete vector of county-level controls summarized in table 1. The county Gini coefficient captures potential Veblen effects in terms of motivation to work to increase consumption relative to a reference group (Bowles and Park 2004), as well as the credit constraints preventing poorer residents of highly unequal counties from taking up self-employment.

The 2010 self-employment rate provides an important baseline in that counties with high self-employment shares in 2010 have less room for increase in that share. Indicators for urbanity, density, and geography are included to account for systematic differences in both average working hours and potential differences in self-employment opportunities across space. Shares of residents with Bachelor's degrees, and of resident employed in arts and "creative occupations" using the USDA definition, captures the potentially higher self-employment growth rates among skilled and creative individuals, as well as the effects of concentrations of creative occupations on subsequent in-migration identified by Florida (2011) and others.

Two indicators of predicted overall employment growth are included. The first is a demand shock variable modeled on Bartik (1991) that predicts county employment growth based on national employment growth rates by sector. Since regions have differing employment concentrations in different industries, a national demand shock for a particular good will have heterogeneous impacts on regional labor markets. Predicted annual employment growth in county  $i$  from 2010 to 2014 is calculated by scaling the number of workers in county  $i$  employed in sector  $j$  in 2010 by the national employment growth rate in sector  $j$  from 2010 to 2014, where the  $j$  sectors are defined at the 6-digit NAICS level. The resulting demand shock can be interpreted as predicted employment growth from 2010 to 2014 in county  $i$  based on county  $i$ 's sectoral specialization in the base year.

Capturing predicted employment growth helps control for the effects of macroeconomic conditions on the availability of wage-and-salary employment in a county, a factor that undoubtedly effects self-employment. A positive relationship between predicted wage-and-salary employment growth and the growth rate of self-employment might indicate 'opportunity' self-employment, with micro-entrepreneurs filling niches in a growing regional economy. Conversely, an inverse relationship provides evidence of self-employment growth out of 'necessity,' with lack of opportunity in local wage-and-salary labor markets pushing workers towards self-employment.

The second labor market control is the product of establishment openings and closures per 1000 employees. Higher establishment churn could on one hand predict more job displacement, pushing workers separated from wage and salary jobs into self-employment; alternatively, dynamism might provide more opportunities for workers dissatisfied with their current positions to switch jobs rather than become self-employed. The latter interpretation is

supported by evidence from Bunten et al. (2014), who find that higher establishment dynamism is correlated with faster local employment growth.

Table 4.1: Summary statistics, unweighted county averages

Variable	Data Source	Mean	Std. Dev.
Average annual percent change in self-employment rate, 2010-2014	Census Nonemployer Statistics, and BLS/QCEW	1.845	1.777
Usual weekly hours worked	Census ACS	39.526	1.885
Gini Coefficient	Census ACS	.432	.036
Self-employment rate: ratio of nonemployer establishments to employees	Census Nonemployer Statistics, and BLS/QCEW	.140	.042
Metropolitan indicator	Census	.269	.443
Micropolitan indicator	Census	.207	.405
Distance to nearest MSA	Census	.807	.652
Population density	Census	.239	1.728
Median age	Census	40.412	4.978
Adult population (thousands)	Census	76.565	243.875
Employment rate	Census	56.218	7.871
Employment (thousands)	Census	55.913	191.505
Median household income	BLS	43.951	11.139
Percent of population with a BA or higher	USDA	12.500	5.270
Percent employed in arts	USDA	.678	.535
Average Employer Establishment Size	Statistics of US Businesses	26.413	10.453
Bartik Demand Shock (2010-2014)	County Business Patterns, BLS, QCEW	12.515	4.769
Establishment Openings * Closures per 1000 Employees	Statistics of US Businesses	15.089	14.159

Note: Variables reported for 2010 unless otherwise noted. n=3041.

#### 4.4 Results

Results of the county-level OLS regression are presented in table 2 below. The results in column II, which include state fixed effects to control for state-level policy differences related to minimum wages, health insurance, and other factors impacting the appeal of wage-and-salary employment compared to self-employment, support the hypothesized U-shaped relationship

between average local working hours and growth in self-employment. At lower levels of local average working hours in 2010, the relationship between local working hours and self-employment growth is negative. This aligns the “necessity” theory of self-employment, suggesting that in areas where average hours are low and involuntary part-time employment likely high, workers turn to self-employment either in place of or in addition to conventional employment to bolster earnings. The positive coefficient estimate on the squared hours term illustrates a positive relationship between hours and self-employment growth in cases of high average county-level working hours, potentially capturing transitions to self-employment as an escape from overwork.

Table 4.2: OLS regression by county. Dependent variable: percent increase in self-employment rate, 2010-2014.

<b>Variable (2010, unless otherwise noted)</b>	<b>I</b>	<b>Impulse Response</b>	<b>II</b>	<b>Impulse Response</b>
Average Hours Worked	-3.867 (3.131)	7.325	-6.492** (3.241)	12.297
Hours Squared	0.051 (0.039)	7.837	0.0831** (0.0398)	12.770
Gini Coefficient	-16.465* (9.937)	0.598	-22.148** (10.514)	0.805
Nonemployer Establishments (thousands)	0.00417 (0.0539)	0.112	-0.0452 (0.055)	1.209
Metropolitan Indicator	0.109 (0.889)	0.048	-0.342 (0.908)	0.151
Micropolitan Indicator	-1.571** (0.717)	0.639	1.43** (0.722)	0.581
Distance to Nearest Metro Area	0.0355 (0.527)	0.023	0.292 (0.587)	0.190
Amenity Score	0.402*** (0.13)	0.919	0.0343 (0.219)	0.078
Population Density	-0.0529 (0.164)	0.092	-0.0452 (0.166)	0.078
Median Age	0.461*** (0.0618)	2.291	0.636*** (0.0689)	3.161
Working Age Population (Thousands)	-0.369 (5.972)	0.090	5.542 (6.135)	1.354
Employment Rate	0.137** (0.0584)	1.076	0.248*** (0.063)	1.948

