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Firm Dynamics, Persistent Effects of Entry Conditions, and Business Cycles

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Abstract

This dissertation examines how the state of the economy when businesses begin operations affects their size and performance over the lifecycle. Using micro-level data that covers the universe of businesses operating in the U.S. since the late 1970s, I provide evidence that businesses born in downturns start on a smaller scale and remain persistently smaller over their entire lifecycle. I also use novel data on the productivity of startups to show that this persistence is related to selection at entry and demand-side channels. Finally, I build a model of firm dynamics to quantify the importance of the different mechanisms.

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1 Summary

The 2007–2009 recession and anemic recovery have reinvigorated the study of persistence in business cycle fluctuations. This fundamental issue motivates an extensive theoretical literature, whose central goal is to understand propagation mechanisms. Recent empirical contributions by Fort, Haltiwanger, Jarmin, and Miranda (2013), and Decker, Haltiwanger, Jarmin, and Miranda (2014) suggest that the entry and exit dynamics of startup businesses is critically important for understanding business cycle fluctuations. Firm births account for a significant portion of total job creation and productivity growth in the U.S. economy. Despite the importance of entry and exit dynamics in business cycle fluctuations, little is known about the role of post-entry dynamics in the propagation of economic shocks over time.

In this paper, I provide new evidence that businesses born during recessionary periods start on a smaller scale and remain smaller over their entire lifecycle. In fact, I find no evidence that the average size of cohorts reverts toward the mean over time. This is a surprising result: in the absence of other frictions the wedge between the size of businesses born in good and bad times should gradually disappear as the initial shocks subside. The fact that it does not suggests that the growth dynamics of businesses over their lifecycle may play a complex and previously unexplored role in the persistence of economic fluctuations. To identify and understand the mechanisms that explain this empirical pattern, I take advantage of detailed micro-level data available from the Census Bureau’s Longitudinal Business Database (LBD) on the location, industry, and organizational structure of every non-farm establishment operating in the United States between 1976 and 2011. Finally, I implement a theoretical framework to quantify the main economic mechanisms generating the empirical patterns found in the data.

I begin by assessing whether the average size of businesses that begin operations during expansions (“expansionary startups”) differs from that of businesses that begin operations in recessions (“recessionary startups”). I estimate these effects using a model that decomposes longitudinal outcomes into age-period-cohort effects. This methodology is well suited to measure the effect of initial economic conditions faced by each generation of businesses while accounting for busi-

nesses's lifecycle patterns and the effect of current business cycle conditions on all businesses. The results are striking: a one percent deviation of the real gross domestic product (GDP) from its trend is associated with a one percent increase in the average size of the cohort born in the same year. The procyclicality of average cohort size is robust to using alternative measures of economic activity that capture fluctuations in aggregate uncertainty, labor market conditions, and access to credit markets. Overall, this evidence is consistent with the hypothesis that differences in initial economic conditions affect the initial investment decisions of startup businesses.

After documenting that the average business size across cohorts is significantly affected by aggregate economic conditions at inception, I evaluate the evolution of this effect over the businesses' lifecycle. I find that the size gap is highly persistent as cohorts age, and does not attenuate over time. A one percent increase in the initial aggregate real GDP is associated with a 1.0 percent increase in average size in the short run and a 1.2 percent increase in the long run. These results are not consistent with the notion that the effects of initial economic conditions on firm dynamics are short lived. Rather, they suggest that the average business size is strongly influenced by temporary economic shocks at the time of inception and, as such, the cohort lifecycle dynamics are path dependent and exhibit hysteresis.¹

There are at least two broad economic forces that can explain the observed differences in firm dynamics across cohorts. First, systematic differences in the quality of businesses entering during economic booms and recessions could create differences in initial investment and growth patterns. The expected value of a new business and the outside options of entrepreneurs depend heavily on current economic conditions. Therefore, the quality of new entrepreneurs may vary systematically with the business cycle. To empirically examine this mechanism, I develop new data that tracks annual revenue at the firm level and build measures of revenue per employee in the LBD. I document that recessionary startups are, on average, more productive than expansionary startups. In addition, I find that the composition of businesses born during economic downturns is tilted toward sectors that require a greater amount of technical skill and entrepreneurial quality.

¹This result is somewhat related to the extant literature documenting that wages of individuals graduating in recessions are negatively affected by the initial conditions even after these conditions have subsided (Kahn, 2010; Oreopoulos et al., 2012).

