International Competitiveness and Monetary Policy

Paul R. Bergin
University of California at Davis and NBER

Giancarlo Corsetti
University of Cambridge and CEPR

Norges Bank Conference
The role of monetary policy revisited
Oslo Sept 26-27 2013

Question

- Can monetary and exchange rate policy raise welfare by promoting a country's competitiveness?
- Classical question in international macro, with positive (?) answer in the traditional (IS-LM Mundell-Fleming) literature.
- Difficult to address in modern models adopted by central banks and policy institutions:
  - The trade-off between output and exchange rate stabilization is shaped by an argument akin to the 'optimal tariff' argument in trade
  - 'real appreciation allows a country to consumer more for any given level of employment'

Competitiveness vs Optimal Tariff

- Monetary version of 'optimal tariff' at odds with policy concerns about 'competitiveness.'
- Same debate in international trade theory and policy.
- Ossa 2011: production relocation externality as a simple mechanism by which 'promoting domestic manufacturing' enhances national welfare.
  - Main idea: A larger share of world production of differentiated goods associated with high trade costs, raises welfare via savings on these costs.
  - Proxy for more complex mechanisms.

What does this paper do?

Propose a development of policy models suitable to address stabilization vs competitiveness: two-sector monetary economies, with comparative advantages and externality in one sector.

- Analysis of optimal monetary policy:
  - Optimal trade-off between output gap and comparative advantages in manufacturing
- Empirical evidence supports key theory prediction:
  - Exports in differentiated goods falls under a currency peg (i.e. inefficient stabilization).

Features of the new approach

Two-sector market structure:

1. Monopolistically competitive sector producing **differentiated products** (**manufacturing**).
   - **Sunk costs of entry**, covered by monopoly profits (standard in trade).
   - **Trade costs**.
   - **Sticky prices**.

2. A sector with less trade costs, less price stickiness
   - For simplicity perfectly competitive homogeneous good sector.

Comparative advantages in Macro

- Stochastic general equilibrium model with aggregate (productivity) shocks.
- Manufacturing firms invest in differentiated goods ahead of production: pricing and entry decisions are sensitive to uncertainty:
  - respond to macroeconomic stabilization.
- Policymakers can improve social welfare:
  - strategic policy policy promotes entry of Home, exit of Foreign manufacturing firms;
  - contributes to comparative advantages.

Main Results

- Externality in manufacturing sector creates incentives to deviate from globally efficient rules with significant beggar-thy-neighbor effects.
- While policy implies **competitively low manufacturing prices**, change in export composition **improves the overall terms of trade**.
- Inefficient monetary stabilization under pegs causes loss of export share of differentiated goods
  - Empirical support from panel regressions.

I. A new approach to policy models

An illustration of the new model

- DSGE monetary model of the kind adopted by most policy institutions.
- Two countries (home and foreign), symmetric but for policies, each with two tradable sectors: homogeneous and differentiated goods.
- Kept simple
  - One period preset prices in manufacturing.
  - No investment, no G spending, i.i.d. shocks
  - Non stochastic production of homogeneous good implies wage equalization and thus perfect risk sharing.

Aggregate demand (households)

- Define monetary stance as μ_t, driving the level of aggregate demand

$$\mu_t = P_t / U'(C_t) = P_t C_t$$

and affecting saving and labor mkt equilibrium:

- Euler

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

- Labor Supply:

$$W_t = \kappa \mu_t$$

Homogeneous Good Production

- Productivity constant/identical across countries

$$y_{D,t} = \alpha_D l_{D,t}$$

- Perfect competition: firms price takers in the goods (as well as in labor) market
  - in equilibrium

$$p_{D,t} = W_t / a_D = k m_t / a_D$$

Differentiated (Manufacturing) Goods

- Production affected by aggregate productivity shocks, α_t

$$y_t(h) = \alpha_t l_t(h)$$

- Manufacturing firms
  - pay a fixed cost in labor units, q_t, each period, in advance of production.
  - set prices one period in advance in domestic currency units (producer currency pricing).
- Trade cost τ of selling in foreign market.

Manufacturing firm problem

- To maximize their value, i.e. the PDV of profits, firms set prices as to equate expected discounted marginal revenue to expected marginal costs augmented by equilibrium markup

$$p_{t+1}(h) \cdot E_t\left[W_{t+1}\right] = \frac{f}{f-1} \cdot E_t\left[W_{t+1}\left(\frac{km_{t+1}}{a_{t+1}}\right)\right]$$

- New firms enter until expected discounted future profits equal fixed cost.