Median Household Income (Thousands)	-0.703*** (0.149)	7.816	-0.679*** (0.159)	7.549
Median HH Income Squared	0.00526*** (0.00125)	6.148	0.00454*** (0.00131)	5.306
Arts Employment Share (2007-2011)	1.02* (0.617)	0.556	0.949 (0.614)	0.517
Average Employer Establishment Size	0.551*** (0.0281)	5.760	0.548*** (0.0281)	5.729
Bartik Demand Shock (2010-2014)	-0.22*** 0.0587	1.049	-0.205*** (0.0655)	0.978
Share of Population with a Bachelor's Degree	0.0897 (0.0941)	0.471	0.154 (0.103)	0.809
Establishment Openings* Closures per 1000 Emp.	-0.0932*** (0.0211)	1.320	-0.1276*** (0.0218)	1.807
State Indicators	N		Y	
Constant	63.607 (63.493)		102.787 (65.97)	
R-Squared	0.200		0.200	
N	2,867		2,867	

Note: Standard errors in parentheses, with one, two, and three stars for significance at the 10, 5, and 1 percent levels. Impulse response = coefficient estimate \* sample standard deviation.

But notably, the joint marginal effect of the level and squared hours is negative at the mean, and in fact in all counties in the sample. Thus in practice, the first two coefficient estimates in Table 4.2 depict an inverse relationship between average local working hours and the growth of the local self-employment ratio that diminishes as local average working hours increase. At least in this specification, then, the “necessity” motivation for self-employment appears to outweigh the “opportunity” or escape from overwork factors (van Es and Van Vuuren 2010). However, counties with higher median household incomes see greater increases in the self-employment rate, with a one-standard-deviation increase in income predicting a one-half percent annual increase in the self-employment growth rate. This effect might be interpreted as evidence of “opportunity” self-employment.

The Bartik demand shock, which predicts growth in wage-and-salary employment, is inversely related to growth in the self-employment share. This could mean that given the choice

– i.e. when local wage-and-salary employment is growing – workers are less likely to become self-employed, which aligns with the “necessity entrepreneurship” theory. And median household income in 2010 is negatively related to self-employment growth, and significantly so: a one-percent increase in median incomes predicts a roughly five-percent slower growth rate in the self-employment rate. But squared median income is strongly positive. These results illustrate a second U-shaped relationship in which self-employment growth declines with increased median income in low-income counties, reflecting a “necessity” element of self-employment, then increases with income in more affluent areas, where self-employment might be driven by opportunity.

After controlling for median income, greater inequality is associated with lower self-employment growth, suggesting a possible credit constrain whereby more unequal income distributions leave more residents without the startup capital necessary to start a nonemployer establishment.

Establishment dynamism, measured as the product of establishment openings and closures per 1000 employees, is negatively related to growth in the local self-employment share. This might be interpreted as supporting the Buntin et al. (2014) finding that establishment dynamism enhances productivity and growth in wage-and-salary employment as successes and failures of enterprises reveal information to followers about pitfalls and opportunities. One would think that information spillovers generated by churn might benefit nonemployer establishments as well. The negative coefficient on the dynamism measure suggests that either these information spillovers are more valuable to employer establishments than they are to self-employers, or that dynamism proxies for increased opportunity in conventional employment, decreasing the self-employment share.



Areas with more employees per establishment on average see robustly faster growth in the self-employment share, with a percentage increase in average establishment size predicting nearly six-percent faster increases in the self-employment share. Larger establishments tend to create new jobs at a proportionally slower rate than smaller establishments, which could explain increasing reliance on self-employment in counties with larger businesses. Alternatively (or additionally), this result could suggest a movement of labor out of wage-and-salary labor markets characterized by monopsony. Further analysis of this relationship is likely to be fruitful for further research.

Arts employment share, amenity scores (with state indicators included), urbanity, and proximity to major metropolitan areas have notably little impact on self-employment growth. Natural amenities are thought to attract entrepreneurs and self-employers, especially those whose business models are location-neutral (Henderson et al. 2007, Stephens et al. 2013). At least among this sample, support for this hypothesis is not found.

#### **4.5 Discussion and Conclusions**

This paper summarizes literature suggesting that workers have little control over their working hours in conventional employment. Underwork is apparent, especially during recessions, while overwork might occur as a result of pay structures such as efficiency wages and “tournaments” designed to promote effort in the face of incomplete contracts, or due to social and emulative consumption pressures. At a regional level, average weekly working hours may proxy for the hours a given individual might expect to work in wage-and-salary employment. If the working hours on offer in geographic proximity are unsatisfactory, self-employment might become a relatively more appealing alternative to entering into an employer-employee contract.

At a county level, empirical analysis suggests a U-shaped relationship between average local working hours and the growth rate of self-employment as a share of total employment in

the subsequent four years in the preferred specification. This supports the hypothesis that workers, lacking agency over working hours in conventional wage-and-salary employment, transition to self-employment at higher rates when local hours are at either extreme.

