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Firms' entry, monetary policy and the international business cycle ☆

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ABSTRACT

This paper proposes a two-country monetary model with firm entry as a means for alleviating the comovement puzzles in international business cycle models. It shows that business formation can generate fluctuations in output, employment, investment and trade flows close to those in the data while at the same time providing positive international comovements. Simulations show that the presence of imported investment goods is essential for replicating these facts.

1. Introduction

This paper studies the international business cycle in a monetary model with firm entry. It shows that business formation can generate fluctuations in output, employment, investment and trade flows close to those in the data while at the same time providing positive international comovements. The capacity to capture these facts simultaneously overcomes well-known difficulties of standard international business cycle models in this regard. As first shown by Backus et al. (1992), these models typically imply very low or even negative cross-correlations (the comovement puzzle) and a correlation of output lower than that of employment, consumption and investment (the quantity anomaly). In addition, they fail to match the counter-cyclical behavior of net exports. Successive research has mostly relied on some form of market incompleteness as a means for alleviating these puzzles. This paper takes a different route by focusing on entry as an international transmission mechanism for business cycle shocks. It finds that a business cycle expansion in one country leads to the formation of new firms in the trading partner's market: firm entry indeed provides a channel for positive comovements.

I propose a two-country dynamic stochastic general equilibrium model with monopolistic competition where producers are subject to a sunk entry cost, a one-period production lag and to an exogenous exit shock. Investments are represented by entry of new firms. A key assumption in the model is that prior to entry investors must acquire a basket of domestic and foreign goods, so that entry costs have a non-negligible component of imports. Later in the paper, I discuss the implications of modeling entry costs as wages. The economy has complete financial markets and a fully specialized structure of production. Nominal rigidity is captured by a price-setting à la Calvo (1983). Monetary policy is represented in the standard form of a feedback rule as in the Neo-Wicksellian framework (Woodford (2003)) and the global nature of the monetary regime is captured by the interaction of interest rules followed by the monetary authorities in the two countries. I consider floating regimes under symmetric Taylor rules, with or without interest smoothing, and a regime where the exchange rate is fixed at all dates. In order to assess the role of sticky prices I also consider a flexible price equilibrium.

Simulations show that accounting for imports in entry costs is essential for matching the properties of the international business cycle in the data. The reason is the role of the terms of trade in creating new investment opportunities worldwide. In order to see why consider a positive productivity shock in the home country. In the face of the shock, the price of home-produced goods falls relative to the price of foreign-

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produced goods, deteriorating the home terms of trade. In the partner country (the low productivity economy) entry costs fall below the present discounted value of future profits (the value of the firm), thereby stimulating investments in new firms. A rise in the number of producers leads to an expansion in output and employment in both economies. This channel is obscured when entry costs comprise domestic goods only.

The paper belongs to a recent line of research stressing the role of firm dynamics in the business cycle.[1] Its theoretical contribution is to provide a monetary model with firm entry as a means for reconciling international business cycle models with the evidence on comovements. The map of the paper in the literature, however, can be read along more than one dimension. A first dimension concerns the specification of the entry costs. As is now well understood, modeling these costs as wages has counterfactual implications in monetary models. For example, a monetary expansion leads to a fall in business formation at odds with the empirical evidence.[2] For this reason, Bergin and Corsetti (2008) have proposed to model entry costs as product prices. In an open economy, the debate extends to the composition of entry costs in terms of domestic and imported goods. An important contribution of this paper is to clarify that varying the import content of entry costs affects the transmission of business cycle shocks among interdependent economies. In the model, the presence of imported investment goods is essential for reproducing the positive comovements in the data.

The other dimension relates to entry costs as a form of investment in production capacity. As first shown by Bergin and Corsetti (2008), firm entry alters the transmission of monetary policy shocks, acting much like investments at the intensive margin in standard (fixed-variety) models. In a closed economy they find that the presence of the extensive margin amplifies the real effects of monetary policy. A fall in the real interest rate, in fact, raises the expected discounted profits from creating a new firm above the entry cost (i.e., the real price of investment drops), thus encouraging business formation. In open economies, a similar mechanism works through movements in the terms of trade. This is true in most international business cycle models, but analyses explicitly stressing this point, as is done in this paper, are rare.[3] In my model, changes in the terms of trade affect the relative price of investment, in the particular form of "investment to setup a new firm". Business formation, in turn, amplifies the international transmission of shocks, thereby alleviating the comovement puzzles.

