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# Optimal monetary policy with endogenous export participation ☆

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ABSTRACT

This paper studies optimal monetary policy in an open economy with firm heterogeneity and monopolistic competition. I consider a two-country dynamic general equilibrium model where firms make decisions to enter and exit the domestic and export markets. I show that endogenous export participation creates an incentive for policymakers to set high interest rates. This leads to high long-run inflation. Firm entry magnifies the welfare cost of inflation generating large gains to international monetary cooperation.

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## 1. Introduction

This paper studies optimal monetary policy in an open economy with firm heterogeneity and monopolistic competition. I consider a two-country dynamic general equilibrium model where firms make decisions to enter and exit the domestic and export markets.[1] Monetary policy affects firm entry, exit, and export decisions because firms fund working capital by borrowing from financial intermediaries.[2] There are two main results regarding optimal monetary policy. Endogenous export participation creates an incentive for policymakers to set higher interest rates than they would do if all firms were to export. This leads to high long-run inflation. Firm entry magnifies the welfare cost of inflation generating large gains to international monetary cooperation.

Determining optimal monetary policy in the open economy requires understanding how countries interact through the terms of trade – the relative price of foreign to home output. In the closed economy, a monetary contraction creates a shortage of liquidity in the financial sector, reducing the supply of loanable funds. The resulting rise in the interest rate induces firms who need working capital to reduce output. The Friedman rule (a zero nominal interest rate) is the optimal

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[1] As in Melitz (2003), new entrants can choose to produce a differentiated variety, or exit immediately. Firms that produce also choose whether or not to export.

[2] Working capital is used by firms to cover payments (e.g. the costs of inputs) prior to the realization of revenues. The working capital channel has recently been stressed by Christiano et al. (2011) and Jermann and Quadrini (2012).

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monetary policy.[3] In the open economy, with a given foreign monetary policy, a home monetary contraction improves the terms of trade, and with a given home monetary policy, an improvement in the terms of trade increases consumption. Thus, it can be optimal for the interest rate to depart from the Friedman rule in the open economy because the terms of trade provide a mechanism through which higher interest rates indirectly raise household consumption.

Once heterogeneous firms make entry and exit decisions there is a second reason for the interest rate to depart from the Friedman rule. Due to selection, only high productivity firms – those which can generate enough revenue to pay market entry costs – export. With a given foreign monetary policy, a home monetary contraction increases the costs associated with production and market entry, and this lowers the rate of export participation. Higher interest rates therefore force weaker firms to exit the market, or shut-down altogether, whilst only the most productive firms continue to export. This process leads to a reallocation of labor towards productive firms and raises economy-wide productivity. Because labor can be reallocated within each country, when countries set monetary policy independently, there is an added incentive for policymakers to raise interest rates, and this leads to higher long-run inflation.

Two parameters play a key role in determining optimal monetary policy in my analysis. First, the lower the elasticity of substitution between home and foreign goods, the larger the improvement in the terms of trade, for a given increase in the interest rate. Since an improved terms of trade allows one country to import more, for a given amount of exports, a low elasticity raises the incentive of the policymaker to set a high interest rate. Second, with fixed costs of exporting, there is a productivity threshold which determines the rate of export participation. When the underlying dispersion of firm productivity is low there are relatively many firms concentrated around the threshold. Marginal firms below the threshold are not too different from those firms that already export and the selection effect is strong. A stronger selection effect generates a larger increase in economy-wide productivity and this further raises the incentive to set a high interest rate.[4]

Endogenous entry also has implications for the welfare loss associated with setting monetary policy independently across countries. I compute the increase in steady-state consumption which an individual would require to be as well-off as under international monetary cooperation. I show analytically, at a given rate of long-run inflation, the welfare loss is an increasing function of the monopoly markup. This magnification effect occurs because inflation discourages firm entry into the domestic market. With Dixit–Stiglitz preferences, the monopoly markup is equated with consumer love-for-variety, and as the markup rises, so does the cost of inflation. Thus, when inflation results from strategic interaction between countries, the welfare loss from setting monetary policy independently departs from the standard model – i.e., the model without firm entry, exit, and export decisions – in two ways. Inflation is higher due to selection and the welfare cost of inflation is magnified due to endogenous firm entry.

Finally, I consider the quantitative implications of the selection effect in my model by fixing heterogeneity in firm productivity and increasing the elasticity of substitution for different monopolistic markups. In the baseline calibration, with an elasticity of 1.25 and a markup of 20%, annual inflation is 7.1%. The implied a welfare loss is 1.7% in units of consumption. I interpret my results in the context of a literature that seeks to evaluate the cost of long-run inflation when countries set monetary policy independently. Cooley and Quadrini (2003) develop a model in which inflation affects the relative price of intermediate inputs for a representative firm. In their baseline calibration, an annual 3.2% inflation generates a welfare loss of 0.7%. In the quantitative analysis, I also extend the model and allow for exogenous labor taxes, import tariffs, and international trade in financial assets.[5] With additional domestic distortions, inflation falls, but the welfare cost of setting monetary policy independently remains high.

In the model I develop, prices are flexible, money is held for transactions purposes, and monetary policy generates real effects because households face restrictions in their choice of portfolio composition, consistent with a limited participation assumption.[6] This source of monetary non-neutrality stands in contrast to the New Keynesian literature, which instead imposes restrictions on the setting of prices or wages, and focuses short-run stabilization policies.[7] Recently, Bergin and Corsetti (2013) have developed an open economy New Keynesian model with a production relocation externality, partly inspired by Ossa's (2011) analysis of trade policy. They find the welfare gains to international monetary coordination (using stabilization rules) are magnified when there is firm entry, complementing the results I present here, which are based on firm heterogeneity and endogenous export participation.

The approach taken in this paper is also related to a growing literature that analyzes trade policy in new trade models with firm heterogeneity. For example, Demidova and Rodriguez-Clare (2009) show how trade policies can be used to correct for monopoly distortions in a small open economy and Felbermayr et al. (2013) study optimal tariffs in a two-country setting. Both of these studies demonstrate that the underlying distribution of productivity plays a key role in determining

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[3] The optimality of the Friedman rule is not particular to the class of monetary model I consider. An extensive discussion is contained in Schmitt-Grohe and Uribe (2010).

[4] Both the dispersion in firm productivity and the monopolistic markup alter firm heterogeneity. I stress the role of productivity dispersion in the discussion because the markup plays an independent role in determining optimal monetary policy.

[5] I do not consider the joint determination of fiscal instruments with monetary policy. In fixed-variety models, optimally set tariffs can eliminate the role of monetary policy to change the terms of trade.

[6] Limited participation models of monetary policy are based on the idea that producers need to finance working capital. See Fuerst (1992).

[7] Corsetti et al. (2010) provide an overview of the sticky-price approach in the open economy, where the welfare gains to international monetary cooperation are thought to be small. In the limited participation framework of Cooley and Quadrini (2003), the welfare loss associated with losing the ability to react optimally to shocks is dominated by the benefits of reduced long-run inflation.

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