Some limitations should be noted. First, this model rests on the assumptions that workers in fact do not have control over their hours, and that average local working hours are a relevant proxy for an individual's options in wage-and-salary employment. Second, the particular time period studied is one characterized by lingering labor market effects of the 2008 recession, and may not be generalizable to other years. This analysis is also unable to speak to the quality of self-employment outcomes, looking instead only at numbers of self-employed people. And lastly, it should be noted that while this analysis is framed in terms of self-employment versus wage-and-salary employment choices, many workers may not have a choice between the two. A substantial literature suggests workers may face "job lock" in wage-and-salary employment in wage-and-salary employment due to reliance on employer-sponsored health insurance (e.g. Madrian 1994), making self-employment infeasible. Likewise, people might find themselves unable to engage in formal wage-and-salary employment for a host of reasons including care responsibilities for dependents, lack of legal documentation, or skill or language barriers.

This work presents important opportunities for continued examination. A robust literature finds that labor market shocks have differential effects on self-employment decisions of men and women (Georgellis and Wall 2006, Wellington 2006). Further work will examine whether male and female county self-employment rates exhibit differing relationships with average local working hours.

## 5. CONCLUSIONS

This work seeks to shed light on two important and under-studied regional labor market features: the relationship between business turnover and local resilience, and the link between work hours and self-employment growth. On the first point, existing literature tends to find positive relationships between various measures of entrepreneurial activity and subsequent local economic growth, while others (e.g. Kitsos and Bishop 2018) find the evidence that dynamism increases susceptibility to macroeconomic shocks. Chapters 1 and 2 of this work help rectify these seemingly contradictory results by suggesting that the effects of business dynamism on local growth may vary across phases of the macroeconomic business cycle, and across countries. In both the US and UK, gross rates of business dynamism correlate, on average over a fairly long time period, with faster local employment growth. But especially in the US, higher churn comes with higher cyclical volatility, as counties with elevated shares of establishment openings and closures experience faster employment growth during macroeconomic expansions and worse losses during recessions. Establishment churn exhibits no positive impact on local median income growth or poverty reduction among US counties, suggesting that while dynamism may produce net gains in economic efficiency, these gains are not distributed evenly across time or across the income distribution.

The policy implications of these mixed findings are not straightforward. Should regional policy makers embrace dynamism by pursuing policies that ease startups' access to space and capital, encourages networking, or offering incentives for existing firms of locate new establishments in their municipalities? Or is it more prudent to focus on supporting existing businesses? These findings, consistent with others, support the notion that business dynamism is conducive to long-run local employment growth. But the caveats raised here – that growth may be uneven across time, and may not in itself lead to median income gains or poverty reduction –

cannot be ignored. And crucial, the nonexistent evidence of dynamism-driven median income growth or poverty reduction suggest that entrepreneurial activity on its own is insufficient to solve the problems of persistent stagnation among lower-earning households, suggesting a policy role in distributing the gains from entrepreneurial churn.

This ambiguity signals potential for future work. An important question not addressed here is *why* rates of business openings and closures vary across space. If different types of dynamism – in different sectors, in the form of businesses of varying sizes, or in ventures with or without public sector support – are found to have different effects on local economic performance, more targeted policies can be developed. The methodology used in this analysis does not distinguish between establishment openings in the form of completely new ventures compared to the expansion of existing businesses, but these two activities could have very different effects, and might be incentivized by different policies. Forthcoming work using longitudinal establishment data will seek to address this issue. Whether and how long-run employment gains from entrepreneurship can be distributed over time and across the income distribution remains an important and difficult question.

The second main contribution of this work is to ongoing discourse over the “gig economy.” Consistent with existing literature, I find evidence of local self-employment growth driven by opportunity – the square of median county household income positively predicts growth in the self-employment share – and necessity, notably in that a shift-share instrument of expected labor demand correlates inversely with local self-employment growth. This analysis also uncovers a previously unacknowledged link between local average working hours in wage-and-salary employment and changes in the share of self-employed workers at the county level. Building on a classical political economy and incomplete contract theory, I hypothesize that counties in which average working hours are excessively long or short might see more rapid

growth in the self-employment share. Empirical analysis over a time frame from 2010 to 2014 supports this notion, revealing a U-shaped relationship between average hours and the subsequent growth of the self-employment share.

This finding again merits additional exploration before firm policy recommendations are reached. An extensive literature suggests that men and women become self-employed for different reasons; is there evidence that the hours-self-employment relationship varies by gender? Do similar results obtain across all sectors, and across different time periods? What this work does indicate is that self-employment has an important local component: factors including but certainly not limited to average working hours in the geographic proximity appear to influence the creation of non-employer establishments. Discussions of the so-called “gig economy” tend to center on broad factors like tax policy, insurance- or housing-related “job lock,” accessibility of mobile technology, and application of labor laws to self-employed workers. But if the local self-employment share also responds to local conditions including average working hours, then policies related to factors such as affordability of childcare and early-childhood education should also be analyzed in terms of their potential effects on self-employment.

Perhaps most importantly, this work reinforces the general need for regional approaches in labor economics. At the time of publication, the US national unemployment rate sits at 3.6% (Bureau of Labor Statistics, April 2019), a near-historic low, while GDP grew 2.6% in 2018 (Bureau of Economic Analysis). But these economy-wide aggregates fail to capture and geographic disparities. 110 US counties have unemployment rates at or above 10%. And while median county employment growth over the 1998-2014 time period studied in this work was 0.3%, one-tenth of all counties experienced employment declines in excess of 1% over this span.

