Is Regulation to Blame for the Decline in American Entrepreneurship?

Nathan Goldschlag[1]
George Mason University

Alexander Tabarrok
Department of Economics
George Mason University

Abstract

Mounting evidence suggests that economic dynamism and entrepreneurial activity are declining in the United States. Over the past thirty years, the annual number of new business startups and the pace of job reallocation have declined significantly. We ask whether this decline in dynamism can be explained by regulation. We combine measures of dynamism with RegData, a novel dataset leveraging the text of the Code of Federal Regulations to create annual measures of the total quantity of regulation by industry. We find that Federal regulation has had little to no effect on declining dynamism.

[1] Disclaimer: The research in this paper was undertaken while Goldschlag was at George Mason University. Any opinions and conclusions expressed herein are those of the author(s) and do not necessarily represent the views of the U.S. Census Bureau. The research in this paper does not use any confidential Census Bureau information.

1. Introduction

The movement of resources from low-productivity firms to high-productivity firms is a key driver of economic efficiency and growth (Syverson 2011, Hseih and Klenow 2009, Bartelsman, Haltiwanger and Scarpetta 2013). Startups contribute significantly to this reallocation process. Many startups fail within a few years, so startups contribute to both job creation and job destruction. A small subset of startups, however, grow quickly, and contribute disproportionally to net job growth and to improvements in industry productivity. Workers also move among firms at tremendous rates which means that gross job creation and destruction is much larger than net job creation (Davis, Haltiwanger, Schuh 1998).

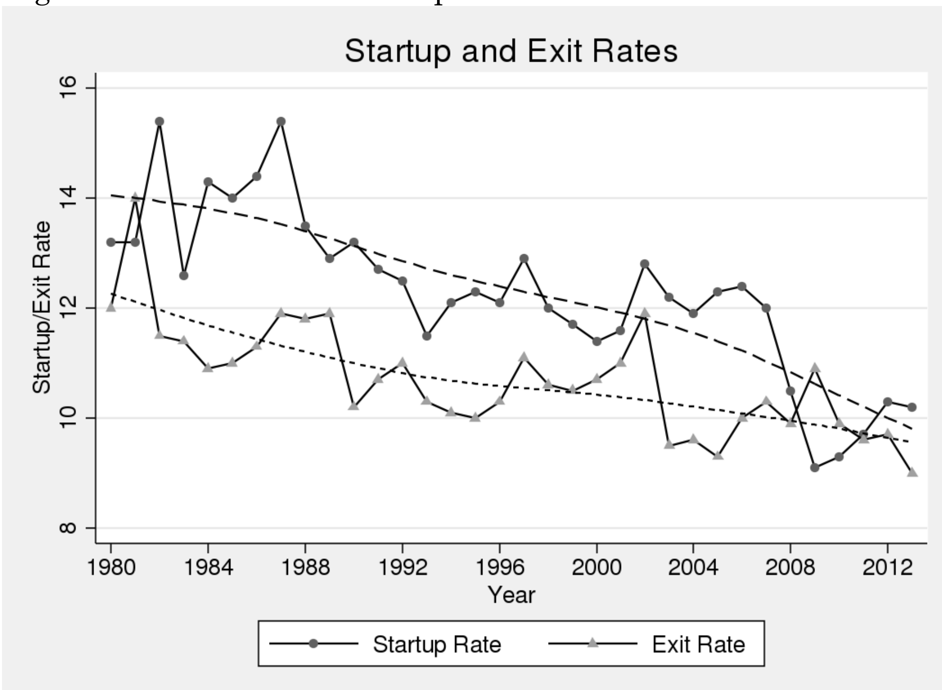
Although the U.S. economy exhibits a rapid pace of startups, job creation, and job destruction, these forces have been in decline for nearly three decades with a possible increase in the rate of decline in the past decade (Decker, Haltiwanger, Jarmin & Miranda 2014, Karahan, Pugsley and Sahin 2015, Molloy, Smith, Trezzi & Wozniak 2016). The dynamism decline is robust, appearing in a variety of data including the Job Openings and Labor Turnover data, the Bureau of labor Statistics' Business Employment Dynamics data, and business dynamics measures from the Census Bureau's Business Dynamics Statistics. The decline in dynamism is associated with reductions in productivity, real wages and employment (Davis and Haltiwanger 2014). The magnitude and pervasiveness of the decline, coupled with the theoretical importance of reallocation for efficiency and growth, underscores the importance of understanding and explaining the trend towards a less dynamic U.S. economy.

A variety of explanations for the decline have been suggested, including an increasing ability of firms to respond to idiosyncratic shocks, technology induced changes in the costs of hiring and training, increasing consolidation, slowing population growth, and increased regulation making reallocation slower and more costly (Decker, Haltiwanger, Jarmin & Miranda 2014, Hathaway & Litan 2014). This research uses a novel source of data on federal regulations to determine the extent to which the stringency of federal regulations affects the severity of the decline in dynamism at the industry level.

2. Economic Dynamism

The rich firm-level dynamics of the U.S. economy, with many firms entering and exiting, have been slowing since the 1980s. Figure 1 shows the substantial decline in startup and exit rates over the past several decades. The startup rate fell from 13.7 percent in 1980 to 11.7 percent just before the Great Recession, with the exit rate falling from 12.1 percent in 1980 to 10.3 percent in 2007. Though startups are important for net job creation, it is not the case that all small or all young firms contribute to job creation. There is a significant population of stagnant firms that are small and experience no employment growth. Moreover, most startups fail—50 percent of jobs generated by an entering cohort of firms are lost after five years. However, conditional on survival some firms experience large employment growth, contributing disproportionately to net job creation.

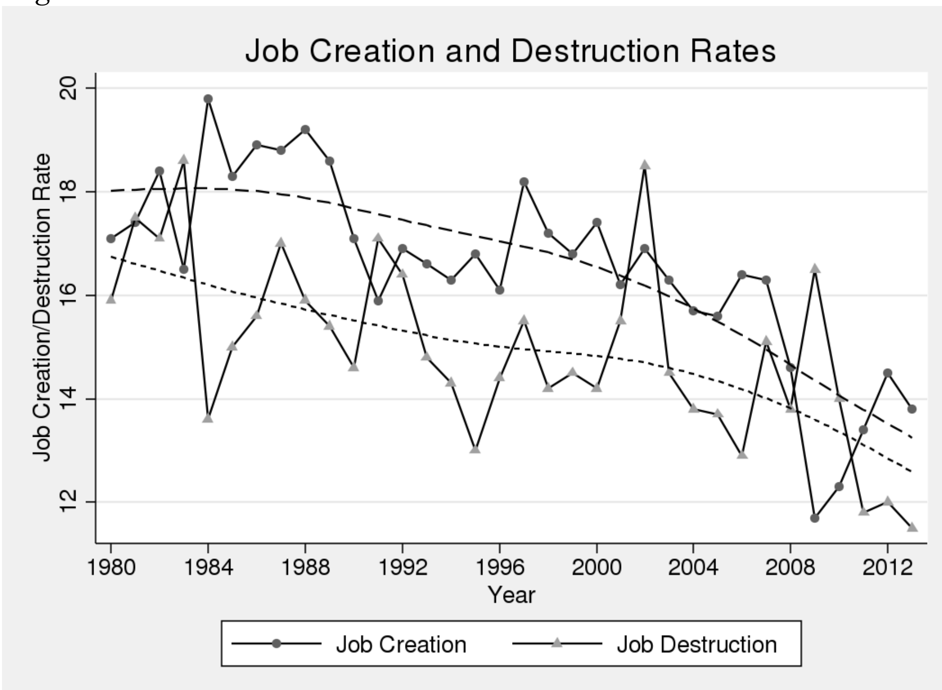
Figure 1: U.S. Annual Startup and Exit Rates



Source: Business Dynamics Statistics, U.S. Census Bureau, author's calculations.
Notes: Hodrick-Prescott filter shown with multiplier 400.

Figure 2 shows the annual job creation and destruction rates for 1980 through 2013. The job creation rate fell from an average of 18.9 percent in the late 1980s to 15.8 percent prior to the Great Recession. Likewise, the job destruction rate fell from 16.1 percent in the late 1980s to just 13.4 percent in the same pre-Great Recession period. These declines are robust to different specifications of dynamism and exist at both the firm and establishment level in a variety of data sources. In addition to less job creation and destruction, Davis, Faberman, Haltiwanger, Jarmin, and Miranda (2010) use Bureau of Labor Statistics data to show that the pace of labor flows through the unemployment pool have declined since the 1980s. Similarly, Davis, Faberman, and Haltiwanger (2012) show a decline in the pace of excess worker reallocation in the Job Openings and Labor Turnover data.

Figure 2: U.S. Annual Job Creation and Destruction Rates



Source: Business Dynamics Statistics, U.S. Census Bureau, author's calculations.
Notes: Hodrick-Prescott filter shown with multiplier 400.

The slowing entrepreneurial activity is also affecting firm-level distributions such as firm age. The Business Dynamics Statistics (BDS) data shows a declining startup rate and stagnant startup size (Haltiwanger, Jarmin, & Miranda, 2013). These trends are placing downward pressure on the share of economic activity attributed to young firms, leading to an aging firm population. Firms aged five years or less accounted for 47 percent of all firms in the late 1980s but only 39 percent prior to the Great Recession. In contrast, the share of firms aged 16 or more has increased substantially; rising by 50% from roughly 22% of all firms in 1992 to 34% of all firms by 2011 (Hathaway and Litan 2014). Job creation by firms aged five years or less fell from 39 percent in the 1980s to 33 percent of all new jobs before the Great Recession. Since young firms tend to contribute disproportionately to both job creation and destruction, the decreasing representation of young firms tends to decrease the overall rates of job creation and destruction (Decker, Haltiwanger, Jarmin & Miranda 2014). In addition, since 2000 there have been fewer high-growth firms among the smaller stock of young firms (Decker et al. 2015).

Measures of economic dynamism are also intimately related to productivity. The literature on productivity has shown persistent differences in productivity across firms within industries. The extent of these differences is surprising–manufacturing firms at the 90th percentile of productivity produce twice as much as firms in the 10th percentile (Syverson 2004). Perhaps less surprising, higher productivity firms are more likely to survive (Syverson 2011). Reallocation in the form of entry, exit, expansions, and contractions have significant effects on productivity. Foster, Haltiwanger, and Krizan (2005) show that, within the massive restructuring of the retail trade industry in the 1990s, nearly all of the labor productivity growth was driven by more productive establishments displacing less productive establishments.

Improvements to firm-level data infrastructures such as the Longitudinal Business Database (LBD) have produced a flurry of empirical research describing the secular decline in dynamism. Despite the importance of the decline, relatively few papers have empirically investigated its cause. In the following sections, we will investigate the extent to which federal regulations are to blame for the trends in entrepreneurship and economic dynamism.