Monetary Policy

- Monetary policy rules respond to home and (potentially) foreign output gap --- hence they respond to productivity shocks:

$$m_t = a_t^{g_1} (a_t^*)^{g_2}$$

$$m_t^* = (a_t^*)^{g_1^*} a_t^{g_2^*}.$$

Monetary policy rules affect firms' pricing and entry decisions

- μ affects marginal revenue Ω and costs μ/α, especially their comovement:

$$p_{t+1}(h) = \frac{f}{f-1} E_t\left[\Omega_{t+1}\left(\frac{k\mu_{t+1}}{a_{t+1}}\right)\right] \Big/ E_t\left[\Omega_{t+1}\right]$$

$$= \frac{kf}{f-1} \frac{E\Omega_{t+1} E\left(\frac{\mu_{t+1}}{a_{t+1}}\right) + Cov\left(\Omega_{t+1}, \left(\frac{\mu_{t+1}}{a_{t+1}}\right)\right)}{E_t\left[\Omega_{t+1}\right]}$$

Old and new view

How can monetary policy help competitiveness?

- Conventional view: by discretionary depreciation in reaction to adverse shocks
- New view: firms gain from policy regimes/rules that prevent macro shocks from reducing expected profits via their effects on costs and revenues.
  - Monetary policy has an effect on average pricing

Competitive devaluation vs Competitive stabilization

International Prices

- Real exchange rate:

$$rer_t \equiv e_t P_t^* / P_t$$

- Terms of trade in manufacturing (trade literature):

$$TOTM_t \equiv p_t(h) / \left(e_t p_t^*(f) \right)$$

- Terms of trade (including all goods)

$$TOTS_t \equiv p(h)_t / [\omega_t e_t p_t^*(f) + \left(1 - \omega_t\right) p_{D,t}]$$

with weights given by expenditure share:

$$\omega_t \equiv e_t p_t(f) n_{t-1}^* c_t(f) / [e_t p_t(f) n_{t-1}^* c_t(f) + p_{D,t}\left(c_{Dt} - y_{Dt}\right)]$$

Notable Model Feature: Risk Sharing

- Arbitrage in homogeneous goods market:

$$P_{Dt} = e_t P^*_{Dt}$$

- No productivity differentials => law of one price implies that nominal wages are equalized.
- Using labor market equilibrium:

$$e_t = \frac{p_{Dt}}{p^*_{Dt}} = \frac{W_t}{W^*_t} = \frac{PC_t}{P^*_t C^*_t}$$

- Rearranging, perfect international risk sharing

$$\frac{e_t P^*_t}{P_t} = \frac{C_t}{C^*_t}$$

II. Results: theory

1. Benchmark of Globally Efficient Rules

- Optimal rules fully stabilize output gap in each country and world wide:

$$\mu_t = \alpha_t, \quad \mu_t^* = \alpha_t^*$$

  Home currency depreciates in response to an asymmetric rise in home productivity $e_t = \alpha_t / \alpha_t^*$

- On average, stabilization at global level lowers manufacturing prices

$$p_{t+1}^{coord}(h) = \frac{\phi}{\phi - 1}\kappa < p_{t+1}^{no\ stab}(h)$$

	No stabilization	Coordination / Flex price
n	0.80	0.80
n^*	0.80	0.80
p	1.0674	1.0672
p^*	1.0674	1.0672
y_m	0.4166	0.4170
y_d	0.500	0.500
y_m^*	0.417	0.417
y_d^*	0.500	0.500
TOTM	1.0000	1.0003
TOTS	1.0000	1.0003
c/l	0.9400	0.9402
c/l**	0.9400	0.9402
utility gain		0.0242
*utility gain**		0.0242

Unconditional means from stochastic simulation of second order approximation.
Utility gain relative to no policy case, in percentage terms.

2. Foreign Country Pegs to Home

- Country that pegs its currency has higher manufacturing prices

$$p^{*}_{t+1}(f) = \frac{f}{f-1} k E_t \left[\frac{a_{t+1}}{a^{*}_{t+1}} \right] > p_{t+1}(h) = \frac{f}{f-1} k$$

less manufacturing firms $n > n^{flex} > n^{*}$

- Country that stabilizes its own output gap
  - Lower CPI and higher consumption
  - Despite depreciated real exch. rate, Home terms of trade rise overall due to composition of trade
  - Asymmetric welfare gain relative to coordinated stabilization

	No stabilization	Coordinatin Flex price	Foreign Peg
n	0.80	0.80	0.81
n^*	0.80	0.80	0.79
p	1.0674	1.0672	1.0671
p^*	1.0674	1.0672	1.0678
y_m	0.4166	0.4170	0.4219
y_d	0.500	0.500	0.494
y_m^*	0.417	0.417	0.411
y_d^*	0.500	0.500	0.506
TOTM	1.0000	1.0003	0.9997
TOTS	1.0000	1.0003	1.0051
c/l	0.9400	0.9402	0.9403
c/l**	0.9400	0.9402	0.9397
utility gain		0.0242	0.0349
*utility gain**		0.0242	-0.0352

Unconditional means from stochastic simulation of second order approximation.
Utility gain relative to no policy case, in percentage terms.