And over the past two decades, regional convergence has stalled, meaning areas with lower average incomes are seeing no faster income gains than others.

More to the point of this work, other labor market factors like establishment dynamism, resilience to recessions, and growth in the self-employment share also depend heavily on local conditions. So while discussions of the labor market effects of national and global trends like artificial intelligence, financialization, and trade are central to labor economics, so too are state, county, and municipal conditions and policies. As outlined above, firm policy recommendations hinge on further research to identify differences in the effects of dynamism on resilience and working hours on self-employment across place, time, and industry, but the findings of these papers suggest that research is well worth pursuing.

## REFERENCES

- Acs, Z., Szerb, L., Ortega-Argilés, R., Aidis, R. and A. Coduras (2015) “The Regional application of the Global Entrepreneurship and Development Index (GEDI): The Case of Spain”, *Regional Studies*, 49(12), 1977-1994
- Aghion, P., & Howitt, P. (1992). “A Model of Growth through Creative Destruction”, *Econometrica*, 60(2), 323-351.
- Akerlof, G. A. (1970). “The Market for "Lemons": Quality Uncertainty and the Market Mechanism.” In *Uncertainty in Economics*, 235-251.
- Akerlof, G. (1976). “The Economics of Caste and of the Rat Race and Other Woeful Tales”, *The Quarterly Journal of Economics* 90(4), pp. 599-617
- Akerlof, G., and Yellen, J. (1990). “The Fair Wage-Effort Hypothesis and Unemployment”, *The Quarterly Journal of Economics* 105(2), pp. 255-283
- Alon, T., Berger, D, Dent, R., and Pugsley, B. (2018). “Older and Slower: The Startup Deficit’s Lasting Effects on Aggregate Productivity Growth.” In *Journal of Monetary Economics*, 93, 68-85
- American Psychological Association. (2017). “Stress in America: The State of our Nation.”
- Anthony, J. (2018). “Economic Prosperity and Housing Affordability in the United States: Lessons from the Booming 1990s.” *Housing Policy Debate*, 28(3), 1-17
- Audretsch, D., & Keilbach, M. (2004). “Entrepreneurship Capital and Economic Performance.” *Regional studies*, 38(8), 949-959.
- Autor, D. (2003). “Outsourcing at Will: The Contribution of Unjust Dismissal Doctrine to the Growth of Employment Outsourcing”, *Journal of Labor Economics* 21(1), pp. 1–42.
- Bartik, T. J. (1991). Who Benefits from State and Local Economic Development Policies? *W.E. Upjohn Institute*
- Bell, L. and Freeman, R. (2000). “The Incentive for Working Hard: Explaining Hours Worked Differences in the U.S. and Germany”, *NBER Working Paper Series* No. 8051
- Bell, L. (1998). “Differences in work hours and hours preferences by race in the U.S.”, *Review of Social Economy* 56(4), pp. 48
- Blanchflower, D. G. & Oswald, A. J. (1998). “What Makes and Entrepreneur?” *Journal of Labor Economics* 16(1), 26-60.

- Bowles, S & Park, Y. (2004). "Emulation, Inequality, and Work Hours: Was Thorsten Veblen Right?", *The Economic Journal* 115(507), pp 397-414.
- Bunten, Devin, Stephan Weiler, Eric Thompson, and Sammy Zahran (2014) "Entrepreneurship, Information, and Growth." *Journal of Regional Science*, 55(4), 560-584.
- Canon, M., Kudlyak, M., & Ree, M. (2014). "Is Involuntary Part-time Employment Different after the Great Recession?," *Federal Reserve Bank of St. Louis*
- Card, D & Krueger, A. (1994). "Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania", *American Economic Review* 84(4), pp. 772-93
- Carlino, G. A. & Mills, E. S. (1987). "The Determinants of County Growth." *Journal of Regional Science* 26(1), 39-54.
- Clark, Andrew E. and Andrew J. Oswald. (1996). "Satisfaction and Comparison Income", *Journal of Public Economics* 61(3), pp. 359-381
- Davis, S. J., Haltiwanger, J., Jarmin, R. S., Krizan, C. J., Miranda, J., Nucci, A., & Sandusky, K. (2009). "Measuring the Dynamics of Young and Small Businesses: Integrating the Employer and Nonemployer Universes." In *Producer Dynamics: New Evidence from Micro Data*, 329 - 366
- Faggian, A., Gemmiti, R., Jaquet, T. & Santini, I. (2018) 'Regional economic resilience: the experience of the Italian local labor systems'. *The Annals of Regional Science*, 60 (2). pp 393-410.
- Foster, L., Grim, C., Haltiwanger, J. C., and Wolf, Z. (2018). "Innovation, Productivity Dispersion, and Productivity Growth." *NBER Working Paper 24420*
- Fotopoulos, G. (2014) 'On the spatial stickiness of UK new firm formation rates'. *Journal of Economic Geography*, 14 (3). pp 651-679.
- Galbraith, J. (1958) *The Affluent Society*. New York: Houghton Mifflin Harcourt
- Galinsky, E., Bond, J., Kim, S., Backon, L., Brownfield, E., & Sakai, K. (2004). "Overwork in America: When the Way we Work Becomes Too Much" *Families and Work Institute*
- Galor, O. & Zeira, J. (1993). "Income Distribution and Macroeconomics." *The Review of Economic Studies* 60(1), 35-52.
- Ganog, P. & Shoag, D. (2017). "Why has Regional Income Convergence in the U.S. Declined?" *Journal of Urban Economics* 102, 76-90.
- Georgellis, Y. & Wall, H. (2000). "Who Are the Self-Employed?," *Federal Reserve Bank of St. Louis*
- Haltiwanger, J., Jarmin, R. S., & Miranda, J. (2013). "Who Creates Jobs? Small Versus Large Versus Young." *Review of Economics and Statistics*, 95(2), 347-361.



