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Abstract

We analyze, in this paper, the optimality of pro-cyclical monetary policy in the presence of informal sector. Our findings suggest that monetary tightening only in case of severe shock with high leverage ratio and that conventional monetary policy favors both the formal and informal sectors irrespective of the severity of the shocks and hence the whole economy if the size of informal sector is significantly large. Furthermore, fixing exchange rate is better policy option if objective is to defend the employment or domestic consumption from falling when negative shock hits the economy. We can not found any disproportionate impact of policies on informal sector. This may be due to static nature of the model and it might be possible that dynamics of responses of the two sectors to shocks differ significantly.

JEL Classification: F0; F4; O17; O23; E52

Keywords: Informal Sector, Credit Constraints, Exchange Rate and Monetary Policy

1. Introduction

In contrast to developed economies, the monetary policy adjustments in emerging economies have been empirically pro-cyclical in nature (see for example Edwards (2001) and

Choudhary et al. (2010)). The main reason for such trend is believed to be the trade-off between external and internal forces working simultaneously and mostly in conflicting directions. For example, emerging economies face external financial constraints (Goldstein, Kaminsky and Reinhart (2000), Eichengreen and Haussmann (2003)) as a result of which they have to keep a balance between exchange rate variability and domestic stability (Devereux and Poon 2004). This is why Goldstein et al. (2000) has considered financial vulnerability a binding constraint on macroeconomic policy in emerging markets. In such economies, with liabilities in foreign currency, firms suffer from exchange rate depreciations (Merola (2010)) and consequently face constraints on investments which then reduce their production. Therefore, it is optimal for monetary authorities in emerging economies to respond pro-cyclically or, at least, less aggressively in case of negative shocks.

Devereux and Poon (2004) shows that it is optimal for authorities to respond in conventional way when shocks are small since the exchange rate acts as a shock absorber. But in case of large negative shocks pro-cyclical policy response would be a better option since exchange rate adjustment may be de-stabilizing by further strengthening the binding constraints. In the similar spirit Choudhary et al. (2010) shows that optimal monetary policy rule calls for even more aggressive monetary contractions in economies with poor governance and weak institutions. Cook (2002), Choi and Cook (2002), Christiano et al. (2002), and Braggion et al. (2003) are other relevant examples.

In this paper we extend the Devereux and Poon (2004) model by incorporating the informal sector of the economy into it and then analyze the optimality of monetary response in case of a negative export demand shock. This is an important extension because a significant part of aggregate production (usually between 40 percent to 60 percent) consists of informal production and it would be interesting to see the response of this sector after being hit by an external shock when it is believed to behave differently as compared to the formal sector. However, it should be kept in mind that the responses of both the sector are static due of the nature of the model borrowed from Deveraux and Poon (2004) and dynamic analysis over a period of time would only be possible by involving time domain into the model. Such extension has been left for the future.

The existence of informal sector has been controversial for economic growth since it can play a shock absorbing role during economic downturn while it can still be an obstacle in economic growth due to low productivity. Also no consensus among the economists exists about the impact of policies on informal sector. One belief is that expansionary monetary policy imposes inflation tax on informal sector and has negative impacts on this sector. The other conviction is that loose monetary policy favors this sector because transactions in this sector are mostly cash-based. However, in the case of Pakistan empirical evidence supports the shock absorbing nature of the informal sector due to strong correlation of its productivity, which is labor intensive to a significant extent, with money supply.

In our model we incorporate (a) informal labor and (b) informal intermediate goods market. Our findings suggest monetary tightening only in case of severe shock with high leverage ratio defined as *"liabilities to net assets ratio*"; and that the conventional monetary policy favors the informal sector irrespective of the nature of shock and hence the whole economy if the size of informal sector is significantly large.