A number of authors have analyzed the open economy implications of firm entry. Among early attempts, Cook (2002) finds positive comovements in a real model with sequential entry, time-varying capital utilization and incomplete financial markets. In his model the transmission mechanism is based on a pro-competitive effect of entry that is absent in my setup: business formation causes a decline in markups that leads to an expansion in output, employment and investment in both economies. More recent contributions have mainly focused on explaining the dynamics of trade margins and foreign investments. In these papers, monetary policy is either overlooked (as for example in Ghironi and Melitz (2005) and Helpman et al. (2004)) or considered as an exogenous source of business cycle variability (as in Russ (2007) and Cavallari (2007, 2010)). Yet the evidence discussed above suggests that monetary policy may play a relevant role in a firm's decision whether to start-up a new production unit.

Open economy models combining endogenous monetary policy and firm entry are surprisingly sparse. Most closely related to my work are the papers by Auray et al. (2012) and Auray and Eyquem (2011). The former focuses on a transmission mechanism that may be considered complementary to the one analyzed here. It emphasizes the role of asset prices in a context of complete financial integration and labor entry costs. The free entry condition in the model, equalizing the value of the firm to labor marginal costs, provides a direct link between asset prices and inflation that is absent in my setup. Entry costs as wages, however, imply a positive relation between business formation and interest rate shocks at odds with the data. The latter paper considers incomplete financial markets with given asset prices. In this setup, firm value is tied to an exogenous entry cost and shocks are transmitted through changes in the real return on assets. A rise in the real return on equity, as after a positive productivity shock, is brought about by an increase in the expected dividends from investing in new firms. In the low productivity economy, this requires a fall in business formation in contrast to what found in the data.

The remainder of the paper is organized as follows. Section 2 models a two-country world economy and Section 3 describes the main steps of the log-linear solution. Section 4 presents the simulation of the model under a number of alternative specifications for entry costs and monetary rules. Section 5 concludes. The appendix contains the steady state of the model and the log-linearized equations.

2. The world economy

2.1. Preferences

In each period t, a typical agent i in country $J = H, F$ derives utility from consuming a basket C containing all the goods produced in the world economy while suffering disutility from labor effort, L. Agents maximize the expected discounted value of flow utility U over their life horizon. Flow utility is additive-separable:

$$U_{it}^{J} = \frac{\left(C_{it}^{J}\right)^{1-\rho}}{1-\rho} - \frac{\varphi\chi}{1+\varphi}\left(L_{it}^{J}\right)^{\frac{1+\varphi}{\varphi}} \tag{1}$$

where $\rho > 0$ is the inter-temporal elasticity and $\varphi > 0$ is the Frisch elasticity of labor supply.

The consumption basket C comprises home, C_H, and foreign goods, C_F:

$$C^{J} = \frac{\left(C_{H}^{J}\right)^{\gamma}\left(C_{F}^{J}\right)^{1-\gamma}}{\gamma^{\gamma}(1-\gamma)^{1-\gamma}} \tag{2}$$

where C_H and C_F are given by:

$$\begin{aligned} C_{H}^{J} &= \left[\int_{0}^{N^{H}} C^{J}(h)^{\frac{\theta-1}{\theta}}dh\right]^{\frac{\theta}{(\theta-1)}} \\ C_{F}^{J} &= \left[\int_{0}^{N^{F}} C^{J}(f)^{\frac{\theta-1}{\theta}}df\right]^{\frac{\theta}{(\theta-1)}} \end{aligned} \tag{3}$$

and $\theta > 1$ denotes the elasticity of substitution across varieties. The welfare-based consumer price indexes are given by[4]:

$$P^{J} = \left(P_{H}^{J}\right)^{\gamma}\left(P_{F}^{J}\right)^{1-\gamma} \tag{4}$$

where the producer price indexes P_H^J and P_F^J are:

$$\begin{aligned} P_{H}^{J} &= \left[\int_{0}^{N^{H}} P^{J}(h)^{1-\theta}dh\right]^{\frac{1}{(1-\theta)}} \\ P_{F}^{J} &= \left[\int_{0}^{N^{F}} P^{J}(f)^{1-\theta}df\right]^{\frac{1}{(1-\theta)}} \end{aligned} \tag{5}$$

[1] A non-exhaustive list of contributions in this area includes Ghironi and Mélitz (2005), Corsetti et al. (2007, 2013) and Bilbiie et al. (2007, 2012).

[2] Using US data, Bergin and Corsetti (2008) document that a monetary easing, i.e. a drop in the nominal interest rate, has a positive impact on business formation. See also Lewis (2009) and Uusküla (2008) among others.

[3] An exception is Corsetti et al. (2012). They document that a positive government spending shock crowds out private demand especially in countries with flexible exchange rates. The reason is the rise in investment costs brought about by a depreciating real exchange rate.

[4] The superscript denotes the currency of denomination of the price index. So, P_H^F for instance is the home producer price index in foreign currency.