- Henderson, J., Low, S., & Weiler, S. (2007). "The Drivers of Regional Entrepreneurship in Rural and Metro Areas", in *Entrepreneurship and Local Economic Development*, ed. Walzmer, N. Lanham: Lexington Books
- Kitsos, A. & Bishop, P. (2016) "Economic resilience in Great Britain: The crisis impact and its determining factors for local authority districts." *Annals of Regional Science*, 60(2), 329-347.
- Krugman, P. (1991). "Increasing Returns and Economic Geography." *Journal of Political Economy*, 99(3), 483-499.
- Lang, W. W. and Nakamura, L. I. (1993). "A Model of Redlining." *Journal of Urban Economics*, 33(2), 223-234
- Lazear, E. & Rosen, S. (1979). "Rank-Order Tournaments and Optimal Labor Contracts", *National Bureau of Economic Research* 401, pp. 1-52
- Lucas, R. E. (1998). "On the Mechanics of Economic Development." *Econometric Society Monographs*, 29, 61-70.
- Madrian, B. (1994). "Employment-Based Health Insurance and Job Mobility: Is There Evidence of Job Lock?" *Quarterly Journal of Economics* 109(1), 27-54.
- Martin, R., Sunley, P., & Tyler, P. (2015). "Local Growth Evolutions: Recessions, Resilience, and Recovery." *Cambridge Journal of Regions, Economy and Society* 8(2), 141-148.
- Maume, D. & Bellas, M. (2001). "The Overworked American or the Time Bind? Assessing Competing Explanations for Time Spent in Paid Labor", *American Behavioral Scientist* 44(7).
- Marx, Karl. (1867). *Capital, Volume 1*, 1867. Chicago: Charles H. Kerr and Co.
- Mian, A. & Sufi, A. (2010). "Household Leverage and the Recession of 2007 to 2009." *IMF Economic Review* 58(1), 74-114
- Michl, T. (2000). "Can Rescheduling Explain the New Jersey Minimum Wage Studies?", *Eastern Economic Journal* 26(3), pp. 265-276
- Mill, John Stuart. (1848) *Principles of Political Economy*. London: Longmans, Green and Co.
- Mincer, J. (1962). "Labor Force Participation of Married Women" *Aspects of Labor Economics*, *National Bureau of Economic Research*, pp. 63-105
- Moore, J. (2018). "The New Gig: The Contributions of Changes in Nonemployer Establishments to Changes in Future Employer Establishments." Working paper.
- Office for National Statistics (2017). "Business Demography, UK: 2016."
- Paychex (2017). "Work More or Stress Less? Workplace Stress is on the Rise."

- Romer, P. M. (1990). "Endogenous Technological Change." *Journal of Political Economy*, 98(5, Part 2), S71-S102.
- Schor, J. (1992). *The Overworked American: The Unexpected Decline in Leisure*. New York: Basic Books
- Schumpeter, J. (1942). "Creative Destruction." *Capitalism, Socialism and Democracy*, 825, 82-85.
- Smith, A. (1776) *An Inquiry into the Nature and Causes of the Wealth of Nations*. London: Methuen & Co., Ltd.
- Strumsky, D., & Thill, J. C. (2013). "Profiling US Metropolitan Regions by Their Social Research Networks and Regional Economic Performance." *Journal of Regional Science*, 53(5), 813-833.
- Spence, M. (1973). "Job Market Signaling", *Quarterly Journal of Economics* 90, pp. 225-43.
- Stephens, H., Partridge, M., & Faggian, A. (2013). "Innovation, Entrepreneurship, and Economic Growth in Lagging Regions", *Journal of Regional Sciences* 53(5), pp. 778-812.
- Veblen, T. (1899) *The Theory of the Leisure Class*. Oxford: Oxford UP
- van Es, F. & van Vuuren, D. (2010). "A Decomposition of the Growth in Self-Employment", *CPB Netherlands Bureau for Economic Policy Analysis* 145
- Williams, N., Vorley, T., & Ketikidis, P. (2013) "Economic Resilience and Entrepreneurship: A Case Study of the Thessaloniki City Region", *Local Economy*, 28(4), 399 - 415

