

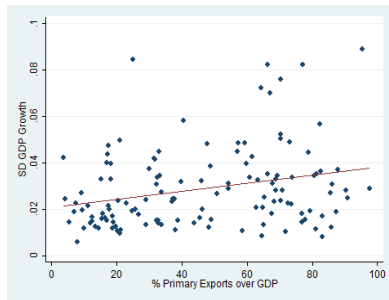
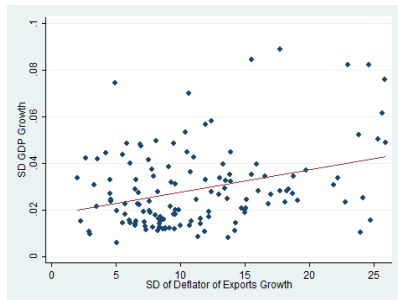
Commodity price shocks and imperfectly credible macroeconomic policies

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Export price volatility and output volatility

- Positive correlation between export price volatility and output volatility
- Positive correlation between the share of primary exports and output volatility

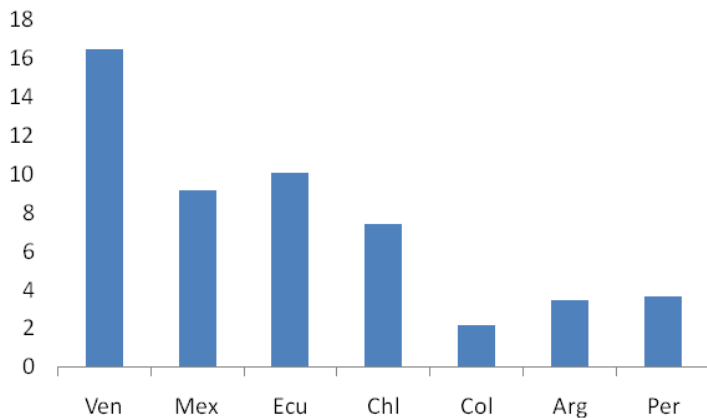


Policy links between commodity prices and activity

- Fiscal policy
 - Commodity exports are a relevant source of government financing, in particular, in emerging economies
 - The elasticity of public revenues to commodity price shocks lies between 0,2 and 0,7 for emerging markets (Ehrhart and Guerineau, 2012; Medina 2010) and between 0,1 and 0,2 for commodity exporting advanced economies (Medina 2010)
 - Then, commodity price fluctuation affect the volatility of public revenues
 - If the government pursue a balanced budget, then public expenditure will be more volatile \Rightarrow more output volatility
 - Government may commit to an a-cyclical behavior, but need to be credible and transparent

Policy links between commodity prices and activity

Figure: Public revenues linked to commodity exports (%GDP)



source: Medina (2010)

- Monetary policy
 - Commodity price increases may lead to exchange rate appreciations
 - If central bank dislike currency appreciation, monetary authority may be tempted to deviate from systematic behavior and pursue a more expansive policy
 - A commitment to stick to a rule may increase effectiveness of policy, but need to be credible and transparent

- We develop a DSGE where macro policies may lack credibility
- We distinguish credibility from transparency
 - Transparency allow private agents to learn fast the true policy rules followed by the authorities
- Simulate impulse-response to a commodity price shock under alternative configurations
- Present some new empirical evidence

- Sketch of model
- Model simulation
- Empirical evidence
- Conclusions

- Small open economy DSGE model

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 - Commodity price determined in the international market
 - All the production is exported
 - A share of the revenues belong to the government (taxes, property)

- Monetary policy

$$\frac{1+i_t}{1+i} = \underbrace{\left[\left(\frac{1+i_{t-1}}{1+i} \right)^{\varphi_i} E_t \left(\frac{1+\pi_{t+1}}{1+\bar{\pi}} \right)^{(1-\varphi_i)\varphi_\pi} \right]}_{1+\tilde{i}_t: \text{systematic behavior}} \exp \zeta_{m,t}$$

with $\zeta_{m,t} \sim N(0, \sigma_m^2)$

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- Parameters σ_m^2 and σ_G^2 determine the reputation of both authorities

