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The Dominant Borrower Syndrome: The Case of Pakistan

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The Dominant Borrower Syndrome: The Case of Pakistan

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Abstract

In this paper, we analyse the pressure fiscal expansion exerts on the economy via credit markets in Pakistan. We extend Melina and Villa (2014) by allowing government to compete with the private borrowers (firms) for the bank credit in monopolistically competitive banking industry to the extent that it can come to dominate banks balance-sheets, a feature observed in Pakistan following 2008 Global Financial Crisis. Our DSGE model captures the counter cyclical behavior of government borrowings that leads to counter cyclical spreads in loans market. Furthermore, we also find that consumption tax is the preferable policy instrument to address the fiscal deficit in bad times rather than resorting to the dominant borrower behavior.

Keywords: DSGE, Commercial Banks, Government Borrowing, Business Cycles, Emerging Economies

JEL Classification: E3, E52, E6, H2

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Non Technical Summary

The interest in using the fiscal policy to influence economic outcomes has reemerged after the 2008 Global Financial Crisis. This reemergence is mainly due to the fact that extraordinary monetary measures taken at the onset of the crisis may have averted a collapse, but their effectiveness to deliver sustainable growth leaves much to be desired. However, international experience on the effectiveness of an expansionary fiscal policy does not bode well either. For example Ilzetzki, Mendoza and Végh (2013) show that for developing countries the fiscal multiplier is negative.

In this paper, we argue that the eventual impact of fiscal expansion on aggregate economy depends on how the funds to finance this expansion are generated in addition to generally accepted view that where these funds are spent. We extend Melina and Villa (2014) model by allowing government to compete with private borrowers (firms) for bank credit in a monopolistically competitive banking industry. The model confirms that when a government has no recourse to other sources to raise finance but to borrow from banks, interest rate spreads rise and private sector investment is crowded out.

We use Pakistan as a case study because government borrowing from the commercial banks has been increasing steadily since 2008 to a point that for the last few years government dominates the private sector borrowing from commercial banks making her their 'dominant borrower'. This pattern of increased government borrowing from commercial banks followed the 2008 IMF program with the understanding that government borrowing from the central bank would be harmful being more inflationary. The continued government borrowing from the banking sector in Pakistan has led to its own possible malaise witnessed by widening interest rate spreads, lower private sector credit- despite the fact that over the last four years policy rate has been reduced from 10.5% to 6.0%, lack of willingness by commercial banks to intermediate because there is ample supply of zero-risk weighted assets in the form of gorvernment paper, and a weakening transmission of monetary policy.

In order to further support our argument we utilize empirical evidence (such as contemporaneous and dynamic correlations) from a number of different economies including Pakistan. We find that Pakistan is not alone in suffering from the dominant borrower syndrome; countries where the association between bank spreads and share of government borrowing in bank lending is strongly positive are those with less developed financial institutions. Further, we also use a Vector Autoregression (VAR) model to validate the negative impact of fiscal side as a dominant-borrower in the credit market of Pakistan.

Our findings suggest that too many expectations from fiscal stimulus would be an error in emerging economies with limited resources and a developing financial infrastructure. As an alternative, we also show that an increase in consumption tax rate would be a better policy choice to finance the expansion in government spending especially during recessionary periods.

1. Introduction

Recently, there has been a renewed interest in using the fiscal policy to influence economic activity. This is because even though the extraordinary monetary meaures taken at the onset of the 2008 Global Financial Crisis may have averted a collapse, but their effectiveness to deliver sustainable growth leaves much to be desired.

However, international experience on the effectiveness of an expansionary fiscal policy does not bode well either. For example Ilzetzki, Mendoza and Végh (2013) show that for developing countries the fiscal multiplier is negative- i.e output declines in response to an increase in fiscal spending.

In this paper, we argue that the eventual impact of fiscal expansion on aggregate economy depends on how the funds to finance this expansion are generated in addition to generally accepted view that where these funds are spent. Focusing our case study on Pakistan, we develop a general equilibrium model and support it empirically by extending Melina and Villa (2014). We introduce a new financing channel on the back of the observation that (since 2008) government in Pakistan has resorted to borrowing from the commercial banks to finance its deficit.[1]

Indeed, Pakistan's government borrowing from the commercial banks has been increasing steadily since 2008 to a point that for the last few years government dominates the private sector borrowing from commercial banks making her their 'dominant borrower'. This pattern of increased government borrowing from commercial banks followed the 2008 IMF program with the understanding that government borrowing from the central bank is harmful because the latter is more inflationary.

The continued government borrowing from the banking sector in Pakistan has led to its own possible malaise witnessed by i) widening interest rate spreads, ii) lower private sector credit - despite the fact that over the last four years policy rate has been reduced from 10.5% to 6.0%, iii) lack of willingness by commercial banks to lend to relatively risky private businesses (because of availability of zero-risk weighted assets in form of gorvernment borrowing), and iv) weakening of transmission of monetary policy.

