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BEYOND COMPETITIVE DEVALUATIONS:

THE MONETARY DIMENSIONS OF COMPARATIVE ADVANTAGE

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Motivated by the long-standing debate on the pros and cons of competitive devaluation, we propose a new perspective on how monetary and exchange rate policies can contribute to a country's international competitiveness. We refocus the analysis on the implications of monetary stabilization for a country's comparative advantage. We develop a two-country New-Keynesian model allowing for two tradable sectors in each country: while one sector is perfectly competitive, firms in the other sector produce differentiated goods under monopolistic competition subject to sunk entry costs and nominal rigidities, hence their performance is more sensitive to macroeconomic uncertainty. We show that, by stabilizing markups, monetary policy can foster the competitiveness of these firms, encouraging investment and entry in the differentiated goods sector, and ultimately affecting the composition of domestic output and exports. Panel regressions based on worldwide exports to the U.S. by sector lend empirical support to the theory. Constraining monetary policy with an exchange rate peg lowers a country's share of differentiated goods in exports between 4 and 12 percent.

Beyond Competitive Devaluations:
The Monetary Dimensions of Comparative Advantage

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Abstract

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Keywords: monetary policy, production location externality, firm entry, optimal tariff
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1. Introduction

This paper offers a new perspective on how monetary and exchange rate policy can strengthen a country's international competitiveness. The conventional policy model emphasizes the competitive gains from currency devaluation, which lowers the relative cost of producing in a country over the time span that domestic wages and prices are sticky in local currency. In modern monetary theory and central bank practice, however, the resort to competitive devaluation is not viewed as a viable policy recommendation, as it invites retaliation and currency wars, and furthermore, is bound to worsen the short-run trade-offs between inflation and unemployment. Conversely, recent contributions to the New Open Economy Macro (NOEM) and New-Keynesian (NK) tradition stress that monetary policymakers can exploit a country's monopoly on its terms of trade. As this typically means pursuing a higher international price of home goods, the implied policy goal appears to be the opposite of improving competitiveness.[1] In this paper, we pursue a different approach, focusing on the implications of monetary and exchange rate regimes for a country's comparative advantage.

We motivate our analysis with the observation that monetary policy aimed at stabilizing marginal costs and demand conditions at an aggregate level (weakening or strengthening the exchange rate in response to cyclical disturbances) is likely to have asymmetric effects across sectors. Stabilization policy can be expected to be more consequential in industries where firms face higher nominal rigidities as well as significant up-front investment to enter the market and price products---features typically associated with differentiated manufacturing goods. To the extent that monetary policy ensures domestic macroeconomic stability, it creates favorable conditions for firms' entry in such industries, with long-lasting effects on their competitiveness, and thus their weight in domestic output and exports.

[1] In virtually all contributions to the new-open economy macroeconomics and New-Keynesian literature, the trade-off between output gap and exchange rate stabilization is mainly modeled emphasizing a terms-of-trade externality (see Obstfeld and Rogoff (2000) and Corsetti and Pesenti (2001, 2005), Canzoneri et al. (2005) in the NOEM literature, as well as Benigno and Benigno (2003), and Corsetti et al. (2010) in the New-Keynesian literature, among others). Provided the demand for exports and imports is relatively elastic, an appreciation of the terms of trade of manufacturing allows consumers to substitute manufacturing imports for domestic manufacturing goods, without appreciable effects in the marginal utility of consumption, while reducing the disutility of labor. The opposite is true if the trade elasticity is low.

To illustrate our new perspective on the subject, we specify a stochastic general-equilibrium monetary model of open economies with incomplete specialization across two tradable sectors. In one sector, conventionally identified with manufacturing, firms produce an endogenous set of differentiated varieties operating under imperfect competition; in the other sector, firms produce highly substitutable, non-differentiated goods under perfect competition. One key distinction between these sectors is that nominal rigidities are relevant only for the differentiated producers, who have some monopoly power and therefore are able to set their product prices. A second key distinction is that establishing a differentiated product requires a sunk entry investment, which does not apply to nondifferentiated goods producers.

The core result from our model is that efficient stabilization rules lower the average relative price of a country's differentiated goods in terms of its nondifferentiated goods, conferring comparative advantage in the sale of differentiated goods both at home and abroad. Underlying this result is a transmission channel at the core of modern monetary literature: in the presence of nominal rigidities, uncertainty implies the analog of a risk premium in a firm's prices, depending on the covariance of demand and marginal costs (See Obstfeld and Rogoff 2000, Corsetti and Pesenti 2005 and more recently Fernandez-Villaverde et al. 2011). We show that, by affecting this covariance, and thus the variability of the ex-post markups, optimal monetary policy contributes to manufacturing firms setting low, competitive prices *on average,* with a positive demand externality affecting the size of the market. A larger market in turn strengthens the incentive for new manufacturing firms to enter, see e.g., Bergin and Corsetti (2008) and Bilbiie, Ghironi and Melitz (2008). We derive a key testable implication of the theory: everything else equal, countries with a reduced ability to stabilize macro shocks will tend to specialize away from differentiated manufacturing goods, relative to the countries that use their independent monetary policy to pursue inflation and output gap stabilization.

We calibrate our model using novel estimates of the TFP process for differentiated and non-differentiated sectors in the US vis-à-vis an aggregate of European countries. In the calibrated model we find that the unconditional mean of the share of a country's exports in differentiated goods falls by more than one percent, and as much as 9 percent depending on the calibration, if a country replaces optimal monetary rules with a unilateral peg implying inefficient output gap stabilization.

At an empirical level, we contribute novel evidence on the key prediction of the model, by conducting panel regressions of the composition of exports to the U.S. by country, on indicators for the exchange rate regime of that country. The regression model includes country and year fixed effects, to account for determinants of comparative advantage, as well as a number of controls to account for macroeconomic and financial factors that may weigh on a country's exports: the real exchange rate, the current account balance, currency and banking crisis dummies, as well as an index of capital account liberalization.

We find that a peg does reduce the share of differentiated goods in a country's exports. This result is robust to changing the reference sample (e.g. to excluding oil exports and oil exporting countries), as well as to adopting alternative classifications of the exchange rate regime, and/or of instruments designed to control for the endogeneity of a peg. The point estimate of this effect is in the range between 2 and 6 percentage points. Given that the average differentiated goods share is around one-half, this implies an effect of 4 to 12 percent, which is a large effect by macroeconomic standards. We should stress here that our study is entirely distinct from the macroeconomic literature on the effects of exchange rate volatility on the volume of exports; we instead provide theoretical arguments and evidence that exchange rate and monetary regimes have appreciable effects on the *composition* of exports by types of good.

In line with well-known contributions to the NOEM and NK literature,[2] our model suggests that efficient stabilization affects a country's terms of trade. The underlying mechanism, however, is distinct. The NOEM and NK literature appeals to a terms-of-trade externality and the (monetary-analog) of the optimal tariff argument. While a terms-of-trade externality is also present in our model, our main result actually rests on a change in the composition of exports. Namely, by lowering average markups in the manufacturing sector,

[2] Our theory has implications for the analysis of cross-border policy cooperation. Namely, the impact of monetary policy on trade and production patterns creates welfare incentives to deviate from monetary rules that are efficient from a global perspective, defining a policy game over comparative advantages. While related to the NOEM literature studying strategic policy and coordination (see the discussion in Corsetti et al. 2010), the mechanism producing gains from cooperation in our model is different.

stabilization policy fosters the production of high value-added goods. As the average supply of these goods rises, their share in exports increases, more than offsetting any fall in manufacturing prices. From the perspective of trade theory, our analysis is related to leading work on tariffs by Ossa (2011), also lending theoretical support to the competitiveness argument. This paper, like ours, models a country's comparative advantage drawing on the literature on the 'home market effect' after Krugman (1980), implying production relocation externalities associated with the expansion of manufacturing.[3]

The text is structured as follows. The next section describes the model. Section 3 derives analytical results for a simplified version of the model, and section 4 uses stochastic simulations to demonstrate a broader set of implications. Section 5 presents empirical evidence in support of the theory. Section 6 concludes.

2. Model

In what follows, we develop a two-country monetary model, introducing a key novel element in the way we specify the goods market structure. Namely, each country—home and foreign--- produces two types of tradable goods. The first type comes in differentiated varieties produced under monopolistic competition. This is the market where firms face entry costs and nominal rigidities. The second type of good is produced by perfectly competitive firms, and is modeled according to the standard specification in real business cycle models. For this good, there is perfect substitutability among producers within a country (indeed, the good is produced under perfect competition), but imperfect substitutability across countries, as summarized by an Armington elasticity.

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[3] According to the 'home market effect,' the size of the market (i.e. a high demand) is a source of comparative advantage in manufacturing. In this literature, the social benefits from gaining comparative advantage in the manufacturing sector stem from a 'production relocation externality.' In the presence of such an externality, acquiring a larger share of the world production of differentiated goods produces welfare gains due to savings on trade costs. Our work is also related to Corsetti et al. (2007), which considers the role of the home market effect in a real trade model, as well as Ghironi and Melitz (2005). We differ in modeling economies with two tradable sectors, as well as considering the implications of price stickiness and monetary policy.

2.1. Goods market structure

Households consume goods from two sectors. The *D* sector consists of differentiated varieties of manufacturing good, which are produced by *n* and *n** monopolistically competitive firms in the home and foreign country, respectively (from now on, foreign variables will be denoted with an asterisk). Each variety in the *D* sector is an imperfect substitute for any other variety in this sector, either of home or foreign origin, with elasticity ϕ. The *N* sector consists of non-differentiated goods, produced by perfectly competitive firms. The home and foreign versions of the *N* good are imperfect substitutes for each other, with elasticity η. For convenience, hereafter we may refer to the first sector as 'manufacturing.'

The overall consumption index is specified:

$$C_t \equiv C_{D,t}^{\theta} C_{N,t}^{1-\theta},$$

where

$$C_{D,t} \equiv \left(\int_0^{n_t} c_t(h)^{\frac{\phi-1}{\phi}} dh + \int_0^{n_t^*} c_t(f)^{\frac{\phi-1}{\phi}} df \right)^{\frac{\phi}{\phi-1}}$$

is the index over the home and foreign varieties of manufacturing good, $c(h)$ and $c(f)$, and

$$C_{N,t} \equiv \left(\nu^{\frac{1}{\eta}} C_{H,t}^{\frac{\eta-1}{\eta}} + (1-\nu)^{\frac{1}{\eta}} C_{F,t}^{\frac{\eta-1}{\eta}} \right)^{\frac{\eta}{\eta-1}}$$

is the index over goods differentiated only by country of origin, with ν accounting for the weight on domestic goods. The corresponding consumption price index is

$$P_t \equiv \frac{P_{D,t}^{\theta} P_{N,t}^{1-\theta}}{\theta^{\theta}(1-\theta)^{1-\theta}}, \tag{1}$$

where

$$P_{D,t} = \left(n_t p_t(h)^{1-\phi} + n_t^* p_t(f)^{1-\phi} \right)^{\frac{1}{1-\phi}} \tag{2}$$

is the index over the prices of all varieties of home and foreign manufacturing goods, and

$$P_{N,t} = \left(\nu P_{H,t}^{1-\eta} + (1-\nu) P_{,Ft}^{1-\eta} \right)^{\frac{1}{1-\eta}} \tag{3}$$

is the index over the prices of home and foreign non-differentiated goods.

These definitions imply relative demand functions for domestic residents:

$$c_t(h) = \left(p_t(h)/P_{D,t}\right)^{-\phi} C_{D,t} \tag{4}$$

$$c_t(f) = \left(p_t(f)/P_{D,t}\right)^{-\phi} C_{D,t} \tag{5}$$

$$C_{D,t} = \theta P_t C_t / P_{D,t} \tag{6}$$

$$C_{N,t} = (1-\theta) P_t C_t / P_{N,t} \tag{7}$$

$$C_{H,t} = \nu \left(P_{H,t} / P_{N,t}\right)^{-\eta} C_{N,t} \tag{8}$$

$$C_{F,t} = (1-\nu)\left(P_{F,t} / P_{N,t}\right)^{-\eta} C_{N,t}. \tag{9}$$

2.2. Home household problem

The representative home household derives utility from consumption (*C*), and from holding real money balances (*M/P*); it derives disutility from labor (*l*). The household derives income by selling labor at the nominal wage rate (*W*); it receives real profits $\left(\Pi_t\right)$ from home firms as defined below, and interest income (*iB*) on holding domestically traded bonds, which are in zero net supply. It pays lump-sum taxes (*T*).

Household optimization for the home country may be written:

$$\max E_0 \sum_{t=0}^{\infty} \beta^t U\left(C_t, l_t, \frac{M_t}{P_t}\right)$$

where utility is defined by

$$U_t = \frac{1}{1-\sigma} C_t^{1-\sigma} + \ln \frac{M_t}{P_t} - \frac{1}{1+\psi} l_t^{1+\psi},$$

subject to the budget constraint:

$$P_t C_t + \left(M_t - M_{t-1}\right) + \left(B_t - \left(1+i_{t-1}\right) B_{t-1}\right) = W_t l_t + \Pi_t - T_t.$$

Above, σ denotes risk aversion and ψ the inverse of the Frisch elasticity. Defining $\mu_t = P_t C_t^{\sigma}$, optimization implies an intertemporal Euler equation:

$$\frac{1}{\mu_t} = \beta(1+i_t)E_t\left[\frac{1}{\mu_{t+1}}\right] \tag{10}$$

a labor supply condition:

$$W_t = l_t^{\psi} \mu_t \tag{11}$$

and a money demand condition:

$$M_t = \mu_t\left(\frac{1+i_t}{i_t}\right). \tag{12}$$

The problem and first order conditions for the foreign household are analogous.