2. The Model

We consider a static small open economy consisting of households who consume foreign and domestically produced goods, hold money balances and supply differentiated labor at a pre-determined wages. Firms sell, both at home and abroad, a final good that is produced by combining locally produced intermediate inputs and an imported input. The local inputs are supplied by firms in both the formal and informal sectors where pure technology considerations separate one type of firm from the other. The foreign input is financed with a local currency letter-of-credit type agreement with firms' net worth serving as the collateral. The letter-of-credit is settled by selling the end-of-period output. A sufficiently low value of the collateral, against which a letter-of-credit is raised, due to sharp exchange rate movements for instance may trigger some rationing of the imported inputs and some substitution towards locally produced inputs acquired both from the formal and informal sectors.

2.1 Firms

2.1.1 The Final Good

A final good Z is produced in a perfectly-competitive setting using a foreign and a composite domestic inputs, y_m and y_d respectively, given by a simple Cobb-Douglas technology

$$Z = y_m^{1-\alpha} y_d^{\alpha}. \tag{1}$$

The domestic input y_d is a CES type production function composed of aggregate intermediate outputs of firms in the formal (F) and informal (I) sectors

$$y_d = [\delta_F^{\frac{\varepsilon-1}{\varepsilon}} y_F^{\frac{1}{\varepsilon}} + \delta_I^{\frac{\varepsilon-1}{\varepsilon}} y_I^{\frac{1}{\varepsilon}}]^{\frac{1}{\varepsilon}} \tag{2}$$

where δ_F and δ_I sum to unity. They denote the share of formal and informal 'aggregate' inputs in total 'domestic' inputs respectively while ε is their elasticity of substitution. The aggregate input used in each sector i is given by

$$y_{i=}\left[\int_0^1 y_{i,n}^{\frac{\vartheta}{\vartheta-1}} dn\right]^{\frac{\vartheta-1}{\vartheta}} \quad i = F, I. \tag{3}$$

where ϑ is the elasticity of substitution, which is assumed similar across the sectors. Let $p_{i,n}$ be the price of input 'n' in the ith sector. Minimizing the cost $\int_0^1 p_{i,n} y_{i,n} dn$ gives the following demand in sector i for each intermediate good n

$$y_{i,n} = \delta_i \left[\frac{p_{i,n}}{p_i}\right]^{-\vartheta} y_i \tag{4}$$

where $p_d = \left[\delta_F p_F^{\varepsilon-1} + \delta_I p_I \delta_I^{\varepsilon-1}\right]^{\frac{1}{\varepsilon-1}}$ is a composite price for domestic inputs and $p_i = \left[\int_0^1 p_{i,n}^{1-\vartheta} dn\right]^{\frac{1}{1-\vartheta}}$ is the aggregate Dixit-Stiglitz price index in sector i.

The producer of the final good can purchase the foreign and the domestically produced formal inputs on credit against its net worth so that

$$Sp_m y_m + p_F y_F \leq N - SD^* - D. \tag{5}$$

In (5) the first term, on the left-hand-side, is the value of imported intermediate input at foreign prices, p_m, evaluated at the exchange rate (S) while the second term is the value of domestic inputs produced in the formal economy. The right-hand-side of (5) is the firm's net worth composed of assets (N), foreign liabilities evaluated at current exchange rate (SD^*) and domestic liabilities (D). This is a collateral constraint and it limits the ability of the firm to finance the purchase of imported intermediate inputs and/or formal-sector inputs when there is a negative shock to the net worth. In this paper we exclusively focus on the impact of adverse exchange rate shocks on the firms' net worth. Exchange rate may effects the net worth of the firm in two ways. On one hand, it raises the value of imported inputs and on the other hand it reduces the net worth of the firm by increasing its foreign liabilities.