In order to further explore the implications and establish the phenomenon of government competing for bank credit with the private sector, we rely on empirical evidence (such as contemporaneous and dynamic correlations) from number of different economies including Pakistan. We also use a Vector Autoregression (VAR) model to validate the negative impact of fiscal side as a dominant-borrower in the credit market of Pakistan.

Furthermore, to assess how widespread the issue of dominant-borrower syndrome is, we also empirically investigate the implications of increased share of government borrowing from commercial banks for a host of countries both advanced and emerging. It turns out that Pakistan is not alone at suffering from the dominant borrower syndrome; countries where the association between bank spreads and share of government borrowing in total commercial bank lending is strongly positive are those with less developed financial institutions.

This empirical regularity means that in economies where the avenues for financing government borrowing are limited, governments demand for credit from commercial banks is the only remaining source for

[1] We discuss this channel in an international context in Choudhary et al. (2016).

financing a deficit which in turn implies that such demand is likely to be less interest elastic relative to the private sector- we use this as a key assumption in our model. We also find high banking spreads and the domination of government borrowing on commercial bank balance sheets for such economies.

To support this argument further, we conduct a VAR analysis to investigate the dynamics of government borrowing and interest rate spreads in response to shocks to government spending and policy rate for Pakistan. The impulse response functions (IRFs) support the earlier findings with one exception for which we delay the discussion.

After establishing some relevant empirical facts, we develop a DSGE model that can replicate these empirical findings. We extend Melina and Villa (2014)[2] model by allowing government to compete with private borrowers (firms) for bank credit in monopolistically competitive banking industry. However, we differ from them in that the expansion in government spending leads to a growth spurt and that the counter cyclical interest rate spread is the result of this expansion[3]. Our stance here is that fiscal deficit is counter cyclical because: a) in recessionary periods tax revenues shrink; b) government expenditures do not decrease proportionally and even move in the opposite direction. Hence government has to borrow from commercial banks because; access to external borrowing is limited in bad times; borrowing from central bank can generate inflationary pressure; and increase in taxes is an unpopular decision for government in such a situation. As a result interest rate spread increases and private investment decreases. This makes the recessionary phase deeper and makes it last longer than otherwise.

The rest of the paper is organized as follows: Section 2 presents empirical motivation for the study, some cross-country evidence and VAR analysis using Pakistan data. Section 3 describes the model. Section 4 provides a brief discussion on parameters calibration. Section 5 examines the impulse responses of selected variables of interest from our model to various shocks. Finally, Section 6 concludes.

2. Empirical Motivation

The empirical motivation for this paper is mainly driven from certain economic facts that have been observed in Pakistan for the last 7 years. However, we were also able to find empirical support for similar economic behavior for some other countries. Therefore, we first discuss the empirical evidence supporting the role of dominant borrower in rising credit spread for Pakistan. After discussing the case of Pakistan, we also provide empirical evidence for selected developed and developing economies.

2.1. Evidence from Pakistan

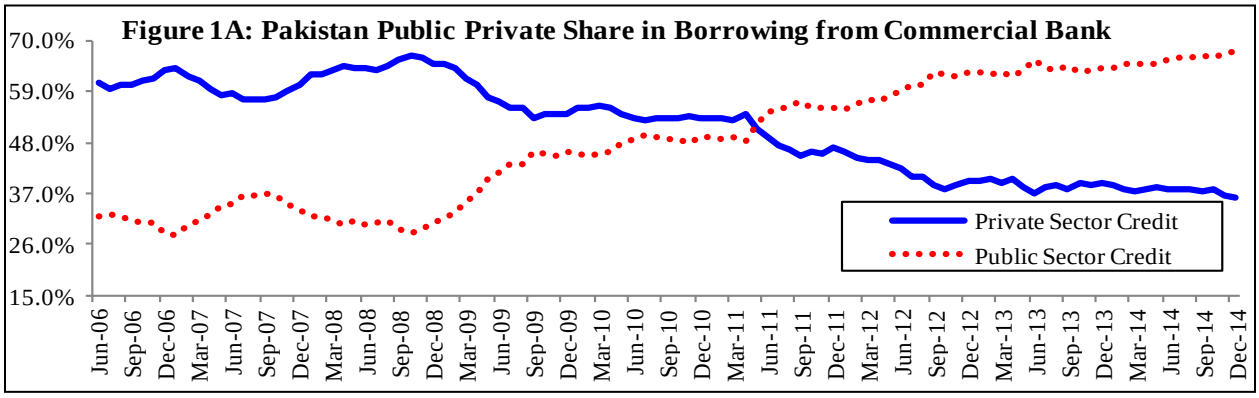
In the interest of creating fiscal discipline and stemming inflationary pressures, the Government of Pakistan in an understanding with the International Monetary Fund (IMF) in 2008 embarked upon a policy of curtailing borrowing from the central bank. The financing shortage created from this change in borrowing

[2] They developed a DSGE model with lending relationship and fiscal policy highlighting the transmission of fiscal stimulus through the banking sector. In their model, fiscal policy shocks affect credit supply and lending rate via its impacts on households' decision regarding consumption, saving, and hence deposits. They also introduced deep habits in both government and private consumption, as well as in borrowing by private firms.