3. Policy Defection from Global Rules

- A self-interested Home Policy differ from global coordination:

$$m_t = a_t^{0.66} a_t^{*0.34}$$

- Home policy makers lean against (fundamental) exchange rate volatility: mute their response to home shocks and counteracts foreign response to own shocks.

- On average:
  - Policy maximizes entry in Home manufacturing
  - Weaker real exchange rate and manufacturing prices, but stronger terms of trade
  - Beggar-thy-neighbor

	No stabilization	Coordination Flex price	Foreign Peg	Unilateral Defection
n	0.80	0.80	0.81	0.81
n^*	0.80	0.80	0.79	0.79
p	1.0674	1.0672	1.0671	1.0669
p^*	1.0674	1.0672	1.0678	1.0676
y_m	0.4166	0.4170	0.4219	0.4218
y_d	0.500	0.500	0.494	0.494
y_m^*	0.417	0.417	0.411	0.412
y_d^*	0.500	0.500	0.506	0.506
TOTM	1.0000	1.0003	0.9997	0.9999
TOTS	1.0000	1.0003	1.0051	1.0052
c/l	0.9400	0.9402	0.9403	0.9405
c^*/l^*	0.9400	0.9402	0.9397	0.9399
utility gain		0.0242	0.0349	0.0545
*utility gain**		0.0242	-0.0352	-0.0118

Unconditional means from stochastic simulation of second order approximation.
Utility gain relative to no policy case, in percentage terms.

4. Consequences for world equilibrium

- Each country expands too little in response to positive shock.
- On average:
  - Welfare gain from coordination over Nash equals 2/3 of gain from Nash over no policy.
  - This relative welfare gain is large compared to past literature.

	No stabilization	Coordination Flex price	Foreign Peg	Unilateral Defection	Nash
n	0.80	0.80	0.81	0.81	0.80
n^*	0.80	0.80	0.79	0.79	0.80
p	1.0674	1.0672	1.0671	1.0669	1.0673
p^*	1.0674	1.0672	1.0678	1.0676	1.0673
y_m	0.4166	0.4170	0.4219	0.4218	0.4168
y_d	0.500	0.500	0.494	0.494	0.500
y_m^*	0.417	0.417	0.411	0.412	0.417
y_d^*	0.500	0.500	0.506	0.506	0.500
TOTM	1.0000	1.0003	0.9997	0.9999	1.0000
TOTS	1.0000	1.0003	1.0051	1.0052	1.0000
c/l	0.9400	0.9402	0.9403	0.9405	0.9401
c^*/l^*	0.9400	0.9402	0.9397	0.9399	0.9401
utility gain		0.0242	0.0349	0.0545	0.0146
*utility gain**		0.0242	-0.0352	-0.0118	0.0146

Unconditional means from stochastic simulation of second order approximation.
Utility gain relative to no policy case, in percentage terms.

III. Results: empirics

Empirical Evidence

- Key implication for the data:
  - Monetary policy constrained by an exchange rate target, all else equal, reduce export specialization in differentiated products.
  - Analysis across countries with fixed and flexible rate regimes.

Data:

- Exports to U.S. by country and industry from World Trade Flows Data base (Feenstra)
- Differentiation Index from Rauch (1999)
  4-digit SITC industries: a good is differentiated if not traded on organized exchange and/or no reference prices published in trade journals.
- Monetary policy independence classification from IMF or others
  - Germany as independent despite member of fixed rate system, because leader.

Pooled Country-sector Analysis

- Specification:

$$\log x_{ijt} = b_0 + b_1 PEG_{jt} DIF_{it} + b_2 PEG_{jt} + c_i + c_j + c_t + e_{ijt}$$

  - x_{ijt} dollar value of exports in industry i from country j to the U.S. in year t.
  - PEG_{jt}, 1 for peg, 0 for independent policy in country j and year t.
  - DIF_i: 1 for differentiated industry i, 0 otherwise.
  - Include fixed effects for country, year, sector.