Policy rules under imperfect credibility

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- We denote by $pr_{i,t}$ the probability of each one of the four cases above in period ($i = 1, \dots, 4$)
- Monetary and fiscal policy do not deviate from their rules, but private agents learn this slowly over time

- Monetary policy

$$\begin{aligned} dev_{i,t} &= i_t - \tilde{i}_t + e_{1,t} \\ &= \zeta_{m,t} - (pr_{1,t} + pr_{4,t}) (1 - \varphi_i) \omega_\pi \ln \left(\frac{P_{Co,t}^*}{P_t^*} \right) + e_{1,t} \end{aligned}$$

where $e_{1,t} \sim N(0, \sigma_1^2)$

Lack of transparency

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where $e_{1,t} \sim N(0, \sigma_1^2)$

- Fiscal policy

$$\begin{aligned} dev_{G,t} &= g_t - \tilde{g}_t + e_{2,t} \\ &= \zeta_{G,t} + (pr_{3,t} + pr_{4,t}) \omega_G \Gamma \ln \left(\frac{P_{Co,t}^*}{P_t^*} \right) + e_{2,t} \end{aligned}$$

where $e_{2,t} \sim N(0, \sigma_2^2)$

- Based on the information available up to $t - 1$, private agents infer the vector of states $\zeta_{t|t-1}$:

$$\zeta_{t|t-1} = [pr_{1,t|t-1} \quad pr_{2,t|t-1} \quad pr_{3,t|t-1} \quad pr_{4,t|t-1} \quad \zeta_{m,t|t-1} \quad \zeta_{G,t|t-1}]$$

- The law of motion of the endogenous variables in the model is given by:

$$x_t = P x_{t-1} + \left(\sum_{j=1}^4 Q_{Co,j} pr_{j,t|t-1} \right) p_{Co,t}^* + Q_m \zeta_{m,t|t-1} + Q_G \zeta_{G,t|t-1}$$

- Using information available in, private agents update their inference regarding $\zeta_{t|t}$ using the Kalman filter and then project $\zeta_{t+1|t}$

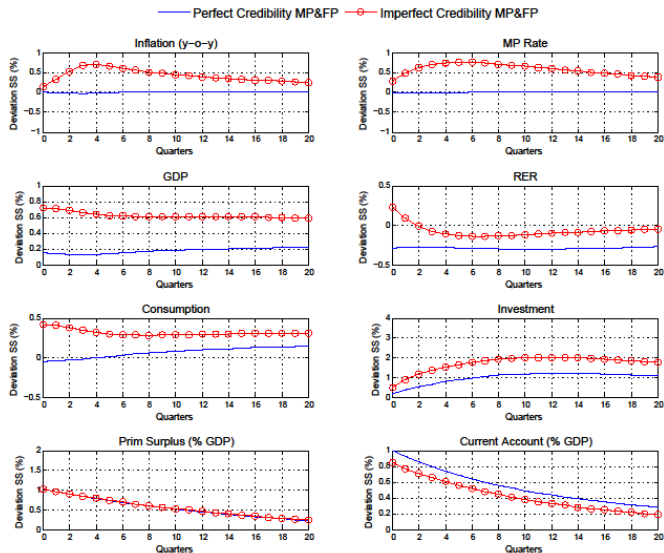
Model calibration

Parameter	Value	Description
h	0.7	Habit persistency
λ	0.7	Share of non-Ricardian households
$1 - \phi$	0.25	Frequency of price adjustments
G/Y	0.12	Share of public consumption
χ	0.4	Share of revenues from commodities owned by the gov.
Y_{Co}/Y	0.1	Share of commodity production