Firm's optimization problem gives following derived demand functions for different inputs.

$$y_i = \frac{\alpha}{\theta \delta_i} \frac{p_h}{p_i^{\frac{\varepsilon}{\varepsilon-1}}} Z \quad , i = [I, F] \tag{6}$$

Where $$\theta = \frac{p_F^{\frac{1}{1-\varepsilon}}}{\delta_F} + \frac{p_I^{\frac{1}{1-\varepsilon}}}{\delta_I}$$

And $$y_m = (1-\alpha)\frac{p_h}{Sp_m} Z \tag{7}$$

Combining (6) and (7) we get

$$y_m = \delta_i \left(\frac{1-\alpha}{\alpha} \right) \theta \frac{p_i^{\frac{\varepsilon}{1-\varepsilon}}}{Sp_m} y_i \tag{8}$$

Also $$y_i = \frac{P_I^{\frac{\varepsilon}{1-\varepsilon}}}{\theta^{\varepsilon} \delta_i} y_d \tag{9}$$

Combining (6), (7) and (9) we get the price of the final good in terms of all the inputs.

$$p_h = \kappa \theta^{\alpha(1-\varepsilon)} (Sp_m)^{1-\alpha} \tag{10}$$

where

$$\kappa = \frac{1}{\alpha^{\alpha} (1-\alpha)^{(1-\alpha)}}$$

The above pricing equation suggests a full pass-through.

Substituting the value of y_{Ft} from (8) in terms of the foreign input (y_{mt}) the financial constraints (5) becomes

$$Sp_m y_{m,} \leq \frac{N - SD^* - D}{\Lambda} \tag{11}$$

where

$$\Lambda = 1 + \frac{p_F^{\frac{1}{\varepsilon-1}}}{\delta_F \left(\frac{1-\alpha}{\alpha} \right) \theta}$$

2.1.2 The Intermediate Inputs Sector

The production of intermediate inputs is divided into formal (F) and the informal (I) sectors. Both sectors are populated by a representative firm that produces output using labor as the only factor of production. The intermediate goods produced in each sector are

imperfect substitutes. Hence, the production function of the representative firm in each sector is given by

$$y_{F,n} = AH_{F,n} \tag{12}$$

and

$$y_{I,n} = \gamma AH_{I,n}; \gamma < 1 \tag{13}$$

The aggregate output in each sector is

$$y_i = \left[\int_0^1 y_{i,n}^{\frac{\upsilon_i - 1}{\upsilon_i}} dn \right]^{\frac{\upsilon_i}{\upsilon_i - 1}} \tag{14}$$

Firm n in each sector i minimizes the cost $\int_0^1 p_{in} y_{in}$ subject to constraint given in Eq. (14). This gives following relationship.

$$y_{in} = \left(\frac{p_{in}}{p_i} \right)^{-\upsilon_i} y_i \tag{15}$$

This computation assumes that each firm has the market power over its products due to imperfect substitutability between inputs.

The amounts of various types of labor employed by firm n in sector i is

$$H_{i,n} = \left[\int_0^1 H(r)_{i,n}^{\frac{\lambda_i - 1}{\lambda_i}} dr \right]^{\frac{\lambda_i}{\lambda_i - 1}} \tag{16}$$

The labor for type r employed in sector i by n firms is

$$H_{ir} = \int_0^1 H_{i,r}(n)dn \tag{17}$$

Total labor employment of all types of labor r in sector i is

$$H_i = \int_0^1 H_{i,r}dr \tag{18}$$

In sector i, the firm n chooses employment so as to minimize costs $\int_0^1 W_{i,r,n}H_{i,r,n}dr$, subject to the constraint (18). The demand for type r labor due to this minimization is

$$H_{i,r}(n) = \left[\frac{W_{i,r}}{W_i}\right]^{-\lambda} H_i(n) \tag{19}$$

Also, firm n maximizes profits $P_{i,n}y_{i,n} - W_i H_{i,n}$ so that

$$p_{i,n} = \left(\frac{v_i}{v_i - 1}\right)\frac{W_i}{\gamma_i A}, \tag{20}$$

$$i = \begin{Bmatrix} I: \\ F: \rightarrow \end{Bmatrix} \begin{matrix} \gamma_i < 1 \\ \gamma_F = 1 \end{matrix}$$

2.2 The Household

A representative household h maximizes an additively separable utility function

$$U(C, M, H) = \ln(C(h)) + \chi \ln(M(h)/P) - \eta \frac{H(h)^{1+\phi}}{1+\phi}, \tag{21}$$

