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Monetary policy and welfare in a small open economy ☆

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ABSTRACT

This paper analyzes optimal monetary policy in a small open economy featuring monopolistic competition and nominal rigidities. It shows that the utility-based loss function for this economy can be written as a quadratic expression of domestic inflation, output gap and real exchange rate. The presence of an internal monopolistic distortion and a terms of trade externality drives optimal policy away from domestic inflation targeting and affects the optimal level of exchange rate volatility. When domestic and foreign goods are close substitutes for each other, the optimal policy rule implies lower real exchange rate volatility than a domestic inflation targeting regime. The reverse is true when the elasticity of substitution between goods is low.

1. Introduction

At the heart of the policy debate in open economies lays the question of whether central banks should react solely to fluctuations in domestic output and inflation, or whether there is a role for stabilizing international relative prices. While some academic studies show that policy objectives in an open economy can be isomorphic to the ones in a closed economy (e.g. Clarida et al., 2001; Gali and Monacelli, 2005), other contributions have stressed that welfare in open economies may be affected by a terms of trade externality (e.g. Obstfeld and Rogoff, 1998; Corsetti and Pesenti, 2001). The current paper focuses on the implications of this externality for optimal monetary policy in a small open economy setting. We derive a welfare-based loss function for this economy, compute the optimal monetary policy plan, and rank the performance of simple policy rules. Our analysis illustrates how the presence of such externality and an internal monopolistic distortion drives optimal policy away from producer price inflation targeting and affects the optimal level of exchange rate volatility.

As documented in the trade theory literature (see, for example, Corden, 1974), a terms of trade externality arises in an open economy setting when the elasticity of demand for export (or supply of imports) is less than infinite. This fact implies that a social planner may wish to exploit domestic monopoly power by imposing an export tax (or an import tariff) and, thereby, improves its terms of trade.

Such externality has been extensively discussed in the international finance literature. Corsetti and Pesenti (2001) analyse the welfare implications of changes in money supply in a setting characterized by an internal distortion – related to monopolistic supply in the domestic market – and the aforementioned external distortion — related to the country's monopoly power in trade. In closed economies, the internal distortion implies that a monetary expansion can increase output toward its efficient level. But in open economies this expansion also reduces domestic consumers' purchasing power internationally. Because of the latter effect, expansionary policies may reduce welfare. As emphasised in Tille (2001), the overall impact of changes in the money supply depends on the relative size of these two distortions.[1] In a stochastic two-country environment, the terms of trade externality has also been shown to play a crucial role in the welfare and policy evaluation (see, for example, Corsetti and Pesenti, 2005; Benigno and Benigno, 2003).

Our analysis focuses on the implication of the terms of trade externality for monetary policy in a small open economy setting, which

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[1] Early contributions emphasising international welfare spillovers of monetary policy shocks also include Obstfeld and Rogoff (1995, 1998).

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also features the internal monopolistic distortion and nominal rigidities. The small open economy model is derived as a limiting case of a two-country dynamic stochastic general equilibrium framework. The model assumes no trade or financial frictions, that is, the law of one price holds and asset markets are complete. In this setting, we follow the linear-quadratic approach developed by Sutherland (2002) and Benigno and Woodford (2006), and derive a utility-based loss function for the central bank. We show that this loss function can be approximated by a quadratic expression in domestic inflation, output gap and real exchange rate. Moreover, we obtain the optimal response to exogenous shocks in the form of a targeting rule. Our framework encompasses, as special cases, a closed economy setting with a general steady-state degree of monopolistic competition (as in Benigno and Woodford (2005)) and a small open economy setting with unitary elasticity of intertemporal and intratemporal substitution (as in Gali and Monacelli (2005)).[2]

As a result of the external distortion, when domestic and foreign goods are close substitutes, an improvement in the terms of trade can increase welfare by inducing agents to consume more imported goods. These consumers are better off since they can reduce their labor effort without a corresponding fall in their consumption levels. Using a second order approximation of the model, we show that a less volatile real exchange rate is associated with a more appreciated exchange rate on average, or improved terms of trade. Therefore, when domestic and foreign goods close substitutes in the utility and terms of trade improvement can enhance welfare, the volatility of the real exchange rate is lower under the optimal rule than under a domestic inflation targeting regime. For sufficiently large values of the elasticity of intratemporal substitution, a policy that targets the exchange rate can outperform (that is, lead to higher welfare) one that stabilizes domestic prices. The conclusions are, nevertheless, reverted if the substitutability between domestic and foreign goods is low and the expenditure switching ability of terms of trade movements is reduced.

We should note that in our setting, monetary policy is affected by an external distortion because the small open economy retains some market power over its terms of trade. Other contributions to the literature, however, consider a small open economy model in which producers of tradable goods are price takers. In such a setting, and in the presence of a non-tradable sector in which prices are sticky, Lama and Medina (2007) find that the goal of monetary policy should be to replicate the flexible price equilibrium.[3]

Moreover, our analysis assumes a cashless economy and does not allow for any active fiscal instrument to operate on economic distortions. Models that consider different policy instruments, such as labor or consumption taxes, and monetary frictions, driven by transaction constraints, include Adao et al. (2003), Correia et al. (2003) and Hevia and Nicolini (2004).

