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Procyclical Monetary Policy and Governance

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Procyclical Monetary Policy and Governance

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Abstract

Weak governance adversely affects firm's net worth and consequently the value of its collateral. This negative impact on the collateral reduces the external credit available for importing inputs constraining potential output. As a result, a stronger procyclical monetary policy stance is adopted for protecting the exchange rate and hence arresting the degradation in the collateral constraint.

JEL Codes: E5; F4; O1

Keywords: Collateral Constraints; Governance; Monetary Policy

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1. Introduction

The existence of a procyclical monetary policy in emerging economies is at odds with that of the developed world. Amongst other reasons, a large literature (Agénor and Montiel (2010) and Frankel (2010)) explains this odd feature by focusing on the theme of the impact of a currency depreciation on the revaluation of debt and the ability to raise future external financing. Another emerging, but limited, literature advances North's (1990) idea on governance and finds evidence that emerging markets which imitate the institutional features of the developed economies tend to conduct *countercyclical* monetary policies (Calderón et al. (2004)). Huang and Wei (2006) show that weak institutions limit the ability of the government to raise revenues and subsequently limits monetary actions available to policy maker.

We believe that these two literatures are linked. Empirically, this connection is motivated by Figure. 1 below, which illustrates a negative relationship between monetary contractions (within a year of a balance-of-payments shock) and governance for 12 emerging economies during 1996-2007. We proxy governance by using factors such as rule of law, corruption, regulation and government effectiveness¹.

In this paper, we are able to connect these two literatures by introducing governance at the firm level. Particularly, we incorporate 'governance' as a direct input in firm's production process à la Hall and Jones (1999). In addition to this modified production function, we use a standard small open-economy model where firms face external financial constraints. Our model shows that the impact of a negative external demand shock on the availability of external credit to firms is much worse with weak governance. In this environment, an aggressive monetary contraction becomes even more important, as it is needed to achieve exchange rate stability for moderating the deterioration of external credit available to firms which import foreign inputs.

The following section presents the model, section 3 discusses the results while section 4 concludes.

2. The Model

Consider a small open economy model ² consisting of a continuum of households h who consume foreign and domestically produced goods, hold money and in exchange provide differentiated labour at a 'pre-determined' wage. The firm produces competitively a common final good using an imported input, domestic labor and governance.

The main innovation in this paper is the presence of governance in the production function. This can be thought of as institutions, laws/regulations and security which support production and for which firms pays a lump sum tax à la Barro and Sala-i-Martin (1992) and Loayza (1995). In addition, these government policies directly affect a firms' net worth, which also serves as its collateral constraint. A binding collateral constraint restricts the amount of external funds available for the purchase of the imported input that leads to decline in potential output.

This setup is suitable for our purpose as emerging economies are known to be price-takers, lack governance efficiency and are vulnerable to external shocks (Frankel (2010) and Agénor and Montiel (2010)).

2.1. Firms

A representative firm j produces output from an imported intermediate input, I , differentiated labour, H , and Governance, G such that

$$Y(j) = AG^\beta H(j)^\alpha I(j)^{1-\alpha-\beta}; \alpha + \beta < 1, \quad (1)$$

where A denotes factor productivity. Total employment at firm j is $H(j) = \left[\int_0^1 H(j, i)^{\frac{\varrho-1}{\varrho}} di \right]^{\frac{\varrho}{\varrho-1}}$, where $H(j, i)$ is firm's j demand for i type of labour and ϱ is the elasticity of substitution between differentiated

¹A large shock is a 15% drop in the real exchange rate. We observed 14 such shocks in 12 countries during 1996-2007. The data for World Bank's governance figures of Kaufmann, Kraay and Mastruzzi (2008) and the remaining from World Development Indicators.

²Our model is very much in the spirit of Devereux and Poon (2004).