$\chi, \eta > 0$ are constants, $\phi > 0$ is the elasticity of substitution and $M(h)/P$ denotes real money holdings. It 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 consumption. Its budget constraint is

$$PC(h) + M(h) = W(h)H(h) + M_0(h) + T(h) + \Pi(h) \tag{22}$$

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

Demand for each of the foreign and domestic produced good can be obtained as.

$$C_d(h) = \sigma \frac{P}{P_h} C(h) \tag{23}$$

$$C_f(h) = (1-\sigma) \frac{P}{P_m} C(h) \tag{24}$$

and that of money balances as:

$$M(h) = \chi PC(h) \tag{25}$$

where as $P = (\frac{P_d}{\sigma})^{\sigma} (\frac{SP_m}{1-\sigma})^{(1-\sigma)}$ is the aggregate price and P_d and P_m denote the price of domestic and foreign consumer goods. We assume that no adjustment in wages take at the time when the shocks hit the economy. Each household faces a downward-sloping labor demand curve. The expected utility maximizing wage is given by

$$W_i = \eta \frac{E\{H_i(h)\}^{1+\phi}}{E\{\frac{H_i(h)}{PC_i(h)}\}} \tag{26}$$

Here subscript i denotes the sector. And aggregate wage is given by

$$W = \left[\mu_F^{\frac{1-\tau}{\tau}} W_F^{\frac{1}{\tau}} + \mu_I^{\frac{1-\tau}{\tau}} W^{\frac{1}{\tau}} \right]^{\tau} \tag{27}$$

The households have market power over the type of labor it supplies to formal sector. Using this market power, they maximize the difference between their expected-utility maximizing wage and the average prevailing wage in the sector so that they maximize $W_F(r)H_F(r) - W_F H_F(r)$. We assume no such differentiation in informal labor. Therefore

$$W_F(r) = \left(\frac{\lambda}{\lambda - 1} \right) W_F \tag{28}$$

So utility maximizing wage for formal and informal sector can be written as

$$W_F(h) = \eta \frac{\lambda}{\lambda - 1} \frac{E\{H_F(h)\}^{1+\phi}}{E\{\frac{HF(h)}{PC_F(h)}\}} \tag{29}$$

$$W_I(h) = \eta \frac{E\{H_I(h)\}^{1+\phi}}{E\{\frac{H_I(h)}{PC_I(h)}\}} \tag{30}$$

The first-order conditions (23) and (24) are the demand for domestic and foreign goods and are negatively sloped in their respective prices. The first-order condition (25) reflects the value of consumption in term of money and (26) gives the inverse supply of labor. It says that

the expected marginal rates of substitution between labor and consumption are equal to the wage rate. In addition, equation (29) for formal sector also reflects the market power of households arising from their monopolistic supply of a differentiated factor input in this sector with elasticity λ. We assume that wages are bargained at the beginning of the period, i.e., intuitively they are conditioned upon the expected money supply.

2.3 Market Clearing Conditions

Assume that foreign demand for locally produced final good is unit elastic

$$X^d = \overline{X}\frac{S}{p_h} \tag{31}$$

where $\overline{X}$ is a demand shock.

The following conditions hold

$$M = M_o + T \tag{32}$$

$$Z = \overline{X}\frac{S}{p_h} + \sigma\frac{PC}{p_h} \tag{33}$$

Equations (32) and (33) show market-clearing condition for the money and product markets respectively.

2.4 Equilibrium Conditions without collateral constraint

In normal times collateral constraint does not bind, so equilibrium conditions can be characterized using money market clearing condition along with profit maximization

$$PC = WH = P_h Z - Sp_m y_m = \alpha p_h Z \tag{34}$$

and

$$M = \chi PC = \chi \alpha p_h Z \tag{35}$$

Therefore equilibrium condition can be written as

(36)

$$Z = \overline{X} \frac{S}{(1-\sigma\alpha)\, p_h}$$

And optimal price is given by

$$P_h = \kappa \theta^{\alpha(1-\varepsilon)} S p_m^{1-\alpha} \tag{37}$$

where $\kappa = \dfrac{1}{\alpha^{\alpha}(1-\alpha)^{(1-\alpha)}}$

Equations (6), (7), (11), (12), (35), (36), and (37) can be solved for P_h, S, Z, y_F, y_I, H_F, and H_I given export demand $\overline{X}$ and wage rate W.