2.1. Regulation and Dynamism

Regulation can increase barriers to entry, tax job destruction, and slow the reallocation of capital. Hopenhayn and Rogerson's (1993) general equilibrium analysis shows that increasing adjustment costs through regulation reduces job destruction but also decreases job creation, startups, and productivity. The empirical literature using cross-country studies has shown that employment protection legislation and other labor market institutions tend to reduce job reallocation rates and could explain the differential performance between American and European labor markets (Haltiwanger, Scarpetta, & Schweiger 2014). Other studies have shown that product and labor market regulations slow factor adjustment and cause allocative inefficiencies (Olley and Pakes 1996, Eslava, Haltiwanger, Kugler, & Kugler, 2010, Davis and Haltiwanger 2014). Similarly, evidence suggests that entry deterrence regulations can slow employment growth (Bertrand & Kramarz, 2002). Thus, regulation is a plausible candidate for explaining declining dynamism.

Regulation, however, need not reduce dynamism. A tax, for example, might reduce the level of economic activity but in equilibrium need not reduce the rate of firm entry or exit or impede the reallocation process that shifts resources from low productivity to high productivity firms. It's important to note that regulation may have many negative effects without greatly impeding dynamism. Some regulations could also increase dynamism. Antitrust law, for example, has an explicit goal of increasing dynamism. As another example, it's possible that making health insurance more easily available on the individual market and making it more portable could reduce job lock and increase entrepreneurship (Gruber and Madrian 2002, Heim and Lurie 2014).

It's common to analyze the consequences of a particular piece of legislation that passed at a particular time. But it is important to look at all federal regulations, large and small, and to consider the net effect of regulation. The thesis we seek to test is whether regulation can explain the reduction in dynamism in the U.S. economy. The thesis is about the net effect of regulation. If some regulations increase and others decrease dynamism in equal measure then regulation cannot explain the decline in US dynamism.

It's also important to consider the net effect of regulation because when regulation accumulates it can have a different effect than when one regulation is considered at a time. Consider Mancur Olson's (1984) theory of regulation in *The Rise and Decline of Nations*. Lobbying for a regulation is a collective action problem. Every group with a common interest does not organize instantaneously or automatically; it takes time and effort to organize. In a stable society, interest groups slowly accumulate. As interest groups accumulate, regulations increase in number and complexity as different groups come to an understanding over how to divide the surplus. Dynamism declines because interest groups limit entry and regulate to avoid rent disruption. Bargaining among interest groups is slow so dynamism slows even when Pareto-optimal moves are possible.

Notice that in Olson's theory no single regulation or handful of regulations explains declining dynamism. Taken in isolation, each regulation might conceivably pass a cost-benefit test. It's rather the accumulation of regulations that reduces dynamism. Regulations in this view are like pebbles tossed into a stream. Each pebble in isolation has a negligible effect on the flow but toss enough pebbles and the stream is dammed.

2.2 RegData

To measure the stringency of federal regulation we draw on RegData, a new and innovative source of federal regulation data (Al-Ubaydli and McLaughlin, 2015). Prior studies of regulation have relied upon crude measures such as file sizes, page counts, and word counts of the Federal Register or Code of Federal Regulations (Mulligan & Shleifer 2005; Coffey et al. 2012; Dawson & Seater 2008). RegData provides an annual industry-level measure of regulation that is based directly on the text of the Code of Federal Regulations.

The Code of Federal Regulations (CFR) is the stock of all federal regulations in effect in a given year. The CFR is divided into sections, including titles, chapters, subchapters, parts, and subparts. To measure regulatory stringency, Al-Ubaydli and McLaughlin (2015) comb the CFR and count the number of restrictive terms or phrases including "shall," "must," "may not," "prohibited," and "required". In this way, each section of the CFR can be assigned a count of restrictions.

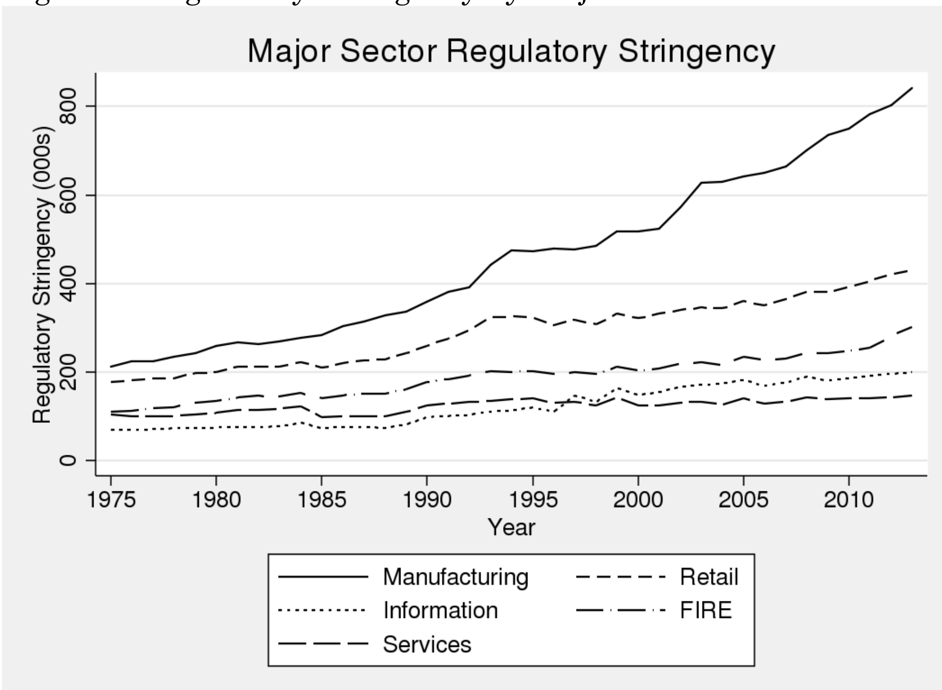
Although the titles of the CFR often have suggestive names such as "Energy", "Banks and Banking", and "Agriculture", a single regulation in any CFR section can affect many industries so there is no simple way to connect the number of regulatory restrictions by section to an industry. To solve this problem, Al-Ubaydli and McLaughlin draw on developments in machine learning and natural language processing techniques.

Algorithms have been produced that can classify images. Google's image search, for example, is trained on a set of tagged images and it is then able to classify images out-of-sample based on the training set. Classification algorithms for text—a much simpler problem—work in a similar way. After being exposed to a set of already-classified training documents the algorithms recognize patterns in "wild" documents and classify them into categories according to probabilities. These kinds of techniques have become standard in the computer science and machine learning literature (Witten and Frank 2005).

Al-Ubaydli and McLaughlin (2015) train their algorithm on long-form descriptions of each industry found in the North American Industry Classification System (NAICS) and on Federal Register (FR) entries that explicitly identify affected industries by NAICS code. (Whereas the CFR contains the stock of federal regulations, the FR captures the flow of new regulations and rules proposed by federal agencies.) The training set is then used to probabilistically match text in the CFR to each industry. Thus, each section in the CFR has a regulatory restrictiveness count and each section can be weighted by the probability that it is about or affects each industry. The restrictions and probability weights are then aggregated to produce an index of regulatory stringency by industry and year. An example of the regulatory text from the CFR, along with its restrictive term count, can be found in Appendix A.

Figure 3 shows the steady increase in regulatory stringency by major sector by year. The popular notion that regulation has been increasing over the past several decades can be seen clearly in the text of the CFR. Especially notable are relatively large increases in regulatory stringency in manufacturing relative to other sectors.

Figure 3: Regulatory Stringency by Major Sector



Source: RegData 2.1, author's calculations.
Notes: Total regulatory stringency by major sector is calculated as the sum of restrictive terms weighted by the probability of association between each industry and CFR part aggregated by major sectors. FIRE includes finance, insurance, and real estate.

There are no other measures of regulatory stringency by industry that we can compare to, but RegData varies in ways that are plausible. Industries, for example, differ widely in the amount of regulation that they face with industries like waste management (NAICS 562) having a regulatory stringency index (97,326) more than 10 times higher than that for courier and messengers (NAICS 492) (7,340). This means that more sections of the CFR text relate to waste management and that these sections contain many restrictive words such as "must" and "prohibited" as compared to sections of the text about couriers and messengers. The large variation in regulation by industry provides scope to identify the possible influence of regulation on dynamism. In particular, if the cause of declining dynamism is a slow accumulation of regulations and regulatory complexity then we ought to see differences in dynamism across industries associated with the regulatory stringency index.

Sections of the CFR can also be associated with the responsible agency. Therefore, we can measure the regulation produced by each agency. Table 1 below shows the top federal agencies by mean regulatory impact between 1999 and 2011. According to RegData, the Environmental Protection Agency is responsible for a greater portion of regulations than any other agency, a plausible finding. Other agencies with notable regulatory incidence are the Department of Homeland Security, Internal Revenue Service, and the Occupational Safety and Health Administration.

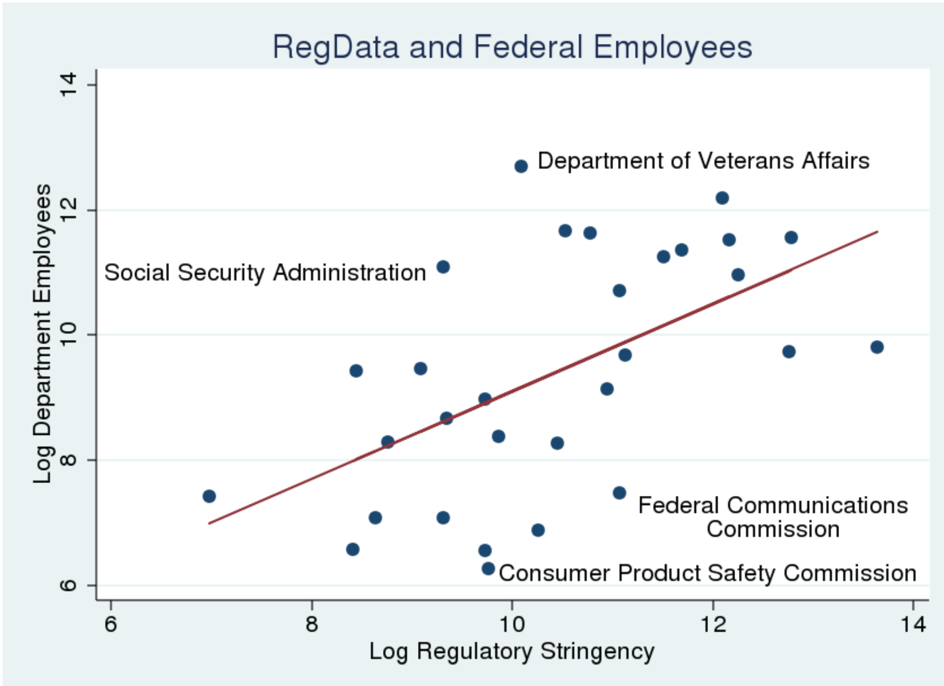
Table 1: Regulatory Stringency by Agency (Average 1999-2011)

Agency Name	Regulatory Stringency
Environmental Protection Agency	576,327
Internal Revenue Service	243,537
Occupational Safety and Health Administration	223,726
Department of Homeland Security	102,799
Office of the Secretary of Defense	66,611
Federal Acquisition Regulation	62,459
Department of Energy	54,791
Federal Aviation Administration	54,556
Federal Communications Commission	53,196
Food and Drug Administration	41,182

Source: RegData 2.1, author's calculations.
Notes: Total regulatory stringency by agency calculated as the sum of restrictive terms weighted by the probability of association between each industry and CFR part aggregated by the agency responsible for each CFR part.