[3] The literature, both theoretical and empirical, is inconclusive about the impact of fiscal expansion on economic activities especially on private consumption and investment. The impact depends on how the increase in government spending is financed whether through increased taxes, or borrowings (Gali et al.(2003)). Even different types of taxes and/or borrowings have different transmission channels and may have different cyclical impacts.

behavior was met by borrowing instead from commercial banks in order to meet part of the fiscal gap. The letter of intent reads:

'The government will use non-SBP domestic sources to meet its financing needs. This approach is based on careful advance planning of quarterly budgetary borrowing requirements. Moreover, the Ministry of Finance (MoF) has taken several measures, in coordination with the SBP, to expand and enhance available financing options for the budget....In addition, T-bill auctions have been successful with significant reductions in the cut-off yields...[.] As a step toward separation of public debt management from monetary policy operations, a volume-based auction approach has been adopted. Pre-announced auction volume targets will be observed and the accepted amount will generally be in line with the target to provide market participants with confidence to plan their investment. This approach complements the government's planning of its budgetary borrowing requirement and facilitates liquidity management by the SBP'.[4]



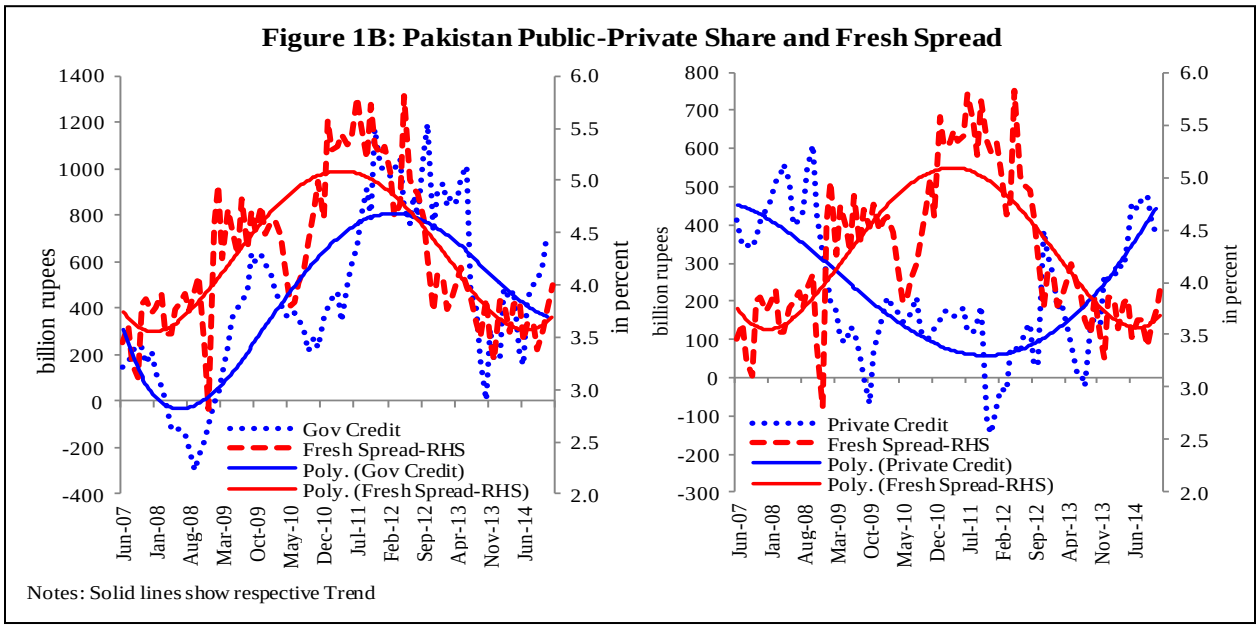


Figure 1A presents the effect of this policy on the evolution of the share of government borrowing in total borrowing from commercial banks. It is clearly evident that by 2011 the Government of Pakistan had become the dominant borrower of the banking system, accounting for 56% of lending by commercial

[4] Pakistan: Letter of Intent, Supplementary Memorandum on Economic and Financial Policies, and Addendum to the Technical Memorandum of Understanding, March 16, 2009

banks. Hence, the dominant borrower syndrome. The share of public borrowing from commercial banks has been consistently rising over the last 7 years with the share being almost 70% by the end of 2014.