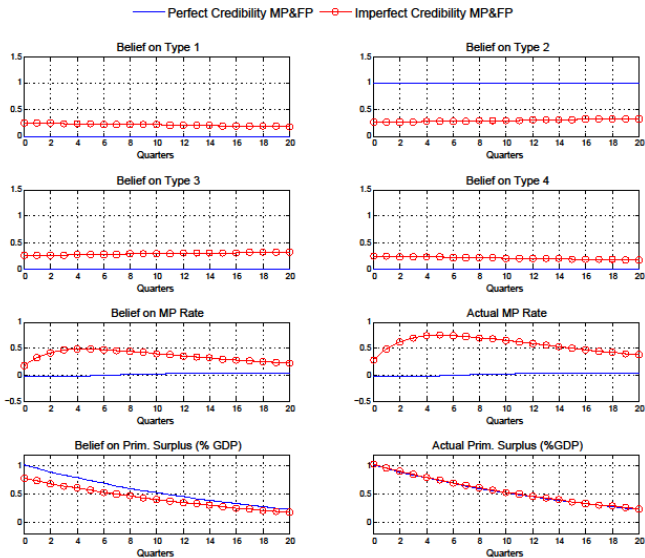
Parameter	imperf. credibility and lack of transp.
ω_{π}	0.05
ω_G	0.5
σ_i^2	0.05
σ_G^2	0.10
σ_1^2	0.02
σ_2^2	0.02

- Commodity price shock of 10%
- We compare the case of full credibility with the other three cases discussed above
- For the cases where there is lack of credibility, private agents begin assigning a probability of 25% of each of one of them

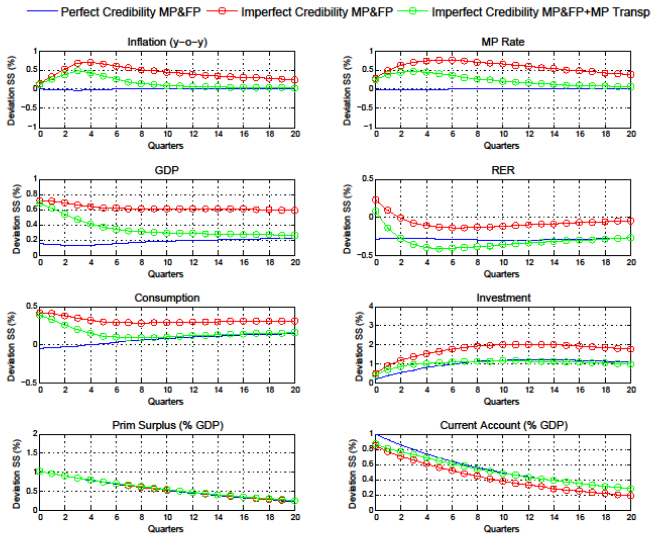
Impulse response response to a commodity price shock



Evolution of beliefs

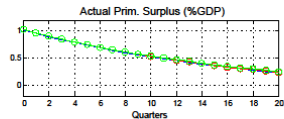
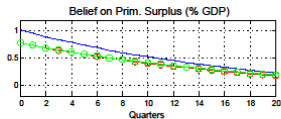
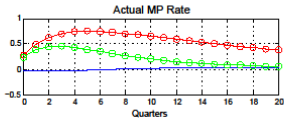
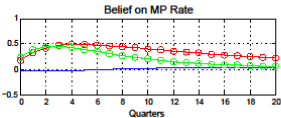
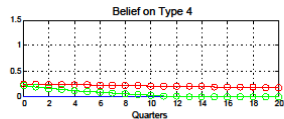
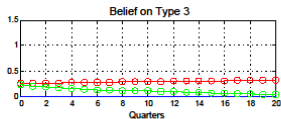
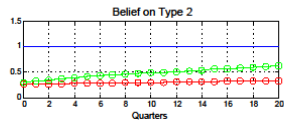
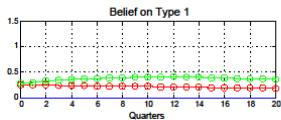


