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Real rigidities and real exchange rate volatility

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This paper shows that certain real rigidities can help explain high volatility of real exchange rates relative to other macroeconomic aggregates. An international real business cycle model is used to demonstrate that real exchange rate volatility increases if (i) it is costly to move labor between sectors and (ii) the consumption of tradable goods requires distribution services. Model dynamics are generated by shocks to productivity and preferences based on sectoral output, employment and consumption data from G-7 countries. The introduction of intersectoral adjustment and distribution costs substantially increases the real exchange rate volatility generated by the model.

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1. Introduction

Real exchange rates are highly volatile relative to other macroeconomic variables. Table 1 reports the average annual percentage standard deviation of real exchange rates relative to output for the G-7 for the period 1970–2004. On average, the real effective exchange rate is 3.15 times as volatile as output. Economists have struggled to account for this “excess volatility.” In the words of Obstfeld and Rogoff (2000, p. 380), “exchange rates are remarkably volatile relative to any model we have of underlying fundamentals such as interest rates, outputs and money supplies.” Chari et al. (2002, p. 533) describe the volatility and persistence of real exchange rates as “the central puzzle in international business cycles.”

One approach to this issue, pioneered by Dornbusch's (1976) “overshooting” model, emphasizes nominal rigidities and monetary shocks. Chari et al. (2002) implement this idea in a calibrated, two-

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Table 1Standard deviations relative to output, 1970–2004^a.

| | REER | RER vs. US |
|----------------|------|------------|
| Canada | 2.52 | 2.76 |
| France | 2.02 | 11.20 |
| Germany | 1.99 | 7.83 |
| Italy | 4.36 | 9.84 |
| Japan | 3.57 | 5.22 |
| United Kingdom | 3.24 | 4.63 |
| United States | 4.36 | – |
| G-7 average | 3.15 | 6.91 |

^a Data: OECD main economic indicators. All data are HP-filtered.

country dynamic general equilibrium model with sticky prices. They are able to match the volatility of the real exchange rate, but only by assuming a high degree of risk aversion.

This paper explores an alternative approach based on real rigidities. It demonstrates that real exchange rates become considerably more volatile when it is costly to move factors of production between sectors, and when consumption of tradable goods requires nontradable distribution services.

The international real business cycle framework developed by [Backus et al. \(1992\)](#) and extended by [Stockman and Tesar \(1995\)](#) is used to examine the effect of distribution costs and intersectoral labor mobility costs on the real exchange rate. Since the intuition is based entirely on relative prices and real costs, money and nominal rigidities are ignored, but the ideas explored here may be viewed as complementary to theories that rely on nominal rigidities. In addition to the standard productivity shocks, preference shocks are introduced to allow consideration of the effects of changes on the demand side of the economy in a nonmonetary framework.

Introducing intersectoral labor mobility and distribution costs causes the standard deviation of the real exchange rate to more than double, increasing from 2.14% to 5.17%. The channels through which real exchange rate movements are affected by real rigidities are investigated by decomposing them into the portions due to the relative price of tradable goods between countries and the relative price of nontradable goods within each country. The effects of the individual shocks are examined by considering the impulse response functions generated by sectoral productivity and relative demand shocks.

The intuition motivating the introduction of costly intersectoral factor movements is relatively simple. Real exchange rates are functions of relative prices. If it is costly to change quantities by reallocating inputs, relative prices will move more. To illustrate, consider a shock that increases the demand for tradable goods. The change in demand raises the relative price of tradables. In the absence of adjustment costs, factors of production would instantly move from the nontradable sector into the tradable sector, increasing the relative supply of tradables, and lowering the price. With adjustment costs, supply does not respond as much and the relative price of tradables remains elevated.

Distribution costs also amplify relative price movements in an intuitively straightforward manner. With distribution costs, when consumers purchase goods, they are also purchasing nontradable services, like retailing. The retail price reflects both the good and service inputs. In order to achieve a given change in retail relative prices, the relative prices of the goods will need to change by a larger amount.

Several strands of empirical research suggest that costs of reallocating labor between sectors may be substantial. The cost of adjusting labor inputs is reflected in the procyclical behavior of labor productivity known as “labor hoarding.” Based on surveys of employers, [Fay and Medoff \(1985\)](#) find that four percent of blue-collar hours should be classified as hoarded during downturns. [Fair \(1985\)](#) provides econometric estimates on aggregate US data consistent with Fay and Medoff’s evidence. [Burgess and Dolado \(1989\)](#) and [Pfann and Palm \(1993\)](#) estimate models of sluggish adjustment of labor inputs on UK data. Both find statistically significant adjustment costs. On the labor supply side, [Lee and Wolpin \(2006\)](#) estimate a dynamic model using survey data on individuals and find significant costs of moving between sectors.

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