Figure 4 also provides some suggestive evidence on the ability of the RegData algorithm to accurately measure regulation. Agency employment increases with regulatory stringency as identified by the algorithm. It's also notable that there is some intuition for the agencies off the regression line. The Department of Veterans Affairs, for example, has very high employment but relatively low regulation since most of its employees are not involved in regulating private markets. The FCC, in contrast, is responsible for much more regulation with relatively few employees.

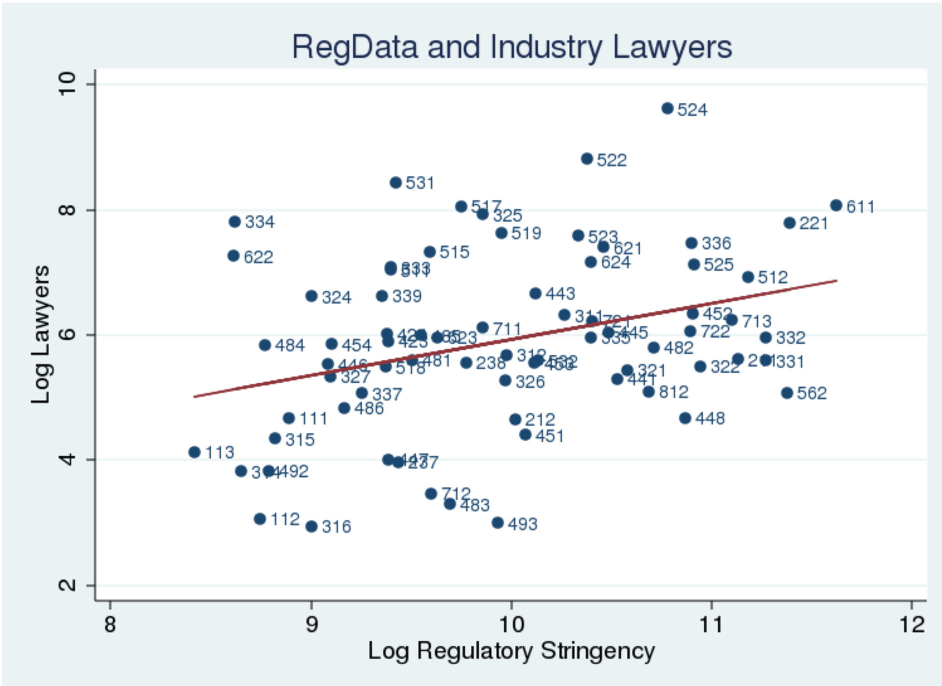
Figure 4: Department Employment and Regulatory Stringency



Source: RegData 2.1, OPM FedScope Employment Cube September 2012, author's calculations.
Notes: Log regulatory stringency by department calculated as the sum of restrictive terms weighted by the probability of association between each industry and CFR part aggregated by the department responsible for each CFR part. Total log count of lawyers by department calculated as the sum of persons covered in the OPM FedScope Employment Cube with occupations including General Attorney (0905) and Tax Law Specialist (0987) by department. The fitted line shows the predicted values of an OLS regression of the logged federal employees as a function of log regulatory stringency.

RegData at the industry level also correlates positively although at a low level with employment of lawyers by industry, a possible sign of regulatory complexity by industry. Figure 5 shows counts of lawyers employed by each industry and that industry's regulation index.

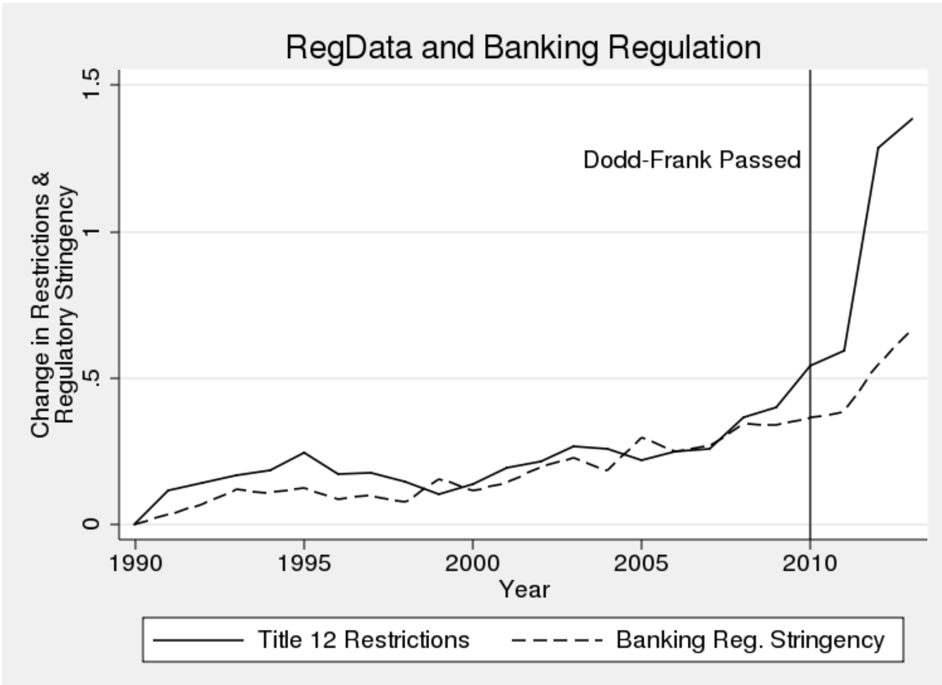
Figure 5: Industry Employment of Lawyers and Regulatory Stringency



Source: RegData 2.1, IPUMS 2000 5% Census microdata, author's calculations.
Notes: Log regulatory stringency by industry is calculated as the sum of restrictive terms weighted by the probability of association between each industry and CFR part aggregated by 3-digit 2007 NAICS industries. Log lawyers by industry derived from the IPUMS microdata as the weighted sum of persons classified with primary occupation of Lawyer (0210) by the type of establishment the person worked classified by 3-digit 1997 NAICS, which are translated to 3-digit 2007 NAICS. The figure excludes NAICS 541 Professional, Scientific, and Technical Services, which includes the industry code for establishments that exclusively provide legal services, 54111 Office of Lawyers. The fitted line shows the predicted values of an OLS regression of the logged count of lawyers as a function of log regulatory stringency.

Perhaps most importantly, RegData clearly signals when major pieces of legislation contribute to regulatory stringency. Figure 6, for example, shows changes in the count of restrictions in Title 12 of the CFR (Banks and Banking) and changes in the regulatory stringency index (the count of restrictions multiplied by the probability such restrictions are about banking). Regulation slowly accumulated in the 1990s and 2000s but the count of words like "shall" and "must" jumps shortly after the Dodd-Frank act is passed (note that it takes time for legislation to be reflected in the regulatory rulings of the CFR) as does the regulatory stringency index for banking.

Figure 6: RegData Signals the Dodd-Frank Act



Source: RegData 2.1, author's calculations.
Notes: Title 12 restrictions is calculated as the annual sum of restrictive terms, e.g. "shall" and "must", within Title 12 Banks and Banking of the CFR. Total banking regulatory stringency is calculated as the sum of restrictive terms weighted by the probability of association between each industry and CFR part for 2007 NAICS 52 Finance and Insurance. Both time series are normalized to show percentage change relative to 1990.

Our conclusion is that while the nominal values of the regulatory index bear little meaning, the relative values of the regulatory stringency index capture well the differences in regulation over time, across industries, and across agencies. See Al-Ubaydli and McLaughlin (2015) and references cited therein for further discussion.

2.3. Statistics of US Businesses (SUSB)

Statistics of U.S. Businesses (SUSB) is a public use[2] annual dataset containing detailed information on establishments, employment, and payroll

[2] https://www.census.gov/econ/susb/

by geographic area, industry (NAICS 2, 3, and 4-digit), and firm size. SUSB is derived from the Business Register, which contains the Census Bureau's most complete, current, and consistent data for the universe of private nonfarm U.S. business establishments. In addition to tabulations for firms, establishments, employment, and payroll, SUSB also provides data on year-to-year employment changes by births, deaths, expansions, and contractions. These employment change tabulations are available for 1992 and 1997 through 2011. By combining SUSB and RegData, we can gain a better understanding of the relationship between federal regulation and economic dynamism.

One limitation of the SUSB data with respect to the analysis to follow is that establishment birth counts in SUSB show positive bias in Economic Census years as some births are incorrectly timed due to census processing activities[3]. As explained in the following section, any bias these year specific effects might have will be controlled via year fixed effects. Another drawback of the SUSB data is the lack of firm age. The subsequent analysis will be unable to address the declining share of employment for young firms as evidence for the secular decline in dynamism and entrepreneurship.

A possible advantage of the SUSB is that the measures of dynamism are at the establishment level rather than at the firm level. Thus, we can take into account the effects of regulation on any expansion regardless of the source (see Tabarrok and Goldshlag 2015 on different measures of entrepreneurship). In practice, however, many of the economic conditions and regulations that raise or lower the costs of starting a firm will also raise or lower the cost of starting a new establishment (e.g. land use regulations). As

[3] Other sources of business dynamics such as Business Dynamic Statistics (BDS) exhibit smoother birth and death time series because it is derived from the Longitudinal Business Database (LBD), which is subjected to algorithms that re-time incorrect births and deaths (Haltiwanger, Jarmin & Miranda 2009). Nevertheless, the correlations between SUSB measures and BDS measures of dynamism over the same period are very high with correlations of .99, .97 and .91 for job creation, destruction and startups respectively.

a result, the establishment entry rate and the firm entry rate are highly correlated (see Appendix B).

The industry classification codes used in the employment change data varies over time, making it necessary to translate between NAICS vintages. The Census Bureau provides concordances between subsequent iterations of the NAICS classification system. In some cases, multiple concordances must be combined to arrive at a consistent classification scheme. To translate between different NAICS we use weights, assuming equal weighting for each match at the 6-digit NAICS level.