2.3. Home firm problem and entry condition

In the differentiated goods sector, production is linear in labor:

$$y_t(h) = \alpha_{D,t} l_t(h), \tag{13}$$

where $l(h)$ is the labor employed by firm h, and α_D is stochastic technology common to all differentiated goods producers in the country. Exports involve an iceberg trade cost, τ_D, so that

$$y_t(h) = d_t(h) + (1+\tau_D)d_t^*(h), \tag{14}$$

where $d_t(h) = c_t(h) + d_{AC,t}(h) + d_{K,t}(h)$ is total demand for the product in the home country, for use in consumption, adjustment costs, and entry costs, respectively; $d_t^*(h)$ is the corresponding demand for home goods abroad. Firm profits are computed as:

$$\pi_t(h) = p_t(h)d_t(h) + e_t p_t^*(h)d_t^*(h) - W_t y_t(h)/\alpha_t - AC_{p,t}(h). \tag{15}$$

There is free entry into the sector. To set up a firm, managers incur a one-time sunk cost, K, and production starts with a one-period lag. In each period, firms face an exogenous probability of exit δ, so that fraction δ of all firms exogenously stop operating each period. Let n_t represent the number of firms, and define new entrants to the export market, ne_t. The stock of firms at each point in time is:

$$n_{t+1} = (1-\delta)(n_t + ne_t). \tag{16}$$

The value function of firms that enter period t may be represented as the discounted sum of profits of domestic sales and export sales,

$$v_t(h) = E_t\left\{\sum_{s=0}^{\infty}\left(\beta(1-\delta)\right)^s \frac{\mu_{t+s}}{\mu_t}\pi_{t+s}(h)\right\}.$$

Firms enter until the point that a firm's value equals the entry sunk cost. This entry cost includes a congestion externality, represented as an adjustment cost that is a function of the number of new firms.

$$K_t = \left(\frac{ne_t}{ne_{t-1}}\right)^{\lambda}\overline{K}.$$

The congestion externality plays a similar role as the adjustment cost for capital standard in business cycle models, which moderates the response of investment to match dynamics in data. We calibrate the adjustment cost to match data on the dynamics of new firm entry. We allow entry costs to consist of labor units or investment in differentiated goods units. The entry condition may be written

$$v_t(h) = \left(\theta_K W_t + (1-\theta_K)P_{Dt}\right)K_t\ , \tag{17}$$

where θ_K =1 is the case of entry costs in labor units, and θ_K =0 is the case of goods units. The goods component of the entry cost falls on both domestically produced and imported goods, in similar proportion as consumption:

$$d_{K,t}(h) = \left(p_t(h)/P_{D,t}\right)^{-\phi}(1-\theta_K)ne_t K_t \tag{18}$$

$$d_{K,t}(f) = \left(p_t(f)/P_{D,t}\right)^{-\phi}(1-\theta_K)ne_t K_t\ . \tag{19}$$

The home firm *h* sets a price *p(h)* in domestic currency units for domestic sales. Under the assumption of producer currency pricing, this implies a foreign currency price

$$p^*{}_t(h) = (1+\tau_D)\,p_t(h)/e_t\ , \tag{20}$$

where the nominal exchange rate, *e*, is defined as home currency units per foreign currency unit. Firms face a nominal cost of adjusting prices

$$AC_t(h) = \frac{\psi_P}{2}\left(\frac{p_t(h)}{p_{t-1}(h)} - 1\right)^2 p_t(h)\,y_t(h)\,. \tag{21}$$

For the sake of tractability, we follow Bilbiie et al. (2008) in assuming that new entrants inherit from the price history of incumbents the same price adjustment cost, and so make the same price setting decision. The aggregate value of the price adjustment costs is:

$$AC_t(h) = n_t AC_t(h). \tag{22}$$

To adjust their price, firms use final goods according to:

$$d_{AC,t}(h) = \left(p_t(h)/P_{M,t}\right)^{-\phi} D_{AC,D,t} \tag{23}$$

$$d_{AC,t}(f) = \left(p_t(f)/P_{M,t}\right)^{-\phi} D_{AC,D,t} \tag{24}$$

$$D_{AC,D,t} = \theta P_t AC_t / P_{D,t} \tag{25}$$

$$D_{AC,N,t} = (1-\theta) P_t AC_t / P_{N,t} \tag{26}$$

$$D_{AC,H,t} = \nu\left(P_{H,t}/P_{N,t}\right)^{-\eta} D_{AC,N,t} \tag{27}$$

$$D_{AC,F,t} = (1-\nu)\left(P_{F,t}/P_{N,t}\right)^{-\eta} D_{AC,N,t}. \tag{28}$$

similar to the composition of equations (4)-(9).

Maximizing firm value subject to the constraints above leads to the price setting equation:

$$\begin{aligned} p_t(h) = {} & \frac{\phi}{\phi-1}\frac{W_t}{\alpha_t} + \frac{\psi_P}{2}\left(\frac{p_t(h)}{p_{t-1}(h)}-1\right)^2 p_t(h) - \psi_P \frac{1}{\phi-1}\left(\frac{p_t(h)}{p_{t-1}(h)}-1\right)\frac{p_t(h)^2}{p_{t-1}(h)} \\ & + \frac{\psi_P}{\phi-1}E_t\left[\beta\frac{\Omega_{t+1}}{\Omega_t}\left(\frac{p_{t+1}(h)}{p_t(h)}-1\right)\frac{p_{t+1}(h)^2}{p_t(h)}\right] \end{aligned} \tag{29}$$

where the optimal pricing is a function of the stochastically discounted demand faced by a domestic differentiated goods producer:

$$\begin{aligned} \Omega_t = {} & \left[\left(\frac{p_t(h)}{P_{M,t}}\right)^{-\phi}\left(C_{D,t} + D_{AC,D,t} + (1-\theta_K)ne_{t-1}K_{t-1}\right)\right. \\ & \left. + \left(\frac{(1+\tau_D)p_t(h)}{e_t P^*_{M,t}}\right)^{-\phi}(1+\tau_D)\left(C^*_{D,t} + D^*_{AC,D,t} + (1-\theta_K)ne^*_{t-1}K^*_{t-1}\right)\right] \Big/ \mu_t. \end{aligned}$$

Note that, since firms are owned by households, these receive firm profits and finance the creation of new firms, so the profit term in the household budget constraint may be written:

$$\Pi_t = n_t \pi_t(h) - ne_t v_t(h).$$

In the second sector firms are assumed to be perfectly competitive in producing a good differentiated only by country of origin. The production function for the home non-differentiated good is linear in labor:

$$y_{H,t} = \alpha_{H,t} l_{H,t} , \tag{30}$$

where $\alpha_{H,t}$ is subject to shocks. It follows that the price of the homogeneous goods in the home market is equal to marginal costs:

$$p_{H,t} = W_t / \alpha_{H,t} . \tag{31}$$

An iceberg trade cost specific to the non-differentiated sector implies prices of the home good abroad are

$$p^*_{H,t} = p^*_{H,t}\left(1+\tau_N\right)/e_t . \tag{32}$$

Analogous conditions apply to the foreign non-differentiated sector.

2.4. Government

The model abstracts from public consumption expenditure, so that the government uses seigniorage revenues and taxes to finance transfers, assumed to be lump sum. The home government faces the budget constraint:

$$M_t - M_{t-1} + T_t = 0 . \tag{33}$$

In the home country, monetary authorities are assumed to pursue an independent monetary policy, approximated by the following Taylor rule:

$$1+i_t = \left(1+\bar{i}\right)\left(\frac{p_t(h)}{p_{t-1}(h)}\right)^{\gamma_p}\left(\frac{Y_t}{\overline{Y}}\right)^{\gamma_Y} . \tag{34}$$

In this rule, inflation is defined in terms of differentiated goods producer prices, while *Y* is a measure of output defined as:

$$Y_t = \left(\int_0^{n_t} p_t(h) y_t(h) dh + p_{Ht} y_{H,t}\right) / P_t .$$

In running the model, we will use either the above or a narrower definition of output, including only manufacturing. Given our calibration of the Taylor rule, with a high coefficient on inflation, this will be immaterial for our results. In the foreign country, monetary authorities are assumed to pursue either a Taylor rule similar to (34) or, alternatively, an exchange rate peg:

$$e_t = \bar{e}. \tag{35}$$

2.5. Market clearing

The market clearing condition for the manufacturing goods market is given in equation (14) above. Market clearing for the non-differentiated goods market requires:

$$y_{H,t} = C_{H,t} + D_{AC,H,t} + (1+\tau_N)\left(C^*_{H,t} + D^*_{AC,H,t}\right) \tag{36}$$

$$y_{F,t} = C_{F,t} + D_{AC,F,t} + (1+\tau^*_N)\left(C^*_{F,t} + D^*_{AC,F,t}\right). \tag{37}$$

Labor market clearing requires:

$$\int_0^{n_t} l_t(h)dh + l_{H,t} + \theta_K n e_t K_t = l_t. \tag{38}$$

Bond market clearing requires:

$$B_t = 0. \tag{39}$$

Under the assumption of no international trade in assets, international trade in goods must be balanced period by period:

$$\begin{aligned}&\int_0^{n_t} p^*_t(h)\left(c^*_t(h) + d^*_{Kt}(h) + d^*_{AC,t}(h)\right)dh - \int_0^{n^*_t} p_t(f)\left(c_t(f) + d_{Kt}(f) + d_{AC,t}(f)\right)df \\ &+ P^*_{Ht}\left(C^*_{Ht} + D^*_{AC,H,t}\right) - P_{Ft}\left(C_{Ft} + D_{AC,F,t}\right) = 0.\end{aligned} \tag{40}$$

2.6. Shocks process and equilibrium definition

The productivity shocks follow the joint log normal distribution:

$$\begin{bmatrix} \log\alpha_{Dt} - \log\overline{\alpha_D} \\ \log\alpha_{Dt}^* - \log\overline{\alpha_D}^* \\ \log\alpha_{Ht} - \log\overline{\alpha_H} \\ \log\alpha_{Ft} - \log\overline{\alpha_F} \end{bmatrix} = \rho \begin{bmatrix} \log\alpha_{Dt-1} - \log\overline{\alpha_D} \\ \log\alpha_{Dt-1}^* - \log\overline{\alpha_D}^* \\ \log\alpha_{Ht-1} - \log\overline{\alpha_H} \\ \log\alpha_{Ft-1} - \log\overline{\alpha_F} \end{bmatrix} + \varepsilon_t$$

With the covariance matrix $E\left[\varepsilon_t \varepsilon_t'\right]$.

A competitive equilibrium for the world economy presented above is defined along the usual lines, as a set of processes for quantities and prices in the Home and Foreign country satisfying: (i) the household and firms optimality conditions; (ii) the market clearing conditions for each good and asset, including money; (iii) the resource constraints—whose specification can be easily derived from the above and is omitted to save space.

2.7. Relative price and export share measures

Along with the *real exchange rate* ($e_t P_t^* / P_t$), we report two alternative measures of international prices. First, as is common practice in the production of statistics on international relative prices, we compute the terms of trade weighting goods with their respective expenditure shares:

$$TOTS_t \equiv \frac{\omega_{Ht} p(h)_t + \left(1-\omega_{Ht}\right) p_{H,t}}{\omega_{Ft} e_t p^*(f)_t + \left(1-\omega_{Ft}\right) e_t p^*_{F,t}}, \tag{41}$$

where the weight ω_{Ht} measures the share of differentiated goods in the home country's overall exports:

$$\omega_{Ht} \equiv \frac{p^*{}_t(h) n_{t-1}\left(c^*{}_t\left(h\right) + d^*{}_{Kt}\left(h\right) + d^*{}_{AC,t}\left(h\right)\right)}{p_t^*(h) n_{t-1}\left(c^*{}_t\left(h\right) + d^*{}_{Kt}\left(h\right) + d^*{}_{AC,t}\left(h\right)\right) + P^*{}_{Ht}\left(C^*{}_{Ht} + D^*{}_{AC,H,t}\right)}, \tag{41a}$$

and ω_{Ft} measures the counterpart for the foreign country:

$$\omega_{Ft} \equiv \frac{p_t(f) n^*_{t-1}\left(c_t\left(f\right) + d_{Kt}\left(f\right) + d_{AC,t}\left(f\right)\right)}{p_t(f) n^*_{t-1}\left(c_t\left(f\right) + d_{Kt}\left(f\right) + d_{AC,t}\left(f\right)\right) + P_{Ft}\left(C_{Ft} + D_{AC,F,t}\right)}. \tag{41b}$$

Since the share of differentiated goods in a country's overall exports is readily available in data, we will report values for ω_{Ht} and ω_{Ft} generated in our simulations, as they provide a useful means for comparing model implications to data. Following the trade literature, we also compute the terms of trade as the ratio of ex-factory prices set by home firms relative to foreign firms in the manufacturing sector: $TOTM_t \equiv p_t(h)/\left(e_t p_t^*(f)\right)$.[4] The latter measure ignores the non-differentiated good sector.

3. Analytical Insights from a Simple Version of the Model

The main goal of this section is to clarify the mechanism by which macroeconomic uncertainty about demand and marginal costs impinges on pricing by differentiated good manufactures, ultimately determining the country's comparative advantage in the sector. To pursue this goal, we will work out a simplified version of the model that is amenable to analytical results. Despite a number of assumptions needed to make the model tractable, we will be able to derive key predictions that remain valid in our full-fledged version of the model.

We specialize our model as follows. First, we posit that manufacturing firms operate for one period only (implying $\delta = 1$ in the entry condition), and symmetrically preset prices over the same horizon. Entry costs are in labor units, i.e., $\theta_K = 1$, as this facilitates analytical solution of our model. Second, we simplify the non-differentiated good by setting its trade costs to zero ($\tau_N = 0$) and let the elasticity of substitution between home and foreign goods approach infinity ($\eta \to \infty$). This implies that the sector produces a homogeneous good, an assumption frequently made in the trade literature.[5] Third, productivity shocks are i.i.d., and only occur in the differentiated good sector (we abstract from productivity shocks in the non-differentiated good sector). Fourth, utility is log in consumption and linear in leisure ($\psi = 0$). Finally, drawing on the NOEM literature (see Corsetti and Pesenti 2005, and Bergin and Corsetti 2008), we carry out our analysis of stabilization policy by defining a country's monetary stance as $\mu = PC$, under the control of monetary authorities via their ability to set the interest rate. Following this approach, we therefore study monetary policy in terms of μ (and μ^* for the foreign country), instead of the interest rate rule (34).

[4] This is the same definition used in Ossa (2011), though in our case it does not imply the terms of trade are constant at unity, because monetary policy does affect factory prices. See also Helpman and Krugman (1989), and Campolmi et al. (2014).
[5] Different from the trade literature, however, we do treat this sector as an integral part of the (general) equilibrium allocation, e.g., exports/imports of the homogeneous good sector enters the terms of trade of the country.

Under these assumptions, the firms' problem becomes

$$\max_{p_{t+1}(h)} = E_t\left[\beta \frac{\mu_t}{\mu_{t+1}} \pi_{t+1}(h)\right].$$

where $\mu_t = P_t C_t$. The optimal preset price in the domestic market is:

$$p_{t+1}(h) = \frac{\phi}{\phi - 1} \frac{E_t\left[\Omega_{t+1}\left(\frac{W_{t+1}}{\alpha_{t+1}}\right)\right]}{E_t\left[\Omega_{t+1}\right]}, \tag{42}$$

where $W_{t+1}/\alpha_{t+1} = \mu_{t+1}/\alpha_{t+1}$ is the firm's marginal costs, that is, the ratio of nominal wages to labor productivity. In this simplified model setting, the stochastically discounted value of future demand facing the firm for its good in both markets, Ω_{t+1}, becomes:

$$\Omega_{t+1} = \left(c_{t+1}(h) + (1+\tau)c^*_{t+1}(h)\right)/\mu_{t+1}.$$ [6]

The home entry condition is a function of price setting and the exchange rate:

$$\frac{K_t}{\beta\theta} = E_t\left[\left(p_{t+1}(h) - \frac{\mu_{t+1}}{\alpha_{t+1}}\right) p_{t+1}(h)^{-\phi}\,\Omega_{t+1}\right]. \tag{43}$$

Provided that the price setting rules can be expressed as functions of the exogenous shocks and the monetary stance, the home and foreign equilibrium entry conditions along with the exchange rate solution above comprise a three equation system in the three variables: *e*, *n* and *n**. This system admits analytical solutions for several configurations of the policy rules.