2.5 Equilibrium Conditions *with* collateral constraint for the Domestic Market

When the collateral constraint binds, the maximum foreign input for the production of the final good that could be purchased is given by

$$y_m = \frac{N - SD^* - D}{Sp_m \Lambda}$$

This value must then be used in all the equilibrium conditions without any constraint so that the total expenditure on domestically produced goods is

$$PC = WH = PC = P_h Z - \frac{N - SD^* - D}{\Lambda} \tag{38}$$

The demand for nominal money balances now becomes

$$M = \chi PC = \chi(P_h Z - Sp_m y_m) = \chi(P_h Z - \frac{N - SD^* - D}{\Lambda}) \tag{39}$$

The total output produced by the economy in the constrained region is

$$Z = \overline{X}\frac{S}{p_h} + \sigma\frac{1}{p_h}(p_h Z - \frac{N - SD^* - D}{\Lambda}) = \frac{\overline{X}S}{(1-\sigma)p_h} + \sigma\frac{N - SD^* - D}{(1-\sigma)\Lambda p_h}) \tag{40}$$

The demand for the domestic input given using the constraint is given by

$$y_d = \left(\frac{N - SD^* - D}{Sp_m\Lambda}\right)^{\frac{\alpha-1}{\alpha}} Z^{\frac{1}{\alpha}} \tag{42}$$

This constrained demand can then be substituted in (9) to obtain factor demands for formal and informal inputs so that:

$$y_F = \frac{1}{\delta_F \theta^{\varepsilon} p_F^{\frac{\varepsilon}{\varepsilon-1}}}\left(\frac{N - SD^* - D}{Sp_m\Lambda}\right)^{\frac{\alpha-1}{\alpha}} Z^{\frac{1}{\alpha}} \tag{43}$$

$$y_I = \frac{1}{\delta_I \theta^{\varepsilon} p_I^{\frac{\varepsilon}{\varepsilon-1}}}\left(\frac{N - SD^* - D}{Sp_m\Lambda}\right)^{\frac{\alpha-1}{\alpha}} Z^{\frac{1}{\alpha}} \tag{44}$$

At equilibrium, demand for all types of domestic inputs must equate to their supply.

Hence, by substituting (35) and (36) in (14) and (15) we find that

$$H_F = \frac{1}{A\delta_F \theta^{\varepsilon} p_F^{\frac{\varepsilon}{\varepsilon-1}}} \left(\frac{N - SD^* - D}{Sp_m \Lambda} \right)^{\frac{\alpha-1}{\alpha}} Z^{\frac{1}{\alpha}} \tag{45}$$

$$H_I = \frac{1}{\gamma A\delta_I \theta^{\varepsilon} p_I^{\frac{\varepsilon}{\varepsilon-1}}} \left(\frac{N - SD^* - D}{Sp_m \Lambda} \right)^{\frac{\alpha-1}{\alpha}} Z^{\frac{1}{\alpha}} \tag{46}$$

In order to obtain the exchange rate we use (6) and (27) to obtain

$$Sp_m y_m = (1-\alpha) p_h Z_t = (1-\alpha) \frac{M}{\alpha\chi} \tag{47}$$

Rearranging the above gives the exchange rate at which the collateral constraint is satisfied below

$$\bar{S} = \frac{1}{D^*} \left(N - D - \Lambda \left(\frac{1-\alpha}{\alpha} \right) \frac{M}{\chi} \right) \tag{48}$$

3 Discussion

We analyze a situation where there is a negative demand shock so that $\bar{X}$ falls in (23). If the country wants to maintain its output, the currency must correspondingly depreciate, i.e. S should go up. But a rise in S (a depreciation) has other effects. As exchange rate depreciates substantially, the trade-credit constraint binds in (33). This implies an overall reduction in the production of the final good (the income effect). At the same time, domestic inputs become relatively cheap and the producer reallocates some of her demand from foreign inputs to domestic inputs. This reallocated demand then redistributes between the formal and informal sector. This distribution depends on many factors such as productivity, relative prices and labor market power between the formal and informal sectors and the size of the sectors. The reaction of the monetary policy to such a shock will then depend on the size of these various effects. Furthermore, a rise in S also raises the price of the final good. The latter is

because the foreign intermediate input is priced in the foreign currency.