Table 2: Summary Statistics for RegData-SUSB Panel

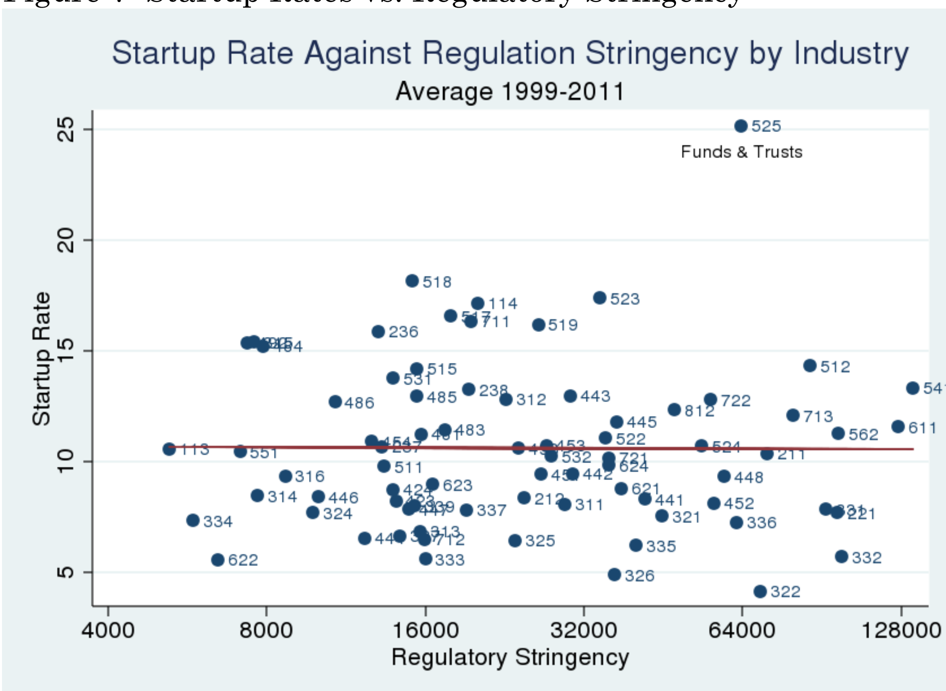
	Obs	Mean	Std Dev	Min	Max
Regulatory Index	975	33407	29362	4463	143593
Annual Pct Chg Regulatory Index	975	3.13	8.90	-51.06	116.94
Specific Regulatory Index	975	2648	4951	130	33210
General Regulatory Index	975	11555	12482	365	73618
Total Regulatory Index (Leontief)	728	364904	88218	67375	686113
Startup Rate	975	10.60	4.32	2.46	46.85
Job Creation Rate	956	14.16	5.35	3.17	59.74
Job Destruction Rate	955	14.90	5.07	3.13	48.66

Source: RegData 2.1, Statistics of U.S. Businesses, author's calculations.
Notes: Observations are industry-year combinations 1999 to 2011. Specific and general regulatory index calculated using concentration of RegData probabilities within CFR parts as described in the following sections. Total regulatory index calculated using input-output tables, and therefore only include industries for which input-output data exist, as described in the following sections. Some industry-year observations are missing values for economic dynamism due to disclosure issues (see SUSB documentation http://www.census.gov/econ/susb/definitions.html).

The final SUSB-RegData panel contains observations between 1999 and 2011. Table 2 provides summary statistics for several measures of reglation and economic dynamism. The variables of interest, which will be used as measures of entrepreneurship and dynamism, are startups, job creation, and job destruction. Figure 7 shows average startup rate versus the average regulation index by industry. The regulatory index axis is plotted on a log scale due to the wide variation in the regulation across industries. The fitted line suggests no obvious relationship between regulation and startups.

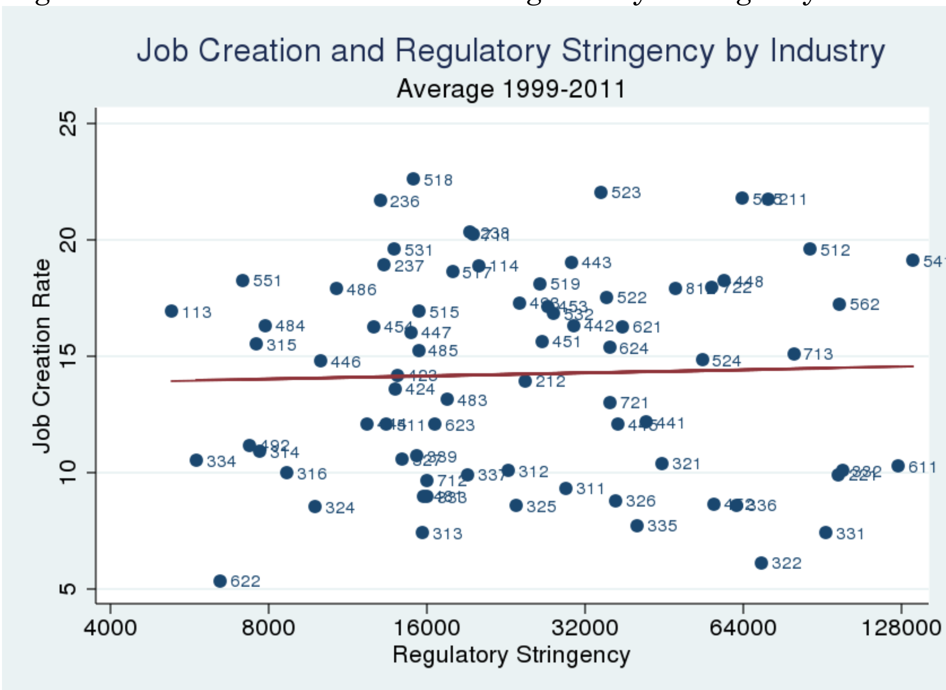
Figures 8 and 9 shows the relationship between job creation and destruction rates respectively and the regulatory index. Job creation appears just slightly positively correlated with regulation at the industry level and job destruction just slightly negatively correlated.

Figure 7: Startup Rates vs. Regulatory Stringency



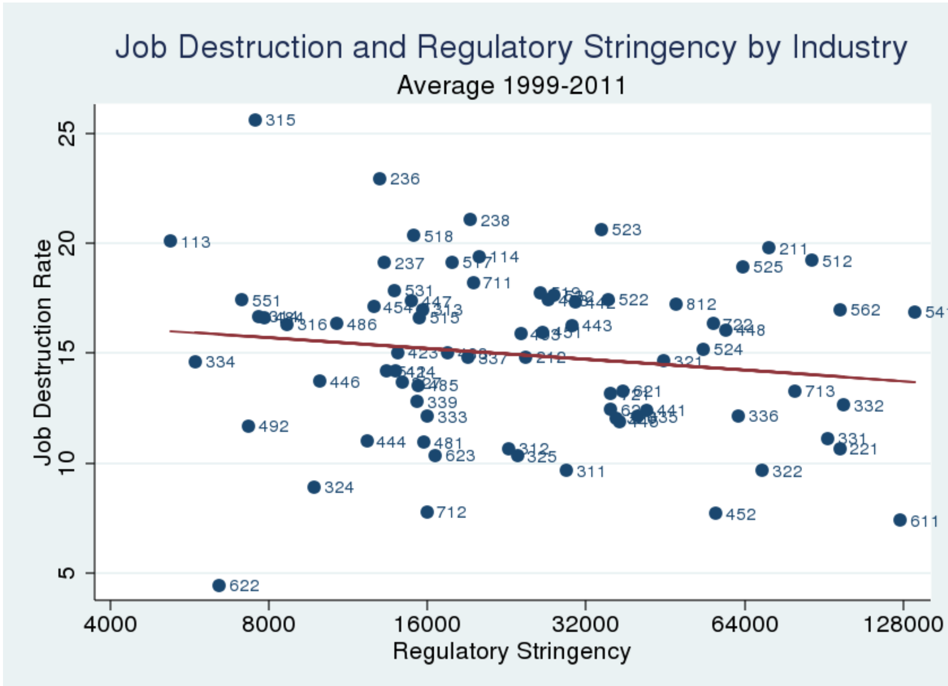
Source: RegData 2.1, Statistics of U.S. Businesses, author's calculations.
Notes: Average regulatory stringency by industry is calculated as the average of the sum of the annual regulatory stringency index between 1999 and 2011 by 3-digit 2007 NAICS industries. Startup rate is calculated as 100*(establishment entry at time t divided by the average of estabs at t and t-1). Births are establishments that have zero employment in the first quarter of the initial year and positive employment in the first quarter of the subsequent year. The fitted line shows the predicted values of an OLS regression of the startup rate as a function of regulatory stringency.

Figure 8: Job Creation Rates vs. Regulatory Stringency



Source: RegData 2.1, Statistics of U.S. Businesses, author's calculations.
Notes: Average regulatory stringency by industry is calculated as the average of the sum of the annual regulatory stringency index between 1999 and 2011 by 3-digit 2007 NAICS industries. Job creation rate is calculated as 100*(job creation at time t divided by the average of employment at t and t-1). The fitted line shows the predicted values of an OLS regression of the job creation rate as a function of regulatory stringency.

Figure 9: Job Destruction Rate vs. Regulatory Stringency



Source: RegData 2.1, Statistics of U.S. Businesses, author's calculations.
Notes: Average regulatory stringency by industry is calculated as the average of the sum of the annual regulatory stringency index between 1999 and 2011 by 3-digit 2007 NAICS industries. Job destruction rate is calculated as 100*(job destruction at time t divided by the average of employment at t and t-1). The fitted line shows the predicted values of an OLS regression of the job destruction rate as a function of regulatory stringency.

Simple cross-sectional averages may be distorted by endogeneity. High dynamism industries, for example, may be more likely to attract scrutiny and regulation. The analysis in the next section will control for year and industry effects to reveal the relationship between regulation and economic dynamism within an industry over time.

3. Methods and Results

To investigate the potential role of federal regulation in the decline in economic dynamism we estimate the effect of our regulatory stringency index by year and NAICS on several key measures of dynamism and entrepreneurship. Year and industry fixed effects are included to focus estimation on changes in dynamism that are explained by changes in industry regulatory stringency over time. We estimate the following fixed effects regression model,

$$Y_{t,n} = \beta_0 + \beta_1 Reg_{t,n} + \lambda_t + \gamma_n + \varepsilon_{t,n}$$

Where $Y_{t,n}$ is the measure of dynamism at time t, for 3-digit NAICS n. Measures of dynamism include: startup rate, job creation rate, and job destruction rate. Startup rate is calculated as 100 times the number of establishments created at time t divided by the Davis-Haltiwanger-Schuh (DHS) denominator, which is the mean number of establishments for times t and $t-1$. The DHS denominator attempts to control for transitory shocks from affecting the relationship between net growth from t-1 to t and size (Davis, Haltiwanger, & Schuh 1998). Job creation (destruction) rate is calculated as 100 times the number of jobs created (destroyed) divided by the mean employment for times t and t-1. $Reg_{t,n}$ is the regulatory stringency index at time t, in 3-digit NAICS n. Finally, λ_t and γ_n are fixed effects for time and industry category respectively. Year fixed effects will control for economy-wide variation in economic dynamism. Fixed effects by year will also control for any upward bias in the SUSB data due to incorrectly timed births and deaths stemming from economic census activities. Industry fixed effects will control for differences in dynamism across industries that do not vary with time.

Estimation results are shown in Table 3. After controlling for year and industry fixed effects, our regulatory stringency index shows no statistically significant effect on startups or job creation and a slightly positive effect on job destruction rates. In short, no evidence for a negative effect of regulation on dynamism. The effect on job destruction rates is small. A 1% increase in regulation is associated with a .03% increase in job destruction rates. Recall from the introduction that declining dynamism is associated with a decline in job destruction rates not an increase so regulation here has the opposite to the hypothesized sign. Moreover, adding in the regulatory index adds less than a percentage point to the variation explained above that of the time and industry fixed effects alone.