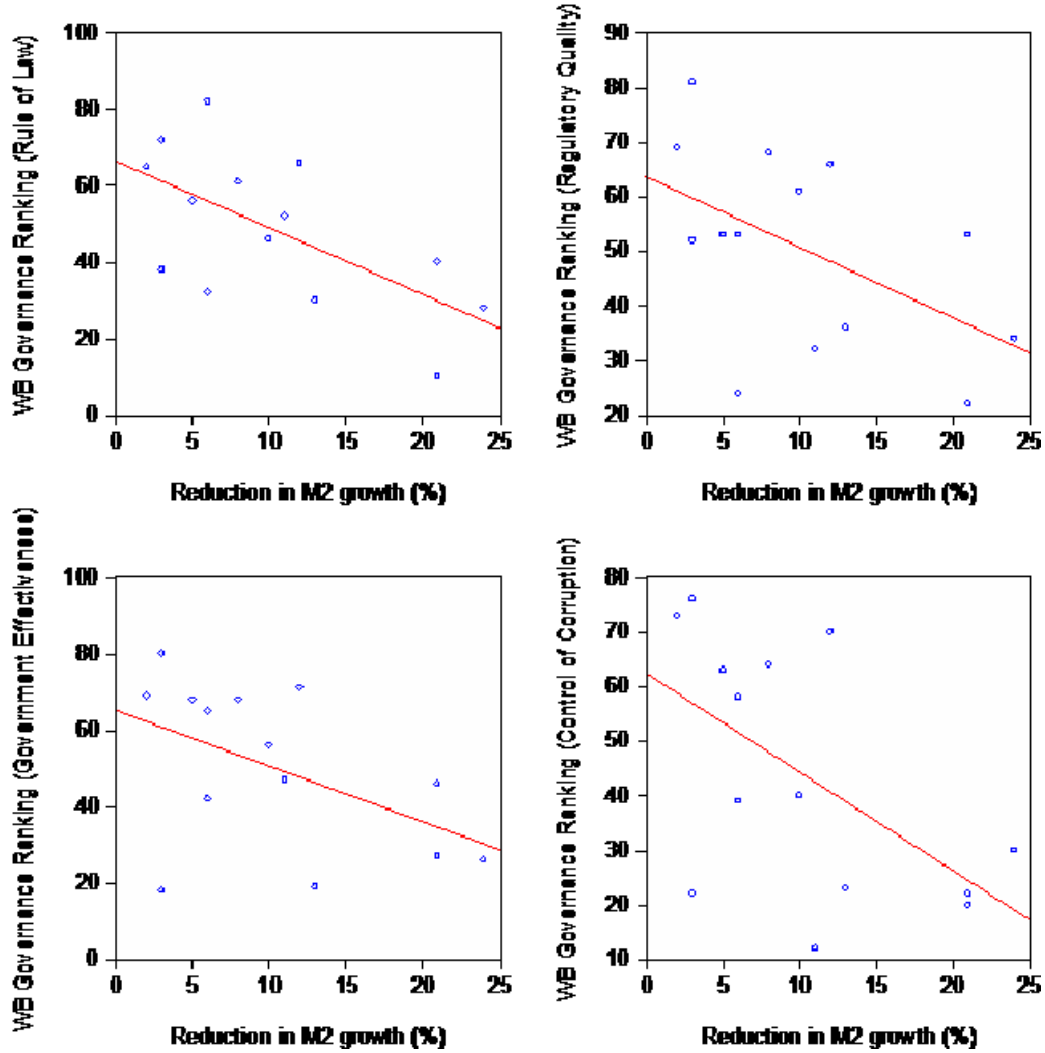


Figure 1: Monetary Contraction and Governance

labour. By minimizing labour costs $\int_0^1 W(i)H(i)di$, where $W(i)$ is the wage for labour i . The inverse demand for labour is

$$W(i) = W \left(\frac{H(i)}{H} \right)^{-1/\epsilon} \quad (2)$$

where $W = [\int_0^1 [W(i)^{1-\epsilon} di]^{\frac{1}{1-\epsilon}}$.