4 Calibration

We assume that demand for exports (X) is exogenous. Further we assume ***three scenarios*** to be tested in case of both the fixed exchange rate and fixed money supply policy separately, however, the leverage only matters in case of the fixed money supply policy. Our aim is to see which of the two policies, either holding money supply constant or exchange rate constant, is more effective when the static economy is hit by an exogenous export demand shock. The three scenarios are the following:

i. In the first case there is no shock to exports with a probability 0.475;
ii. in the second case there is a moderate shock that decreases output by 5 percent with probability 0.475;
iii. and in the third case a severe shock that decreases output by 11 percent with small probability 0.05. It is only in this case that the external constraints become a binding.

The main issue in calibration of such model for emerging economies is that information regarding deep parameters is limited or unavailable, especially for the parameters related to the informal sector. There are 15 parameters to be calibrated (see table 1) in our model. Most of the values chosen for these parameters are consistent with features of developing countries like Pakistan. The Share of domestic inputs in production (α) is assumed to be 0.75. This is consistent with the estimate for intermediate imports as a fraction of GDP for Pakistan. The preference parameter on money (χ) is set equal to unity. Elasticity of substitution between formal and informal inputs (ε) is set equal to 1.9 by assuming low substitution between two types because of their different nature. The parameter on technological differential (γ) is assumed to be 0.7 since no information regarding this parameter is available. Similarly, the elasticity of substitution between different types of labor (λ) is assumed to be 5. The elasticity of substitution between intermediate inputs in each sector (ν) is set equal to 6. This value is taken from literature for formal inputs. The value for parameter representing weight on leisure (η) is taken as 0.6, based on evidence that households allocate 33 percent of their time for work. Share of informal sector production (δI) is set equal to 0.4 on the basis of estimates on informal sector in such countries. The share of labor in formal sector (μ_F) is set equal to 0.65.

This estimate is taken from Labor Force Survey (LFS) of Pakistan. Information regarding the elasticity of substitution between formal and informal labor (τ) are not available, so we assume a value of 2 for this parameter. Based on some evidence that 35% of consumption in developing countries consists of foreign goods we set share of domestic consumption in total consumption (σ) equals to 0.65. We use different leverage ratios (defined as the ratio of foreign liabilities to net total assets) between 0.25 (most probably non-binding financial constraint) and 1.00 (highly binding financial constraint). Finally the value on the inverse elasticity of labor supply (ϕ) is set equal to 0.9.

Table 1: Calibration of Model Parameters

S.No.	*Parameter*	*Definition*	*Value*
1	α	Share of domestic inputs in production	0.75
2	χ	Preference parameter on money	1
3	ε	Elasticity of substitution b/w formal and informal inputs	1.9
4	γ	Technological differential b/w formal and informal sector	0.7
5	υ	Elasticity of substitution b/w intermediate goods in each sector	6
6	λ	Elasticity of substitution b/w different types of labor	5
7	η	Weight on leisure	0.6
8	P_m	Price of imported inputs	1
9	δI	Share of informal sector inputs in domestic inputs	0.4
10	δF	Share of formal sector inputs in domestic inputs	0.6
11	μ	Share of labor in formal sector	0.65
12	τ	Elasticity of substitution b/w formal and informal labor	2
13	σ	Share of domestic consumption in total consumption	0.65
14	lg	Leverage ratio defined as ratio of liabilities to net assets of firm	0.25 – 1
15	ϕ	Inverse of Elasticity of labor supply	0.9