Furthermore, in Pakistan credit spread has been moving in the same direction as the government borrowing from banks. In particular, an increase in lending by commercial banks to government is correlated with higher credit spread for new loans as shown by the two panels of Figure 1B and vice versa.

We now discuss the results from a structural vector autoregressive (SVAR) model estimated for Pakistan economy. This model provides not only the overview of the behavior of different variables in response to exogenous policy shocks but also a benchmark comparison. Figure A1 and A2 in the Appendix A show the impulse responses of variables of interest to fiscal (government spending) and monetary (interest rate) shocks respectively. The detail of our SVAR models and Figure A1 and Figure A2 are presented in Appendix A.

Figure A1, shows the impulse response of macro variables to a positive government expenditure shock. Impulse response, shown in Figure A1, implies an initial increase followed by a sharp decline in output after 3rd quarter to a positive fiscal shock. The recovery of output is gradual and longer. The government borrowing from commercial bank decreases at first but shows a sudden increase after the fifth quarter and remains above the steady state value for more than four years. Initial decrease in government borrowing is due to higher revenues as a result of improved aggregate demand but in the long run output falls as government borrowing increases. The interest rate spread rises as result of increased government borrowing and converges to long run value after four years. Although, the change in interest rate spread is in the right direction, the magnitude is small. This smaller magnitude can be explained by the term structure in Pakistan having an unusually large difference between short- and long-term rates - a topic covered in Choudhary and Limodio (2016). The higher government borrowing demand coupled with high interest rate spread marginalizes the private sector credit. The recovery of private sector to steady state is also sluggish. The inflation rate shows a significant fluctuation on both sides. The inflation stays above the steady state till sixth quarter and then falls below. This is mainly because of the cost channel at work (since the rise in credit spread results in increased cost of production ceteris paribus). The increase in output is smaller and shorter as compared to the increase in inflation. This does not support the idea that fiscal expansion is non inflationary if financed through borrowing from the commercial banks instead of central bank.

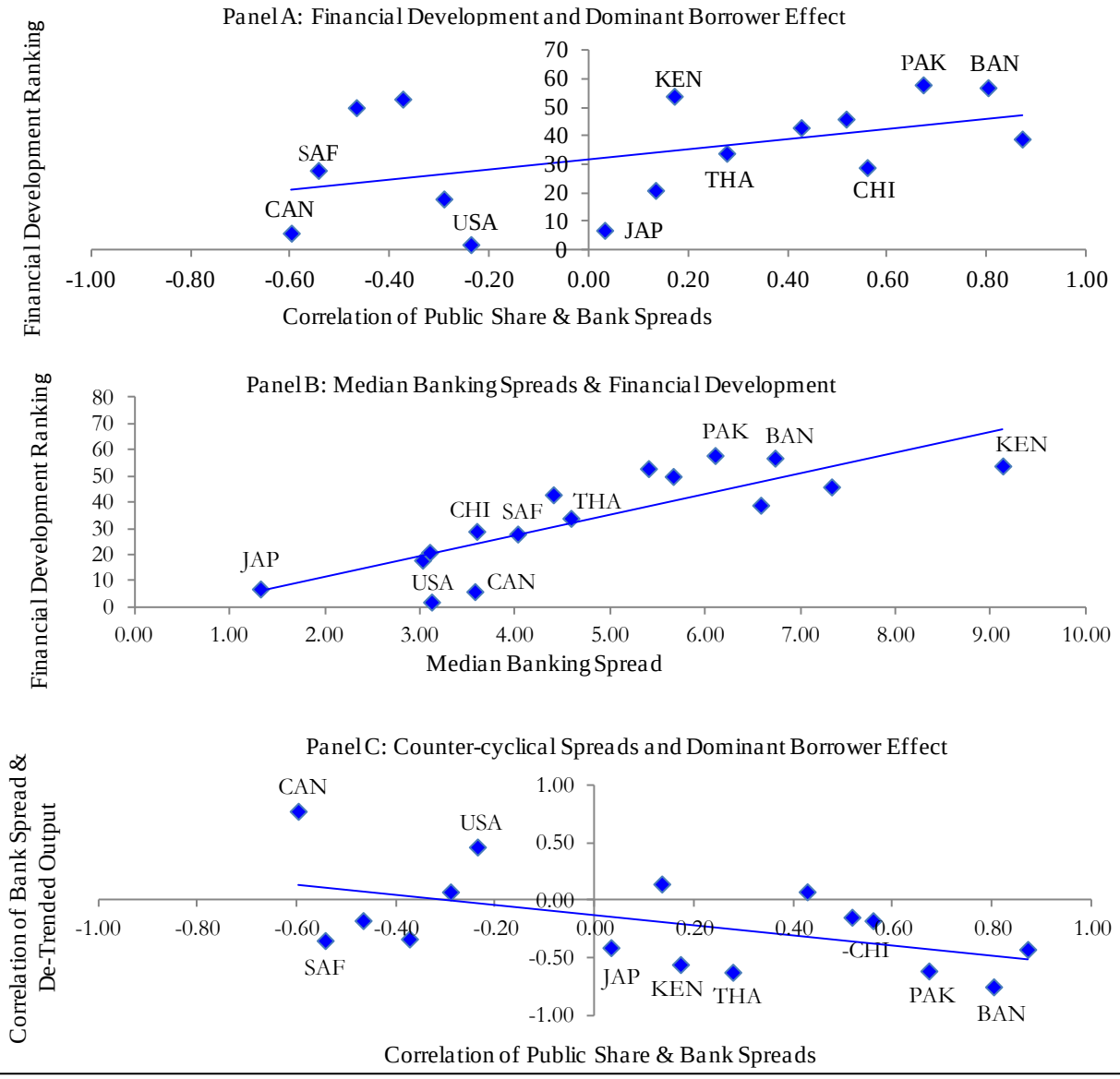
Figure A2, shows the Structural VAR impulse responses of aggregate variables to a positive interest rate shock. Impulse responses in Figure A2 show that in case of monetary shock the credit to private sector falls due to high borrowing costs and in turn both output and inflation fall below their respective steady states. The government borrowing increases as revenues fall due to reduction in national income. The credit spread shows a significant increase partially due to increase in policy rate and partially due to increase in government borrowing demand from commercial banks. Impulse responses show that the impact of monetary shock on all variables lasts for a longer period of time.