- Model predicts $\beta_1 < 0$

Pooled Regression: Baseline Specification

	(1)	(2)	(3)
PEG x DIF	-0.198***	-0.383**	-0.318***
	(0.052)	(0.0980)	(0.0961)
PEG	0.0986*	0.168*	-0.0991
	(0.0411)	(0.0726)	(0. 0707)
Obs.	719603	719603	719603
R-sq	0.390	0.387	0.367
adj. R-sq	0.389	0.383	0.363
Country FE	yes	yes	
Year Fixed Effect	yes	yes	
Sector Fixed Effect	yes		
Country-Year FE			yes
Country-Sector FE		yes	yes

Notes: DIF not included as regressor because subsumed in sector fixed effect.
Heteroskedasticity Robust Standard errors in parentheses:
* significance at 5%; ** significance at 1%; ***significance at 0.1%

Pooled Regression: Baseline Specification cont.ed

	>$10,000	No energy	Alternative peg classification
PEG x DIF	-0.142**	-0.196**	-0.194***
	(0.052)	(0.0107)	(0.0531)
PEG	-0.0727	-0.0471*	0.217***
	(0.0411)	(0.0179)	(0. 0432)
Obs.	503393	634009	800054
R-sq	0.339	0.364	0.367
adj. R-sq	0.337	0.360	0.363
Country-Year FE	yes	yes	yes
Country-Sector FE	yes	yes	yes

Notes: DIF not included as regressor because subsumed in sector fixed effect.
Heteroskedasticity Robust Standard errors in parentheses:
* significance at 5%; ** significance at 1%; ***significance at 0.1%

Pooled Country-sector Analysis

- Results support prediction: $\beta_1 < 0$
- Robust to restricting the sample to rich countries, non-oil exporting countries, manufacturing goods only, alternative classifications of pegs.
- More on this in the near future.

Country Level Analysis

- Define country differentiation index:

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

- Specification:

$$SDIF_{jt} = \beta_0 + \beta_1 PEG_{jt} + \varepsilon_{jt}$$

- Model predicts

$$\beta_1 < 0$$

- Results support prediction.

Country Level Analysis

	(1) Baseline	(2) Non-oil exporters	(3) >$10,000 countries	(4) Additional controls
PEG	-0.0585***	-0.0625***	-0.0628***	-0.0546**
	(0.0163)	(0.0166)	(0.0218)	(0.0182)
N	3646	3190	1877	2624
R-sq	0.741	0.721	0.815	0.775
adj. R-sq	0.728	0.706	0.803	0.759

Notes: Coefficients on country and sector fixed effects not reported. Heteroskedasticity Robust Standard errors in parentheses: * significance at 5%; ** at 1%; *** at 0.1%

Country Level Analysis cont.ed

	(5) Manufac. Exports	(6) No Energy Goods
PEG	-0.0334	-0.0486**
	(0.0205)	(0.0164)
N	3632	3645
R-sq	0.602	0.711
adj. R-sq	0.581	0.696

Notes: Coefficients on country and sector fixed effects not reported. Heteroskedasticity Robust Standard errors in parentheses: * significance at 5%; ** at 1%; *** at 0.1%

Conclusions

- Monetary policy cannot be expected to play the same role as real factors (research and development, investment in human and physical capital, market structure, taxation) in determining a country's competitiveness.
- Nonetheless, theoretical and empirical considerations suggest that its potential role is far from negligible.

Conclusions

- Closer integration of trade and macro model opens new and exciting directions for economic research.
- Most importantly, it may enrich the set of intellectual, quantitative and empirical tools monetary authorities can rely on, to respond the challenges of stabilizing increasingly open domestic economies.

Aggregate Demand

Home consumption index, C, includes

- all n varieties h of the differentiated goods produced at Home
- all n^* varieties f produced in Foreign,
- the homogeneous good.

$$C_t \circ C_{M,t}^{q} C_{D,t}^{1-q}$$

where

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

Households Problem

$$\max E_0 \sum_{t=0}^{\infty} \beta^t \left[\ln C_t + \chi \ln \frac{M_t}{P_t} - \kappa l_t \right]$$

$$P_t C_t = W_t l_t + \int_0^{n_t} \pi_t(h)\, dh - W_t q + M_t - M_{t-1} + B_t - (1 + i_{t-1}) B_{t-1} - T_t$$

- Utility from consumption, real money balances (M/P), negative utility from labor (l).
- Income from labor earnings at wage rate W, interest (i) on domestic bonds (B), profits from ownership of firms (π). Pay lump sum tax (T).