It could be the case that the negative effects of regulation take years to materialize. To verify whether this is the case we add the regulation index *t-1* and *t-2*. The regulatory stringency index once lagged is positive and statistically significant in the job creation regression but the effect is small. Overall, the results suggest that lagged regulation indices are no better able to account for the decline than regulation at time *t*. (In separate results not reported here we show that this remains true using t-1 or t-2 in place of regulation at time t and with the inclusion of industry trends.)

Table 3: Dynamism and Regulatory Stringency

VARIABLES	Startups	Job Creation	Job Destruction	Startups	Job Creation	Job Destruction
Log Regulatory Stringency	1.043	1.810	3.170***	-0.332	-0.206	1.390
	(1.043)	(0.969)	(1.197)	(0.969)	(1.284)	(1.361)
Log Reg Stringency (-1)				2.596	2.061**	0.0296
				(1.813)	(0.959)	(1.199)
Log Reg Stringency (-2)				-0.493	0.867	2.401
				(0.806)	(1.182)	(1.229)
Constant	0.473	-2.412	-17.52	-6.591	-11.27	-23.84
	(10.32)	(9.635)	(11.97)	(16.07)	(10.97)	(13.45)
Observations	975	956	955	975	956	955
R-squared	0.211	0.335	0.292	0.217	0.338	0.294
Number of Industries	75	75	75	75	75	75
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Source: RegData 2.1, Statistics of U.S. Businesses, author's calculations.
Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05. Observations are industry-year combinations. Some industry-year combinations were suppressed in the source SUSB data due to disclosure issues. All dependent variables are rates, except when otherwise denoted.

Table 4 breaks establishments into three classes by firm size, small (less 1-9 employees), medium (10-499) and large (>500) and looks at job creation and destruction within these classes. As before, we find a few statistically significant results especially for large firms but the signs suggest regulatory in associated with small increases not decreases in dynamism as measured by job creation and job destruction rates.

Table 4: Regulatory Stringency and Dynamism by Firm Size

	Small <10		Medium 10-499		Large >499	
VARIABLES	Job Creation	Job Destruction	Job Creation	Job Destruction	Job Creation	Job Destruction
Log Regulatory Stringency	0.357	1.561	2.779**	3.137	2.708**	4.127**
	(3.360)	(2.114)	(1.222)	(2.105)	(1.204)	(1.562)
Constant	25.04	2.311	-13.16	-17.56	-13.02	-28.34
	(33.69)	(21.17)	(12.07)	(21.28)	(12.00)	(15.64)
Observations	911	900	938	942	872	868
R-squared	0.058	0.112	0.178	0.132	0.318	0.228
Number of Industries	75	75	75	75	74	74
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Source: RegData 2.1, Statistics of U.S. Businesses, author's calculations.
Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05. Observations are industry-year combinations. Some industry-year combinations were suppressed in the source SUSB data due to disclosure issues. Firm (enterprise) size is a categorical variable determined by the summed employment of all associated establishments under common ownership.

Similarly, the primary negative impacts of regulation may be in the extent to which they change over time, causing firms to incur costs to adjust to new rules. Table 5 indicates that shifting focus to the year over year percent change in the regulation index does not suggest that regulation is a major factor contributing to the decline in dynamism.

Table 5: Dynamism and Regulatory Change

VARIABLES	Startups	Job Creation	Job Destruction
Annual Change in Reg Stringency	-0.935	-0.642	0.132
	(0.696)	(0.667)	(0.898)
Constant	10.98***	15.71***	14.08***
	(0.212)	(0.290)	(0.315)
Observations	975	956	955
R-squared	0.211	0.332	0.285
Number of Industries	75	75	75
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Source: RegData 2.1, Statistics of U.S. Businesses, author's calculations.
Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05. Observations are industry-year combinations. Some industry-year combinations were suppressed in the source SUSB data due to disclosure issues.

The above analysis shows that regulation, lagged regulation, or changing regulation does not account for the decline in economic dynamism. It may be the case that only certain types of regulations are important for economic dynamism, and our focus on all regulations weakens that relationship. If two types of regulation have offsetting effects that isn't a problem for our analysis since we are interested in the net effect of all regulation on dynamism. If only one type regulation has a negative effect, however, then combining it with other types having a zero effect could attenuate our results. Thus, we next distinguish general from specific regulation and ask whether either of these types of regulation alone is responsible for declines in dynamism.

Some types of regulation concern only a single industry, such as those relating to specific techniques of mining. Other types of regulation, such as labor regulation, cut across many different industries. As mentioned in the previous section, our index is the aggregation of the probability a block of text is related to an industry multiplied by the number of restrictions in that block of text. A probability of association is calculated between each CFR part and all 3-digit NAICS industries. A CFR part which deals only with the mining industry will have a vector of probabilities that is highly concentrated on the mining industry. A CFR part that is more general, however, will exhibit a less concentrated vector of probabilities. In order to separate out these types of regulation we create for each part in the CFR an HHI index of concentration. To give one example, we find that the subchapter in Title 29 covering topics such as minimum wage and records that employers must keep has a concentration index value about half that of Title 30 subchapter K, which discusses the use of explosives and waste disposal in mineral mines.

Using this HHI concentration we then create two new indices, a specific and general regulatory indices. The specific regulation index only includes CFR parts where the HHI index on the probabilities is greater than the 80th percentile of concentration indices across all parts. Conversely, the general regulation index uses only text with a concentration value less than the 20th percentile. The regression results using these new indices are reported in Table 6.

Neither the specific nor general regulatory indices are related to dynamism in a statistically significant manner in the hypothesized direction.[4]

[4] Another advantage of the specific and general regulatory index is that to the extent that reverse causation from dynamism to regulation is an issue it's an issue that affects regulation about a specific industry rather than general regulation which affects many industries.

Table 6: Dynamism and Industry Regulation, Specific and General Regulations

VARIABLES	Startups	Job Creation	Job Destruction
Log Specific Regulation Index	0.000167	-0.000154	7.97e-05
	(0.000128)	(0.000277)	(0.000139)
Log General Regulation Index	2.05e-05	7.85e-05***	2.69e-05
	(2.62e-05)	(2.27e-05)	(3.19e-05)
Constant	10.26***	15.20***	13.62***
	(0.405)	(0.752)	(0.614)
Observations	975	956	955
R-squared	0.212	0.343	0.286
Number of Industries	75	75	75
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Source: RegData 2.1, Statistics of U.S. Businesses, author's calculations.
Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05. Observations are industry-year combinations. Some industry-year combinations were suppressed in the source SUSB data due to disclosure issues. Specific and general regulation indices are calculated using the concentration of probabilities across industries within CFR parts, which is calculated as the sum of squared probabilities of association between the text and each industry by CFR part. Specific regulation index includes only CFR parts where the concentration is greater than the 80th percentile of concentrations across all parts and years. General regulation index includes only CFR parts where the concentration is less than the 20th percentile of concentration.

Alternatively, it could be the case that only the most active regulatory agencies write binding and impactful regulations. Thus, we focus on the top ten agencies responsible for the most regulation as measured by our stringency index. Table 7, however, again shows that none of our measures of dynamism are associated with regulatory stringency, even for the most active regulatory agencies.

Table 7: Dynamism and Regulation: Top Ten Regulatory Agencies by Stringency of Regulation Only

VARIABLES	Startups	Job Creation	Job Destruction
Log Regulatory Stringency	0.00400	-0.00123	0.00227
	(0.00375)	(0.00358)	(0.00318)
Constant	10.86***	15.65***	14.08***
	(0.187)	(0.275)	(0.271)
Observations	9,450	9,268	9,258
R-squared	0.211	0.334	0.279
Number of Industries	75	75	75
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Source: RegData 2.1, Statistics of U.S. Businesses, author's calculations.
Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05. Observations are agency-industry-year combinations. Sample includes only the top ten agencies by regulatory incidence, calculated as the sum of the regulatory stringency index between 1999 and 2011. The observation count is less than the number of agencies (10) times the number of years (13) and the number of industries (75) because not all of the top agencies are observed in all years.

3.1. A Leontief Measure of Regulation

The RegData methodology probabilistically assigns regulatory text to industries, which may only capture partial or first-round regulatory incidence. For example, while regulations directed at the production of basic chemicals may affect chemical manufacturers, presumably those restrictions also impact industries that rely on those chemicals as an intermediate good. To address this concern, we use the 2007 detailed industry level Input-Output tables published by the Bureau of Economic Analysis[5]. The Input-Output data show how each industry relies on inputs from all other industries. We use these relationships to calculate two new measures of "full regulatory incidence", which capture the extent to which each industry is exposed to regulation via its purchases from other industries.

Our first measure of full regulatory incidence simply multiplies the use share from the input-output table for industry i from industry j by the

[5] http://www.bea.gov/industry/io_annual.htm

regulatory stringency of the input industries (excluding purchases from the same industry) and then sum as shown below:

$$RegSecondary_i = \sum_{j=1}^{n} a_{ij}\, Reg_j$$

Where a_{ij} is the input share used by industry *i* from industry *j*. Thus *RegSecondary* increases in size when an industry buys a significant share of inputs from industries that are themselves highly regulated.

Our second measure of full regulatory incidence is inspired by the Leontief input-output model[6]. In that model there is some consumer or final demand for outputs such as gasoline and steel but the gasoline industry also uses gasoline and steel to produce gasoline as does the steel industry. The question is to find the gross production of gasoline and steel such that both the intermediate and final demands can be satisfied. Note that in solving the model one solves for all the ripple effects—that is, to produce an extra final gallon of gasoline requires additional gasoline and steel but to produce the additional gasoline and steel requires additional gasoline and steel and so forth.

In an analogous way we treat the regulation imposed by law as the final level of regulation and the regulation that ripples from industry to industry through the input-output matrix as the intermediate level. We then look for gross levels of regulation such that the final and intermediate levels of regulation are satisfied[7]. We label the result the Leontief Regulatory Stringency Index.

[6] See Simon and Blume (1994) for an elementary treatment.

[7] More formally, we can write A as the n by n matrix of input-output shares, B as a n by 1 vector of final regulatory stringency, and X as the full regulatory incidence faced by each industry.

$$X = AX + B$$

Solving for *X* we have full regulatory incidence for each industry as the Leontief inverse multiplied by the vector of industry specific regulatory stringency.

$$X = (I_n - A)^{-1}B$$

Table 8 shows our measures of dynamism against our "partial" regulatory index (as used previously) and our two measures of full regulatory incidence. Results are consistent with previous results. In particular, we find no effect of either measure of regulatory incidence on startups. For job creation and destruction we find occasional results where either the partial regulatory stringency index is positive or one of the full incidence measures of regulation are positive, i.e. of the "wrong" sign and in all cases the size of the effect is small. The regulatory stringency index is negative and small in the regression for job creation when including the Leontief regulatory index, which is positive and significant in that regression.[8]

Overall, we continue to find little to no evidence that regulatory stringency, whether measured at a partial equilibrium level or using full incidence, is correlated with reduced economic dynamism.