Our results, nevertheless, complement the analysis of the policy implications of the terms of trade externality documented in the literature. Namely, Corsetti and Pesenti (2005), Devereux and Engel (2003), and Sutherland (2005) have shown that the presence of incomplete pass-through, arising from local currency pricing strategies of firms, can give rise to an international dimension of monetary policy. In particular, when prices of goods are sticky in local currencies, foreign firms' profits are a function of domestic monetary policy; and if the domestic central bank ignores this link, import prices would be too high relative to prices of domestically produced goods.[4] Under producer currency pricing, Benigno and Benigno (2003) identify gains from policy cooperation across countries, as policymakers acting independently have an incentive to affect the terms of trade.[5] Furthermore, Tille (2002) finds that in the presence of sector specific shocks, exchange rate fluctuations translate into misallocation of resources between different firms within a sector. As a result, the monetary authority has an incentive to restrict these fluctuations. In addition, as demonstrated in Corsetti et al. (2007), strategic interactions between upstream and downstream firms may prevent perfect stabilization of the domestic price of final goods. These interactions can induce misalignment of prices both across firms and across sectors, even when shocks affect downstream firms only. Yet, these contributions assume a two-country setting. A specific advantage of studying a small open economy is that one can trace more directly the macroeconomic implications of monetary and exchange rate policy disregarding cross-border strategic interactions in policy making.

Finally, while our approach is to consider a simple specification of an open economy and derive an analytical representation of the monetary policy problem, a large set of the literature have used numerical techniques to evaluate optimal policy in open economies (see, for example, the works of Kollmann (2002), Cova and Søndergaard (2004), and Bergin et al. (2007)). Although these studies have the disadvantage of not being able to illustrate analytically the economic mechanism behind their results, they can be applied to more complex, and possibly more realistic settings.

The remainder of the text is structured as follows. In Section 2, we describe the model features and present the small open economy's dynamics. Section 3 is dedicated to the derivation of welfare and the quadratic loss function. In Section 4, we derive the optimal policy plan, and the inefficiencies of the flexible price allocation are illustrated in Subsection 4.1. In Section 5, we examine the performance of standard policy rules in our small open economy. Finally, concluding remarks are presented in Section 6.

Table 1
Home equilibrium conditions

$$\hat{\pi}_t^H = k\left(\rho\hat{C}_t + \eta\hat{Y}_t + \lambda(1-\lambda)_t^{-1}\hat{Q}_t + \hat{\mu}_t - \eta\hat{\varepsilon}_t\right) + \beta E_t\hat{\pi}_{t+1}^H \quad \text{(AS)}$$

$$\hat{Y}_t = (1-\lambda)\hat{C}_t + \lambda\hat{C}_t^* + \gamma\hat{Q}_t + \hat{g}_t \quad \text{(AD)}$$

$$\hat{C}_t = \hat{C}_t^* + \frac{1}{\rho}\hat{Q}_t \quad \text{(RS)}$$

Where variables are expressed in log deviations from steady-state, i.e. $\hat{X} \equiv \log(X/\bar{X})$.

2. The model

The baseline framework consists of a two-country dynamic general equilibrium model with complete asset markets, monopolistic competition in production and sticky prices. In particular, we assume that home price setting follows a Calvo-type contract. The model features complete pass-through, as prices are set in the producer's currency. Moreover, we abstract from monetary frictions by considering a cashless economy.[6]

In the setup considered, even though the law of one price holds, deviations from purchasing power parity arise from the existence of home bias in consumption. This bias depends on the degree of openness and the relative size of the economy. The specification allows us to characterize the small open economy by taking the limit of the home economy size to zero. Prior to applying the limit, we derive the optimal equilibrium conditions for the two-country model. After the limit is taken, the two countries, Home and Foreign, represent the small open economy and the rest of the world, respectively.

[2] The framework considered in Gali and Monacelli (2005) only imposes unitary elasticity of intertemporal and intratemporal substitution when deriving the objective function.

[3] Similar conclusions are suggested in Aoki (2001), in which a two-sector closed economy model is applied to a small open economy that produces differentiated goods whose prices are sticky and imports goods whose prices are flexible. We should note that, given that the model considered in Lama and Medina (2007) also features segmented markets, the aforementioned result holds when abstracting from policy incentives to enhance risk sharing.

[4] Devereux and Engel (2003) suggest that optimal policy in this environment may consist of a fixed exchange rate regime. But, as Corsetti (2007) and Duarte and Obstfeld (2008) point out, the fact that the exchange rate does not move under the optimal policy can be a result of the (symmetric) structure of the model and not a product of efficient stabilization.

[5] A similar analysis is discussed in Pappa (2004).

[6] For details on this specification see Woodford (2003, chapter 2).