Before proceeding, it is worth noting two properties of our simplified version of the model. First, both economies produce the same homogeneous good with identical technology under perfect competition, and this good is traded costlessly across borders. Hence, with arbitrage ensuring that $P_{Dt} = e_t P^*_{Dt}$, the exchange rate can be expressed as:

$$e_t = \frac{p_{Dt}}{p^*_{Dt}} = \frac{W_t}{W^*_t} = \frac{P_t C_t}{P^*_t C^*_t} = \frac{\mu_t}{\mu^*_t}, \tag{44}$$

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[6] Upon appropriate substitutions and cancellations, equation (42) may also be written with Ω_{t+1} defined as $\Omega_{t+1} = \left(n_{t+1}p_{t+1}(h)^{1-\phi} + n^*_{t+1}p^*{}_{t+1}(f)^{1-\phi}e_{t+1}{}^{1-\phi}(1+\tau)^{1-\phi}\right)^{-1} + \left(n_{t+1}p_{t+1}(h)^{1-\phi} + n^*_{t+1}p^*{}_{t+1}(f)^{1-\phi}e_{t+1}{}^{1-\phi}(1+\tau)^{\phi-1}\right)^{-1}$.

where we have used the labor supply condition (11) imposing linear preferences in leisure ($\psi = 0$). Given symmetric technology in labor input only, the law of one price implies that nominal wages are equalized (once expressed in a common currency) across the border. By the equilibrium condition in the labor market with an infinite labor supply elasticity, then, the exchange rate is a function of the ratio of nominal consumption demands, hence of monetary policy stances.

Second, per effect of nominal wage equalization (due to trade in a single homogenous good whose production is not subject to shocks), production risk in our simplified economy is efficiently shared, even in the absence of trade in financial assets, and independently of the way production and trade are specified in the other sector. Equation (44) clearly can be rewritten as the standard perfect risk sharing condition:

$$\frac{e_t P_t^*}{P_t} = rer_t = \frac{C_t}{C_t^*}.$$

Home consumption rises relative to foreign consumption only in those states of the world in which its relative price (i.e. the real exchange rate) is weak.

3.1. The equilibrium consequences of nominal rigidities

To gain insight into the transmission mechanism underlying our results, we rewrite (42) as follows:

$$p_{t+1}(h) = \frac{\phi}{\phi - 1} \left\{ E_t \left[\left(\frac{W_{t+1}}{\alpha_{t+1}} \right) \right] + \frac{Cov_t \left[\Omega_{t+1} \left(\frac{W_{t+1}}{\alpha_{t+1}} \right) \right]}{E_t \left[\Omega'_{t+1} \right]} \right\} \qquad (42')$$

By the covariance term on the right-hand side of this expression, the optimal preset pricing depends on the comovements of a firm's marginal costs ($W_{t+1}/\alpha_{t+1} = \mu_{t+1}/\alpha_{t+1}$), and overall world demand for the firm's good, Ω_{t+1}. Since both marginal costs and overall demand are functions of monetary stances, policy rules critically impinge on pricing (and thus on entry) via their effects on the covariance term. To wit: assume no monetary stabilization, i.e., posit that the monetary stance is constant in either country ($\mu_t = \mu_t^* = 1$), implying a constant nominal exchange rate at $e_t = \mu_t / \mu_t^* = 1$. Since, with i.i.d. shocks, there are no dynamics in predetermined variables such as prices and numbers of firms, the optimal preset prices (42') simplify to

$$p_{t+1}^{no\,stab}(h) = \frac{\phi}{\phi-1} E_t\left[\frac{1}{\alpha_{t+1}}\right] \qquad p_{t+1}^{*no\,stab}(f) = \frac{\phi}{\phi-1} E_t\left[\frac{1}{\alpha^*_{t+1}}\right],$$

that is, prices are equal to the expected marginal costs (coinciding with the inverse of productivity) augmented by the equilibrium markup. Most critically, under a constant monetary stance, these optimal pricing decisions do not depend on the term Ω' (hence do not vary with trade costs and firms entry), as they do in the general case. The number of firms can be computed by substituting these prices into the entry condition (43), so to obtain:

$$n_{t+1}^{no\,stab} = n_{t+1}^{*no\,stab} = \frac{\beta\theta}{q\phi}.$$

Intuitively, for given monetary stances, there is no change in the exchange rate. With preset prices, a shock to productivity will have no effect on the terms of trade, the real exchange rate and consumption demands, hence no change in the level of production in either type of good. With no monetary response, an i.i.d. shock raising productivity in the home manufacturing sector necessarily leads to a fall in the level of employment in the same sector (not compensated by a change in employment in the other sectors of the economy). Firms end up producing at low marginal costs and thus suboptimally high markups, since nominal rigidities prevent firms from re-pricing and scaling down production. Conversely, given nominal prices and demand, a drop in productivity will cause firms to produce too much at high marginal costs, hence at suboptimally low markups.

So, in a regime of no monetary stabilization, firms face random realization of inefficiently high and inefficiently low levels of production and markup. When presetting prices, managers maximize the value of their firm by trading off higher markups in the low productivity state, with lower markups in the high productivity states. In our model above, they weigh more the risk of producing too much at high marginal costs: it is easy to see that preset prices are increasing in the variance of productivity shocks (by Jensen's inequality, $E_t\left[\frac{1}{\alpha_{t+1}}\right] > \frac{1}{E_t\left[\alpha_{t+1}\right]} = 1$).[7] The implications of this result for our argument are detailed next.

3.2. Prices and firm dynamics under efficient and inefficient stabilization of output gaps

Since the model posits that the homogenous good sector operates under perfect competition and flexible prices, there is no trade-off in stabilizing output across different sectors. It is therefore possible to replicate the flex-price allocation under the following simple monetary policy rule: the monetary stance in each country moves in proportion to productivity in the differentiated good sector: $\mu_t = \alpha_t, \quad \mu_t^* = \alpha_t^*$. The exchange rate in this case is not constant, but contingent on productivity differentials. Namely, the home currency depreciates in response to an asymmetric rise in home productivity:

$$e_t = \frac{\alpha_t}{\alpha_t^*}.$$

The active monetary policy just described affects optimal pricing by firms. By ensuring that the nominal marginal costs μ/α remain constant, the above policy ensures that the covariance term in (see (42')) is zero, thus insulating the ex-post markup charged by home manufacturing firms from uncertainty about productivity.[8] Note that, to the extent that monetary policy stabilizes marginal costs completely, it also stabilizes markups at their flex-price equilibrium level. It follows that the price firms preset is lower than in an economy with no stabilization:

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[7] As discussed in Corsetti and Pesenti (2005) and Bergin and Corsetti (2008) in a closed economy context, given nominal demand, high preset prices allow firms to contain overproduction when low productivity squeezes markups, rebalancing demand across states of nature. High average markups, in turn, exacerbate monopolistic distortions and tend to reduce demand, production and employment on average, discouraging entry.

[8] As is well understood, the policy works as follows: in response to an incipient fall in domestic marginal costs domestic demand and a real depreciation boost foreign demand for domestic product. As nominal wages rise with aggregate demand, marginal costs are completely stabilized at a higher level of production. Vice versa, by curbing domestic demand and appreciating the currency when marginal costs are rising, monetary policy can prevent overheating, driving down demand and nominal wages. Again, marginal costs are completely stabilized as a result.

$$p_{t+1}^{stab}(h) = \frac{\phi}{\phi - 1} < p_{t+1}^{no\,stab}(h) = \frac{\phi}{\phi - 1} E_t \left[\frac{1}{\alpha_{t+1}} \right].$$

In a multi-sector context, a key effect of monetary stabilization is that of reducing a country's differentiated goods' price in terms of domestic nondifferentiated goods, redirecting demand across sectors. This rise in demand for differentiated goods supports the entry of additional manufacturing firms. As shown in the appendix, the number of manufacturing firms is:[9]

$$n_{t+1}^{stab} = \frac{\beta\theta}{q\phi} E_t \left[\frac{2 + \left(\frac{\alpha_{t+1}}{\alpha_t^*} \right)^{1-\phi} \left((1+\tau)^{1-\phi} + (1+\tau)^{\phi-1} \right) (1+\tau)^{1-\phi}}{1 + \left(\frac{\alpha_{t+1}}{\alpha_t^*} \right)^{1-\phi} \left((1+\tau)^{1-\phi} + (1+\tau)^{\phi-1} \right) (1+\tau)^{1-\phi} + \left(\frac{\alpha_{t+1}}{\alpha_{t+1}^*} \right)^{2(1-\phi)}} \right]$$

the same as under flexible prices. The above generalizes to our setup a familiar result of the classical NOEM literature (without entry) assuming that prices are sticky in the currency of the producers (Corsetti and Pesenti (2001, 2005) and Devereux and Engel (2003), among others): despite nominal rigidities, policymakers are able to stabilize the output gap relative to the natural-rate, flex-price allocation.

The analysis of a peg provides a further key insight on our model, and yields a key testable implication. Consider the case in which the home government fully stabilizes its output gap, while the foreign country maintains its exchange rate fixed against the home currency:

$$\mu_t = \alpha_t \text{ and } e_t = 1, \text{ so that } \mu_t^* = \mu_t = \alpha_t .$$ [10]

Under the policy scenario just described, the optimally preset prices of domestically and foreign produced differentiated goods are, respectively:

$$p_{t+1}(h) = \frac{\phi}{\phi - 1}, \qquad p_{t+1}^*(f) = \frac{\phi}{\phi - 1} E_t \left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}} \right].$$

[9] As discussed in the appendix, it is not possible to determine analytically whether symmetric stabilization policies raise the number of firms compared to the no stabilization case. Model simulations suggest that there is no positive effect for log utility, and a small positive effect for CES utility with a higher elasticity of substitution. Nonetheless, we are able to provide below an analytical demonstration of asymmetric stabilization, which is our main objective.

[10] A related exercise consists of assuming that the foreign country keeps its money growth constant ($\mu_t^* = 1$) while home carries out its stabilization policy as above.

While the home policy makers manage to stabilize the markup of manufacturing firms completely, the foreign firms producing under the peg regime face stochastic marginal costs/markups driven by shocks to productivity, both domestically and abroad. With i.i.d. shocks, preset prices will be increasing in the term $E_t(1/\alpha^*_{t+1})$, as in the no stabilization case.

The equilibrium number of firms *n* and *n** instead solve the following two-equation system:

$$\frac{1}{n_{t+1} + An^*_{t+1}} + \frac{1}{n_{t+1} + Bn^*_{t+1}} = \frac{q\phi}{\beta\theta}$$

$$\frac{A}{n_{t+1} + An^*_{t+1}} + \frac{B}{n_{t+1} + Bn^*_{t+1}} = \frac{q\phi}{\beta\theta}$$

where

$$A \equiv \left(E_t\left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}} \right] \right)^{1-\phi} \left(1+\tau\right)^{1-\phi}, \quad B \equiv \left(E_t\left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}} \right] \right)^{1-\phi} \left(1+\tau\right)^{\phi-1}.$$

While it is not possible to solve for the number of firms in closed form, the system above does allow one to prove that

$$n > n^{flex} > n^*$$

(the proof is given in the appendix). Other things equal, the constraint on macroeconomic stabilization implied by a currency peg tends to reduce the size of the manufacturing sector in the foreign country: there are fewer firms, each charging a higher price. The home country's manufacturing sector correspondingly expands. In other words, the country pegging its currency tends to specialize in the homogeneous good sector.

To fix ideas: insofar as a peg results in higher markups and exacerbates monopolistic distortions in the foreign manufacturing sector, inefficient stabilization redirects demand towards the (now relatively cheaper) non-differentiated good sector. Most crucially, as the ratio of the country's differentiated goods prices to nondifferentiated goods prices rises compared to the home country, the foreign comparative advantage in the sector weakens: domestic demand shifts towards differentiated imports from the home country. Because of higher monopolistic distortions and the higher trade costs in imports of differentiated goods, foreign consumption falls overall (in line with the predictions from the closed economy one-sector counterpart of our model, e.g., Bergin and Corsetti 2008). All these effects combined reduce the incentive for foreign firms to enter in the differentiated good sector. The country's loss of competitiveness is mirrored by a trend appreciation of its welfare-relevant real exchange rate, mainly due to the fall in varieties available to the consumers. But real appreciation is actually associated with weaker, not stronger, terms of trade. Weaker terms of trade follow from the change in the composition of foreign production and exports, with more weight attached to low value added non-differentiated goods.

The consequences of a foreign peg on the home economy are specular. The home country experiences a surge of world demand for its differentiated good production, while stronger terms of trade boost domestic consumption. More firms enter the manufacturing sector, leading to a shift in the composition of its production and exports in favor of this sector.

As a result, with a foreign country passively pegging its currency, there are extra benefits for the home country from being able to pursue stabilization policies. The home manufacturing sector expands driven by higher home demand overall, and fills part of the gap in manufacturing production no longer supplied by foreign firms. At the same time, the shifting pattern of specialization ensures that the home demand for the homogeneous good is satisfied via additional imports from the foreign country.

4. Numerical simulations

In this section, we evaluate the quantitative implications of our full model, by conducting stochastic simulations. Despite the many differences between the simplified and the full version of our model, we will show that key results from the former continue to hold in the latter. Namely, in our general specification it will still be true that, if the foreign country moves from efficient stabilization to a peg, while the home country sticks to efficient stabilization rules, (a) the foreign average markups in manufacturing will tend to increase and (b) there will be production relocation---firm entry in the foreign country will fall on average, while entry in the home country will rise on average. Correspondingly, average consumption will rise at home relative to foreign. We will also show that this relocation will be associated with an average improvement in the home terms of trade (while the home welfare-relevant real exchange rate depreciates).

We first discuss our calibration of the model, then present our main results.

4.1. Parameter values

Parameter values are chosen to be consistent with an annual frequency, to match the frequency of the data available for sectoral productivity. We set time preferences at $\beta = 0.96$; risk aversion at $\sigma = 2$; labor supply elasticity at $1/\psi = 1.9$, from Hall (2009).

The price stickiness parameter is set at $\psi_p = 8.7$, a modest value which in a Calvo setting would correspond to half of firms resetting price on impact of a shock, with 75 percent resetting their price after one year.[11] The death rate is set at $\delta = 0.1$, which is four times the standard rate of 0.025 to reflect the annual frequency. The sunk cost of entry is normalized to the value 1.