Overall, these results suggest that the average quality of new entrepreneurs is countercyclical, which means that other economic forces must be responsible for the observed differences in initial investment and growth over time. The differences in average entrepreneurial quality should, if anything, mitigate the initial size discrepancy between expansionary and recessionary cohorts.

Second, the observed differences in firm dynamics across cohorts could also be caused by economic constraints on the ability of businesses to adjust their size following an initial investment. These mechanisms could take the form of capital adjustments costs or, alternatively, could be related to the inability of businesses to overcome demand-side constraints. I exploit differences in physical capital intensity across sectors (e.g. Hall, 2004) to formally examine if capital adjustment costs affect the observed persistence in size differences across cohorts. The findings suggest that differences in physical capital intensity are not significantly associated with differences in size persistence. I then use sectoral differences in the importance of product reputation and customer relations to gauge whether demand-side channels might explain the size persistence observed in the data. I employ two proxies for the sectoral importance of these demand-side channels: the share of total inputs spent on advertising and the product differentiation index developed by Gollop and Monahan (1991). I find that these proxies are significantly related to the persistence of size differences across cohorts. My empirical findings suggest that the process of demand accumulation through consumer reputation and brand awareness affects the ability of recessionary startups to catch up to their expansionary counterparts.

In the second part of the paper, I propose an analytically tractable framework that formally illustrates and quantifies the role of selection at entry and demand-side channels in explaining the entry and post-entry dynamics of cohorts that start in different stages of the business cycle. I develop a model of firm dynamics with endogenous entry and exit in the spirit of Hopenhayn (1992), in an environment where exogenous aggregate shocks affect the profitability of businesses. The model features an endogenous productivity distribution of entrants: potential entrants receive a signal about their idiosyncratic productivity and decide whether to enter the market based on the current state of aggregate demand. Incumbent firms are endowed with heterogeneous productivities that evolve over time, and they must decide how much to produce and

whether to exit. In line with the observed empirical patterns, I introduce size persistence over the lifecycle by allowing the demand for each firm's differentiated product to be dynamic, such that if the business sells more today, it accumulates reputational capital and expands its future demand.

I calibrate the model to the U.S. economy and use the simulated data to estimate the age-period-cohort models used in the empirical section. When I parameterize the model to match a set of observed moments concerning the entry, survival, and size of businesses in the economy, the framework successfully replicates the growth and exit patterns by age. The simulated data generates estimates of the effect of economic conditions on the average size that are similar to those obtained from the actual data. In particular, the initial cohort size is also procyclical and the differences in the size of cohorts do not dissipate over time. I use the model to construct a counterfactual scenario in which I isolate the effect of reputational capital on firm dynamics by holding constant the composition of entrants across cohorts, effectively muting the impact of selection at entry. The wedge between the initial investment made by expansionary and recessionary startups is more than twice as large in this counterfactual scenario as when selection at entry effects are not muted. This result is due to the fact that favorable aggregate demand conditions reduce the average cohort size by incentivizing smaller and less productive businesses to enter the market.

I also employ my framework to analyze the persistence of size differences between cohorts over their lifecycle. In the counterfactual scenario, the difference in average business size between recessionary and expansionary cohorts decreases by approximately three percent per year. By contrast, the simulated average size difference in the baseline scenario is initially smaller but does not decrease over time. This result shows that the demand accumulation process induces a slow convergence of the initial size differences created by temporary aggregate demand shocks. Moreover, the endogenous entry and exit of businesses create a compositional effect that conceals this underlying convergence. The intuition for this result is subtle: a larger share of less productive businesses, which would not be started during bad periods, enter during economic booms. These businesses, which are also smaller and less resilient are more likely to exit as cohorts age, thereby

further slowing the size convergence across cohorts. Furthermore, the idiosyncratic productivity process is mean-reverting, which also contributes to the dissipation of initial differences in the distribution of idiosyncratic productivities.

Finally, I use the model to quantitatively evaluate the role of the persistent effects of entry conditions in the propagation of the Great Recession. I produce an exogenous shock in the model's aggregate demand to mimic the decline in the entrance of new firms that was observed during the Great Recession. My simulations show that the impact of the crisis on businesses born in 2008 and 2009 implied a reduction in aggregate employment by at least 1 percentage point in the following ten years. This accounts for a permanent loss of 1.2 million jobs in the economy.