2.2. International Evidence from Selected Countries

Interestingly, the positive relationship between public share in commercial bank credit and credit spread is not unique to Pakistan. In this section, we explore further associative empirical evidence from selected countries where similar economic behavior exist to a varying degree.

In Figure 2 (Panels A and B), we further dig into the potential implications of increased share of government borrowing from commercial banks for a host of countries including Pakistan.

Figure 2: International Evidence for Selected Countries



From our analysis, we find that a high share of government borrowing from commercial banks alone is not so bad for the economy. Countries like US, Japan and Canada also have a very high share of public borrowing in total borrowing from commercial banks.

The key is the relationship between public credit share and banking spread of a given economy. Figure 2 (Panel A), shows that countries that have a high positive association[5] between bank spreads and share of government borrowing in total commercial bank lending are also the ones that are ranked way down in terms of financial and institutional development. Furthermore, there is a strong association between financial development[6] and banking spreads of a given economy as depicted by Panel B.

Table 1: Empirical Motivation

Financial Development	Credit Spread	Credit Spread & Public Share	Credit Spread & De-trended Output
Rank	Median	Correlation	Correlation
High	3.07	-0.26	0.27
Medium	4.03	0.28	-0.35
Low	6.73	0.52	-0.55

This implies that in economies where avenues for financing government borrowing are limited, governments demand for credit from commercial bank can dominate priavte sector credit, and at the same time banking spreads tend to be high.

Figure 2 (Panel C), in turn shows that where we observe a strong and positive association between banks spreads and a dominant borrower, we also simultaneously observe a high negative association of bank spreads on output.

Looking at all these panels together, we conjecture that increased share of government borrowing in total borrowing from commercial banks together with a strong linkage with banking spreads leads to a higher output contraction in economies with lower financial development.

After documenting importance, even suggestive, of the dominant borrower phenomenon for countries other than Pakistan, we turn our focus on investigating the role of government presence in Pakistani credit market in detail. We need a comprehensive framework that can capture the implications of this phenomenon on relevant macroeconomic variables such as investment and output in a dynamic manner while controlling for other factors that impact the aggregate economy. Therefore, we develop a General Equilibrium framework for our analysis.

3. Model

We have six type of agents i.e. households, government, entrepreneurs, final good producing firms, commercial banks and the central bank. We briefly discuss each agent in turn. Households consume, supply labor to entrepreneurs, deposit part of their savings in commercial banks and save in government bonds. Households exhibit deep habits in consumption a la Ravn et al (2006). The government finances her expenditures partially through levying taxes on consumption and wage income of the households and partially through borrowings from commercial banks. Government also exhibits deep habits in both consumption and in their borrowing behavior from the commercial banks. Entrepreneurs use capital and labor to produce homogeneous intermediate goods and sell it to the final goods producing firms. The

[5] We report the correlation between public share and credit spread with leads and lags using the YoY flow data and fresh credit spread for Pakistan as per suggestion of one of the referees. The dynamic correlations are reported in Table B1 in Appendix B.

