Contents lists available at ScienceDirect

Journal of Macroeconomics

journal homepage: www.elsevier.com/locate/jmacro

Entry costs and the dynamics of business formation

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ARTICLE INFO

Article history: Received 16 October 2014 Accepted 3 March 2015 Available online 8 April 2015

JEL classification: E31 E32 E52

Keywords: Entry cost Firm entry Firm exit Business cycle Business creation Business destruction

1. Introduction

ABSTRACT

This paper studies the implications of entry costs for business formation in a dynamic stochastic general equilibrium model with endogenous entry and exit. The paper first documents some facts about business formation in the US. Exit is more volatile than entry, both are more volatile than output and co-move over the cycle. Firms are less volatile than output and pro-cyclical. Then, it shows that a model with entry and exit can replicate these facts fairly well. In addition it captures important features of the US business cycle, outperforming models with a fixed exit rate and a fixed number of firms. The performance of the model is sensitive to changes in the composition of entry costs.

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The importance of firm entry and exit for the business cycle is well recognized.¹ A novel vintage of general equilibrium models has stressed the role of firm entry and creation of new products in propagating business cycle fluctuations.² They typically consider monopolistic competitive markets where firms produce unique varieties. With a few exceptions, that will be discussed later in the paper, these studies overlook firm exit and the destruction of products as a distinct channel for the transmission of shocks. Some authors, as Bilbie et al. (2008, 2012) and Ghironi and Melitz (2005), focus on labor costs in the spirit of Grossman and Helpman (1991) and Romer (1990). In these models, start-up activities require labor inputs and entry costs are measured as wages. Others, as Bergin and Corsetti (2008) and Cavallari (2013a,b), assume that investors buy materials for the set-up of a new firm, so that entry costs vary with their price. How to model entry costs is an open question.

Entry costs are akin to investment costs in standard (fixed-variety) business cycle models. As for traditional models, there is some debate on the form of these costs. Specifically, the theoretical discussion is on the composition of investment/entry costs and the extent to which these are subject to nominal frictions. Studies that address the role of nominal frictions in entry models include Bergin and Corsetti (2008), Lewis and Poilly (2012) and Uusküla (2008) among others. They document a negative relation between nominal interest rate innovations and business creation and a positive relation between the former and business failures. These findings are at odds with the implications of models that measure entry costs as wages. In these models, a

² A non-exhaustive list of contributions includes: Bilbiie et al. (2008, 2012), Etro and Colciago (2010), Ghironi and Melitz (2005), Bergin and Corsetti (2008), Floetotto and Jaimovich (2008), Lewis (2009), Cavallari (2007), Cavallari (2010), Cavallari (2013a), Cavallari (2013b) and Russ (2007).

http://dx.doi.org/10.1016/j.jmacro.2015.03.002 0164-0704/© 2015 Elsevier Inc. All rights reserved.





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¹ Examples of competitive models of industry dynamics with aggregate fluctuations comprise, among others, Clementi and Palazzo (2013), Campbell (1998) and Lee and Mukoyama (2012).

monetary expansion pushes on labor demand, increasing wages and entry costs. It therefore discourages the creation of new firms. For this motive, Bilbiie et al. (2008) consider entry costs fixed in units of consumption in the sticky price version of their model, while Lewis and Poilly (2012) focus on sticky wages and Bergin and Corsetti (2008) measure entry costs as product prices. Successive research has showed that entry cost specification has important consequences also for the capacity of these models to replicate stylized business cycle facts.³ Surprisingly, the cyclicality of entry and exit is not included among the facts that need to be explained. Furthermore, most studies in this area neglect the role of firm exit for the propagation of shocks.⁴

This paper aims to shed some light on these questions. For this purpose, it provides a dynamic stochastic general equilibrium model that combines a mechanism of firm entry à la Ghironi and Melitz (2005) and endogenous firm exit as in Lee and Mukoyama (2012). The start-up of a new firm requires a combination of labor and capital so as to address entry cost specification. Given the scope of the analysis, which is focused on the implications of sticky prices for firms dynamics, the model considers price staggering à la Calvo (1983) and a monetary policy in the tradition of the Taylor rule (Taylor, 1993) as in Cavallari (2013a).