4.1 Stylized Facts

Though we cannot find correlation between formal and informal sector production and consumption due to unavailability of information on these variables, but we can check the

correlations between the growth of currency in circulation and growth in employment and wages in both of sectors. We used LFS's data from 1991 to 2007 to calculate correlations of (formal and informal) wage growth with currency growth and correlation of (formal and informal) employment growth with currency growth respectively. We can see from table 2 that these correlations are stronger in case of informal sector as compared to the formal sector. This shows that any reduction in money supply hurts informal sector more than formal sector. Furthermore, the correlation between growth of informal employment and money growth is even stronger then the correlation between growth of formal employment and money growth. This means that in case of any changes in money supply, the change in wages in the informal sector is relatively small and hence a large adjustment takes place in employment due to lower labor cost in this sector.

Table 2

Correlations of currency growth with growth of labor and wages			
Informal wage	Formal wage	Informal Employment	Formal Employment
0.25	0.09	0.41	0.10

4.2 Simulations Results

The static model is simulated for the three scenarios outlined above and the results are organized in the tables below. In table 3, expected loss in output, employment and consumption are presented against each of the two policy option. These results show that fixing exchange rate is the better policy option only in case of severe export demand shock with indebtness higher than 50% of the net assets of the firm. Fixed exchange rate is also better policy option if the objective is to prevent losses in employment due to the negative shock to export demand. Furthermore, loss in employment decreases with increase in leverage ratio i.e. indebtness of the firm. This is because of substitution of labor for imported inputs as firm become more financially constrained.

The fixed exchange rate is also better option if policy is consumption oriented. An appreciated

exchange rate results into reduction in exports and favors domestic consumption. Or in other words, the loss in exports is disproportionally higher as compared to domestic consumption if the exchange rate does not depreciate in response to a negative shock. The loss in consumption also varies inversely with leverage ratio.

Table 3

Policy Option	Leverage Ratio	Expected Loss					
		yf	yi	Z	Hf	Hi	C
Fixed Exchange Rate	-	0.051	0.051	0.051	0.051	0.051	0.051
Fixed Money	0.25	0.017	0.017	0.048	0.074	0.074	0.102
	0.5	0.048	0.048	0.049	0.073	0.073	0.098
	1	0.088	0.088	0.052	0.072	0.072	0.092

In table 4, expected utility of household is shown for different policy options and for shocks of different magnitudes. Results show that expected utility of households is higher in case of fixed money supply irrespective of the leverage ratio and extent of shock though it falls as shock becomes more and more severe. Level of indebtness has no impact on expected utility if shock is small but it varies inversely with leverage ratio in case the shock is of significant magnitude.

Table 4

Policy Option	Leverage Ratio	Expected Utility of Household		
		X1	X2	X3
Fixed Exchange Rate	-	0.261	0.244	0.192
Fixed Money	0.25	0.364	0.338	0.248
	0.5	0.364	0.338	0.261
	1	0.364	0.338	0.279

These results confirm the hypotheses that in case of a small shock exchange rate adjustments have stabilizing role but when the shock is large, the exchange rate depreciation will

deteriorate the situation even further. However, our model fails to show any disproportionate impact of policies on formal and informal sector. This may be due to the static nature of the model and it might be possible that dynamics of responses of the sectors to shocks differ significantly.

5Conclusion

The static study shows that fixing exchange rate is a better policy option only in case of:

i. severe export demand shock with high indebtness;
ii. or if the objective is to defend the employment or domestic consumption from falling when negative export demand shock hits the economy.

We can not found any disproportionate impact of policies on informal sector. This may be due to static nature of the model and it might be possible that dynamics of responses of the two sectors to shocks differ significantly.

Though this study is helpful in analyzing the different policy options available to policy makers, there are some caveats which, although out of scope of this paper, require further research. Firstly, the model is static and is not capable of analyzing the dynamic impacts of different policy options. Secondly, the external sector is not properly modeled, and thirdly, the model is silent about the optimal policy response in case of domestic demand shock. However, despite these shortcomings, the study may be helpful in designing better policies to stabilize the economy by keeping balance internal and external forces.

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