This paper relates to a number of existing literatures. First, I contribute to the empirical literature on aggregate employment dynamics and its links to business microstructure. Previous literature recognizes that there is substantial heterogeneity in the composition of businesses in an economy and that understanding such variation is critical to study how economic shocks affect employment. Moscarini and Postel-Vinay (2012) documents that the negative correlation between net job creation and the unemployment rate is more pronounced for large firms. By contrast, Fort et al. (2013) shows evidence that younger and smaller businesses are more sensitive to business cycle shocks because the difference between the net job creation rate of young/small and large/mature businesses declines during recessions. More recently, Haltiwanger et al., 2013 provide evidence that age is more important than size in explaining employment creation by firms. Ouimet and Zarutskie (2014) and Davis and Haltiwanger (2014) suggest that the secular decline in the share of young businesses disproportionately affects the younger and less-educated individuals who are more likely to be hired by these firms. I contribute to this work by arguing that the cohort composition of businesses in an economy has important implications for its aggregate gross and net job creation. Moreover, my results suggest that the lower business dynamism of recessionary cohorts could have negative implications for the labor market outcomes of individuals that enter the labor market during downturns.

The facts presented in the paper also speak to an important literature on the propagation of aggregate economic shocks (Cogley and Nason, 1995; King and Rebelo, 1999). The notion that the economic conditions faced by a startup business at inception can have long-lasting consequences for their performance has received little attention by the literature. The exception is Sedláček and Sterk (2014).² This paper studies cohort-level employment in the U.S., and documents that total employment variations across cohorts are found to be persistent, and largely driven by differences in average firm size. Unlike this study, I use micro-level data to empirically estimate how much aggregate economic conditions affect the average size and growth trajectory of businesses. Moreover, I use the granularity of the data to examine the mechanisms that govern this relationship and, guided by these empirical findings, I build a model that allows me to study shock propagation and quantitatively evaluate the role of persistent effects of entry conditions in the amplification and persistence of aggregate shocks.

This paper is also related to a literature that studies the relationship between entrepreneurial activity and business cycles (e.g. Caballero and Hammour (1994), Bernanke and Gertler (1989) Rampini (2004)). Caballero and Hammour (1994) uses a “vintage model of creative destruction” to study the entry and exit of firms in response to fluctuations in aggregate demand and finds that startup rates in the economy depend heavily on the structure of startup costs. The literature also suggests that during economic booms, agency frictions between financial intermediaries and entrepreneurs are less pronounced, which allows entrepreneurs to borrow and invest more (e.g. Bernanke and Gertler (1989)). In this setting, there is a lagged procyclical mechanism running from output to entrepreneurship. Rampini (2004) proposes a model in which positive shocks to an economy increase the productivity of business activities, thereby making agents more willing to tolerate the risk of starting a firm. I add to this literature by examining not only how startup rates vary over the business cycle but also how the quality and evolution of these startups depend on initial business cycle conditions.

The paper also contributes to the literature that examines the role of cohort effects in the labor

²There are also papers inspired by the organizational ecology literature, which suggest that founding conditions can have long-lasting effects because of the importance of initial strategic choices (e.g. Boeker, 1989) or initial stocks of financial and human capital (Cooper, Gimeno-Gascon, and Woo, 1994).

market. This literature suggests that the economic conditions faced by workers when they enter the labor market significantly affect their future earnings. Baker et al. (1994) documents that the initial wage of workers within a firm is affected by the business cycle and that workers who start with higher wages maintain this advantage over time. More recently, Kahn (2010) and Oreopoulos, von Wachter, and Heisz (2012) offer causal evidence that initial labor market conditions significantly affect the lifecycle wage profile of graduating students. Other work suggests that these effects are also found in the market for CEOs. Schoar and Zuo (2013) finds that the economic conditions when individuals become CEOs have a lasting effect on their careers and managerial styles. My paper expands this line of analysis to firm dynamics and shows that firms' post-entry dynamics are also significantly influenced by economic conditions at their time of entry.

Finally, this paper is also related to previous theoretical work on firm dynamics. Lee and Mukoyama (2008) and Clementi and Palazzo (2013) also use Hopenhayn's framework to study entry and exit decisions over the business cycle. More specifically, Clementi and Palazzo (2013) uses a model that includes capital adjustments and decreasing returns to scale, finding that entry and exit enhance the effects of aggregate shocks. In line with the empirical evidence documented in Foster et al. (2008) and Foster et al. (2015), firm growth dynamics are primarily driven by idiosyncratic demand shocks in their model. My empirical findings suggest that differences in input adjustment cost are not significantly associated with differences in size persistence. The model developed in this paper studies firm dynamics in a monopolistic competitive environment where demand plays a role in hindering the ability of businesses to adjust their size.

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