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Entry, exit and business cycles in a general equilibrium model

Roberto M. Samaniego *

Economics Department, George Washington University, 2115 G street, NW, Suite 340, Washington, DC 20052, USA

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Abstract

This paper studies the role of entry and exit in the short run behavior of a general equilibrium model with industry dynamics. For tractability, and to preserve potential asymmetries in the impulse responses, I focus on the transition dynamics of the economy after shocks. Entry and exit are found to be insensitive to productivity shocks of reasonable magnitude. Moreover, the dynamics of GDP are insensitive to fluctuations in entry and exit rates, and any asymmetries are negligible. As an application of the model, the paper also asks whether firing costs may interact with entry and exit to affect transition dynamics after shocks, finding that they do not.

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1. Introduction

Recent advances in modeling and in computation have facilitated the development of general equilibrium models of industry dynamics. Although the steady state behavior of such models is well-understood,[1] little is known regarding their short-run behavior. In particular, it is not known whether the process of *entry and exit* is quantitatively important for the response of such an economy to macroeconomic shocks. Nor is it known whether changes in entry and exit rates *themselves* may lead to sizeable macroeconomic fluctuations.

There are several reasons why entry and exit might be important for short-run macroeconomic dynamics. Endogenous entry and exit allow the composition of the economy to vary—a new and relatively unexplored channel that may affect the propagation of shocks. Also, entry and exit are inherently asymmetric decisions, and it is of interest to see whether models with entry and exit are characterized by asymmetric responses to positive and negative shocks. For instance, McQueen and Thorley (1993) find that contractions are sharper than expansions in US data, and models with endogenous entry and exit may also display this feature given that productive capacity in the form of new establish-

* Fax: +1 202 994 6147.
E-mail address: roberto@gwu.edu.

[1] For example, building on the industry model of Hopenhayn (1992), Hopenhayn and Rogerson (1993) study job flows and firing costs, and Samaniego (2008) studies the role of embodied technical change.

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ments is slow to build up but may be quick to destroy. Campbell (1998) develops a model of entry and exit based on a stochastic frontier for embodied technology: however, that paper adopts a linear approach.

This paper develops a general equilibrium model with endogenous entry and exit. I study the response of the model economy to aggregate productivity shocks, and also to shocks that affect the costs of entry and rates of exit. Simulating a stochastic business cycle model with entry and exit represents a technical challenge: however, the business cycle literature finds that impulse response functions can be very informative about short term macroeconomic behavior. Hence, I focus on the transition dynamics of the model economy after a persistent shock to productivity. This approach has the advantage of being tractable, while preserving any asymmetries in the response to positive and negative shocks.

I find that, perhaps surprisingly, entry and exit play very little role in the response of the model economy to aggregate productivity shocks. Entry and exit rates are not sensitive to aggregate shocks, as high-frequency changes in aggregate productivity are too small to significantly affect both the value of startups and the incentive to exit, in addition to being offset by general equilibrium changes in input prices. When the shock also entails changes in the determinants of entry and exit, so that turnover rates fluctuate alongside productivity, changes to the number of entering and exiting plants still account for only a very small portion of job flows under reasonable parameterizations, so that the productive capacity of the economy and the marginal return to inputs are not significantly affected by changes to entry and exit rates.

With one notable exception, related work on the short run behavior of general equilibrium models of industry dynamics typically assumes that the determinants of entry or exit are exogenous. This includes Veracierto (2001), which studies the transition dynamics of the Hopenhayn and Rogerson (1993) framework after the removal of firing costs, and Veracierto (2008), which compares the business cycle behavior of a similar model with and without firing costs. As an application of the current results, I ask how firing costs might affect the business cycle behavior of the model economy when entry and exit are endogenous. While firing costs significantly dampen the response of the aggregate economy to shocks as in Veracierto (2008), entry and exit do not appear to play an important role, and no significant asymmetry is observed with regards to this response. Overall, the paper suggests that related work may safely abstract from entry, exit, and from any attendant asymmetry.

Section 2 describes the model environment. Section 3 defines equilibrium in the model, and Section 4 outlines the calibration procedure. Section 5 examines the response of model aggregates to different kinds of shocks, and the role of entry and exit.

2. Economic environment

The model framework is drawn from Samaniego (2006), which presents a general equilibrium model similar to Hopenhayn and Rogerson (1993) except for the approach to entry and exit. The model description assumes an environment without aggregate uncertainty, as the experiments in Section 5 focus on the deterministic transition dynamics of the model economy.

2.1. Production

A continuum of plants of endogenous mass produce a numeraire good. At any date $t \in \mathbb{N}$, a given plant is characterized by an idiosyncratic productivity shock $z_t > 0$ which is drawn from a distribution $F(z_{t+1}|z_t)$. Firms also face a sequence of aggregate productivity levels $\{s_t\}_{t=0}^{\infty}$, $s_t > 0$, which are common across establishments, and are known with perfect foresight. Each plant chooses its capital input k_t and its labor input n_t so as to maximize discounted profits. Labor is indivisible, so that n_t also equals the number of workers. The plant's production function is $\gamma^t s_t z_t k_t^{\alpha_k} n_t^{\alpha_n}$, where γ is an exogenous productivity growth factor and $\alpha_k + \alpha_n < 1$. The plant pays a wage w_t and a rental rate r_t for each unit of labor and capital that it hires, respectively, and discounts the future at rate ι_t. Let x_t denote the aggregate state of the economy, and let μ_t denote the measure of idiosyncratic shocks z_t across plants. Thus, the aggregate state variable is a triple $x_t = \{\mu_t, K_t, s_t\}$. Let Γ be the law of motion for x_t, so that $x_{t+1} = \Gamma(x_t)$.

2.2. Entry and exit

Aside from the numeraire, there is an intermediate or "managerial" good, one unit of which may be used to create a new establishment. Plants begin operations the period after they are created. Their initial productivity shock z_t is

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