[6] A country financially developped at the highest level is ranked lowest.

entrepreneurs operate in a perfectly competitive environment. They borrow from commercial banks to finance their investment and wage bill. They also exhibit deep habits in borrowing from commercial banks. The final good producing firms buy intermediate goods from entrepreneurs, differentiate it and sell it to households and government in a monopolistic market. The commercial banks collect deposits from households and lend them out to both entrepreneurs and government in a monopolistically competitive environment. Finally the monetary authority sets policy rate using a Taylor type rule.

3.1. Households

Each household $j \varepsilon (0,1)$, from the population of continuum of identical households of measure one, maximizes her lifetime utility function given by:

$$U_0^j = E_0 \sum_{t=0}^{\infty} \beta^t f(X_t^{cj}, 1 - H_t^j) \qquad (1)$$

where $\beta \varepsilon (0,1)$ is the discount factor and H_t^j is labor supply in terms of hours worked. X_t^{cj} is a habit -adjusted consumption composite of differentiated goods indexed by $i \varepsilon (0,1)$:

$$X_t^{cj} = \left[\int_0^1 \left(C_{i,t}^j - \theta^C S_{i,t-1}^c \right)^{\frac{\eta^C - 1}{\eta^C}} di \right]^{\frac{\eta^C}{\eta^C - 1}} \qquad (2)$$

where $S_{i,t-1}^c$ denotes the stock of habit in consumption of good i in period t, the parameter η^C is the elasticity of substitution between different intermediate goods. The parameter $\theta^C \varepsilon (0,1)$ is a measures of degree of external habit formation. We assume here that stock of external habit depends on a weighted average of past periods consumption. The law of motion governing the stock of habit formation of consumption is given by:

$$S_{i,t}^C = \rho^c S_{i,t-1}^C + (1 - \rho^c) C_{i,t} \qquad (3)$$

The parameter $\rho^c \varepsilon (0,1)$ measures the speed of adjustment of the stock of external habit in any individual variety to any change in the average level of consumption of all other varieties. When ρ^c is zero, this means habit is measured only by last period's consumption. In our model, households solve three different but related optimization problems. Firstly, household try to minimize total expenditure $\int_0^1 P_{it} C_{it}^j di$, subject to constraint (3), where $P_{i,t}$ denotes the price of i^{th} good at time t. This optimization gives the following demand function for the i^{th} consumption good by the j^{th} household.

$$C_{i,t}^j = \left[\frac{P_{i,t}}{P} \right]^{-\eta^C} X_t^{cj} + \theta^C S_{i,t-1}^c \qquad (4)$$

where $P = \int_0^1 \left[P_{i,t}^{1-\eta} di \right]^{\frac{1}{1-\eta}}$ is the nominal price index. Equation (4) shows that consumption of each variety i decreases as its relative price increases, while it increases with the level of habit adjusted consumption. The first term in equation (4), representing the demand function for variety i, is the price-elastic component while the second term is perfectly price-inelastic. Using the definition of the nominal price index and (4), actual consumption expenditure by the household j can be expressed as:

$$C_t^j = X_t^{cj} + \theta^C \int_0^1 \frac{P_{i,t}}{P} S_{i,t-1}^c di \qquad (5)$$

The second optimization problem faced by household relates to the maximization of earnings from their deposits at different banks.

It is well known that deposit mobilization in developing countries tend to be rigid. In the case of Pakistan, deposit mobilization as a percentage of GDP for the country has remained stagnant over the last few years. In particular, it has averaged around 31% over the last 15 years with the latest number being 30.6%. In comparison, the average deposits-to-GDP ratio for South Asia is around 54%. The most troubling fact is that this ratio has been on a downward trajectory for the last few years after reaching a peak of 35% in 2005.

This empirical regularity led us to incorporate *deep habit in deposits* in the model. This rigidity can also be explained by financial illiteracy, the presence of a large informal sector, etc.

Let X_t^{Dj} be the habit-adjusted composite of deposits of household j held in a continuum of banks indexed by $b \ \varepsilon(0,1)$.

$$X_t^{Dj} = \left[\int_0^1 \left(D_{b,t}^j - \theta^D S_{b,t-1}^D \right)^{\frac{\eta^D - 1}{\eta^D}} db \right]^{\frac{\eta^D}{\eta^D - 1}} \qquad (6)$$

and

$$S_{b,t}^D = \rho^D S_{b,t-1}^D + (1-\rho^D) D_{b,t} \qquad (7)$$

where ρ^D measures habit persistence in deposits.