[8] We also considered that our full incidence measures of regulation could be proxying for the number of connections to other industries which might be associated with dynamism. Thus, in regressions not shown here we also included a Herfindahl-Hirshschman input index over the shares of inputs from other industries (thus an industry that purchased 25% of its inputs from one industry would receive a higher HHI index than one that purchased 5% of its inputs from five industries.). Results were similar to those in the text.

Table 8: Dynamism and Regulation: Full Regulatory Incidence

VARIABLES	Startups	Job Creation	Job Destruction	Startups	Job Creation	Job Destruction
Log Regulatory Stringency	1.346	-0.152	3.940***	1.747	-3.464**	4.183**
	(0.867)	(0.956)	(1.468)	(1.154)	(1.383)	(2.082)
Log Secondary Regulatory Stringency	-2.433	19.24***	2.424			
	(3.490)	(3.678)	(4.193)			
Log Leontief Regulatory Stringency				-6.101	49.51***	0.0484
				(6.753)	(9.432)	(11.51)
Constant	25.14	-183.0***	-39.36	74.62	-589.3***	-16.53
	(34.38)	(36.03)	(40.35)	(79.88)	(112.6)	(134.6)
Observations	728	709	708	728	709	708
R-squared	0.781	0.763	0.660	0.781	0.761	0.660
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Source: RegData 2.1, Statistics of U.S. Businesses, BEA Input-Output Accounts data, author's calculations.
Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05. Observations are industry-year combinations. Sample includes only industries for which both RegData and input-output data exists. Secondary regulatory incidence is calculated as the sum of the percent of inputs purchased from each industry multiplied by the regulatory stringency of that industry, exclusive of purchases from own industry. Input-output shares are the 2007 detailed industry use tables. Leontief regulatory stringency calculated as the total regulatory stringency the solves the input-output equations of the form $X = (I_n\text{-}A)^{-1}B$, where X is total regulatory stringency, A is the input-output shares, and B is the regulatory stringency by industry.

3.2. Attenuation Bias and Measurement Error

Since RegData provides the first industry specific measures of regulation. one might reasonably be concerned about attenuation bias due to measurement error in our independent variable. This type of bias would tend to under estimate the effect of our regulation index on economic dynamism although it would be surprising if regulation reduced dynamism yet all of our measures of regulation showed no such effect. In order to address these concerns we implement an empirical strategy that leverages the information found in a series of proxy variables to minimize attenuation bias.

The Lubotsky and Wittenberg (2006) method provides a simple way of minimizing attenuation bias by providing an estimate that optimally aggregates the information held in a set of proxy variables. As described in the previous sections, there are a number of ways to measure regulation using RegData. We treat each of our measures of regulation—the basic regulation index, general regulation index, specific regulation index, and a Leontief total regulation index—as proxies of an unobserved measure of true regulation. We estimate a regression model that simultaneously includes all of these proxies. We then aggregate the resulting coefficients using the Lubotsky and Wittenberg (2006) procedures to achieve an estimate with the least amount of attenuation bias of the true relationship between regulation and dynamism[9]. Table 9 shows the estimated values of the weights for each proxy ρ_j, the estimated coefficient of each proxy, and the overall estimated effect of unobserved regulation. Again, in agreement with the analyses in previous sections, none of the estimates shows a negative relationship between regulation and economic dynamism. It appears, therefore, that attenuation bias does not account for the findings that regulation cannot account for the decline in economic dynamism.

[9] More specifically, we calculated a weighted sum of the estimated coefficients of each proxy according to $\sum_{j=1}^{k} \frac{cov(y,x_j)}{cov(y,x_1)} b_j$, where b_j is the estimated coefficient of proxy $j = 1, \dots, k$. See Lubotsky and Wittenberg (2006) for additional detail.

Table 9: Estimating Effects of Latent Regulation

	Startup ρ	Startup Proxies	Job Creation ρ	Job Creation Proxies	Job Destruction ρ	Job Destruction Proxies
Log Regulatory Stringency	1.000	1.685	1.000	-1.385	1.000	5.455
		(1.979)		(1.743)		(2.894)
Log Specific Regulatory Stringency	-0.166	0.157	10.408	-1.292	0.197	2.386***
		(0.931)		(1.668)		(0.990)
Log General Regulatory Stringency	1.733	0.015**	-65.237	-0.855	-0.203	-0.779
		(0.931)		(0.695)		(0.724)
Log Leontief Regulatory Stringency	-1.105	-6.089	26.623	52.315***	1.189	3.753
		(9.682)		(11.523)		(14.716)
Estimated Unobserved "Regulation" Effect		-2.170		604.610***		4.787***
		(2.030)		(135.900)		(1.243)

Source: RegData 2.1, Statistics of U.S. Businesses, author's calculations.
Notes: Robust standard errors in parentheses, *** p<0.01, ** p<0.05. Observations are industry-year combinations. Estimates from proxy regression used to calculate estimated effect of unobserved regulation as in Lubotsky and Wittenberg (2006). The implicit index that produces that estimate is generated as $\boldsymbol{x^{\rho} = \frac{1}{\beta}\sum_{j=1}^{k} x_j b_j}$.This implicit index was then used to obtain the standard errors for the estimate of the effect of unobserved regulation. All regressions also include year and industry fixed effects.

3.3. Digging Deeper - The Case of Manufacturing

To better understand the relationship between changes in regulation and changes in measures of dynamism, we now focus on manufacturing industries. With RegData, we are able to identify manufacturing industries that experienced the largest increases and decreases in regulatory stringency between 1999 and 2011. Research has shown that regulation can have a significant effect on firm productivity and the ability to compete internationally. Most analyses of regulation in the manufacturing sector focus on the impacts of environmental regulations. Using plant level micro data, Gray and Shadbegain (1993), show that more heavily regulated plants have significantly lower productivity levels and slower productivity growth. Manufacturing regulation can also have significant impacts on the dynamics of the industry. Becker and Henderson (2000) find that differential regulatory incidence by attainment status decreases startups and alters the timing of investments.

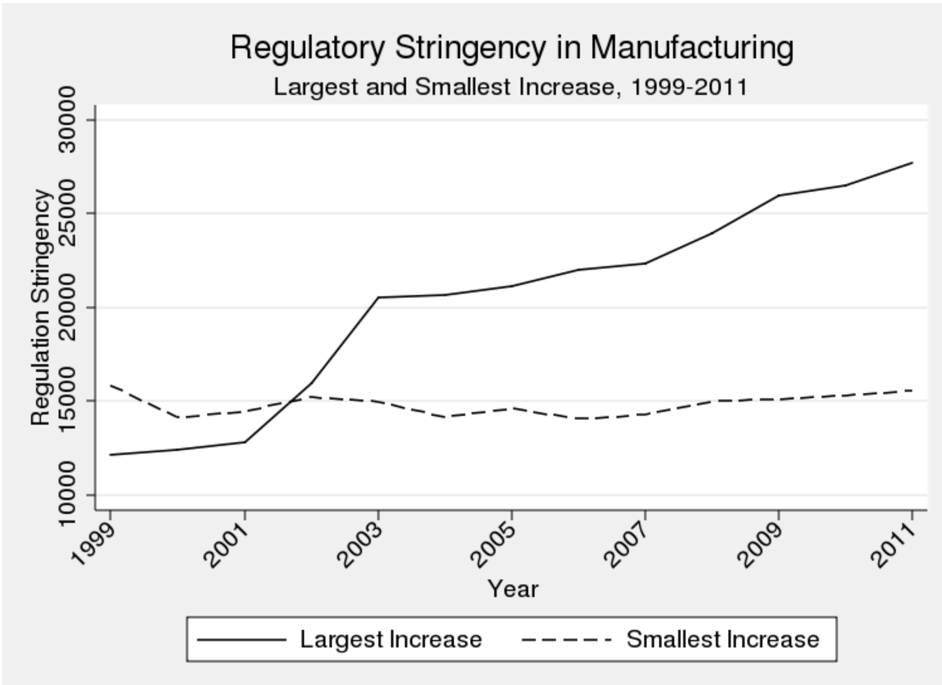
Table 10 shows the five manufacturing industries that experienced the largest and smallest percent change in our regulatory index from 1999 to 2011. Mineral products, furniture, and plastics experience the largest increase in regulatory stringency, while beverages, food, and leather products experienced a loosening in regulatory stringency. Figure 10 shows the regulatory index for these two groups. The average regulation index for the largest increase group increases more than doubles, where the smallest increase remains flat from 1999 through 2011.

Table 10: Manufacturing - Change in Regulation Index 1999 to 2011

Largest Increase in Regulation Stringency		Smallest Increase in Regulation Stringency	
Name (NAICS Code)	Percent Change	Name (NAICS Code)	Percent Change
Nonmetallic Mineral Product	182.24	Beverage and Tobacco Product	-17.31
Furniture and Related Product	137.72	Food	-4.60
Plastics and Rubber Products	133.78	Leather and Allied Product	18.14
Textile	114.22	Apparel	20.71
Machinery	81.35	Computer and Electronic Product	31.73

Source: RegData 2.1, author's calculations.

Figure 10: Manufacturing Industries with Highest and Lowest Increase in Regulatory Stringency

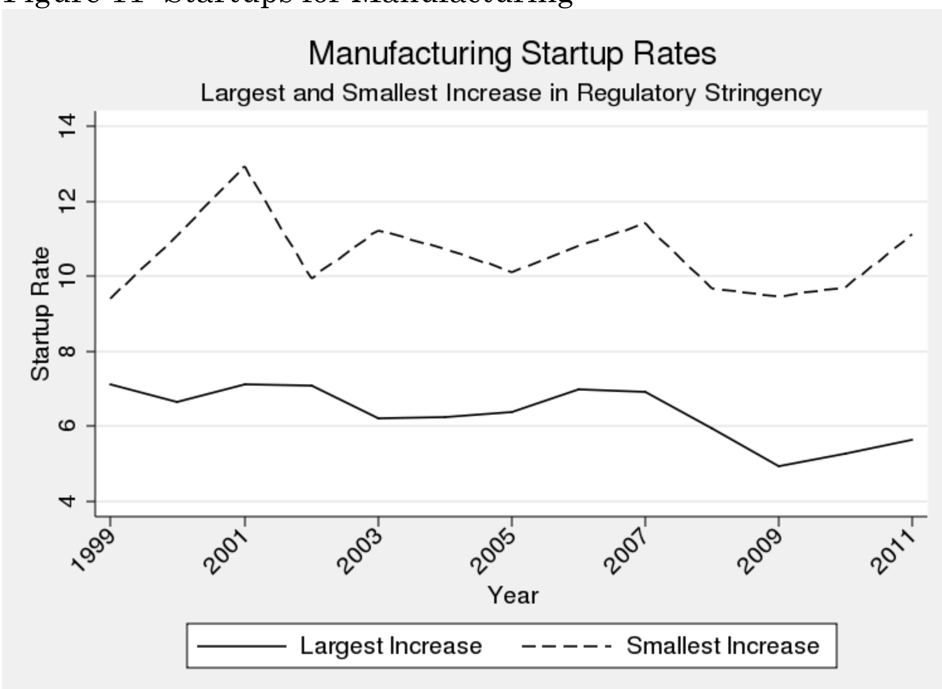


Source: RegData 2.1, author's calculations.
Notes: Regulatory stringency for the largest increase sample includes the sum of regulatory stringency for the five manufacturing industries experiencing the largest increase in regulatory stringency between 1999 and 2011, shown in Table 10. Similarly, the smallest increase sample includes the five industries shown in Table 10 that experience the smallest increase in regulatory stringency.