Monetary policy transparency



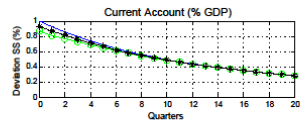
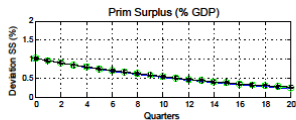
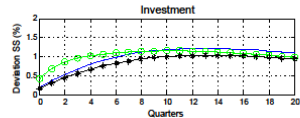
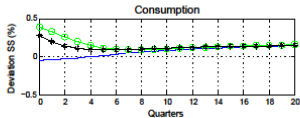
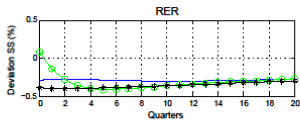
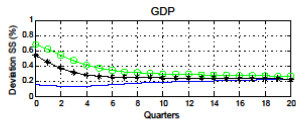
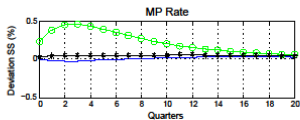
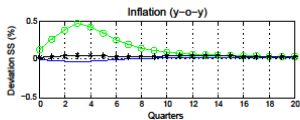
Evolution of beliefs

— Perfect Credibility MP&FP ◻ Imperfect Credibility MP&FP ◻ Imperfect Credibility MP&FP+MP Transp



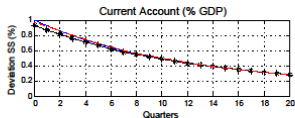
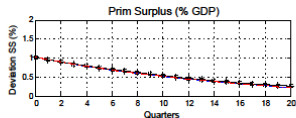
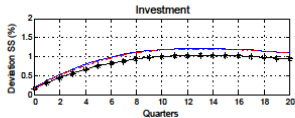
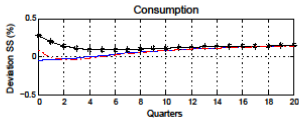
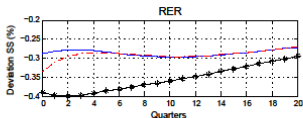
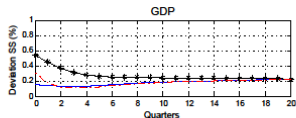
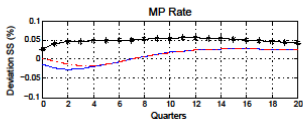
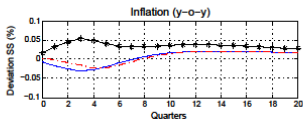
Monetary policy transparency and reputation

— Perfect Credibility MP&FP ○ Imperfect Credibility MP&FP+MP Trans. ← Imperfect Credibility MP&FP+MP Trans&Reput



Monetary policy transparency and reputation, and fiscal policy transparency

— Perfect Credibility MP&FP — Imperfect Credibility MP&FP+MP Transp&Reput: - - - Imperfect Credibility MP&FP+MP Transp&Reput+FP Transp



- We estimate a set of cross-country regressions of the form:

$$\sigma_{\Delta y,i}^2 = \alpha_0 + \alpha_1 \sigma_{\Delta P_x,i}^2 + \alpha_2 \sigma_{\Delta P_x,i}^2 q_i + \varepsilon_i$$

where $\sigma_{\Delta y,i}^2$ is the volatility of output growth, $\sigma_{\Delta P_x,i}^2$ is the volatility of the export/commodity price relevant to country i , and q_i is a variable that measures either credibility or transparency of policies

- Measures of credibility
 - Run auxiliary regressions to estimate monetary policy rules for the period 1985-2000; We use the standard deviation of the residuals as our proxy for monetary credibility
 - For fiscal policy credibility we use the standard deviation of measures of the structural balance of government for the period 1985-2000 from the IMF
- Measures of transparency
 - Monetary policy: Dincer and Eichengreen (2009) index
 - Fiscal policy: Open Budget Index (OBI)
- Additionally, we consider dummy variables for whether countries have IT regime or whether they have a fiscal rule in place according to the classification of the IMF