To choose parameters for the differentiated and non-differentiated sectors we draw on Rauch (1999). We choose θ so that differentiated goods represent 57 percent of U.S. trade in value.[12] The home share of non-differentiated goods is set at $\nu = 0.5$, which implies a trade share of about 30%, given the trade costs and elasticities below. To set the elasticities of substitution for the differentiated and non-differentiated goods we draw on the estimates by Broda and Weinstein (2006), classified by sectors based on Rauch (1999). The Broda and

[11] As is well understood, a log-linearized Calvo price-setting model implies stochastic difference equation for inflation of the form $\pi_t = \beta E_t \pi_{t+1} + \lambda mc_t$, where *mc* is the firm's real marginal cost of production, and where $\lambda = (1-q)(1-\beta q)/q$, with q is the constant probability that firm must keep its price unchanged in any given period. The Rotemberg adjustment cost model used here gives a similar log-linearized difference equation for inflation, but with $\lambda = (\phi - 1)/\kappa$. Under our parameterization, a Calvo probability of $q = 0.5$ implies an adjustment cost parameter of $\kappa = 8.7$. This computation is confirmed by a stochastic simulation of a permanent shock raising home differentiated goods productivity without international spillovers, which implies that price adjusts 50% of the way to its long run value immediately on impact of the shock, and 75% at one period (year in our case) after the shock.

[12] Values vary by year and by whether a conservative or liberal aggregation is used. Taking an average over the three sample years and the two aggregation methods reported in Table 2 of Rauch (1999) produces an average of 0.57. Replicating this value in our steady state requires a calibration of the consumption share at θ =0.38, which compensates for the fact that trade for investment purposes (sunk cost) involves differentiated goods only.

Weinstein (2006) estimate of the elasticity of substitution between differentiated goods varieties is ϕ=5.2 (the sample period is 1972-1988). The corresponding elasticity of substitution for nondifferentiated commodities is η = 15.3.

To set trade costs, we need to think beyond costs associated with just transportation. These are often thought to be higher for commodities than for high value differentiated goods. As Rauch (1999) points out, differentiated goods involve search and matching costs, whereas commodities and goods traded on an organized exchange with a published reference price avoid such costs. Estimates are available for the tariff equivalent of language costs, with a value of 11% in Hummels (1999) or 6% in Anderson and van Wincoop (2004), so we use 8% in between. Since Obstfeld and Rogoff (2000) recommend a calibration of total trade costs at 16%, our calibration implies that half of this is due to language and matching costs, and the other half due to transportation. This implies a calibration of τ_D= 0.16 for differentiated goods, and τ_N =0.08 for non-differentiated goods.

The parameters in the home monetary policy rule are determined by the values that maximize home utility. As typically found, the optimal weight on inflation is the maximum value considered in the grid search (γ_P=1000), and the optimal value on output is γ_Y =0. The foreign country is assumed to peg its exchange rate at parity with the home country: *e*=1.

To our knowledge, no one else has calibrated a DSGE model with sectoral shocks distinct to differentiated and nondifferentiated goods. Annual time series of sectoral productivities are available from the Groningen Growth and Development Centre (GGDC), for the period 1980-2007. Data for the U.S. is used to parameterize shocks to the home country, and an aggregate of the EU 10 for the foreign country.[13] TFP is calculated on a value-added basis. For each country, the differentiated goods sector comprises total manufacturing excluding wood, chemical, minerals, and basic metals; the non-differentiated goods sector comprises agriculture, mining, and subcategories of manufacturing excluded from the differentiated sector. To calculate the weight of each subsector within the differentiated (or

[13] These EU 10 countries are AUT, BEL, DNK, ESP, FIN, FRA, GER, ITA, NLD and the UK. See http://www.euklems.net/euk08i.shtml.

non-differentiated) sector, we use the 1995 gross value added (at current prices) of each subsector divided by the total value added for the differentiated (or non-differentiated) sector. After taking logs of the weighted series, we de-trend each series using the HP filter. Parameters ρ and Ω, reported in Table 1, are obtained from running a VAR(1) on the four de-trended series.

The benchmark simulation model specifies entry costs in units of goods (θ_K =0), as Cavallari (2013) shows this is important for matching international business cycle moments in a sticky price model. We will also report results for entry costs in labor units in our sensitivity analysis. The adjustment cost parameter for new firm entry, λ, is chosen to match the standard deviation of new firm entry in the benchmark simulation to that in data. Time-series for firm entry is limited. The World Bank's Entrepreneurship Survey and data base provides a count of new businesses registered during a calendar year, for the period 2004 to 2012 for selected countries. We use the data available for France, Germany, Italy and the U.K. to represent the foreign country in our model. Data for the U.S. on establishment entry are available from the Longitudinal Business Database. Standard deviations for logged and HP-filtered series are reported as ratios to the standard deviation of GDP for the same period: the value for the U.S. is 5.53, and the European average is 3.01. A value of $\lambda = 0.25$ in the simulation model, with the remaining parameters and shocks as described above, generates standard deviations of new firm entry close to these values. (See Table 2b.)

4.2. Simulation results

This section first illustrates the properties of the model, looking at the impulse responses generated by fluctuations in manufacturing productivity. It then discusses results for the unconditional means of variables, drawn from stochastic simulations of a second order approximation of the model.

4.2.1. Impulse responses

Consider the dynamics of the benchmark model in response to a one standard deviation positive shock to productivity in the differentiated goods sector of the home country, where both countries employ efficient stabilization policy. Results are shown in Figure 1, which plots the percentage deviation from the unconditional mean of key variables of interest. As home policymakers fully stabilize the markup, they react to the shock by expanding domestic demand and depreciating the exchange rate. This policy reaction boosts production in the differentiated sector, in line with its enhanced productivity. The number of firms in the sector rises, and production shifts in favor of home differentiated goods, away from nondifferentiated goods. In the foreign country, the shift in production pattern partly reflects the cross-country autocorrelation of shocks in the calibration. Since the foreign country also experiences a rise in differentiated goods productivity, the number of firms and the volume of differentiated output also rise in this country, though by a smaller magnitude than at home where the shock originated, and with a one period lag.

To further clarify the role of the cross-country correlation of shocks, in Figure 2 we simplify the analysis by setting the cross-country elements of the shock autorcorrelation matrix equal to zero. This figure thus shows the effects of a rise in the differentiated goods productivity at home that remains asymmetric. Foreign production of differentiated goods falls (while it rises at home); conversely foreign production of nondifferentiated goods rises (while it falls at home).

The case of asymmetric policies---with the foreign country pegging its exchange rate, and the home country employing efficient stabilization policy---is shown in the next two figures. In response to a favorable shock to home differentiated-goods productivity, the behavior of home variables in Figure 3 is very similar to Figure 1. But in Figure 3, the response of the foreign variables closely resembles those of the home variables. The commitment to exchange rate stability causes the foreign monetary authorities to expand money supply and demand by more, in step with the home country, providing extra stimulus to the foreign differentiated goods sector at the expense of the nondifferentiated goods sector.

Figure 4 shows the effects of a productivity shock to the differentiated goods sector in the country pursuing a peg (that is, foreign). It differs noticeably from the other figures. In the absence of a stabilizing policy response, manufacturing entry in the foreign economy, while positive, is an order of magnitude smaller compared to entry in the home economy in the previous figures. Likewise, the rise in foreign production of differentiated goods is much smaller and much shorter lived.

4.2.2. Unconditional means

Table 2a reports the unconditional means of key variables obtained from stochastic simulations of a second order approximation of the benchmark model, and Table 2b reports standard deviations. In Column (1) of Table 2a both countries use stabilization policy, while in column (2) the foreign country adopts an exchange rate peg. Column (3) reports the percent change between the previous columns, hence accounting for changes when the foreign country pursues a peg instead of inflation stabilization. Note that country means in column (1) are not completely symmetric despite symmetric policies, due to the cross-border differences in the estimated shock process.

The simulation results fully confirm the main analytical insights from the previous section. First and foremost, when the foreign country pegs, average production of the differentiated good shifts away from the foreign country and toward the home country; the foreign country instead has higher production of the non-differentiated good. This shift in production is reflected in a 0.73 percent fall in the number of foreign differentiated goods firms, in contrast to a 0.63 percent rise at home. This implies that the ratio of foreign firm number relative to the home counterpart falls 1.4 percent. The share of differentiated goods in exports (ω_F) falls by 0.56 percent in the foreign country, while the share in the home country (ω_H) rises by 0.61 percent. This implies that the ratio of the foreign export share relative to the home counterpart falls 1.2 percent.

Second, also consistent with the transmission mechanism discussed in the previous section, what drives the foreign loss in the differentiated goods market share under a peg is the higher average markup charged by foreign producers of these goods. Note that the foreign price of differentiated goods rises relative to both wages and non-differentiated goods (.07 percent in both cases).

Finally, when the foreign policymaker abandons efficient stabilization policy for a peg, the foreign *terms of trade including the homogenous good, TOTS*, actually worsen (.38 percent). This stands in contrast with the movements in the (conventionally-defined) terms of trade including only differentiated goods, *TOTM*, which remains nearly unchanged (.01 percent). The contrasting behavior of the *TOTS* and *TOTM* is due to a composition effect: the shift in foreign export share away from differentiated goods means these more expensive goods receive a smaller weight in the average price of foreign exports and a larger weight in the average price of foreign imports.

International price adjustment highlights a notable difference between the simplified and the full model. As our results in Table 2a emphasize, despite a lower markup, the terms of trade of *manufacturing* do not necessarily fall with better stabilization. This will be so because, in the full model, a high level of entry tends to raise production costs, as wages respond to a higher demand for domestic labor. To the extent that labor supply is not infinitely elastic (as assumed in the simplified model), this effect may become strong enough to prevent the international price of domestic manufacturing from falling in tandem with average markup in the sector.

Table 2b shows that the calibration of our model is in line with the volatility of output in the US and the EU-10 countries, as well as the volatilities of key variables (in ratio to the volatility of output), such as consumption, employment and net business formation.

4.2.3. Alternative model specifications

Table 3 summarizes the range of results for unconditional means that are possible under alternative model specifications. To save space, we only report the percentage change in number of firms and percent change in differentiated export share when the foreign country switches from inflation stabilization to exchange rate peg, by country as well as accumulated across countries. The first column repeats for comparison the key result for the benchmark case from Table 2a. This result depends completely upon free entry of firms, as Column (2) indicates that the changes in differentiated export share disappear when the number of firms is held fixed exogenously. We conclude that the endogenous shift in number of firms between countries is essential for the change in monetary policy to translate into quantitatively meaningful effects on export shares.

The version of price stickiness, whether in units of the producer or local currency, is not consequential to the effect of policy on product specialization. When the price adjustment specification of the benchmark model is replaced by the local currency version, results are nearly unchanged, as reported column (3). (See the appendix for the LCP version of Rotemberg pricing for this case.) Even if prices are inelastic to the exchange rate in the short run, they are ex-ante sensitive to the covariance of marginal costs and demand, which is the core mechanism by which monetary stabilization impinges on competitiveness.

Stickiness in wage adjustment, in contrast, can significantly magnify the effects of monetary policy on product specialization. Suppose households supply differentiated labor, indexed by *j*, and face a cost of adjusting wages $AC_{W,s}(j)=\frac{\kappa_w}{2}\left(W_s(j)/W_{s-1}(j)-1\right)^2 l_s(j)$ and face a labor demand $l_t(j)=\left(W_t(j)/W_t\right)^{-\phi_L} l_t$. Utility maximization now implies a wage setting condition to replace the labor supply condition in the benchmark model:

$$\phi_L \frac{l_t^{1+\psi}}{W_t} = -\frac{1}{\mu_t}\left(\left[(1-\phi_L)\right]l_t - \frac{l_t\kappa_w}{2}\left(\left(\frac{W_t}{W_{t-1}}-1\right)^2(-\phi_L)+2\left(\frac{W_t}{W_{t-1}}-1\right)\frac{W_t}{W_{t-1}}\right)\right)$$
$$+\beta E_t\left[\frac{1}{\mu_{t+1}}\left(W_{t+1}l_{t+1}\kappa_w\left(\frac{W_{t+1}}{W_t}-1\right)\left(-\frac{W_{t+1}}{W_t^2}\right)\right)\right]$$

(as well as including in the labor market clearing condition the labor expended in adjusting the wage). Barattieri et al. (2014) estimate the average time to reset a wage is between 3.8 and 4.7 quarters. To match this finding we apply the logic employed above for the sticky price calibration, and compute that a value of κ_w = 32.3 in our annual model implies that half of wages have been reset one year after a shock. The substitutability between labor varieties is set to ϕ_L =6. The parameterization of the monetary policy rule is adjusted to γ_p = 3 to permit model solution.[14]

Sticky wages significantly amplify the effect of a peg on the steady state number of firms and export shares, lowering the foreign/home ratios by 4.7% and 3.4%, respectively. Some intuition can be draw from equation (42') derived for the case of the simplified model. Recall that differentiated goods prices are set lower, hence encouraging greater specialization in differentiated goods, if there is a smaller covariance of nominal marginal costs (wage divided by productivity) with demand. Firms dislike a situation where they are required to produce more when production costs are high. In the benchmark simulation with only price stickiness, monetary policy assures that demand is high during positive productivity shocks that lower production costs. But this policy also has the effect of raising nominal wages, which works the opposite direction to raise production costs. Sticky wages work to prevent such a rise in wage costs, and hence maintain a low covariance of costs with demand.[15]

Another key determinant of the rise in wage and hence costs following a shock is the labor supply elasticity. Recall that the preferences assumed in the analytical model imply an infinite labor supply elasticity, in contrast with the value of 1.9 assumed in the numerical economy. There is a wide range of values for this elasticity supported in the macroeconomics literature.[16] When the labor supply elasticity is raised in the simulation model to an extreme value of 5, we obtain a stronger effect of a peg on the mean export share, but the difference is modest (see column 5).

However, the effect becomes dramatic when this calibration is combined with a change in the specification of preferences to remove the wealth effect on labor supply, as in a GHH

[14] No solution is possible in the model when significant wage rigidity is combined with a monetary policy that tries to hold prices nearly constant. Because prices depend primarily upon the production cost, that is, the ratio of wage to the productivity, a shock to productivity requires a similar movement in wage if prices are to remain constant. We resolve this problem by reducing the weight on inflation in the monetary policy rule, using a value of 3 based on Schmidt-Grohe and Uribe (2007).

[15] Implications of policy for the mean level of sticky wages have little impact on comparative advantage in our model, since, in contrast with sticky prices, the wage rate affects both sectors symmetrically.