APPENDICES

**Appendix 1 – Median Household Income Full Results**

Table A1

<b>Dependent Variable: Annual Change in Median Household Income</b>				
	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>
<b>Variable</b>	<b>Coeff. Est. (Std. Error)</b>	<b>Coeff. Est. (Std. Error)</b>	<b>Coeff. Est. (Std. Error)</b>	<b>Coeff. Est. (Std. Error)</b>
Churn * 2005	1.646*** (0.608)	2.932*** (0.627)	1.37 (1.11)	2.911*** (0.76)
Churn * 2006	2.05*** (0.624)	4.33*** (0.665)	5.273*** (1.158)	3.005*** (0.825)
Churn * 2007	0.546 (0.665)	2.459*** (0.718)	2.194* (1.311)	1.198 (0.878)
Churn * 2008	-1.736** (0.699)	0.671 (0.755)	3.099** (1.277)	-2.012** (0.909)
Churn * 2009	-1.635** (0.711)	0.795 (0.754)	3.387** (1.351)	-1.139 (0.915)
Churn * 2010	-3.622*** (0.781)	-2.59*** (0.742)	-.236 (1.360)	-4.106*** (0.92)
Churn * 2011	-5.042*** (0.73)	-3.6*** (0.76)	-3.560** (1.424)	-5.202*** (0.925)
Churn * 2012	-3.812*** (0.667)	-1.627** (0.748)	1.976 (1.472)	-4.963*** (0.889)
Churn * 2013	-1.763*** (0.648)	1.186 (0.765)	4.012*** (1.513)	-1.187 (.94)
Churn * 2014	-3.053*** (0.723)	0.319 (0.873)	4.089** (1.749)	-3.106*** (1.062)
Lagged openings	0.066** (0.031)	0.026 (0.036)	.018* (.112)	0.032 (0.039)
Lagged closures	-0.158*** (0.03)	-0.175*** (0.037)	-.349*** (.092)	-0.166*** (0.04)
Self Employment Rate	-9.83*** (3.016)	-3.519 (3.948)	-.272 (5.333)	-10.695** (4.944)
Median Rent / Median Income	85.009*** (2.581)	104.69*** (3.292)	103.819 (7.452)	115.637*** (3.753)
Employment	5.152***	5.52***	4.157***	2.969***

	(0.556)	(0.704)	(1.193)	(0.884)
Bartik Instrument	0.923 (1.212)	-0.209 (1.23)	.479 (1.893)	-0.815 (1.54)
Specialization Index	0.948** (0.449)	0.231 (0.533)	-.675 (1.123)	1.089* (0.616)
Constant	-60.452*** (5.75)	-361.692*** (138.149)	80.69 (309.727)	-201.927 148.954
State-Year Fixed Effects	N	Y	Y	Y
Counties	All	All	Metro	Nonmetro
Obs.	31,577	27,225	8,124	19,101
R-Squared	0.213	0.25	0.319	0.237

Note: \*, \*\*, and \*\*\* for significance at the 10%, 5%, and 1% levels. Robust standard errors clustered at the county level. Year and state-year fixed effects coefficient estimates suppressed. Metropolitan and nonmetropolitan classifications based on 2010 Census designations.

## Appendix 2 – Poverty Rate Full Results

Table A.2

<b>Dependent Variable: Annual Change in Median Household Income</b>				
	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>
<b>Variable</b>	<b>Coeff. Est. (Std. Error)</b>	<b>Coeff. Est. (Std. Error)</b>	<b>Coeff. Est. (Std. Error)</b>	<b>Coeff. Est. (Std. Error)</b>
Churn * 2005	0.962*** (0.243)	0.965*** (0.243)	1.181*** (0.392)	1.744*** (0.307)
Churn * 2006	1.101*** (0.223)	1.082*** (0.223)	1.389*** (0.362)	0.992*** (0.291)
Churn * 2007	0.579*** (0.224)	0.586*** (0.225)	1.257*** (0.367)	0.540* (0.289)
Churn * 2008	1.324*** (0.228)	1.423*** (0.229)	1.996*** (0.392)	1.554*** (0.293)
Churn * 2009	1.328*** (0.235)	1.506*** (0.239)	1.484*** (0.423)	1.920*** (0.295)
Churn * 2010	1.276*** (0.280)	1.462*** (0.280)	1.566*** (0.476)	1.446*** (0.355)
Churn * 2011	2.165*** (0.273)	2.324*** (0.275)	2.472*** (0.463)	2.591*** (0.358)
Churn * 2012	1.563*** (0.274)	1.696*** (0.274)	1.827*** (0.463)	1.976*** (0.355)
Churn * 2013	0.852*** (0.248)	0.945*** (0.254)	1.009** (0.433)	1.171*** (0.324)

Churn * 2014	0.848*** (0.263)	0.927*** (0.275)	0.942* (0.496)	1.082*** (0.346)
Lagged openings	0.0332** (0.0155)	0.0329** (0.0156)	0.00696 (0.0342)	0.0360** (0.0173)
Lagged closures	0.0441** (0.0196)	0.0427** (0.0194)	0.000474 (0.0305)	0.0493** (0.0228)
Self Employment Rate	0.139 (1.468)	0.00713 (1.634)	4.989* (2.586)	-2.697* (1.583)
Median Rent / Median Income	-10.54*** (0.710)	-13.19*** (0.803)	-13.99*** (1.597)	-11.58*** (1.004)
Employment	0.351** (0.177)	0.0791 (0.199)	0.0560 (0.341)	-0.0975 (0.244)
Bartik Instrument	-0.544 (0.430)	-0.288 (0.436)	-1.117 (0.753)	0.143 (0.538)
Specialization Index	-0.287 (0.181)	-0.143 (0.184)	-0.171 (0.284)	-0.120 (0.217)
Constant	-0.436 (1.835)	172.5*** (30.20)	124.3* (64.47)	196.1*** (32.76)
State-Year Fixed Effects	N	Y	Y	Y
Counties	All	All	Metro	Nonmetro
Obs.	31,577	27,225	8124	19,101
R-Squared	0.102	0.100	0.119	0.104

Note: \*, \*\*, and \*\*\* for significance at the 10%, 5%, and 1% levels. Robust standard errors clustered at the county level. Year and state-year fixed effects coefficient estimates suppressed. Metropolitan and nonmetropolitan classifications based on 2010 Census designations.