Figure 11 shows the startup rates for those industries that saw the largest and smallest increase in regulatory stringency. The industries that saw big increases in regulation had lower startup rates but they had lower startup rates throughout the period. Despite experiencing dramatic increases in regulation the increasingly regulated industries did not see increasingly lower startup rates.

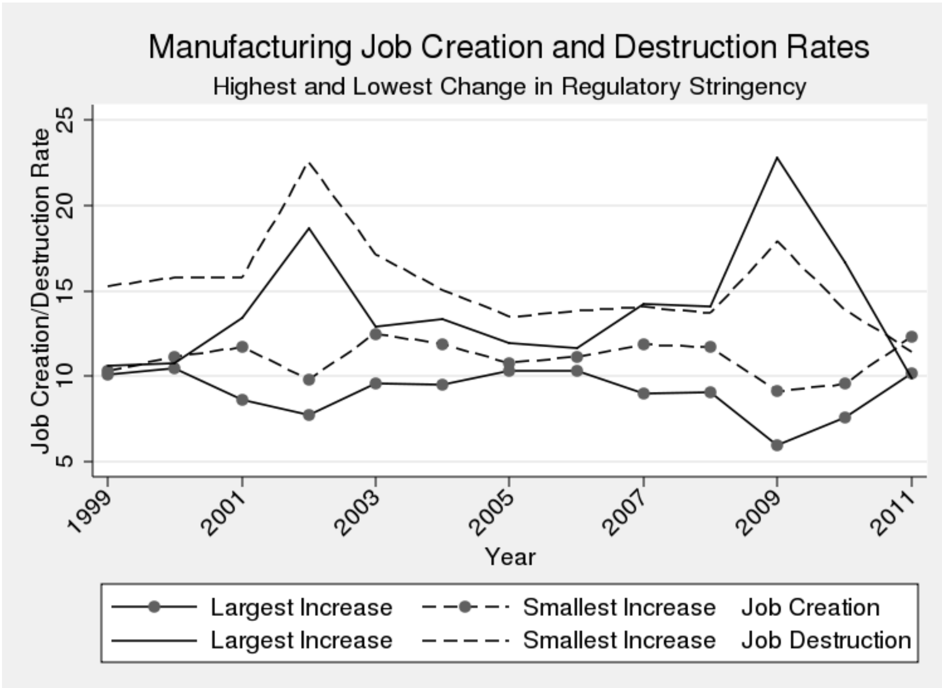
A similar story appears in the job creation and destruction rates for these two groups. Figure 12 shows that job creation and destruction rates follow very similar trajectories, experiencing the same peaks and troughs, despite the fact that these groups of industries saw very different trends in regulatory stringency. The fact that trends in startups, job creation, and job destruction follow a similar path for manufacturing industries with large and small increases in regulatory stringency suggests that causes other than regulation are driving changes in dynamism. These patterns also appear when focusing on retail trade, where the trends in dynamism for industries experiencing large and small changes in regulatory stringency are nearly identical.

Figure 11: Startups for Manufacturing



Source: RegData 2.1, Statistics of U.S. Businesses, author's calculations.
Notes: Startup rate is calculated as 100*(establishment entry at time t divided by the average of estabs at t and t-1).

Figure 12: Job Creation and Destruction in Manufacturing



Source: RegData 2.1, Statistics of U.S. Businesses, author's calculations.
Notes: Job creation rate is calculated as 100*(job creation at time t divided by the average of employment at t and t-1). Job destruction rate is calculated as 100*(job destruction at time t divided by the average of employment at t and t-1).

4. Other Causes of Declining Dynamism

If one is committed to that view that Federal regulation reduces dynamism then suspicion is naturally thrown upon our measure of regulation or techniques. Indeed, both the authors expected to find a large role for Federal regulation in reducing dynamism. After working with the data, however, our view is that if the effect of Federal regulation on dynamism were strong then it would show up more consistently and clearly even given possible weaknesses in our data or techniques. As noted earlier, the question we examine is not whether regulation influences dynamism, it surely does in both positive and negative directions. The question is whether regulation on net has been an important cause of the decline in dynamism in the United States. While other measures of industry-level regulation and other techniques are to be encouraged we suspect that the main message of our paper—we should be looking elsewhere than Federal regulation for the cause of declining dynamism—is robust. Thus, it's appropriate to briefly consider other possible causes of declining dynamism.

Federal law is the most extensive and widely-discussed source of regulation but other sources, such as state-based legislation or common-law judicial interpretation, may also be important for understanding trends in dynamism. Davis and Haltiwanger (2014), for example, find that job reallocation rates are lower in states whose common-law courts weakened the employment at-will doctrine and they suggest that state-based minimum wages may also have decreased dynamism. The employment at-will doctrine and minimum wages affect some industries more than others, however, so it would be useful to investigate whether these factors can be used to understand trends in dynamism by industry.

A variety of other reasons, however, suggest that regulation in general may play only a small role in the decline in dynamism in the United States. If we look around the world, for example, the most common type of regulations that impede dynamism are those that prevent firms from growing larger. The U.S. economy, however, hosts the largest firms in the world, which are growing even larger. Furthermore, larger firms are more productive on average and the positive relationship between size and productivity is strongest in the U.S. (Haltiwanger 2012). If regulation were preventing small firms from growing large then we would expect startup size to be increasing. Instead, we observe no trend towards increased startup size (Haltiwanger, Jarmin, & Miranda 2013). Molloy, Smith, Trezzi and Wozniak (2016) find that that declines in labor market fluidity are not more pronounced in states with greater land use regulation.

Declining dynamism may have more fundamental causes than regulation. Gordon (2016) and Cowen (2011), for example, argue that the rate of technological growth has fallen. Declines in technology growth could explain declining rates of dynamism across developed economies. One reason to start a new firm, for example, is to implement a new idea. If progress on the technological frontier is slowing, then entrepreneurs would see fewer new ideas to be profitably implemented and would therefore be less likely to start a new firm (Tabarrok and Goldschlag 2015). The decline of dynamism is not limited to the United States (Criscuolo, Gal & Menon 2014). Increasing regulation everywhere could be responsible for declining dynamism but countries are more likely to experience similar trends in technology than similar trends in regulation.

Similarly, Hathaway and Litan (2014) and Karahan, Pugsley and Sahin (2015) argue that much of the decline in the rate of new firm growth can be accounted for in the United States by broad trends in the growth rate of the labor force. Explanations based on the labor force have the virtue of explaining declining trends across all US industries and regions.

It should also be kept in mind that many measures of declining dynamism are associated with greater GDP per capita. For example, on average there are fewer entrepreneurs and more large firms in more developed economies both cross-sectionally and over-time (Bento and Restuccia 2014, Lucas 1978, Poschke 2014). Improvements in information technology may be increasing the ability of large firms to adapt to shocks. Creative destruction brings benefits but at the price of bankruptcies, unemployment, and worker reallocation. If information technology can allow creative destruction to be internalized to the firm rather than the industry this may increase welfare. Declining dynamism and increasing stability are but two ways of naming the same thing.

Better measures of dynamism may be needed to sort out different types of declining dynamism. Some types of declining dynamism may be beneficial (reduced churn). Other types may be harmful but may have a variety of causes ranging from slowdown in technology growth to slowdown in labor force supply and increases in regulation. It may be that better measures of dynamism are required before we are able to pinpoint the causes of the different types.

We also may be mis-measuring dynamism. As already noted, a great deal of internalized creative destruction or the remaking and restructuring of large firms is not captured by business dynamics statistics. Nor is globalized dynamism. The great majority of Apple's approximately 750 suppliers, for example, are located in Asia. The Apple eco-system, however, is not static. With each iPhone iteration, Apple drops some suppliers and adds others but as this dynamism occurs abroad it isn't measured in US statistics.[10]

4. Conclusions

The decline in economic dynamism appears unsettling because theory suggests that reallocation plays an important role in economic efficiency. There are solid theoretical reasons to suspect that regulation may deter entry and slow the reallocation of labor. To investigate the extent to which the decline in entrepreneurship can be attributed to increasing regulation, we utilize a novel data source, RegData, which uses text analysis to measure the extent of regulation by industry. Our analysis suggests that Federal regulation is not a major cause of the decline in US business dynamism.

To the extent that Federal regulation is not the cause of declining dynamism, attention should flow to other sources of regulation such as state and judicial regulation through the common law. Greater attention should also be given to deeper forces that may reduce dynamism such as a slowdown in the technological frontier that reduces the flow of new ideas ready to be profitably implemented. Technology, especially information technology, may also be changing the nature of dynamism in ways that are difficult to measure. The restructuring and rearranging of large firms, for example, can greatly improve the allocation of resources but is not currently well measured. The integration of business dynamic statistics globally would also

[10] We discuss these issues at greater length in Goldschlag and Tabarrok (2015).

give us a greater grasp on global dynamism, which may be increasing even as measured national dynamism decreases.

Appendix A - RegData Example

As an example, the text below is highly associated with the Mining (except oil and Gas) industry.

2010 Title 30 - Mineral Resources

SUBCHAPTER K—PERMANENT PROGRAM PERFORMANCE STANDARDS

PART 819—SPECIAL PERMANENT PROGRAM PERFORMANCE STANDARDS-AUGER MINING

§ 819.1 Scope.

This part sets environmental protection performance standards for surface coal mining and reclamation operations involving auger mining.

§ 819.11 Auger mining: General.

(a) Auger mining operations **shall** be conducted in accordance with the requirements of part 816 of this chapter, except as provided in this part.

(b) The regulatory authority may prohibit auger mining, if necessary to—

(1) Maximize the utilization, recoverability, or conservation of the solid-fuel resource, or

(2) Protect against adverse water-quality impacts.

§ 819.13 Auger mining: Coal recovery.

(a) Auger mining **shall** be conducted so as to maximize the utilization and conservation of the coal in accordance with § 816.59 of this chapter.

(b) Auger mining **shall** be planned and conducted to maximize recoverability of mineral reserves remaining after the operation and reclamation are complete.