Price Indexes and Goods Demand

- Price indices:

$$P_t \equiv \frac{P_{M,t}^{\theta} P_{D,t}^{1-\theta}}{\theta^{\theta}\left(1-\theta\right)^{1-\theta}} \qquad P_{Mt} = \left(n_t p_t\left(h\right)^{1-\phi} + n_t^{*} p_t\left(f\right)^{1-\phi} \right)^{\frac{1}{1-\phi}}$$

and demands for goods with elasticity ϕ

$$P_{Mt} C_{Mt} = \theta P_t C_t \qquad c_t(h) = \left(p_t\left(h\right) / P_t \right)^{-\phi} C_{Mt}$$

$$P_{Dt} C_{Dt} = \left(1-\theta\right) P_t C_t \qquad c_t(f) = \left(p_t\left(f\right) / P_t \right)^{-\phi} C_{Mt}$$

- Analogous expressions for foreign country.

Manufacturing Firms' problem

- Define e as the exchange rate. Firms profits are

$$\pi_t(h) = p_t(h)c_t(h) + e_t p_t^*(h)c_t^*(h) - W_t y_t(h)/\alpha_t$$

with export prices (including trade costs)

$$p^*_{t+1}(h) = (1+\tau)\, p_{t+1}(h)/e_{t+1}$$

- Firms optimally preset prices to maximize their value, i.e. the PDV of profits

$$\max_{p_{t+1}(h)} = E_t \left\{ b \frac{m_t}{m_{t+1}} p_{t+1}(h) \right\} q_t W_t$$

New entry until expected discounted future profits equal fixed cost.

Parameter Values

Preferences:

$\phi = 6$ (elasticity between varieties)

$\theta = 0.5$ (share of manufactured goods)

$\beta = 0.96$ (discounting, annual frequency)

$\kappa = 1$ (Labor supply)

$\chi = 1$ (money demand)

Production and Trade costs:

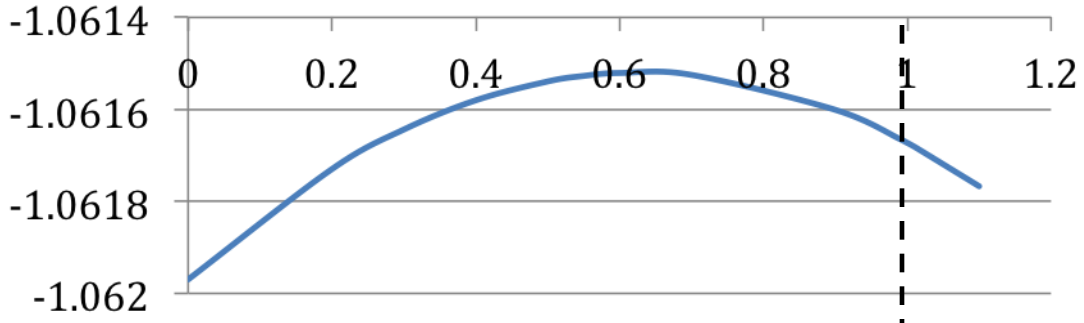
$q = 0.1$ (fixed cost)

$\tau = 0.10$ (iceberg cost)

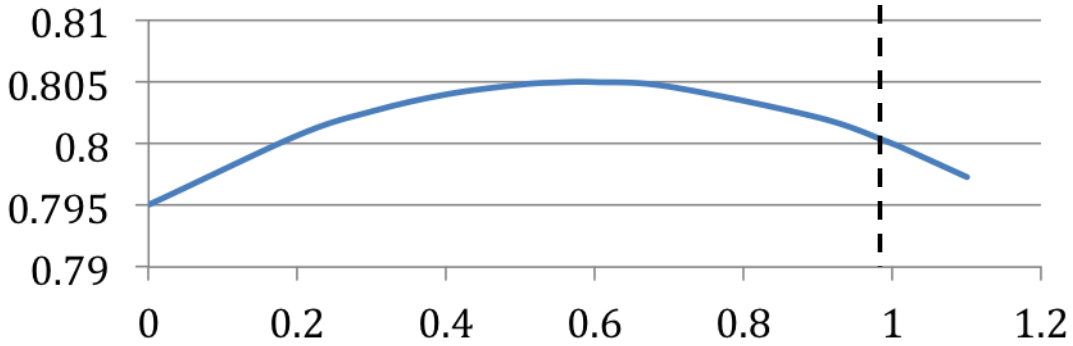
$\ln \alpha_t \sim N\left(\ln \overline{\alpha}, \sigma_\alpha\right) \quad \overline{\alpha} = 1; \quad \sigma_\alpha = 0.017$

$\alpha_D = 1$

Home utility as function of policy parameter γ_1



Home # firms as function of policy parameter γ_1



(value of 1 is full stabilization case that replicates the flexible price allocation)