The Endogeneity of the Exchange Rate as a Determinant of FDI: A Model of Money, Entry, and Multinational Firms

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Introduction

• This is a very interesting paper.

• It contributes to a growing literature that combines recent developments in research on international trade and investment with modern international macroeconomics (Bergin and Glick, various works; Corsetti, Martin, and Pesenti, 2003; Ghironi and Melitz, 2004, among others).

- FDI has become a key channel for resource flows across countries
- How do exchange rate (ER) fluctuations affect FDI?
    - In particular, what is the effect of ER volatility?
- Existing empirical studies report mixed evidence.
    - Goldberg and Kolstad (1995): ER volatility increases FDI (consistent with FDI being a substitute for exports).
    - Campa (1993): ER volatility deters FDI (the more so the larger sunk entry costs into foreign market).

• Most empirical studies are based on partial equilibrium theories of FDI that take the ER as exogenous.

• This paper develops a microfounded, general equilibrium model of FDI and the ER.

• The model combines a version of Helpman, Melitz, and Yeaple (2004)/Melitz (2003) with Devereux and Engel's (2001) model of internationalized production with sticky prices.

• Katheryn adds firm heterogeneity and entry subject to sunk entry costs to the Devereux-Engel setup.

• The model makes it possible to analyze the effect of ER volatility on FDI when both the ER and FDI depend on the same set of fundamentals.

• Key result: ER volatility matters for FDI, but the effect depends on the source of volatility:

- Volatility that originates in the host country encourages FDI.

- Volatility that originates in the native country discourages FDI.

• Hence, the paper provides a structural explanation for ambiguous empirical evidence (and guidance for future empirical work).

• Very nice!

The Endogeneity of the Exchange Rate as a Determinant of FDI

• FDI is endogenous to the ER.

• It is plausible to think that, in general equilibrium, the ER should be endogenous to FDI.

- That sounds realistic to me.

• It is not a feature of this model: The ER does not depend on FDI (or its determinants) in any way.

• Why?

Monetary Policy and Exchange Rate Determination

• The model assumes exogenous money supply (lognormal M^S growth at home and abroad).

• (Relative) money demand, risk-sharing through the market for contingent bonds, and the exogenous M^S ratio are the centerpieces of ER determination.

$$\Rightarrow \quad S_t = \frac{M_t\left(1-\beta\theta\right)}{M_t^*\left(1-\beta\theta^*\right)}.$$

• Once we know the exogenous M^S, we know the ER.

• Recent literature has deemphasized the role of exogenous M^S and money demand in ER determination.

• Empirical evidence: Exogenous monetary shocks play little role relative to systematic response of monetary policy to economic conditions.

• At least since Taylor (1993), it is commonplace to think of monetary policy in terms of endogenous response of the interest rate to the conditions of the economy.

• That has implications for exchange rate determination.

A Simple Log-linear Example

• Assume UIP: $i_{t+1} - i^*_{t+1} = E_t S_{t+1} - S_t$

• Assume PPP: $P_t = S_t + P^*_t \quad \Rightarrow \qquad \pi_t = \Delta S_t + \pi^*_t$

• Assume central banks set interest rates to react to inflation and GDP:

$$i_{t+1} = \alpha_1 \pi_t + \alpha_2 y_t + \xi_t,$$
$$i^*_{t+1} = \alpha_1 \pi^*_t + \alpha_2 y^*_t + \xi^*_t,$$

where ξ is the exogenous component of monetary policy (if we want to have it).

- Policy implies: $i_{t+1}^{D} = \alpha_1 \pi_t^{D} + \alpha_2 y_t^{D} + \xi_t^{D}$.

- But $\pi_t^{D} = \Delta S_t$ (PPP) and $i_{t+1}^{D} = E_t S_{t+1} - S_t$ (UIP).

- Hence, $E_t S_{t+1} - S_t = \alpha_1 \left(S_t - S_{t-1} \right) + \alpha_2 y_t^{D} + \xi_t^{D}$.

- Two implications:

  - No role for money (easy to see if $\alpha_2 = 0$ but true in more general cases).

  - If $\alpha_2 > 0$, the ER depends on the GDP differential and, in turn, on variables that affect it (for instance, net foreign assets).

• PPP does not hold with FDI.

$$\Rightarrow \qquad E_t S_{t+1} - S_t = \alpha_1 \pi_t^D + \alpha_2 y_t^D + \xi_t^D \,. \qquad (*)$$

• Inflation and GDP differentials will depend on ER and (plausibly) FDI in ways that depend on details of the model.

• But, in general, equation (*) will imply that ER is affected by FDI.

• When monetary policy responds endogenously to the conditions of the economy, FDI and ER are endogenous with respect to each other and jointly determined in equilibrium.

• ER volatility will affect FDI, but FDI flows (and their determinants) will matter for the ER.

• It would be very important to investigate the results under a more realistic specification of monetary policy.

• Especially true for a theory that aims to provide guidance for empirical work and in which monetary policy is a key determinant of FDI.

A Model of Entry and Multinational Firms

• When I approached work with Marc, I thought of entry as a mechanism for propagation of economic fluctuations over time (among other roles).

• I still think that.

• The number of firms that produce (N) can be thought of as the capital stock of the economy in our model.

• Potential entrants must pay a one-time sunk entry cost to enter the economy during period t.

• They do that before observing their firm-specific productivity (and subject to other sources of uncertainty).