Each firm j pays a lump sum tax $\Psi(j)$ so that $G = \eta \sum_1^m \Psi(j)$ where $\eta \in (0, 1]$ is a governance efficiency scale and with $\eta < 1$ the authorities have less than successfully translated tax revenue into effective governance. Given a representative-agent system, the governance bill is spread equally across firms so that $G = \eta m \Psi$. Firms maximize profit $\Pi = P_h Y - WH - \theta SI - \frac{1}{\eta m} G$, subject to (1), where P_h , W , S , denote the output price, an aggregate wage index and the nominal exchange rate respectively. This results in the well-known price equation

$$P_h = \kappa \frac{W^\alpha (S\theta)^{1-\alpha-\beta}}{A(\eta m)^\beta}; \kappa = \frac{1}{\alpha^\alpha \beta^\beta (1-\alpha-\beta)^{1-\alpha-\beta}}, \quad (3)$$

with the difference that $\theta = q/\eta$ is the ‘effective’ price of the foreign input where q is the actual price in foreign currency while $1/\eta$ is a governance markup. Therefore, $\eta < 1$ raise the cost-of-doing-business reflected in the price (see De Soto (1989) for practical examples).

The collateral constraint on the purchase of the intermediate input is

$$\theta SI = \frac{q}{\eta} SI \leq N - SD. \quad (4)$$

Eq. (4) says that the credit extended for the purchase of foreign input can not exceed firm’s net worth: the difference between net domestic assets, N , and existing foreign currency liabilities D . In the region where (4) binds the maximum foreign input that can be financed through credit is $I = \eta(\frac{N-SD}{Sq})$ leading to a constrained level of output

$$Y = AG^\beta H^\alpha \left[\eta \left(\frac{N - SD}{Sq} \right) \right]^{1-\alpha-\beta} \quad (5)$$

2.2. The Household

A representative household h maximizes the following utility function

$$U(C, M, H) = \ln(C(h)) + \chi \ln(M(h)/P) - \mu \frac{H(h)^{1+\phi}}{1+\phi}, \quad (6)$$

where $\chi, \mu > 0$ are constants, $\phi > 0$ is the elasticity of substitution and $M(h)/P$ denote real money holdings. She consumes foreign, C_f , and domestically, C_d , produced goods so that $C(h) = C_d^\sigma(h) C_f^{1-\sigma}(h)$ where σ is the share of domestic goods in consumption. The budget constraint is

$$PC(h) + M(h) = W(h)H(h) + M_0(h) + T(h) + \Pi, \quad (7)$$

where $P, M_0(h), T, \Pi$ denote the general price level, initial money holding, transfers from the monetary authority and profits from selling the final good.

Maximizing (6) subject to (7) and (2) yields

$$C_d(h) = \sigma \frac{P}{P_d} C(h), \quad (8)$$

$$C_f(h) = (1 - \sigma) \frac{P}{P_f} C(h), \quad (9)$$

$$M(h) = \chi PC(h), \quad (10)$$

$$W(h) = \mu \left(\frac{\varrho}{\varrho - 1} \right)^{\frac{1}{1+\phi}} \frac{\alpha^{\frac{\phi}{1+\phi}}}{\chi} [E(M)^{1+\phi}]^{\frac{1}{1+\phi}}. \quad (11a)$$

Eqs. (8) and (9) are the usual demand functions where $P = (\frac{P_d}{\sigma})^\sigma (\frac{P_f}{1-\sigma})^{(1-\sigma)}$ is the price index, and P_d and P_f denote the prices of domestic and foreign goods. Money balances (10) reflect the value of consumption. The wage equation (11a) shows the usual market power of households arising from their monopolistic supply of a differentiated labour with elasticity ϱ . We assume that wages are bargained at the beginning of the period as a result they are conditioned on the expected money supply.

2.3. Market Clearing

In a symmetric equilibrium the indices capturing households, h , and firms, j , drop out. In addition, all markets clear. Money market clears so that money stock is the sum of previous nominal money balances and transfers

$$M = M_{-1} + T \quad (12)$$

The goods market equilibrium condition is

$$Y = X^d + \sigma \frac{PC}{P_h} + \frac{PCg}{P_h} \quad (13)$$

where $X^d = \bar{X} \frac{S}{P_h}$ is the unit-elastic foreign demand for locally produced goods and \bar{X} is the demand shock. C and Cg are the composite households and government consumptions.