[16] See for Example Keane and Rogerson (2012).

specification. Let preferences be defined: $U_t = \left(C_t - l_t^{1+\psi}/(1+\psi)\right)^{1-\sigma} \Big/ (1-\sigma) + \ln\left(M_t/P_t\right)$,

which implies a labor supply $l_t^{\psi} = W_t/P_t$ and a redefinition of $\mu_t = P_t\left(C_t - l_t^{1+\psi}/(1+\psi)\right)^{\sigma}$.

The effect of a peg on the number of firms and the differentiated export share is amplified by an order of magnitude compared to the benchmark model, as seen in column (6). The mechanism is similar to that for the sticky wage case. The preference specification removes the wealth effect in wage determination, in that consumption does not appear in the labor supply condition. Unlike the benchmark model, a rise in consumption induced by a rise in productivity does not reduce labor supply and require a rise in wage to induce workers to supply labor. Hence there is less pressure for wage to rise for a given rise in production, which serves to lower the covariance between costs and output.[17]

For completeness, we consider a case where entry costs are specified in labor units (θ_K =1), as assumed in the analytical model. The effect of stabilization policy on the mean level of wages now has strong implications for the mean level of entry. Recall from the benchmark case in Table (2a) that a stabilizing country has a higher mean wage compared to the nonstabilizing country. When entry cost is specified in labor units this can strongly dampen entry in the stabilization country, and as a result, we find that policy has a trivial effect on the mean level of firm entry under the benchmark preference specification (not reported in Table 3). Column (7) reports a modified simulation where this rise in mean wage is moderated by assuming the preferences used for the preceding column (6). Stabilization policy then has a significant effect to raise entry and export share, albeit still less than in the case with entry costs specified in goods units.

In addition to wage movements, another feature of the benchmark model that could limit the effect of a peg is the correlation of exogenous shocks across countries. The fairly high shock correlations in the benchmark calibration reflect the close relationship between the U.S. and the EU-10 countries in the data used for calibration. But this high correlation might not

[17] We also investigated a version of the model with complementarity between consumption and labor, as advocated in Hall and Milgrom (2008). While this specification did dampen the rise in wage during a rise in output and hence raise the mean share of differentiated goods in exports, the effect was small, and this case is not reported in our table of results.

apply to many other, especially developing, countries. Column (8) of Table 3 shows that if the calibration assumes zero contemporaneous correlations across all shocks, the effect of the peg on entry and export shares doubles compared to the benchmark calibration.

Finally, as a complement to productivity shocks, we study a fiscal shock.[18] Letting T_{Dt} represent the fraction of differentiated good production that is surrendered to the government, the differentiated goods market clearing condition becomes: $\left(1-T_{Dt}\right)y\left(h\right)=d_t\left(h\right)+\left(1+\tau_D\right)d_t^*\left(h\right)$. Similarly for a tax on nondifferentiated goods production, T_{Nt}, market clearing becomes $\left(1-T_{Nt}\right)y_{H,t}=C_{H,t}+D_{AC,H,t}+\left(1+\tau_N\right)\left(C_{H,t}^*+D_{AC,H,t}^*\right)$. It is assumed that the goods surrendered to the government as tax payments are consumed directly by the government, and this yields no household utility. This implies pricing equations for the two types of goods:

$$p_t\left(h\right)=\frac{\phi}{\phi-1}\frac{W_t}{\alpha_t\left(1-T_{Dt}\right)}+\frac{\psi_P}{2}\left(\frac{p_t\left(h\right)}{p_{t-1}\left(h\right)}-1\right)^2 p_t\left(h\right)-\psi_P\frac{1}{\phi-1}\left(\frac{p_t\left(h\right)}{p_{t-1}\left(h\right)}-1\right)\frac{p_t\left(h\right)^2}{p_{t-1}\left(h\right)}$$
$$+\frac{\beta\psi_P}{\phi-1}E_t\left[\frac{\mu_t}{\mu_{t+1}}\frac{\Omega_{t+1}}{\Omega_t}\left(\frac{p_{t+1}\left(h\right)}{p_t\left(h\right)}-1\right)\frac{p_{t+1}\left(h\right)^2}{p_t\left(h\right)}\right]$$

and $$p_{H,t}=\frac{W_t}{\alpha_{H,t}\left(1-T_{Nt}\right)}.$$

Note that from the firm perspective this tax shock is very similar to a negative productivity shock. The tax shocks are assumed to follow autoregressive processes in log deviations from steady state, where the calibration of the shock is taken from the estimations of Leeper et al. (2010).[19]

Results reported in column (9) of Table 3 show that this simple tax shock acts much like a productivity shock. The addition of this new shock essentially doubles the effect of

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[18] We also studied the effects of shocks to tastes, both intertemporally and between sectors, as well as money supply and money demand shocks. These shocks did not have significant implications for the steady state share of allocation of production between sectors.

[19] The process estimated by Leeper et al (2010) for capital tax shocks is converted from a quarterly frequency to an annual frequency by stochastic simulation of the process and then fitting an annual sampling of the artificial data to a first order autoregression. The resulting autoregressive parameter of 0.741 and standard deviation of shocks of 0.0790 are applied to tax shocks in each country and each sector. These shocks are assumed to be orthogonal to each other. The mean level of this tax, 0.184, is also taken from Leeper et al (2010).

monetary stabilization on the mean number of firms and the share of differentiated goods in exports, as compared to the case in column (1) with productivity shocks alone.

5. Empirical evidence

In this section, we investigate if there is any empirical support for the idea that monetary policy can actually affect long-run competitiveness. In particular, we carry out an empirical analysis of the key testable implication of the model: countries with monetary policy targeting domestic macro (inflation and output gap) stabilization should have (everything else equal) greater specialization of production and export in differentiated products, relative to countries with a constrained monetary policy. The empirical strategy consists of taking the U.S. as the base country, and calculating the share of differentiated goods in total exports by country, for the period 1972-2004. Using this share as our dependent variable, we then run panel regressions on a proxy for a country's monetary regime, including country and year fixed effects as well as a number of controls.

To identify countries pursuing efficient domestic stabilization, we distinguish countries with or without monetary policy independence, relying on available classifications of either exchange rate or monetary regimes. Namely, we proxy lack of independence by the adoption of a pegged exchange rate regime.

Before proceeding, it is worth clarifying that our empirical strategy is not inconsistent with the fact that a country's monetary regime is an endogenous policy choice. A country choice to embrace a peg, rather than a float, or adopt an inflation targeting regime, rather than other strategies, can always be regarded as deriving from the maximization of some social welfare function. For our empirical strategy to be sound, we need that such a choice is not specifically driven by changes in the composition of exports. As further discussed below, the fact that policy strategies are endogenously chosen, if anything, can be expected to smooth out differences across exchange rates and monetary regimes in the data---hence making it more difficult for us to find statistically significant results.

We should also stress from the start that the inclusion of a country fixed effect in the regression specification controls for different (time-invariant) determinants of comparative advantage, other than monetary policy. A country fixed effect also addresses specific endogeneity issues, arising when time-invariant characteristics of a country determine the composition of exports and at the same time motivate the choice of a particular exchange rate regime (say, an oil rich country pegging the national currency to the dollar over the entire sample period). Nonetheless, there may be issues that cannot be addressed with the inclusion of a country fixed effect. We will resort to splitting the sample according to specific country or product type characteristics, and conduct IV estimations. Finally, a year fixed effect is required to deal with the fact that the share of differentiated goods exports trends upward, especially in the first part of our sample period.

5.1. Data construction and description

For the classification of exchange rate regimes, we rely on two sources. The International Monetary Fund produces a classification based upon the observed degree of exchange rate flexibility and the existence of formal or informal commitments to exchange rate paths. The definition of peg includes countries with no separate legal tender, currency board arrangements, exchange rate bands, or crawling pegs; this excludes countries classified as managed floating and independent floating. We will also consider the classification system of Shambaugh (2004), which identifies a peg if a country sets its interest rates following systematically the policy decision in some base country. One advantage of this classification is that it focuses on monetary independence rather than exchange rate regime per se. For example, in this classification, Germany in years prior to the euro is classified as retaining monetary independence despite participating in different regimes of fixed exchange rates in Europe, because it consistently acted as the leader within pegging blocks. By the same token, countries where capital controls insulated domestic monetary policy from global market pressure are also classified as having monetary independence---e.g., China is classified as having monetary independence in much of the sample. Note that, for our purposes, the exchange rate classification needs not be defined relative to the country we use as base country in the regression analysis (U.S.). A European country in the euro area has effectively limited or no monetary independence, even if the euro is floating against the dollar.

To identify exports of differentiated goods, we rely on Rauch (1999), which provides a classification of 4-digit SITC industries in terms of the degree of differentiation among products. Some products are traded on organized exchanges, while some others have reference prices published in trade journals. Those products for which neither is true are classified as differentiated. Roughly 58% of the industries fall into the differentiated category.

Trade data come from the World Trade Flows Database (see Feenstra, et al., 2005). Exports to the U.S. (in dollars) are available disaggregated by country and by four-digit industry, on an annual basis for the period 1972-2004.

The set of countries covered both by the trade data and exchange rate classification number 164. The sample years are determined by the availability of U.S. disaggregated import data, covering the period 1972-2004.

5.2. Empirical specification

Our dependent variable is the share of differentiated goods in exports. Let x_{ijt} denote the dollar value of exports in industry *i* from country *j* to the U.S. in year *t*. Let *DIF* take the value of 1 for a differentiated industry and 0 otherwise. For country *j* in year *t*, we define a measure of the share of differentiated goods in the overall exports of a country to the U.S.:

$$SDIF_{jt} = \frac{\sum_i DIF_i \cdot x_{ijt}}{\sum_i x_{ijt}}.$$

The index takes values on the continuous interval between 0 and 1. In some of our experiments we will restrict attention to manufacturing exports only. In this case, we will only consider x_{ijt} if belonging to a SITC sector with a code starting with 5 through 8.

Our regression specification is

$$SDIF_{jt} = \beta_0 + \beta_1 PEG_{jt} + \beta_2 X_{jt} + \chi_{jt} + \varepsilon_{jt}, \tag{32}$$

where *X* is a vector of additional variables that we may include in the analysis as additional controls, and χ are country and year fixed effects. *PEG* takes the value of 1 for a fixed exchange rate and 0 otherwise. Across all our regressions, standard errors are clustered by country.

Note that the country fixed effect controls for standard determinants of comparative advantage, such as factor endowments and institutions that do not vary over the sample period. Among the controls, we nonetheless include macroeconomic variables that may have an effect on the composition of trade above and beyond the mechanism highlighted by our model, such as the current account (CA_GDP), and dates of currency (CRISIS_C) or banking crises (CRISIS_B). Access to credit and exposure to credit conditions may in fact vary across industries, in part reflecting the type of markets in which they operate. We also include the real exchange rate level (RER), as an additional control for the effects on exports of large swings in international prices. Finally, we include a measure of financial openness (CLOSED).[20]

5.3. Regression results

The model predicts $\beta_1 < 0$: the share of a country's exports in differentiated goods is lower in countries pursuing a fixed exchange rate policy. Results from the regression model are shown in Table 4 (without controls) and Table 6 (with controls). By the point estimate shown in column 1 of Table 4, when a country adopts a peg, the share of its exports in differentiated goods falls by about 6 percentage points. Given that for the typical country differentiated goods account for about half of its exports, the estimated coefficient implies that the export share drops by about 12% of its value. The result is robust to using the alternative classification of exchange rate regime by Shambaugh (2004), which allows for monetary independence in some countries with a fixed exchange rate, due to capital controls or because they are the leader of a pegging block.

A concern with endogeneity is raised by the possibility that countries that discover oil or other commodities in their territory may choose to peg their currencies to the dollar *because* these commodities are priced in U.S. dollars. In this case, a peg regime would be the consequence, rather that the cause, of a change in the composition of production and exports away from differentiated goods. One way to address this potential issue consists of excluding OPEC members and other large oil exporters from the data set (column 2) and excluding fuel

[20] The dates of currency and banking crises are provided by Reinhart and Rogoff (2013) and Reinhart (2010). The measure of financial openness is supplied by Chinn and Ito, see bhttp://web.pdx.edu/~ito/Chinn-Ito_website.htm.

from the set of export industries (SITC categories beginning with 3, see column 6). In either exercise, the estimations continue to support our theoretical result. We also show below that the result is robust to instrumenting for endogenous choice of exchange rate regime.

A related source of concern is that poor countries may simultaneously produce mostly non-differentiated goods, and adopt some form of currency peg. Although the country fixed effect takes care of cross-sectional differences, we further check for robustness by limiting the sample to more developed countries, with cutoffs in per-capita income of $1035, $4085 and $12,615, according to the World Bank classification.[21] As shown in columns 3 and 4, our results are almost unchanged when we exclude poor countries below the first cutoff point, and also when we limit the sample to upper middle and high income countries above the second cutoff. The only case for which the result is not statistically significant is when we limit the sample to only the richest countries. Nonetheless, we find that this last result also becomes significant if we allow some dynamics in the specification to better account for the effects of monetary regimes, as described below.

Table 5 introduces a lagged *PEG* regressor, with the goal of accounting for the delayed effects of a switch in monetary regimes. In every case, the *PEG* has a statistically significant negative effect on the export share, either contemporaneously or with a lag, or both. This includes the subset of rich countries, for which the contemporaneous effects is zero (as found in the previous table), but the lagged effect is significantly negative. Still, the magnitude of the coefficient does appear to be smaller than for the other samples, suggesting that good monetary stabilization policy has a stronger effect in middle-income countries (where non-monetary institutions and policies may be less developed) than in rich countries, in terms of promoting export competitiveness in differentiated goods.

Results are robust to specifications including controls, shown in Table 6. The exchange rate regime remains significant when we control for a number of factors that may impinge on exports, including financial conditions, external deficit, financial openness, and the real exchange rate.

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[21] This is the World Bank income classification by GNI per capita As of 1 July
Source: http://data.worldbank.org/about/country-classifications.

To deal with potential sources of endogeneity (not taken care of by the country fixed effect, and other than the oil discoveries, discussed above), we instrument for the exchange rate regime choice with the variable proposed by Klein and Shambaugh (2006). This consists of the share of neighboring countries that also peg their currency to the same base country. The logic is that if, for instance, France pegs its currency to the U.S. dollar, in doing so it might be motivated by the goal of stabilizing its currency to its neighbor Germany, which also pegs to the dollar. To the degree that these regional ties dictate the choice of the exchange rate regime, one can conclude that a French peg to the dollar is not endogenously driven by its trade relationship with the U.S., nor, more importantly, by the composition of its trade with the U.S. For consistency, we run our IV estimation adopting the classification of the peg regime by Shambaugh (2004), as in the last column of Table 4. The results, shown in Table 7, continue to support our claim, with a statistically significant negative coefficient on the peg term. The table also shows that our main results are robust to using another instrument, the lagged exchange rate regime dummy, which is also widely adopted in the literature. For consistency and to verify robustness of our result, in this case the table reports estimation based on the exchange rate classification regime by the IMF.