### Appendix 3 – Robustness check, using 2004–2007 average product of establishment openings and closures per 1000 employees to measure pre-recession dynamism

Table A.3

Dependent Variable: Annual Employment Growth	
Variable	Coefficient Estimate (Standard Error)
Dynamism * 2005	0.518*** (0.11)
Dynamism * 2006	0.39*** (0.116)
Dynamism * 2007	0.628*** (0.138)

Dynamism * 2008	-0.332** (0.152)
Dynamism * 2009	-0.257 (0.171)
Dynamism * 2010	-0.390*** (0.149)
Dynamism * 2011	-0.2 (0.16)
Dynamism * 2012	0.133 (0.158)
Dynamism * 2013	0.646*** (0.154)
Dynamism * 2014	0.735*** (0.152)
Lagged openings	0.141*** (0.023)
Lagged closures	-0.125*** (0.019)
Self Employment Rate	19.424*** (3.655)
Median Rent / Median Income	-1.161 (1.3)
Employment	-15.373*** (1.027)
Bartik Instrument	5.461*** (1.007)
Specialization Index	2.017*** (.53)
Constant	145.667 (130.469)
Obs.	27,225
R-Squared	0.374

Note: \*, \*\*, and \*\*\* for significance at the 10%, 5%, and 1% levels. Robust standard errors clustered at the county level. Year and state-year fixed effects coefficient estimates suppressed.

#### Appendix 4: Alternative specification

Table A.4: OLS regression, by county. Dependent variable: percent increase in county self-employment rate, 2010-2014.

Variable (2010, unless otherwise noted)	Coefficient Estimate (Standard Errors in Parentheses)	Coefficient Estimate (Standard Errors in Parentheses)
Indicator of Average Hours 2 Standard Deviations Above Mean	2.891** (1.477)	3.313** (1.497)
Indicator of Average Hours 2 Standard Deviations Below Mean	3.168 (2.352)	3.668 (2.348)
Gini Coefficient	-16.088 (9.906)	-22.314** (10.511)
Nonemployer Establishments (thousands)	0.0077 (0.0537)	-0.046 (0.055)
Metropolitan Indicator	0.149 (0.89)	-0.249 0.91
Micropolitan Indicator	-1.647** (0.71)	-1.434** (0.718)
Distance to Nearest Metro Area	0.108 (0.515)	0.34 (0.578)
Amenity Score	0.411*** (0.13)	0.0344 (0.218)
Population Density	-0.0358 (0.163)	-0.0305 (0.164)
Median Age	0.475*** (0.0631)	0.648*** (0.0689)
Working Age Population (Thousands)	-0.735 (5.953)	5.586 (6.135)
Employment Rate	0.148** (0.0579)	0.249*** (0.0628)
Median Household Income (Thousands)	-0.704*** (0.149)	-0.675*** (0.158)
Median HH Income Squared	0.00532*** (0.00125)	0.00455*** (0.00131)
Arts Employment Share (2007- 2011)	0.903 (0.608)	0.91 (0.61)
Average Employer Establishment Size	0.555*** (0.0277)	0.552*** (0.0277)
Bartik Demand Shock (2010- 2014)	-0.224*** (0.0584)	-0.209*** (0.0653)
Share of Population with a Bachelor's Degree	0.0666 (0.0931)	0.142 (0.10)
Establishment Openings * Closures per 1000 Employees	-0.0931*** (0.0211)	-0.125*** (0.0219)

State Indicators	N	Y
Constant	-10.573 (7.684)	-24.423*** (8.09)
R-Squared	0.201	0.247
N	2,867	2,867

Note: Standard errors in parentheses, with one, two, and three stars for significance at the 10, 5, and 1 percent levels.

Similar to the results presented in Table 4.2, in this specification counties with very high average working hours – here measured as two standard deviations above the mean, or 43.3 hours per week or more – see significantly faster growth in the self-employment share. Counties with average hours two standard deviations below the mean in 2010 (less than 35.7 hours per week) also experience faster growth in the self-employment share, but results for the latter group are not statistically significant in this or similar specifications.

#### **Appendix 5: A game theoretical model of a prisoner’s dilemma in working hours**

Suppose that in an economy in which there is no competition for promotions, workers choose labor supply labor time  $h$  to maximize utility  $U$  from consumption of goods  $C$  purchased from income, and leisure  $L$ , defined as hours not spent working. Let  $T$  represent a worker’s total time endowment, and  $h$  represent hours worked.

$$U = f(C, L) \dots \text{ where } L \equiv T - h$$

Workers maximize utility by choosing  $L^*$ , and by extension  $h^*$ , according to the following marginal condition:

$$\frac{\partial U}{\partial L} * \frac{1}{w} = \frac{\partial U}{\partial C}$$



Worker  $i$  then earns utility  $U_i = aw h_i + b(T - h_i)$ , where  $a$  and  $b$  are positive scalar coefficients on utility from consumption and leisure, respectively. For simplicity we assume both are linear, but could also take non-linear forms.

This is the standard condition that workers supply labor to the point at which compensation equals the rate of substitution between the marginal utility of consumption and the marginal disutility of work. The resulting  $h^*$  is a function only of the individual worker's utility function, as well as the wage, thus far assumed to be exogenous.

We next consider how competition for promotions or raises might affect the working hours decision. Assume households supply labor and earn income in two periods, early career and late career. For simplicity, we first consider a case in which two workers compete directly for a raise, with the raise going to whomever works more hours in period 1. If both players work the same number of hours, the raise is given to one of the two by chance.

We now subscript player by  $i$  and  $j$ , and subscript time periods by 1 and 2. We use  $w' > w$  to represent the higher wage a worker earns after a raise. The discount rate  $r [0, 1]$  is assumed to be common across players. A player's consumption  $C_i$  and in turn lifetime utility  $U_i$  now depends not only on that player's own choice of working hours, but also on player  $j$ 's decision. Note that since  $h = T - L$ , workers earn negative utility from increasing  $h$ .