The paper first documents some facts about entry and exit. Evidence is from plant-level data that cover almost the entire production activity in the United States over the period 1977–2011. Three facts stand out. 1. Exit is more volatile than entry and both are far more volatile than output, almost as much as investments. 2. Entry is pro-cyclical, exit is counter-cyclical and they are negatively correlated between each other. 3. The stock of producers is smoother than output and pro-cyclical.

Then, it compares the performance of the model at replicating these facts under alternative assumptions on entry, exit and the composition of entry costs. A baseline model with endogenous entry and exit replicates business formation data fairly well. In addition, it matches key facts of the US business cycle at least as well as other models. Actually, it does better at matching the smoothness of consumption, investments and hours and their correlation with output.

The baseline model fares favorably relative to a specification with a fixed number of firms because of the role of entry as a business cycle amplifier. As stressed in previous studies, this facilitates the match of macroeconomic data with no need to rely on unplausible high shocks as in traditional (fixed-variety) models. In addition, the baseline model fares better than a specification with a fixed exit rate. I stress that counter-cyclical exits help to reduce the excessive smoothness of macroeconomic variables that is commonly found in models with a fixed exit rate.

The performance of the model is sensitive to changes in the composition of entry costs. In my setup, these costs affect firms' start-ups as well as firms' failures. A free entry condition links firm value to entry costs (actually, they coincide in equilibrium). Firm value in turn is inversely related to the probability of exit. A high volatility of entry reflects a strong incentive to adjust the start-up margin over the cycle, for example by creating a new firm in cyclical upturns. Similarly, the volatility of exit reflects the incentive to modify market participation, for instance by increasing exits in cyclical downturns.

An important contribution of the paper is to clarify the role of endogenous movements in entry costs/firm value in shaping these incentives. Pro-cyclical entry costs – as when these costs are measured by wages – discourage the start-up of new firms and lead to a low volatility of entry. Pro-cyclical firm values, on the other hand, raise the benefits of staying in the market and reflect into a high volatility of exits. By the same token, counter-cyclical entry costs – as when they are measured by product prices – lead to a high volatility of entry and a low volatility of exits.

The paper is organized as follows. Section 2 documents some facts about entry and exit in the US. Section 3 presents the model. Section 4 discusses the results of simulations, illustrates the mechanism of shock propagation at work in the model and assesses its performance at replicating key facts in the data. Section 5 contains conclusive remarks.

2. Entry, exit, and the business cycle

Many studies have documented the behavior of entry and exit over the cycle. A detailed survey of this literature is beyond the scope of this paper. I will rather focus on the comovements with macroeconomic variables, overlooking other important features of firms dynamics that may vary over the cycle. Among the most prominent early studies, Chatterjee and Cooper (1993) show that net business formation and new business incorporations are strongly pro-cyclical. Similarly, Devereux et al. (1996) show that business failures are counter-cyclical.⁵ Floetotto and Jaimovich (2008) confirm these patterns after accounting for heterogeneity at the industry level and for the role of small firms. Broda and Weinstein (2010) have addressed the cyclicality of product variety, documenting pro-cyclical product creation and counter-cyclical product destruction. Yet evidence about volatility and smoothness is sparse. In this section, I address this omission by providing unconditional moments for entry, exit, net entry and the number of establishments in the US economy over the period 1977–2011.

Data are annual and cover the period from 1977 to 2011. Macroeconomic data are from the Bureau of Economic Analysis (BEA). Business formation data are from the Business Dynamics Statistics (BDS) of the US Census Bureau.⁶ The

⁵ These studies provide evidence from Dun & Bradstreet Reference Book and Failure Statistics reported in U.S. Department of Commerce (1975).

³ Cavallari (2013a) shows that measuring entry costs in terms of products helps to alleviate the comovement puzzles in international business cycle models. Cavallari (2013b) shows that it helps to overcome the difficulty of entry models in reproducing the smoothness and persistence of macroeconomic variables together with the volatility of profits and markups.

⁴ A recent evidence suggests the importance of product destruction for economic activity. Bernard et al. (2010) show that the lost value from product destruction represents 30 percent of US output over a 5-year horizon.

⁶ The BDS dataset is publicly available at http://www.census.gov/ces/dataproducts/bds/. It is part of the confidential Longitudinal Business Database (LBD). It covers most of the country's economic activity. The only major exclusions are self-employed individuals, employees of private households, railroad employees, agricultural production employees, and most government employees.

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