In assessing the above results, we should stress that the exchange rate regime provides only an imperfect proxy for the extent to which monetary policy falls short of stabilizing the domestic economy. By way of example, one could argue that a peg may be a good stabilization strategy depending on the type of shock. According to a standard argument, in the presence of financial shocks, a credible strategy of fixed exchange rate could ensure better stabilization than a float. Moreover, capital controls may relax the external financial constraints on monetary policy even under regimes of limited exchange rate flexibility. While these considerations are well-grounded, we observe that they both work against our hypothesis: other things equal, they tend to smooth out differences between a peg and a floating regime, in terms of their implications for competitiveness. In other words, if the estimation is confounded by such forms of endogeneity, our estimates would underestimate the importance of efficient domestic stabilization policy on competitiveness, biasing our results towards zero.

6. Conclusion

According to a widespread view in policy and academic circles, monetary and exchange rate policy has the power to benefit or hinder the competitiveness of the domestic manufacturing sector. However, the guidance the academic literature offers to this question is of limited practical relevance. The conventional policy model emphasizes the competitive gains from currency devaluation, which lowers the relative cost of producing in a country over the time span that domestic wages and prices are sticky in local currency. In modern monetary theory and central bank practice, however, the resort to competitive devaluation is not viewed as a viable policy recommendation, as it invites retaliation and currency wars, and furthermore, such discretionary policy worsens the short-run trade-offs between inflation and unemployment. Conversely, recent contributions to the New Open Macro Macroeconomics and new-Keynesian tradition stress that monetary policy can exploit a country's monopoly on its terms of trade. As this typically means pursuing a higher international price of home goods, the implied policy goal appears to be the opposite of improving competitiveness.

This paper revisits the received wisdom on this issue, exploring a new direction for open-economy monetary models and empirical research. Our argument is that macroeconomic stabilization affects the comparative advantage of a country in producing goods with the characteristics (high upfront investment, monopoly power and nominal frictions) typical of manufacturing. A stabilization regime that reduces output gap (and marginal cost) uncertainty can strengthen a country's comparative advantage in the production of these goods, beyond the short run.

To be clear, an effective stabilization policy requires contingent expansion and contractions in response to shocks affecting the output gap, which ex post foster (or reduce) the international price competitiveness of a country. But such a policy regime by no means would aim to gain short-run gains by opportunistic exchange rate policy---exchange rate movements would be an implication of efficient domestic stabilization. In this sense, our results suggest that monetary stabilization affects the long-run comparative advantage of a country in a way that is completely separate from the competitive devaluations familiar from traditional policy models. By the same token, our analysis marks a key departure from a well-known conclusion of recent New

Keynesian models, that monetary policy should trade off output gap stabilization with stronger terms of trade. In our model, efficient stabilization makes differentiated good manufacturing more competitive, at home and abroad. But is also results in a shift in the sectoral allocation of resources and composition of exports, in favor of manufacturing. Because of this shift, a larger weight of high-value added goods in exports improves the country overall stronger terms of trade.

Overall, the theory developed in this paper, and the empirical evidence produced in support of its key implications, point to new promising directions for integrating trade and macro models and bring the literature closer to addressing core concerns in the policy debate.

References

Anderson, James E. and Eric van Wincoop, 2004. “Trade Costs,” *Journal of Economic Literature* 42, 691-751.

Barattieri, Alessandro, Susanto Basu, and Peter Gottschalk, 2014. "Some Evidence on the Importance of Sticky Wages," *American Economic Journal: Macroeconomics* 6, 70-101.

Benigno, Gianluca and Pierpaolo Benigno, 2003. “Price Stability in Open Economies,” *Review of Economic Studies* 70, 743-764.

Bergin, Paul and Giancarlo Corsetti, 2008. “The Extensive Margin and Monetary Policy,” *Journal of Monetary Economics* 55, 1222-1237.

Bilbiie, Florin O., Fabio Ghironi, and Marc J. Melitz, 2008. “Monetary Policy and Business Cycles with Endogenous Entry and Product Variety,” in Acemoglu, D., K. S. Rogoff, and M. Woodford, eds., *NBER Macroeconomics Annual 2007*, University of Chicago Press, Chicago, 299-353.

Broda, Christian and David E. Weinstein, 2006. “Globalization and the Gains from Variety,” *The Quarterly Journal of Economics* 121, 541-585.

Campolmi, Alessia, Harald Fadinger, and Chiara Forlati, 2014. “Trade Policy: Home Market Effect Versus Terms-of-trade Externality,” *Journal of International Economics,* 93(1): 92-107.

Canzoneri, Matthew B. Robert E. Cumby and Behzad Diba, 2005. “The Need for International Policy Coordination; What’s Old, What’s New, What’s Yet To Come?” *Journal of International Economics* 66, 363-384.

Cavallari, Lilia, 2013. “Firms' Entry, Monetary Policy and the International Business Cycle,” *Journal of International Economics* 91, 263-274.

Corsetti, Giancarlo, Luca Dedola, and Sylvain Leduc, 2010. “Optimal Monetary Policy in Open Economies,” *Handbook of Monetary Economics*, vol III, ed by B. Friedman and M. Woodford, 861-933.

Corsetti, Giancarlo, Philippe Martin and Paolo Pesenti, 2007. “Productivity, Terms of Trade and the `Home Market Effect',” *Journal of International Economics* 73(1), 99-127.

Corsetti, Giancarlo, and Paolo Pesenti, 2001. “Welfare and Macroeconomic Interdependence,” *Quarterly Journal of Economics* 116, 421-446.

Corsetti, Giancarlo, and Paolo Pesenti, 2005. “International Dimensions of Optimal Monetary Policy,” *Journal of Monetary Economics* 52(2), 281-305.

Devereux, Mick and Charles Engel, 2003. “Monetary Policy in the Open Economy Revisited: Price Setting and Exchange Rate Flexibility,” *Review of Economic Studies* 70, 765-783.

Feenstra, Robert C., Robert E. Lipisey, Haizan Deng, Alyson, C. Ma and Hengyong Mo, 2005. "World Trade Flows," NBER Working Paper 11040.

Fernández-Villaverde, Jesús, Pablo Guerrón-Quintana, Juan F. Rubio-Ramírez, and Martin Uribe, 2011. "Risk Matters: The Real Effects of Volatility Shocks," *American Economic Review* 101, 2530–2561.

Ghironi, Fabio and Marc J. Melitz, 2005. "International Trade and Macroeconomic Dynamics with Heterogeneous Firms," *The Quarterly Journal of Economics* 120(3), 865-915.

Hall, Robert E., 2009. "By How Much Does GDP Rise If the Government Buys More Output?" *Brookings Papers on Economic Activity* 2, 183–231.

Hall, Robert E, and Paul R. Milgrom, 2008. "The Limited Influence of Unemployment on the Wage Bargain," *American Economic Review* 98, 1653-1674.

Helpman, Elhanan and Paul Krugman, 1989. *Trade Policy and Market Structure*, MIT Press.

Hummels, David, 1999. "Have International Transportation Costs Declined?" Work Paper, Purdue University.

Leeper, Eric M., Michael Plante, and Nora Taum, 2010. "Dynamics of Fiscal Financing in the United States," *Journal of Econometrics* 156, 304-321.

Keane, Michael and Richard Rogerson, 2012. "Micro and Macro Labor Supply Elasticities: A Reassessment of Conventional Wisdom," *Journal of Economic Literature*, 464-476.

Klein, Michael W. and Jay C. Shambaugh, 2006. "Fixed Exchange Rates and Trade," *Journal of International Economics* 70, 359-383.

Krugman , Paul, 1980. "Scale Economies, Product Differentiation, and the Pattern of Trade," *American Economic Review* 70, 950-959.

Obstfeld, Maurice and Kenneth Rogoff, 2000. "New Directions for Stochastic Open Economy Models," *Journal of International Economics* 50, 117-154.

Ossa, Ralph, 2011. "A "New Trade" Theory of GATT/WTO Negotiations," *Journal of Political Economy* 119, 122-152.

Rauch, James E., 1999. "Networks Versus Markets in International Trade," *Journal of International Economics* 48, 7–35.

Reinhart, Carmen, 2010. "This Time is Different Chartbook: Country Histories on Debt, Default, and Financial Crisis," NBER Working Paper 15815.

Reinhart, Carmen M. and Rogoff, Kenneth S., 2013. "Banking Crises: An Equal Opportunity Menace," *Journal of Banking and Finance* 37(11), 4557-4573.

Schmitt-Grohe, Stephanie and Martin Uribe, 2007. "Optimal Simple and Implementable Monetary and Fiscal Rules," *Journal of Monetary Economics* 54, 1702-1725.

Shambaugh, Jay C., 2004. “The Effect of Fixed Exchange Rates on Monetary Policy,” The *Quarterly Journal of Economics* 119, 301-352.

Appendix:

1. Entry condition:

The single-period version of the entry condition (17) is:

$$W_t K = E_t\left[\beta \frac{\mu_t}{\mu_{t+1}} \pi_{t+1}(h)\right].$$

Combine with the single-period version of the profit function (15), in which the dynamic adjustment cost ($AC_{p,t}(h)$) is set to zero, and simplify:

$$W_t K = E_t\left[\beta \frac{\mu_t}{\mu_{t+1}}\left(\left(p_{t+1}(h) - \frac{W_{t+1}}{\alpha_{t+1}}\right) c_{t+1}(h) + \left(e_{t+1} p^*_{t+1}(h) - (1+\tau)\frac{W_{t+1}}{\alpha_{t+1}}\right) c^*_t(h)\right)\right]$$

Under producer currency pricing of exports:

$$W_t K = E_t\left[\beta \frac{\mu_t}{\mu_{t+1}}\left(\left(p_{t+1}(h) - \frac{W_{t+1}}{\alpha_{t+1}}\right) c_{t+1}(h) + \left((1+\tau) p_{t+1}(h) - (1+\tau)\frac{W_{t+1}}{\alpha_{t+1}}\right) c^*_{t+1}(h)\right)\right]$$

$$W_t K = E_t\left[\beta \frac{\mu_t}{\mu_{t+1}}\left(\left(p_{t+1}(h) - \frac{W_{t+1}}{\alpha_{t+1}}\right)\left(c_{t+1}(h) + (1+\tau) c^*_{t+1}(h)\right)\right)\right]$$

Using demand equations for C_M and $c(h)$, as well as definition of P_M:

$$W_t K = E_t\left[\beta \frac{\mu_t}{\mu_{t+1}}\left(\left(p_{t+1}(h) - \frac{W_{t+1}}{\alpha_{t+1}}\right)\left(\left(\frac{p_{t+1}(h)}{P_{M,t+1}}\right)^{-\phi} \theta\left(\frac{P_{t+1}}{P_{Mt+1}}\right) C_{t+1} + (1+\tau)^{1-\phi}\left(\frac{p_{t+1}(h)/e_{t+1}}{P^*_{M,t+1}}\right)^{-\phi} \theta\left(\frac{P^*_{t+1}}{P^*_{Mt+1}}\right) C^*_t\right)\right)\right]$$

$$W_t K = E_t\left[\beta \frac{\mu_t}{\mu_{t+1}}\left(\left(p_{t+1}(h) - \frac{W_{t+1}}{\alpha_{t+1}}\right) p_{t+1}(h)^{-\phi}\, \theta \left(\begin{array}{l}\left(n_{t+1} p_{t+1}(h)^{1-\phi} + n^*_{t+1} p_{t+1}(f)^{1-\phi}\right)^{-1} P_{t+1} C_{t+1} \\ +(1+\tau)^{1-\phi} e_{t+1}{}^{\phi}\left(n_{t+1} p^*{}_{t+1}(h)^{1-\phi} + n^*_{t+1} p^*{}_{t+1}(f)^{1-\phi}\right)^{-1} P^*{}_{t+1} C^*{}_t\end{array}\right)\right)\right]$$

Under log utility, where $W_t = \mu_t$ and $P_t C_t = \mu_t$, this becomes equation (43).

2. Entry under full stabilization

Substitute prices, $p_{t+1}(h) = p^*{}_{t+1}(f)\left(\phi/(\phi-1)\right)$, and policy rules ($\mu = \alpha, \quad \mu^* = \alpha^*$) into (43) and simplify:

$$\frac{K\phi}{\beta\theta} = E_t\left[\left(n_{t+1} + n^*_{t+1}\left(\frac{\alpha_{t+1}}{\alpha^*{}_{t+1}}\right)^{1-\phi}(1+\tau)^{1-\phi}\right)^{-1} + (1+\tau)^{1-\phi}\left(\frac{\alpha_{t+1}}{\alpha^*{}_{t+1}}\right)^{\phi-1}\left(n_{t+1}\left(\frac{\alpha_{t+1}}{\alpha^*{}_{t+1}}\right)^{\phi-1}(1+\tau)^{1-\phi} + n^*_{t+1}\right)^{-1}\right]$$

Impose symmetry across countries:

$$n_{t+1} = \frac{\beta\theta}{K\phi} E_t\left[\left(1 + \left(\frac{\alpha_{t+1}}{\alpha^*{}_{t+1}}\right)^{1-\phi}(1+\tau)^{1-\phi}\right)^{-1} + (1+\tau)^{1-\phi}\left(\frac{\alpha_{t+1}}{\alpha^*{}_{t+1}}\right)^{\phi-1}\left(\left(\frac{\alpha_{t+1}}{\alpha^*{}_{t+1}}\right)^{\phi-1}(1+\tau)^{1-\phi} + 1\right)^{-1}\right]$$

$$n_{t+1} = \frac{\beta\theta}{K\phi} E_t \left[\frac{2 + \left(\frac{\alpha_{t+1}}{\alpha^*_{t+1}}\right)^{1-\phi} \left((1+\tau)^{\phi-1} + (1+\tau)^{1-\phi} \right)}{1 + \left(\frac{\alpha_{t+1}}{\alpha^*_{t+1}}\right)^{1-\phi} \left((1+\tau)^{\phi-1} + (1+\tau)^{1-\phi} \right) + \left(\frac{\alpha_{t+1}}{\alpha^*_{t+1}}\right)^{2(1-\phi)}} \right]$$

Which is the same as for the flexible price case.