$U_i = aw h_{1i} + b(T - h_{1i}) + r[aw' h_{2i} + b(T - h_{2i})]$	if $h_{1i} >$ $h_{1j}$
$U_i = aw h_{1i} + b(T - h_{1i}) + r[aw h_{2i} + b(T - h_{2i})]$	if $h_{1i} <$ $h_{1j}$
$U_i = aw h_{1i} + b(T - h_{1i}) + r[.5ah_{2i}(w' + w) + b(T - h_{2i})]$	if $h_{1i} =$ $h_{1j}$

If a worker succeeds in earning a raise, she may choose  $h_{i2} \leq h_{i1}$  in the second period depending on the relative size of the income and substitution effects from the higher wage. Thus we assume that workers always choose  $h_2$  to maximize 2<sup>nd</sup> period utility. Regardless, period 2 utility will be greater if a worker earns a raise than if she does not. But, if a worker works hours in excess of  $h_i^*$  in period 1 but does *not* succeed in earning the raise, her lifetime utility is necessarily lower than if she had worked  $h_i^*$  in period one, since she will receive sub-optimal utility in period one without higher utility in period 2.

Consider a game in which players  $i$  and  $j$  each have two strategies: the first is to work  $h^*$  in period 1 - that is, the number of hours they would work without competition for raises, and the second is to work some  $h' > h^*$  in period 1. For simplicity only player  $i$ 's payoffs are reported; player  $j$ 's are identical across the diagonal, and a mirror image of  $i$ 's on the off-diagonal.

		Player $j$	
		$h^*$	$h'$
Player $i$	$h^*$	$awh_{1i} + b(T - h_{1i})$ $+ r[.5ah_{2i}(w' + w)$ $+ b(T - h_{2i})]$ $awh_{1j} + b(T - h_{1j})$ $+ r[.5ah_{2j}(w' + w)$ $+ b(T - h_{2j})]$	$U_i = awh_{1i} + b(T - h_{1i})$ $+ r[awh_{2i}$ $+ b(T - h_{2i})]$ $U_i = awh'_{1j} + b(T - h'_{1j})$ $+ r[awh'_{2j}$ $+ b(T - h'_{2j})]$
	$h'$	$awh_{1i} + b(T - h_{1i}) + r[aw'h_{2i}$ $+ b(T - h_{2i})]$ $U_i = awh_{1j} + b(T - h_{1j})$ $+ r[awh_{2j}$ $+ b(T - h_{2j})]$	$awh'_{1i} + b(T - h'_{1i})$ $+ r[.5ah_{2i}(w'$ $+ w)$ $+ b(T - h_{2i})]$ $awh'_{1j} + b(T - h'_{1j})$ $+ r[.5ah_{2j}(w'$ $+ w)$ $+ b(T - h_{2j})]$

Each player is indifferent between the two strategies if:

$$.5rh_2(w' - w) = w(h_1^* - h_1')$$

The left-hand side shows the period 2 wage gains associated with earning a promotion, weighted by the discount rate and the fact that if both  $i$  and  $j$  work hours  $h^*$ , both have a 50% chance of earning the promotion. The right-hand side reflects the extra utility a worker receives when supplying only  $h^*$  hours of labor in period 1 compared to the higher  $h'$ . If the left-hand side of this equation is greater – that is, if the discounted possibility of future wage gains more than offsets the lost utility in period 1 – each player’s dominant strategy is to play  $h'$ , resulting in a unique Nash equilibrium at  $[h', h']$ . If the lost utility in period 1 more than offsets the lure of a potential promotion, the unique Nash equilibrium is  $[h^*, h^*]$ .

Comparing the payoffs resulting from outcomes  $[h^*, h^*]$  and  $[h', h']$ , we see that the second term in parentheses is identical: workers either receive the promotion or not with probability 0.5, and supply labor hours  $h_2$  to maximize second-period utility accordingly. But  $U(wh_1^*)$  is necessarily greater than  $U(wh_1')$ , since if workers are going to either earn the promotion or not with probability 0.5, they would prefer to work the optimal number of hours in period 1 rather than over-supplying labor. Thus if  $[h', h']$  is

Alternatively, and more realistically, consider instead a variation of this game in which workers choose  $h_1$  as a continuous variable rather than a discrete one. Each worker’s best response is to marginally outwork the other up to but not beyond the point at which the disutility from additional labor outweighs the discounted value of the raise. Both workers supplying  $h^*$ , the optimal labor supply in the absence of competition for promotions, is not a feasible Nash equilibrium, since as long as the promotion is nontrivial, either worker is willing to accept a marginal increase in current disutility from work in exchange for a sure promotion. Thus the unique Nash equilibrium of this game is for both workers to supply first-period labor exactly to the point at which:

$$-\frac{\partial U}{\partial h_1} = r * v$$

where  $v$ , the value of the promotion in terms of second-period utility, is equal to  $.5w'h_2 + .5wh_2 - w'h_2$ .

Both variations share some notable features: when workers choose first-period labor supply considering the possibility of a promotion alongside the usual labor-leisure trade-off, labor supply in period one increases (and may increase or decrease in period two for those who earn the promotion depending on the relative sizes of income and substitution effects), and this higher labor supply may constitute a prisoner's dilemma, in that the longer-hours equilibrium may be Pareto inferior compared to a symmetrical lower labor supply.