• They start producing in period $t + 1$.

• The free-entry condition equates the value of the firm (expected PDV of profits from $t + 1$ to ∞) to the sunk entry cost.

• N moves over time as an endogenous state variable.

• There is no endogenous state variable in Katheryn's model.

• There is a predetermined range of possible varieties to which consumers have access:

$$C_t = \left[\int_0^1 c_H(i,t)^{\frac{\mu-1}{\mu}} di + \int_1^2 c_F(i,t)^{\frac{\mu-1}{\mu}} di \right]^{\frac{\mu}{\mu-1}}$$

Home owns potential entrants between 0 and 1; foreign owns potential entrants between 1 and 2.

• At the end of period $t - 1$, each potential entrant finds out its firm-specific productivity in period t.

• The firm then decides whether or not to pay fixed costs to produce at home and abroad during period t based on expectations of economic conditions at home and abroad in that period.

- Fixed cost is sunk relative to ER uncertainty (not relative to productivity).

• $n_{H,t}$ home firms and $n_{F,t}$ foreign firms choose to produce in the home country during period t.

• This sequence of events is repeated every period (firm-specific productivity is i.i.d.).

• In each period t, the home consumer has access to varieties in the ranges $[0, n_{H,t}]$ produced by home-owned firms and $(1, 1 + n_{F,t}]$ produced by foreign-owned firms.

• It helps me to think of this structure of production and access to varieties as an "accordion."

• When all potential entrants produce, the home consumer has access to varieties in the ranges [0, 1] and (1, 2]. This is the maximum amplitude of the accordion.

• In each period t, the accordion is extended to a position that varies depending on how close $n_{H,t}$ is to 0 or 1 and $n_{F,t}$ is to 1 or 2.

• There is no persistence in entry decisions at home or abroad: $n_{H,t}$ and $n_{F,t}$ are not state variables.

• The equilibrium is such that $n_{H,t}$ and $n_{F,t}$ are actually constant.

- The accordion settles at the same amplitude in each period.

• But i.i.d. productivity implies that the identity of the firms that are producing in each period changes relative to the previous period.

- In each period, different buttons are being pushed on the accordion.

• I find it a bit hard to reconcile that with entry and FDI as the creation of new productive facilities or a commitment that involves a potentially long-lasting investment position.

- OECD (1999) definition of FDI: "FDI reflects the objective of obtaining a *lasting interest* by a resident entity in one economy ("direct investor") in an entity resident in an economy other than that of the investor ("direct investment enterprise"). The lasting interest implies the existence of a *long-term relationship* between the direct investor and the enterprise…" (Emphasis added.)

- It seems to me that Katheryn's model could be reinterpreted as follows:

  - Some time in the past (phase 1), firms invested in the creation of productive facilities at home and abroad, defining the maximum possible amplitude of the accordion.

  - They did that subject to uncertainty on their firm-specific productivity and by sinking resources in a one-time fashion.

  - Firms can then decide in each period whether or not to actually turn on these plants subject to period-by-period fixed costs (phase 2, Katheryn's model).

• In this interpretation, I think of phase 1 as the entry and FDI phase, where long-lasting investments are made.

• In a model of phases 1 and 2, one would want to endogenize the maximum amplitude of the accordion, which would become the endogenous state variable that is now missing.

• An alternative is to just slow down the movement of the accordion by using one-time sunk entry costs.

• In my paper with Marc,

$$C_t = \left[\int_{\omega \in \Omega} c_t(\omega)^{\frac{\mu-1}{\mu}} d\omega \right]^{\frac{\mu}{\mu-1}},$$

where the continuum Ω defines the maximum amplitude of our accordion.

• In period *t*, only goods in $\Omega_t \subset \Omega$ are actually available – those supplied by N_t home producing firms and those supplied by $N_{X,t}^*$ foreign exporters (a subset of N_t^* firms producing in the foreign country).

• Suppose we change our model:

* No trade. Foreign firms can set up production facilities at home (using the same technology they use in their native country) subject to one-time sunk costs of the type we now have only for domestic entry.

* A foreign firm contemplating entry into home during period t compares the expected PDV of profits from sales in the home market from $t + 1$ on to the sunk entry cost.

* In each period, there are $N_{E,t}^{H}$ home entrants in the home economy and $N_{E,t}^{F}$ foreign entrants into home.

* Assuming the same exogenous death shock as in my paper with Marc, the total number of firms producing at home during period *t* is:

$$N_t = (1-\delta)\left(N_{t-1} + N^{H}_{E,t-1} + N^{F}_{E,t-1}\right)$$

* FDI into home during period *t* would then be measured by $N^{F}_{E,t}$ (or by $N^{F}_{E,t}$ times the value of foreign firms into home during period *t*).

* Entry (at home or abroad) is a persistent decision and the number of producing firms in each country is an endogenous state variable, propagating fluctuations over time.

* In a world of sticky prices (or wages), it would then be possible to investigate how ER fluctuations affect FDI and how the effects are transmitted across countries and over time.

* This would be a channel for long-lasting real effects of nominal exchange rate movements (Baldwin and Krugman, 1989).

* This may be complicated to do.

* But it is certainly worth trying.

Conclusions

• I like accordion music! I learned a lot from this very insightful paper.

• I see it as the starting point of an exciting research agenda and I look forward to reading more of Katheryn's work in the future.