To compare to the no stabilization case, write this as

$$n^{stab}_{t+1} = n^{no\,stab}_{t+1} E_t \Gamma_{t+1}$$

$$\text{where } \Gamma = \frac{2 + \left(\frac{\alpha_{t+1}}{\alpha^*_{t+1}}\right)^{1-\phi} \left((1+\tau)^{\phi-1} + (1+\tau)^{1-\phi} \right)}{1 + \left(\frac{\alpha_{t+1}}{\alpha^*_{t+1}}\right)^{1-\phi} \left((1+\tau)^{\phi-1} + (1+\tau)^{1-\phi} \right) + \left(\frac{\alpha_{t+1}}{\alpha^*_{t+1}}\right)^{2(1-\phi)}}$$

Note that $n^{stab}_{t+1} > n^{no\,stab}_{t+1}$ if $E_t\Gamma_{t+1} > 1$. However Γ_{t+1} switches from a concave function of $\alpha_{t+1}/\alpha^*_{t+1}$ to a convex function near the symmetric steady state value of $\alpha_{t+1}/\alpha^*_{t+1} = 1$. Hence we cannot apply Jensen's inequality to determine whether $E_t\Gamma_{t+1} > 1$. This finding reflects the fact that the effects of symmetric stabilization are small. Our analysis, nonetheless, will show that the effects of asymmetric stabilization can be large.

3. Case of fixed exchange rate rule:

Substitute prices and policy rules ($\mu = \alpha_*, \mu^* = \mu = \alpha \quad (\text{so } e = 1)$) into (43):

$$\frac{K}{\beta\theta} = E_t \left[\left(\left(\frac{\phi}{\phi-1} - 1\right) \left(\frac{\phi}{\phi-1}\right)^{-\phi} \left(\begin{array}{l} \left(n_{t+1}\left(\frac{\phi}{\phi-1}\right)^{1-\phi} + n^*_{t+1}\left(\frac{\phi}{\phi-1} E_t\left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}}\right]\right)^{1-\phi} (1+\tau)^{1-\phi} \right)^{-1} \\ +(1+\tau)^{1-\phi}\left(n_{t+1}\left(\frac{\phi}{\phi-1}\right)^{1-\phi} (1+\tau)^{1-\phi} + n^*_{t+1}\left(\frac{\phi}{\phi-1} E_t\left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}}\right]\right)^{1-\phi} \right)^{-1} \end{array} \right) \right) \right]$$

Pass through expectations and simplify

$$\frac{K\phi}{\beta\theta} = \left(\left(n_{t+1} + n^*_{t+1}\left(E_t\left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}}\right]\right)^{1-\phi} (1+\tau)^{1-\phi} \right)^{-1} + \left(n_{t+1} + n^*_{t+1}\left(E_t\left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}}\right]\right)^{1-\phi} (1+\tau)^{1-\phi} \right)^{-1} \right)$$

Do the same for the foreign entry condition:

$$\frac{K\phi}{\beta\theta} = \left(E_t\left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}}\right]\right)^{1-\phi} \left(\left(n^*_{t+1}\left(E_t\left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}}\right]\right)^{1-\phi} + n_{t+1}(1+\tau)^{1-\phi} \right)^{-1} + \left(n^*_{t+1}\left(E_t\left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}}\right]\right)^{1-\phi} n_{t+1}(1+\tau)^{\phi-1} \right)^{-1} \right)$$

Rewrite the home and foreign conditions as fractions:

Home: $\frac{K\phi}{\beta\theta} = \frac{1}{n_{t+1} + An^*_{t+1}} + \frac{1}{n_{t+1} + Bn^*_{t+1}}$

Foreign: $\frac{K\phi}{\beta\theta} = \frac{A}{n_{t+1} + An^*_{t+1}} + \frac{B}{n_{t+1} + Bn^*_{t+1}}$

Where we define:

$$A \equiv \left(E_t \left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}} \right] \right)^{1-\phi} (1+\tau)^{1-\phi}, \quad B \equiv \left(E_t \left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}} \right] \right)^{1-\phi} (1+\tau)^{\phi-1}$$

Equating across countries:

$$\frac{2n_{t+1} + (A+B)n^*_{t+1}}{(n_{t+1} + An^*_{t+1})(n_{t+1} + Bn^*_{t+1})} = \frac{(A+B)n_{t+1} + 2ABn^*_{t+1}}{(n_{t+1} + An^*_{t+1})(n_{t+1} + Bn^*_{t+1})}$$

$$\frac{n_{t+1}}{n^*_{t+1}} = \frac{2AB - A - B}{2 - A - B}$$

so $\frac{n_{t+1}}{n^*_{t+1}} > 1$ if $\frac{2AB - A - B}{2 - A - B} > 1$

Note that the denominator will be negative provided the standard deviation of shocks is small relative to the iceberg costs, which will be true for all our cases:

$$\sigma < \left(\ln\left(2/\left((1+\tau)^{1-\phi} + (1+\tau)^{\phi-1} \right) \right) / \frac{1-\phi}{2} \right)^{0.5}$$

For shocks independently log normally distributed with standard deviation σ so that $E_t \left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}} \right] = e^{\frac{1}{2}\sigma^2}$. For example, with τ=0.1 and ϕ =6, σ must be less than 0.209. Our calibration of σ is 0.017.

So $\frac{n_{t+1}}{n^*_{t+1}} > 1$ if $2AB - A - B < 2 - A - B$ or $AB < 1$

$$AB = \left(E_t \left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}} \right] \right)^{1-\phi} (1+\tau)^{1-\phi} \left(E_t \left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}} \right] \right)^{1-\phi} (1+\tau)^{\phi-1} = \left(E_t \left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}} \right] \right)^{2(1-\phi)}$$

For independent log normal distributions of productivity:

$$\left(E_t \left[\frac{\alpha_{t+1}}{\alpha^*_{t+1}} \right] \right)^{2(1-\phi)} = e^{(1-\phi)\sigma^2} < 1 \text{ since } \phi > 1$$

We can conclude that *n*>*n**.

4. LCP version of price adjustment costs

Under the specification that prices for domestic sales, $p_t(h)$, and exports, $p^*_t(h)$, are set separately in the currencies of the buyers, the Rotemberg price setting equations for our model become:

$$p_t(h) = \frac{\phi}{\phi-1}\frac{W_t}{\alpha_t} + \frac{\kappa}{2}\left(\frac{p_t(h)}{p_{t-1}(h)}-1\right)^2 p_t(h) - \kappa\frac{1}{\phi-1}\left(\frac{p_t(h)}{p_{t-1}(h)}-1\right)\frac{p_t(h)^2}{p_{t-1}(h)}$$
$$+\frac{\beta\kappa}{\phi-1}E_t\left[\frac{\mu_t}{\mu_{t+1}}\frac{\Omega_{H,t+1}}{\Omega_{H,t}}\left(\frac{p_{t+1}(h)}{p_t(h)}-1\right)\frac{p_{t+1}(h)^{2-\phi}}{p_t(h)^{1-\phi}}\right]$$

and

$$p_t^*(h) = \frac{\phi}{\phi-1}\frac{W_t(1+\tau_t)}{\alpha_t e_t} + \frac{\kappa(1+\tau_t)}{2}\left(\frac{p_t^*(h)}{p_{t-1}^*(h)}-1\right)^2 p_t^*(h) - \frac{1}{\phi-1}\kappa(1+\tau_t)\left(\frac{p_t^*(h)}{p_{t-1}^*(h)}-1\right)\frac{p_t^*(h)^2}{p_{t-1}^*(h)}$$
$$+\beta\frac{\kappa}{\phi-1}E_t\left[\frac{\mu_t}{\mu_{t+1}}\frac{\Omega_{H,t+1}^*}{\Omega_{H,t}^*}\left((1+\tau_{t+1})\left(\frac{p_{t+1}^*(h)}{p_t^*(h)}-1\right)\frac{e_{t+1}}{e_t}\frac{p_{t+1}^*(h)^{2-\phi}}{p_t^*(h)^{1-\phi}}\right)\right]$$

where $\Omega_{H,s} = P_{M,s}{}^{\phi} D_{M,s}$ and $\Omega_{H,s}^* = P^*{}_{M,s}{}^{\phi} D^*{}_{M,s}$.

Table 1. Benchmark Parameter Values

Preferences

Risk aversion	$\sigma = 2$
Time preference	$\beta = 0.96$
Labor supply elasticity	$1/\psi = 1.9$
Differentiated goods share	$\theta = 0.38$
Non-differentiated goods home bias	$\nu = 0.5$
Differentiated goods elasticity	$\phi = 5.2$
Non-differentiated elasticity	$\eta = 15.3$

Technology

Death rate	$\delta = 0.1$
Price stickiness	$\kappa = 8.7$
Differentiated good trade cost	$\tau_D = 0.16$
Non-differentiated good trade cost	$\tau_N = 0.08$
Firm entry adjustment cost	$\lambda = 0.25$

Shocks:

$$\rho = \begin{bmatrix} 0.6665 & -0.6145 & 0.1328 & -0.2064 \\ 0.3724 & 0.0447 & 0.0360 & -0.0250 \\ 0.5194 & -1.6747 & 0.1289 & 0.6588 \\ 0.2646 & -0.4435 & -0.0474 & 0.4407 \end{bmatrix}$$

$$E\left[\varepsilon_t \varepsilon_t^{'}\right] = \begin{bmatrix} 5.11e-4 & 1.68e-4 & 9.25e-5 & 3.45e-5 \\ 1.68e-4 & 1.45e-4 & 1.82e-5 & 6.47e-5 \\ 9.25e-5 & 1.82e-5 & 6.76e-4 & 7.50e-5 \\ 3.45e-5 & 6.47e-5 & 7.50e-5 & 1.70e-4 \end{bmatrix}$$

Table 2a: Unconditional Means under Alternative Policies

	symmetric stabilization	foreign fixed exchange rate	% difference
n	1.967	1.980	0.63
*n**	1.951	1.936	-0.73
ω_H	0.573	0.576	0.61
ω_F	0.569	0.566	-0.56
ym	0.469	0.472	0.68
yd	0.606	0.604	-0.34
*ym**	0.466	0.464	-0.58
*yd**	0.608	0.612	0.53
c	0.982	0.982	0.00
*c**	0.981	0.981	-0.03
p(h)	1.186	1.193	0.60
p(f)*	1.267	1.192	-5.91
w	0.959	0.964	0.60
*w**	1.024	0.963	-5.91
p(h)/w	1.239	1.239	0.00
p(f)/w**	1.238	1.239	0.07
p(h)/pdh	1.239	1.239	0.00
p(f)/pdf**	1.238	1.239	0.07
rer	1.000	1.000	0.01
TOT-Man	1.001	1.001	0.01
TOT-total	1.000	1.002	0.38

Results come from a stochastic simulation of a second-order approximation to the model. ω_H represents the share of differentiated goods in overall exports of the home country, and it is computed

$$\omega_{Ht} \equiv \frac{p^*_t(h) n_{t-1}\left(c^*_t(h) + d^*_{Kt}(h) + d^*_{AC,t}(h)\right)}{p^*_t(h) n_{t-1}\left(c^*_t(h) + d^*_{Kt}(h) + d^*_{AC,t}(h)\right) + P^*_{Ht}\left(C^*_{Ht} + D^*_{AC,H,t}\right)};$$

ω_{Ft} represents the counterpart for the foreign country.

Table 2b: Standard deviations (percent)

	data	symmetric stabilization	peg
GDP (U.S.)	2.07	2.62	2.51
GDP(EU-10)*	1.61	1.50	1.83
As ratios to std. dev. of GDP:			
ne	5.46	4.10	4.34
*ne**	3.48	3.65	4.52
c	0.75	0.43	0.45
*c**	0.88	0.40	0.34
l	0.87	0.40	0.45
*l**	0.96	0.44	0.68

U.S. data are used for home country; an average of the EU-10 for foreign.

Table 3: Summary of implications of alternative model specifications for key variables

	(1) bench-mark	(2) no entry	(3) LCP	(4) sticky wage	(5) high labor elasticity	(6) GHH & high elasticity	(7) labor entry costs	(8) uncor-related shocks	(9) tax shocks
n	0.63	0.00	0.49	2.55	0.68	6.12	0.23	1.27	1.07
*n**	-0.73	0.00	-0.77	-2.14	-0.76	-7.36	-0.41	-1.45	-1.53
n-n*	-1.36	0.00	-1.25	-4.69	-1.44	-13.48	-0.64	-2.73	-2.60
diffshare	0.61	0.05	0.60	1.58	0.64	4.54	0.32	1.22	1.18
*diffshare**	-0.56	-0.02	-0.54	-1.77	-0.60	-4.78	-0.37	-1.09	-0.88
diffshare-diffshare*	-1.17	-0.06	-1.14	-3.35	-1.24	-9.32	-0.69	-2.31	-2.06

Table reports the percent change in a variable when the foreign country replaces inflation stabilization with exchange rate peg. Table also reports the difference between the home and foreign percent changes.
ω_H represents the share of differentiated goods in overall exports of the home country, and it is computed

$$\omega_{Ht} \equiv \frac{p^*_t(h) n_{t-1}\left(c^*_t(h) + d^*_{Kt}(h) + d^*_{AC,t}(h)\right)}{p^*_t(h) n_{t-1}\left(c^*_t(h) + d^*_{Kt}(h) + d^*_{AC,t}(h)\right) + P^*_{Ht}\left(C^*_{Ht} + D^*_{AC,H,t}\right)};$$

ω_F represents the counterpart for the foreign country.

Table 4: Baseline Regression

	(1) Benchmark	(2) Non-oil exporting countries	(3) Exclude Low Income	(4) High & Upper Middle Income	(5) High Income & Non-oil	(6) No Energy Goods	(7) Shambaugh Peg
PEG	-0.0585***	-0.0635***	-0.0632***	-0.0642***	-0.0234	-0.0487***	-0.0367**
	(0.0163)	(0.0166)	(0.0169)	(0.0195)	(0.0191)	(0.0164)	(0.0162)
Obs.	3646	3256	2942	2094	953	3645	4757
R-sq	0.741	0.725	0.786	0.816	0.818	0.712	0.718
adj. R-sq	0.728	0.710	0.774	0.805	0.803	0.696	0.706
Country Fixed Effect	yes	yes	yes	yes	yes	yes	yes
Year Fixed Effect	yes	yes	yes	yes	yes	yes	yes

Notes: DIF not included as regressor because subsumed in fixed effects.

Standard errors (clustered by country) in parentheses:

* significance at 10%; ** significance at 5%; ***significance at 1%

Table 5: Baseline Regression with Lagged Peg

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Benchmark	Non-oil exporting countries	Exclude Low Income	High & Upper Middle Income	High Income & Non-oil	No Energy Goods	Shambaugh Peg
PEG	-0.0270*	-0.0228*	-0.0292*	-0.0476**	0.0000	-0.0179	-0.0177
	(0.0158)	(0.0136)	(0.0176)	(0.0212)	(0.0140)	(0.0146)	(0.0127)
L.PEG	-0.0360**	-0.0488***	-0.0422***	-0.0188	-0.0253*	-0.0345*	-0.0257**
	(0.0154)	(0.0157)	(0.0156)	(0.0145)	(0.0130)	(0.0181)	(0.0124)
Obs.	3481	3113	2809	1997	911	3480	4580
R-sq	0.747	0.731	0.791	0.822	0.820	0.722	0.727
adj. R-sq	0.733	0.715	0.779	0.810	0.805	0.706	0.715
Country Fixed Effect	yes	yes	yes	yes	Yes	yes	yes
Year Fixed Effect	yes	yes	yes	yes	Yes	yes	yes

Notes: DIF not included as regressor because subsumed in fixed effects.