Therefore, household j maximize $\int_0^1 R_{b,t}^D D_{b,t}^j db$ subject to constraint (7) where $R_{b,t}$ denotes the deposit rate by b^{th} bank. This optimization gives the following deposit supply curve (function) to the b^{th} bank from the j^{th} household.

$$D_{b,t}^j = \left[\frac{R_{b,t}^D}{R_t^D} \right]^{-\eta^D} X_t^{Dj} + \theta^D S_{b,t-1}^D \qquad (8)$$

where $R_t^D = \int_0^1 \left[\left(R_{b,t}^D \right)^{1-\eta} db \right]^{\frac{1}{1-\eta}}$ is the deposit rate index. Later in the paper we assume that all banks charge the same deposit rate set at some minimum level. This is in view of regulations from the State Bank of Pakistan (BPRD circulars 7 of 2013, 01 of 2012 and 7 of 2008) which require commercial banks to pay a minimum deposit rate of 5%, 6% and finally linking it to the floor of the interest rate corridor (SBP Repo Rate) on all categories of saving accounts (irrespective of maturity). Even after all such regulations, commercial banks continue to pay minimal deposit rates. The actual deposits can be expressed as:

$$D_t^j = X_t^{Dj} + \theta^D \int_0^1 \frac{R_{b,t}^D}{R_t^D} S_{b,t-1}^D db \qquad (9)$$

Finally the household maximizes the discounted lifetime utility presented in (1) subject to the following budget constraint:

$$P_t(1+\tau_t^c)(X_t^{Cj}+\Omega_t^C)+(X_t^{Dj}+\Omega_t^D)+B_t^j \le \left\{\begin{array}{c}(1-\tau_t^w)W_tH_t^j+\\(1+(1-\tau_t^d)R_{t-1}^D)(X_{t-1}^{Dj}+\Omega_t^D)\\+(1+R_{t-1}^{CB})B_{t-1}^j\\+\int_0^1\Pi_{t,i}di+\int_0^1\Pi_{t,b}db+TR_t\end{array}\right\} \quad (10)$$

where $\Omega_t^C = \theta^C\int_0^1\frac{P_{i,t}}{P}S_{i,t-1}^c di$ and $\Omega_t^D = \theta^D\int_0^1\frac{R_{bt}^D}{R_t^D}S_{b,t-1}^D db$.

Here B_t^j, W_t, R_t^D, R_t^{CB}, $\Pi_{t,i}$, $\Pi_{t,b}$, τ_t^c, τ_t^w, τ_t^d and λ_t^j denote respectively the government bond holdings, nominal wage rate, deposit rate, bond rate, dividend payments from intermediate firms, dividend payments from banks, tax rate on consumption, tax rate on wage earnings, tax rate on interest earning from deposits, and the Lagrange multiplier.

The left hand side of equation (10) represents expenditure while right hand side represents income of the household. The first term on left hand side is habit adjusted consumption including the consumption tax. The second term is habit adjusted deposits, while the third term is the bonds held by the household. The first term on right hand side is after tax wage income, the second term is income, net of tax, from previous period deposits. The third term gives the income from previous period's bond holdings. The fourth and fifth terms are dividends payments from the firms and the banks respectively. The last term is a lump-sum transfer from government to the household.

The first order conditions of household optimization problem are as under:

$$U_{X_t}^j = \lambda_t^j P_t(1+\tau_t^C) \quad (11)$$

$$\beta E_t\left[\left\{1+(1-\tau_{t+1}^d)R_t^D\right\}\lambda_{t+1}^j\right] = \lambda_t^j \quad (12)$$

$$\beta E_t\left[\left(1+R_t^{CB}\right)\lambda_{t+1}^j\right] = \lambda_t^j \quad (13)$$

$$-U_{H_t}^j = \lambda_t^j(1-\tau_t^w)W_t \quad (14)$$

using (12) and (13) we obtain

$$\beta E_t\left[\left\{1+(1-\tau_{t+1}^d)R_t^D\right\}\lambda_{t+1}^j\right] = \beta E_t\left[\left(1+R_t^{CB}\right)\lambda_{t+1}^j\right] \quad (15)$$

Equation (11) equates the marginal utility from additional consumption good and the cost paid for it (price plus tax). Equation (14) equates the marginal utility from leisure to after tax wage rate. While equitation (15) equates net returns on deposits and bonds.