- Dependent variable: output growth volatility 1995-2010

	(1)	(2)	(3)	(4)	(5)
SD Comm. price	0.000247 (0.000234)	0.000169 (0.000203)	0.000198 (0.000228)	-0.000215 (0.000694)	0.000144 (0.000170)
SD. Comm. price X Mon. Transp.	-4.12e-05* (2.16e-05)				
SD Comm. price X Mon. Cred.	-3.46e-07*** (1.21e-07)				
SD Comm. price X Fiscal Transp.	3.27e-07 (2.69e-06)				
SD Comm. price X Fiscal Cred.	8.42e-05* (3.22e-05)				
SD Comm. price X Inf. Target	-0.000192 (0.000121)				
Constant	0.0292** (0.0126)	0.0266*** (0.00908)	0.0218*** (0.00666)	0.0300 (0.0377)	0.0280*** (0.00636)
Observations	23	25	24	7	32
R-squared	0.137	0.042	0.030	0.234	0.081

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

SD Comm. price = Standard Deviation of Commodity Price Growth

- Dependent variable: output growth volatility 1995-2010

	(1)	(2)	(3)	(4)	(5)	(6)
SD Exports Defl.	0.000846** (0.000352)	0.00113*** (0.000265)	0.000790** (0.000365)	-0.000899 (0.000881)	0.00160*** (0.000306)	0.000596** (0.000254)
SD Exports Defl. X Mon. Transp	-0.000114* (6.10e-05)					
SD Exports Defl. X Mon. Cred.	-4.22e-07 (7.72e-07)					
SD Exports Defl. X Fiscal. Transp.	9.47e-06 (6.71e-06)					
SD Exports Defl. X Fiscal. Cred.	0.000289*** (7.94e-05)					
SD Exports Defl. X Fiscal Rule	-0.00105*** (0.000232)					
SD Exports Defl. X Inf. Target	-0.000932*** (0.000322)					
Constant	0.0301*** (0.00502)	0.0191*** (0.00319)	0.0199*** (0.00623)	0.0291*** (0.00658)	0.0265*** (0.00506)	0.0300*** (0.00424)
Observations	90	87	80	31	65	139
R-squared	0.080	0.194	0.066	0.219	0.053	0.080

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

SD Exports Defl. = Standard Deviation of Deflator of Exports Growth

- Dependent variable: output growth volatility 1995-2010

	(1)	(2)	(3)	(4)	(5)	(6)
SD Exports Defl. X % Prim. Exports/GDP	8.49e-06** (3.85e-06)	1.07e-05*** (3.24e-06)	5.24e-06 (4.47e-06)	-5.51e-06 (1.57e-05)	5.02e-06 (3.25e-06)	4.07e-06 (5.93e-06)
SD Exports Defl. X % Prim. Exports/GDP X Mon. Transp.	-1.88e-06* (1.08e-06)					
SD Exports Defl. X % Prim. Exports/GDP X Mon. Cred.		-6.85e-09 (1.98e-08)				
SD Exports Defl. X % Prim. Exports/GDP X Fiscal Transp.			1.17e-07 (1.23e-07)			
SD Exports Defl. X % Prim. Exports/GDP X Fiscal Cred.				4.14e-06** (1.86e-06)		
SD Exports Defl. X % Prim. Exports/GDP X Inf. Target					-2.07e-05*** (6.29e-06)	
Constant	0.0334*** (0.00320)	0.0264*** (0.00229)	0.0280*** (0.00442)	0.0252*** (0.00266)	0.0335*** (0.00335)	0.0300*** (0.00312)
Observations	86	81	76	29	130	59
R-squared	0.042	0.138	0.040	0.184	0.057	0.016

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

SD Exports Defl. = Standard Deviation of Deflator of Exports Growth; % Prim. Exports/GDP = Share of Primary Export to Total Product Export

- Isolating the economy from terms of trade movements requires enough degrees of exchange rate flexibility and a fiscal policy that shields public spending from fluctuations in revenues
- Well designed monetary and fiscal rules that induce these types of systematic behavior is a necessary condition to reduce output volatility
- However, the mechanic implementation of these rules is not enough: these rules will not be effective if monetary and fiscal authorities lack credibility and are not transparent
- The empirical evidence in this paper tends to support that view
- Institutional arrangement that enhance the transparency of policies and good reputation will make macro policies more effective in isolating the economy from commodity price fluctuations