Standard errors (clustered by country) in parentheses:

* significance at 10%; ** significance at 5%; ***significance at 1%

Table 6: Baseline Regressions with Controls

	(1) benchmark	(2) 5 year averages
PEG	-0.0528***	-0.0465**
	(0.0186)	(0.0221)
CA_GDP	0.000337	0.00101
	(0.000619)	(0.00181)
RER	0.00855	0.0182*
	(0.0122)	(0.0101)
CRISIS_C	0.00646	0.0154
	(0.0111)	(0.0210)
CRISIS_B	0.00521	0.0126
	(0.0154)	(0.0249)
CLOSED	-0.0185	-0.00285
	(0.0261)	(0.0329)
Obs.	2523	646
R-sq	0.785	0.853
adj. R-sq	0.769	0.804
Country and Year Fixed Effects	yes	yes

Table 7: IV Regressions

	IV: Lagged IMF Exchange Rate		IV: Klein-Shambaugh Index	
PEG	-0.0739*** (0.0206)	-0.0739*** (0.0104)	-0.108*** (0.0273)	-0.108*** (0.0133)
Obs.	3481	3481	3443	3443
R-sq	0.183	0.183	0.165	0.165
adj. R-sq	0.137	0.137	0.120	0.120
Standard Errors	Clustered	Robust	Clustered	Robust
Country Fixed Effect	yes	yes	yes	yes
Year Fixed Effect	yes	yes	yes	yes

Notes: DIF not included as regressor because subsumed in fixed effects.

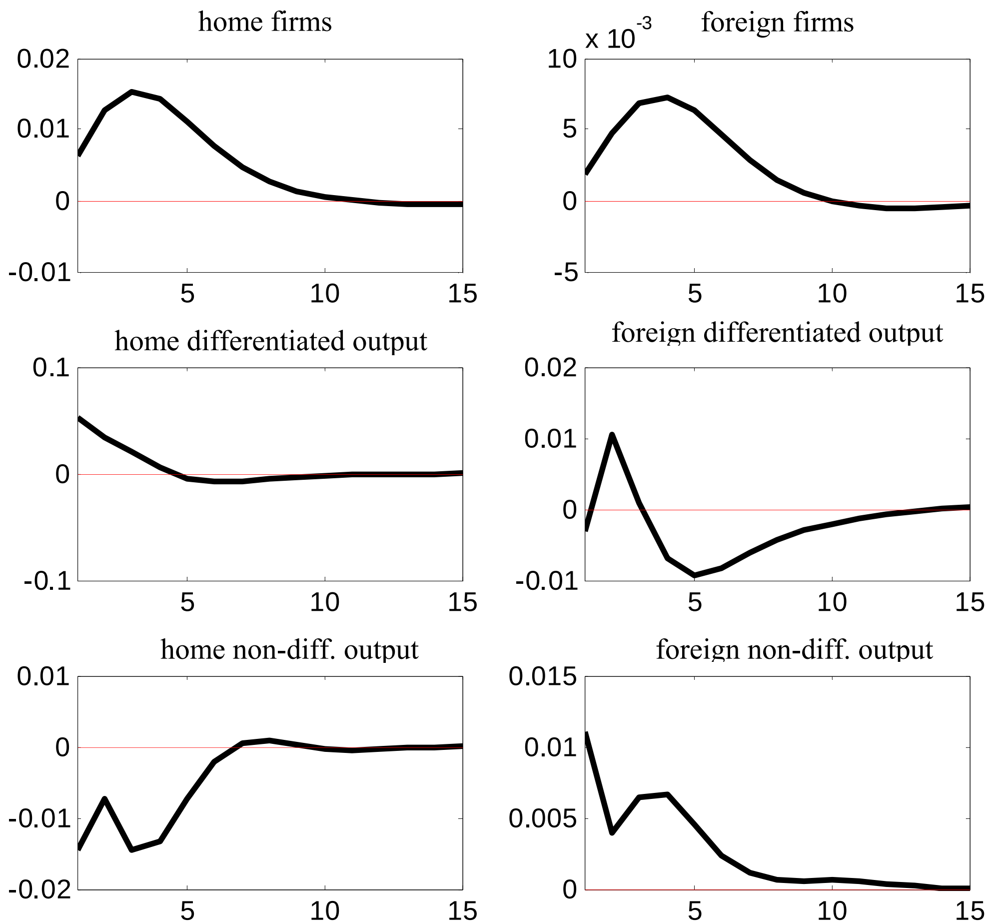
If the instrument is Klein and Shambaugh, the instrumented variable is the Shambaugh peg;
If the instrument is the lagged IMF exchange rate index, the instrumented is the contemporaneous IMF exchange rate index.

Under "IV: Klein-Shambaugh Index":

Standard errors (either clustered by country or heteroskedasticity-robust) in parentheses:

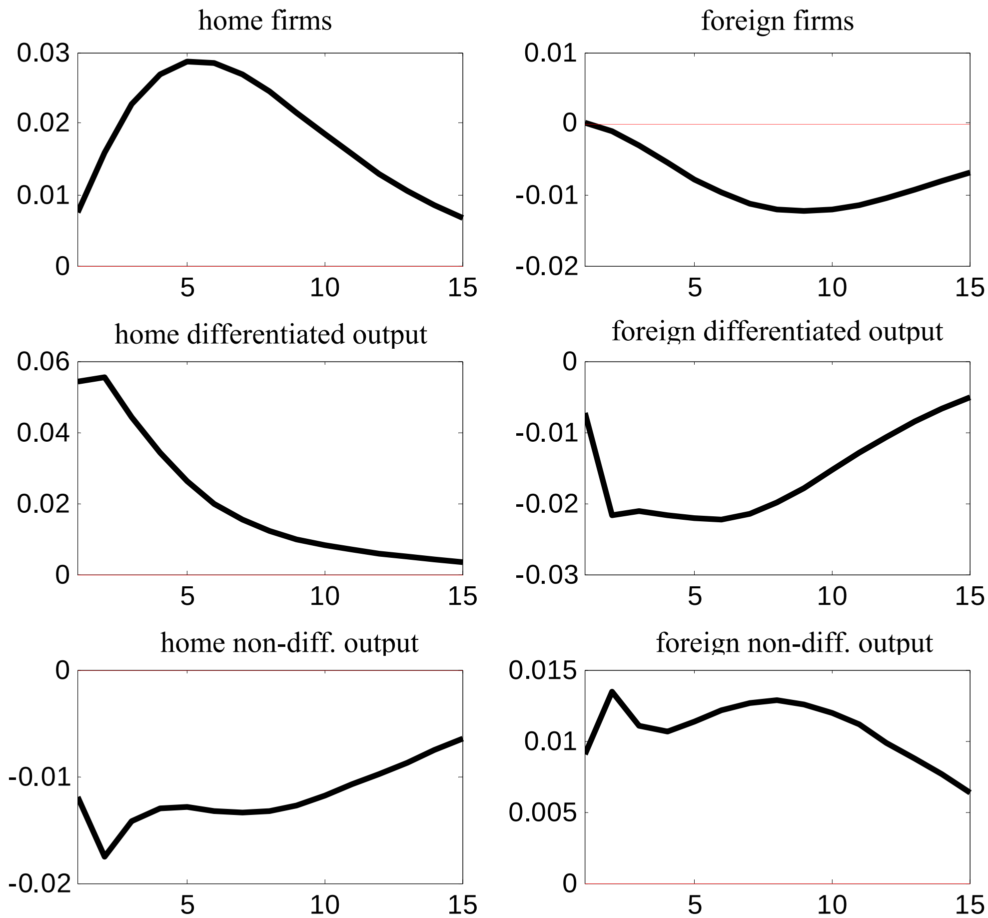
* significance at 10%; ** significance at 5%; ***significance at 1%

Fig 1.
Responses to a 1 std dev rise in home manufacturing productivity;
both countries use efficient stabilization monetary policy



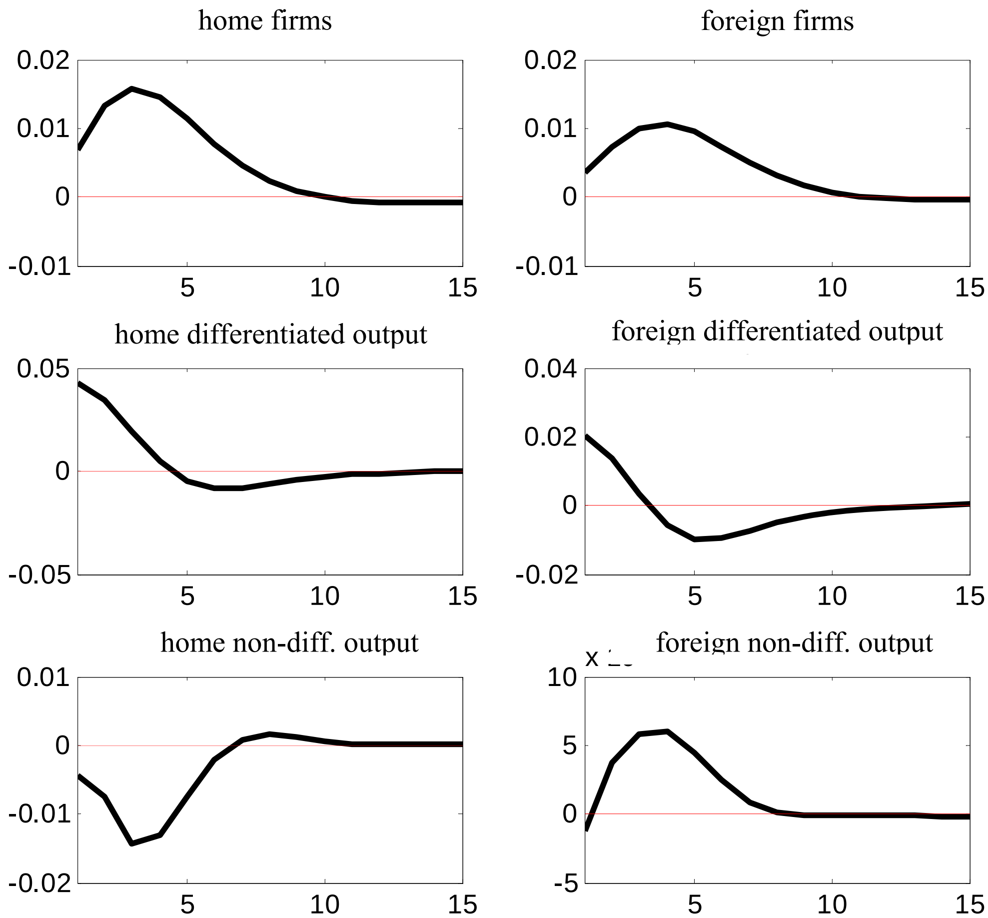
Vertical axis is percent deviation (0.01=1%) from steady state levels. Horizontal axis is time (in years).

Fig 2.
Responses to a 1 std dev rise in home manufacturing productivity;
both countries use efficient stabilization monetary policy;
No autocorrelation in shocks across countries



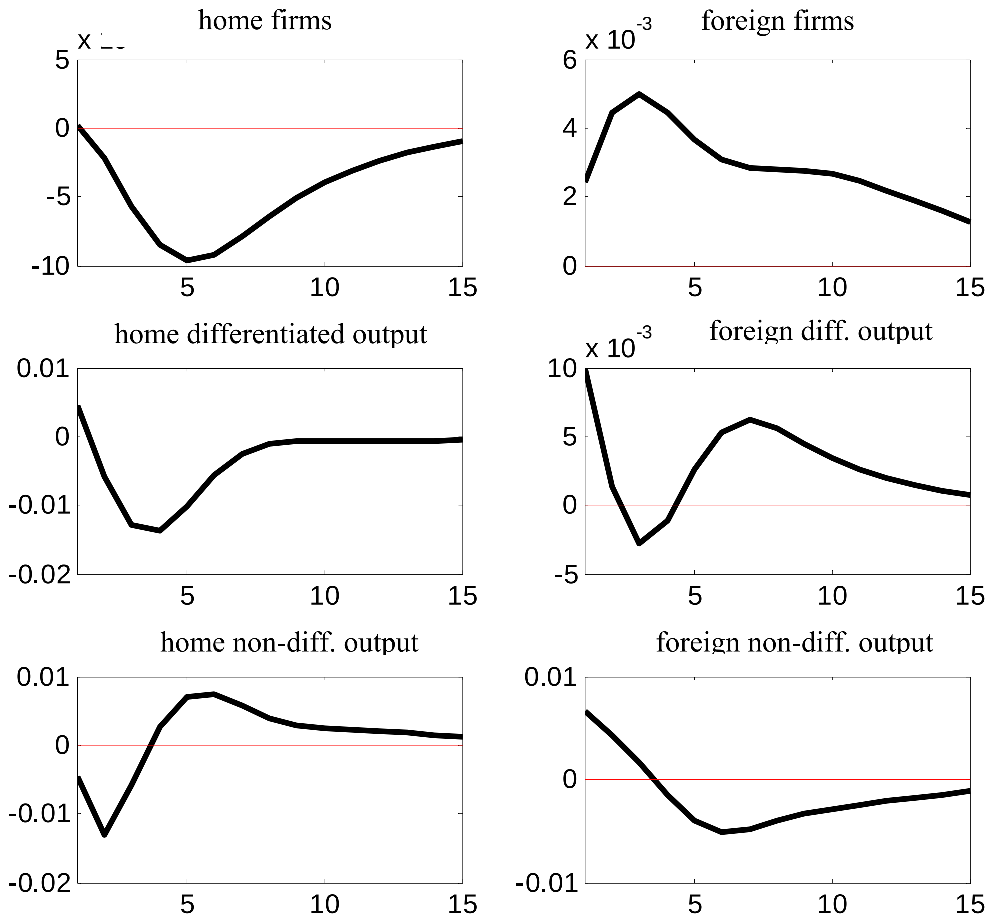
Vertical axis is percent deviation (0.01=1%) from steady state levels. Horizontal axis is time (in years).

Fig 3:
Responses to a 1 std dev rise in home manufacturing productivity;
foreign country pegs



Vertical axis is percent deviation (0.01=1%) from steady state levels. Horizontal axis is time (in years).

Fig 4.
Responses to a 1 std dev rise in foreign manufacturing productivity;
foreign country pegs



Vertical axis is percent deviation (0.01=1%) from steady state levels. Horizontal axis is time (in years).