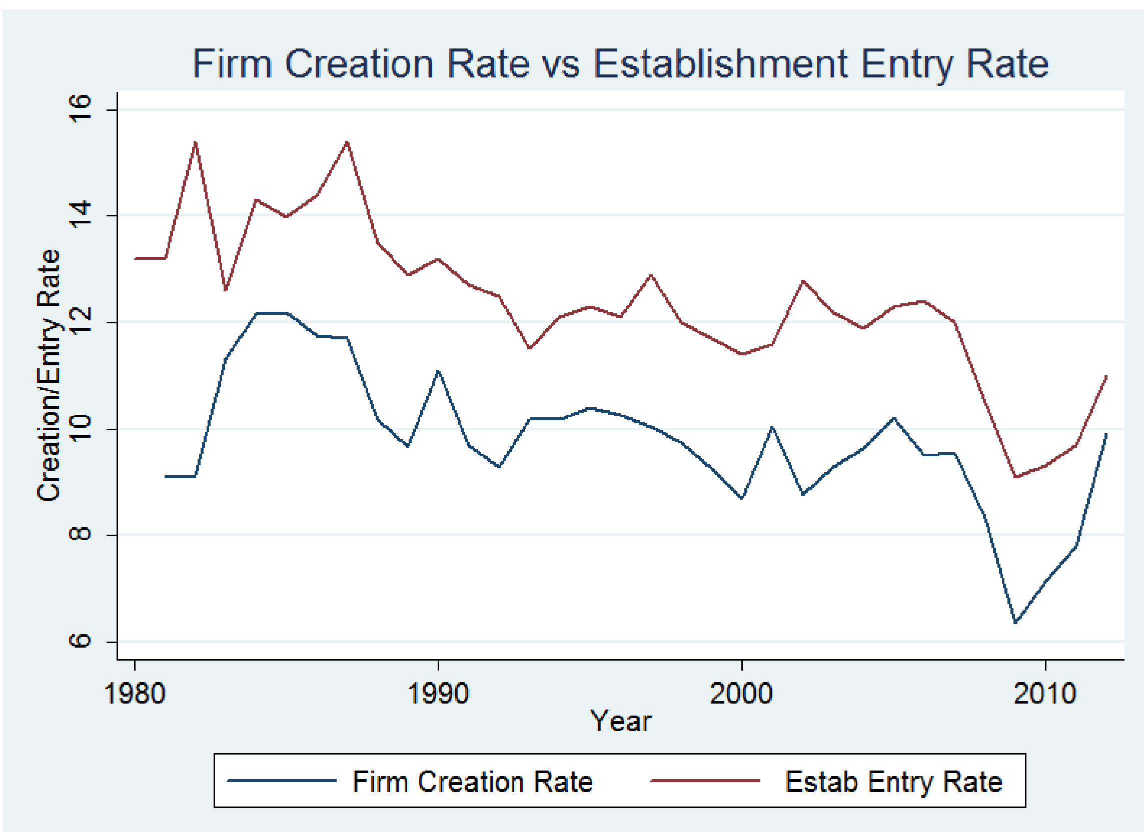
(c) Each person who conducts auger mining operations **shall** leave areas of undisturbed coal, as approved by the regulatory authority, to provide access for future underground mining activities to coal reserves remaining after augering is completed, unless it is established that the coal reserves have been depleted or are so limited in thickness or extent that it will not be practicable to recover the remaining coal. This determination **shall** be made by the regulatory authority upon presentation of appropriate technical evidence by the operator.

Appendix B: Firm versus Establishment Startup Rate

In our view Steve Jobs was an entrepreneur when he co-founded Apple computer in 1976 (firm creation) but also when he returned to Apple in 1997 restoring Apple to productivity and greatly expanding the number of products and Apple stores (establishment entry) (Goldschlag and Tabarrok 2015). Thus it's appropriate to measure dynamism at the establishment level. Note also that most regulations will affect new establishments in a similar way to new firms. Regulation of labor, land use, safety and environmental regulations, for example, will affect new firms and new establishments thus it's better to use the larger measure.

In figure B1 we show the national firm creation rate as defined by Hathaway and Litan (2014) and the national establishment entry rate from the BDS data. The establishment rate, which includes new firms, is above the firm creation rate but the two trend together both secularly and over shorter periods of time. The two correlate at .75.

Figure B1.



Source: Business Dynamics Statistics, U.S. Census Bureau, author's calculations.

References

Al-Ubaydli, O. and P. McLaughlin (2015). 'RegData: a numerical database on industry-specific regulations for all U.S. industries and federal regulations, 1997-2012,'. Regulation and Governance, in press.

Bartelsman, E., Haltiwanger, J., & Scarpetta, S. 2013. Cross-Country Differences in Productivity: The Role of Allocation and Selection. *American Economic Review*, 103(1): 305–34.

Becker, R., & Henderson, V. (2000). Effects of air quality regulations on polluting industries. Journal of political Economy, 108(2), 379-421.

Bento, P., & Restuccia, D. 2014. *Misallocation, Establishment Size, and Productivity*. Working Paper no. tecipa-517. University of Toronto, Department of Economics. Retrieved from https://ideas.repec.org/p/tor/tecipa/tecipa-517.html

Bertrand, M., & Kramarz, F. (2001). Does entry regulation hinder job creation? Evidence from the French retail industry (No. w8211). National Bureau of Economic Research.

Coffey, B., McLaughlin, P. A., & Tollison, R. D. (2012). Regulators and Redskins. Public Choice, 153, 191-204.

Cowen, T. 2011. *The Great Stagnation: How America Ate All the Low-Hanging Fruit of Modern History, Got Sick, and Will (Eventually) Feel Better*. New York: Dutton Adult.

Criscuolo, C., Gal, P. N., & Menon, C. 2014. *The Dynamics of Employment Growth*. OECD Science, Technology and Industry Policy Papers. Paris: Organisation for Economic Co-operation and Development. Retrieved from http://www.oecd-ilibrary.org/content/workingpaper/5jz417hj6hg6-en

Davis, S. J., Faberman, R. J., & Haltiwanger, J. (2012). Labor market flows in the cross section and over time. Journal of Monetary Economics, 59(1), 1-18.

Davis, S. J., Faberman, R. J., Haltiwanger, J., Jarmin, R., & Miranda, J. (2008). Business volatility, job destruction, and unemployment (No. w14300). National Bureau of Economic Research.

Davis, S. J., & Haltiwanger, J. 2014. *Labor Market Fluidity and Economic Performance*. Working Paper no. 20479. National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w20479

Davis, S. J., Haltiwanger, J. C., & Schuh, S. (1998). Job creation and destruction. *MIT Press Books*, *1*.

Dawson, J., & Seater, J. (2008). Federal Regulation and Aggregate Economic Growth. Working Paper.

Decker, R., Haltiwanger, J., Jarmin, R., & Miranda, J. (2014). The role of entrepreneurship in US job creation and economic dynamism. The Journal of Economic Perspectives, 28(3), 3-24.

Decker, R. A., Haltiwanger, J., Jarmin, R. S., & Miranda, J. (2015). *Where Has All The Skewness Gone? The Decline In High-Growth (Young) Firms In The U.S.*. Working Paper no. 21776. National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w21776

Eslava, M., Haltiwanger, J., Kugler, A., & Kugler, M. (2010). Factor adjustments after deregulation: panel evidence from Colombian plants. The Review of Economics and Statistics, 92(2), 378-391.

Foster, L., Haltiwanger, J., & Krizan, C. J. (2006). Market selection, reallocation, and restructuring in the US retail trade sector in the 1990s. *The Review of Economics and Statistics*, *88*(4), 748-758.

Gordon, R. J. 2016. *The Rise and Fall of American Growth: The U.S. Standard of Living since the Civil War*. Princeton: Princeton University Press.

Gray, W. B., & Shadbegian, R. J. (1993). *Environmental regulation and manufacturing productivity at the plant level* (No. w4321). National Bureau of Economic Research.

Gruber, J., & Madrian, B. C. 2002. *Health Insurance, Labor Supply, and Job Mobility: A Critical Review of the Literature*. Working Paper no. 8817. National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w8817

Haltiwanger, J. (2012). Job creation and firm dynamics in the United States. In *Innovation Policy and the Economy, Volume 12* (pp. 17-38). University of Chicago Press.

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.

Haltiwanger, John, Ron Jarmin, and Javier Miranda. 2009. "Business Dynamics Statistics: An Overview." Kauffman Foundation: Other Research. Available at SSRN: http://ssrn.com/abstract=1456465.

Haltiwanger, J. & Scarpetta, S. & Schweiger, H., 2014. "Cross country differences in job reallocation: The role of industry, firm size and regulations," Labour Economics, Elsevier, vol. 26(C), pages 11-25.

Hathaway, Ian, & Litan, Robert. (2014). *What's Driving the Decline in the Firm Formation Rate? A Partial Explanation.* The Brookings Institution.

Heim, B. T., & Lurie, I. Z. 2014. Did reform of the non-group health insurance market affect the decision to be self-employed? Evidence from the State Reforms in the 1990s. *Health Economics*, 23(7): 841–860.

Hopenhayn, H., & Rogerson, R. (1993). Job turnover and policy evaluation: A general equilibrium analysis. Journal of political Economy, 915-938.

Hsieh, C.-T., & Klenow, P. J. 2009. Misallocation and Manufacturing TFP in China and India. *The Quarterly Journal of Economics*, 124(4): 1403–1448.

Lucas, R. E., Jr. 1978. On the Size Distribution of Business Firms. *The Bell Journal of Economics*, 9(2): 508–523.Mulligan, C., & Shleifer, A. (2005). The Extent of the Market and the Supply of Regulation. Quarterly Journal of Economics, 120, 1445-1473.

Karahan, F., Pugsley, B., & Sahin, A. 2015. *Understanding the 30 year Decline in Business Dynamism: a General Equilibrium Approach*. 2015 Meeting Paper no. 1333. Society for Economic Dynamics. Retrieved from http://econpapers.repec.org/paper/redsed015/1333.htm

Lubotsky, D., & Wittenberg, M. (2006). Interpretation of regressions with multiple proxies. *The Review of Economics and Statistics*, *88*(3), 549-562.

Molloy, R., Smith, C. F., Trezzi, R., & Wozniak, A. 2016. Understanding declining fluidity in the U.S. labor market. Brrokings Papers on Economic Activity, Conference Draft.

Olley, G. S., & Pakes, A. (1996). The Dynamics of Productivity in the Telecommunications Equipment Industry. *Econometrica: Journal of the Econometric Society*, 1263-1297.

Olson, M. 1984. *The Rise and Decline of Nations: Economic Growth, Stagflation, and Social Rigidities*. New Haven: Yale University Press.

Poschke, M. 2014. *The Firm Size Distribution Across Countries and Skill-Biased Change in Entrepreneurial Technology*. SSRN Scholarly Paper no. ID 2403128. Rochester, NY: Social Science Research Network. Retrieved from http://papers.ssrn.com/abstract=2403128

Simon, C. P., & Blume, L. E. 1994. *Mathematics for Economists*. New York, NY: W. W. Norton & Company.

Syverson, C. 2004. Market Structure and Productivity: A Concrete Example. *Journal of Political Economy*, 112(6): 1181–1222.

Syverson, C. 2011. What determines productivity? *Journal of Economic Literature*. 49(2): 326-365.

Tabarrok, A. & N. Goldschlag. (2015). Is Entrepreneurship in Decline? In Understanding the Growth Slowdown (ed. Brink Lindsey) pp. 169-187. Wash. DC: Cato Institute Press.

Witten, I. H., & Frank, E. (2005). Data Mining: Practical machine learning tools and techniques. Morgan Kaufmann.