Assuming balanced budget so that expenditure equals revenue we have

$$\begin{aligned} PCg &\equiv m\Psi \\ &= G/\eta \end{aligned} \quad (14)$$

These conditions together with first-order-conditions solve for $\{P_h, S, Y\}$ conditioned on \bar{X} and the preset wage W .

2.4. Equilibrium for the non-binding region

When the collateral constraint is not binding our model replicates the Mundell-Flemming model. In this case, the money demand equation (10) and first-order-conditions give the following three equations in terms of P_h , S and Y

$$P_h = \kappa \frac{W^\alpha (S\theta)^{1-\alpha-\beta}}{A(\eta m)^\beta} \quad (15)$$

$$M = \chi \alpha \kappa \frac{W^\alpha (Sq)^{1-\alpha-\beta}}{A(m)^\beta \eta^{1-\alpha}} Y \quad (16)$$

$$Y = \left(\frac{\kappa}{(1 - \sigma\alpha - \beta)} \right) \frac{A(m)^\beta \eta^{1-\alpha} S^\alpha}{W^\alpha (q)^{1-\alpha-\beta}} \quad (17)$$

The downward-sloping LM curve (16) in the $S - Y$ space is obtained from combining (15) and (10) where a rise in S implies a depreciation in the local currency. (17) is the upward-sloping IS curve and obtained from (13) and (15).

2.5. Equilibrium in the binding region

Using the IS curve in (5), the aggregate labour demand is

$$H = Y^{1/\alpha} A^{-1/\alpha} G^{-\beta/\alpha} \left[\eta \left(\frac{N - SD}{Sq} \right) \right]^{\frac{\alpha+\beta-1}{\alpha}} \quad (18)$$

Aggregate labour demand positively depends on output and negatively on productivity, governance and the collateral constraint. The household money demand equation, our LM curve here, is obtained using (13) (10) and (4):

$$M = \chi \left\{ \frac{W}{\alpha} A^{-1/\alpha} G^{-\beta/\alpha} Y^{1/\alpha} \left[\eta \left(\frac{N - SD}{Sq} \right) \right]^{\frac{\alpha+\beta-1}{\alpha}} - (N - SD) - PCg \right\}. \quad (19)$$

Higher wages, output raise household's demand for money while the same is crowded out by both the purchases of the foreign input (in the sense of a drain on net-foreign assets) as well as the expenditure on governance by the government. Note that, an exchange rate depreciation triggers a rise in household's money demand through the following channels (19). First, the demand for the imported input falls and part of it is substituted for by labour which in turn raises wages (see (18)). Second, the price of locally produced good rises because (i) export demand increases owing to the depreciation and (ii) foreign inputs becoming costlier.

By combining (18) and (13) we obtain the new IS equation:

$$Y^{1/\alpha} = \frac{\alpha}{1-\sigma} [\bar{X}S - \sigma(N - SD) - (1-\sigma)PC_g] G_\alpha^{\frac{\beta}{\alpha}} \left[\eta \frac{N - SD}{Sq} \right]^{\frac{1-\alpha-\beta}{\alpha}} \quad (20)$$

The wage equation is obtained using (11a), (10) and the budget constraint (7)

$$W = \left(\frac{\mu}{1 - \frac{1}{\rho}} \right)^{\frac{1}{1+\phi}} \frac{\alpha^{\frac{\phi}{1+\phi}}}{\chi} \{E(M)^{1+\phi}\}^{\frac{1}{1+\phi}} \quad (21a)$$

Eq. (21a) reflects the market power of households arising from the monopolistic supply of differentiated labour with elasticity ρ and as $\rho \rightarrow \infty$, their market power disappears.

3. Results

For model parameter estimates below we draw from Liu (2008), Comin et al. (2009), Choudhary and Levine (2006) and Devereux and Poon (2004) which provide useful evidence for developing countries.

Parameter	Definition	Value
α	Labour share in production	0.5
β	Imported input share in production	0.25
σ	Consumption share in home produced goods	0.65
ρ	Substitution Elasticities between labour types	5

For our exercise we consider export demand \bar{X} in three shock states: 0, -5% and -20% occurring with probability 0.475, 0.475 and 0.05 with crash-state having the lowest likelihood. For each shock scenario we consider four values of, η (1, 0.8, 0.6 and 0.4) and compute them for low, medium and high leverage ratios l (0.25, 1.5 and 3)³. Note that the binding region for (4) is where export demand collapses by 20% governance is weak and leverage is high.

Using (15)-(17) for the non-binding region and (13)-(21a) we compute the expected⁴ output losses under three policy arrangements: a fixed exchange rate (ER), a fixed money supply (MS) and their optimal mix which is system-determined. In the fixed exchange rate case, the monetary authorities adjust the money supply to absorb external shocks to contain output losses. The exchange rate is fixed to its pre-shock levels⁵ from (15)-(17) and consequently the collateral constraint does not bind. An alternative policy is to fix the money supply to its pre-shock levels, in (15)-(17) and (13)-(21a). Finally, a mathematically driven intermediate policy mix of the two alternatives above. A mix that can not be directly implemented by the policy maker.

³ $l = \frac{SD}{N - SD}$, from (4), is the ratio of foreign liabilities to net total assets.

⁴Expected according to state probabilities.

⁵Note that each η has its own equilibrium exchange rate.

	Fix ER		Fix MS			Optimal Mix		
a	b	c	d	e	f	g	h	
η		$l = 0.25$	$l = 1.5$	$l = 3$	$l = 0.25$	$l = 1.5$	$l = 3$	
1	0.0715	0.0756	0.0774	0.0784	0.0648	0.0657	0.0661	
0.8	0.1637	0.1703	0.1717	0.1726	0.0641	0.0650	0.0656	
0.6	0.2744	0.2795	0.2807	0.2814	0.0629	0.0640	0.0646	
0.4	0.3910	0.4098	0.4106	0.4111	0.0608	0.0620	0.0627	

In Table 2 with perfect governance ($\eta = 1$) and highly leveraged firms ($l = 3$), a fixed exchange rate leads to a lower expected percentage output loss (column b) compared with a floating exchange policy (column e). A mix of a monetary contraction together with a small depreciation is a superior policy option with the least amount of output contraction (column h). For firms with low leverage ratios, a free-float is a better policy option. This is because for highly leveraged firms, a depreciation in the exchange rate limits firms' credit availability to obtain the foreign input and produce output; a result consistent with Devereux and Poon (2004). However, in Table 2 rows are not comparable to one another as each level of governance implies a separate equilibrium.

	% Contraction in Money Supply		
a	b	c	d
η	$l = 0.25$	$l = 1.5$	$l = 3$
1	2.4	2.4	2.6
0.8	2.9	3.0	3.1
0.6	3.7	3.8	3.9
0.4	5.8	5.8	5.8

In Table 3, we compute the required level of monetary contraction for the same expected percentage loss of output at each level of η . Given a high leverage ratio (column d) and worsening governance a greater monetary contraction is required for same percentage loss in output. Indeed, weak governance lowers the output potential reducing the value of the collateral, which makes it more likely for the collateral constraint to bind. Consequently, a greater monetary contraction is required to protect the exchange rate, as a unit drop in the currency is worse for the firm, in collateral terms.

	$\frac{y^a - y^{na}}{m^a - m^{na}}$
η	Average over leverage ratios l
1	0.46
0.8	0.39
0.6	0.35
0.4	0.21

a: action; na: inaction

Alternatively, Table 4 shows the ratio of the difference between expected output with and without policy actions after an external shock. Once again as governance deteriorates a unit contraction is less effective.

Together Tables 3 and 4 pin down the relationship between governance and procyclical monetary stance for emerging markets explaining our empirical motivation in Fig 1.

4. Conclusion

By incorporating governance at the firm-level, we are able to explain the procyclical monetary stance taken by emerging market central banks in response to a typical external demand shock.

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