3.1.1. Government

In a similar fashion to households, we also introduce deep habits in government consumption of each individual variety of goods it purchases. So the habit-adjusted government's consumption composite of differentiated goods X_t^g is given by:

$$X_{i,t}^g = \left[\int_0^1\left(G_{i,t}-\theta^g S_{i,t-1}^g\right)^{\frac{\eta^g-1}{\eta^g}}di\right]^{\frac{\eta^g}{\eta^g-1}} \quad (16)$$

where

$$S_{i,t}^{g} = \rho^{g} S_{i,t-1}^{g} + (1-\rho^{g}) G_{i,t} \qquad (17)$$

Analogous to the households case, optimization gives the following optimal level of actual consumption expenditure by the government.

$$G_t^{j} = X_t^{g} + \theta^{g} \int_0^1 \frac{P_{i,t}}{P} S_{i,t-1}^{g} di \qquad (18)$$

In order to finance expenditure, government borrows for a fraction of its expenditures from commercial banks and minimizes her total borrowing cost by re-adjusting her borrowing from each individual bank. In Pakistan's case, this is realistic in that in 2012 the share of government paper held by the commercial banks approached 55% of total assets from 25% in 2008.[7]

At present, there is no regulation in place from the central bank that stops commercial banks from piling on government paper. This borrowing essentially reflects the size of the fiscal deficit in the country according to the balance sheet of the government below. The budget deficit is highly persistent in Pakistan[8].

Therefore, government minimizes her borrowing cost $\int_0^1 R_{b,t}^{L} L_{b,t}^{g} db$ given the following constraint;

$$[\int_0^1 \left(L_{b,t}^{g} - \theta^{L^g} S_{b,t-1}^{L^g} \right)^{\frac{\eta^{L^g}-1}{\eta^{L^g}}} db]^{\frac{\eta^{L^g}}{\eta^{L^g}-1}} = X_t^{L^g} \qquad (19)$$

where

$$S_{b,t}^{L^g} = \rho^{L^g} S_{i,t-1}^{L^g} + (1-\rho^{L^g}) L_{b,t}^{g} \qquad (20)$$

This optimization gives government's credit demand from the individual bank b.

$$L_{b,t}^{g} = \left(\frac{R_{b,t}^{L^g}}{R_t^{L^g}} \right)^{-\eta^{L^g}} X_t^{L^g} + \theta^{L^g} S_{b,t-1}^{L^g} \qquad (21)$$

where $R_t^{L^g} = \int_0^1 \left[\left(R_{b,t}^{L^g} \right)^{1-\eta^{L^g}} db \right]^{\frac{1}{1-\eta^{L^g}}}$ is the lending rate index. Equation (21) shows that government credit demand from each bank decreases as the relative interest rate charged by that bank increases, while it increases as the level of habit adjusted credit demand increases.

The first term in equation (21), is the contemporaneous interest-elastic demand, while the second term captures the longterm demand that is perfectly interest-inelastic due to habituation to credit. It is plain that government's total demand for credit from a specific bank depends on the parameters η^{L^g} and θ^{L^g}. η^{L^g} is small relative to η^{L^e} because we have assumed that government borrowing is less sensitive to interest rate movements compared to the entrepreneurs. Similarly, θ^{L^g} is larger than θ^{L^e} due to greater habit persistence in the behavior of government borrowing as compared to borrowing by enterprenures.The government faces the following budget constraint:

[7] Authors' calculations based upon 'advances by borrower type'.

[8] The budget deficit has been 5.2% of GDP on average for the last 15 years.

$$B_t + L_t^g = \left(1+R_t^B\right)B_{t-1} + \left(1+R_t\right)L_{t-1}^g + G_t + TR_t - \tau^C C_t - \tau^w W_t H_t - \tau^d R_t^D D_t \quad (22)$$

The first term on left hand side of (22) is bond issued by government, while the second term is government borrowing from the commercial banks. The first and second terms on the right hand side are repayments of bonds issued and borrowed fund in previous period respectively. The third and fourth terms on the right hand side represent government spending and transfers to households. While last three terms are revenues from taxes on consumption, wage income, and profit earned on deposits. In case of a balanced budget, the right-hand-side would be zero.

Equation (21) and (22) jointly determine the impact of an increase in government borrowing from commercial banks on credit spread. Equation (22) shows that government borrowing requirement from commercial banks increases with an increase in budget deficit. Furthermore, we assume that government is insensitive to the cost of borrowing to finance its budget deficit because it has no recourse to other sources of finance to square its deficit other than borrowing from commercial banks. This assumption might seem extreme but in a developing economy like Pakistan this is a reality where secondary markets are shallow. Hence, the first term of equation (21) becomes inelastic and plays an insignificant role in the price setting of loans. The result is that overall credit spreads rise as government borrowing demand increases, which is contrary to the case of increase in credit demand by the firms. The reason for this is that the interest-insensitive party comes to dominate the price setting of loans. All fiscal policy instruments follow an AR1 process.

$$X_t = \rho_X X_{t-1} \exp \varepsilon_t^X$$

where $X_t = \left[G_t, \tau_t^c, \tau_t^w, \tau_t^d\right]$

3.2. Entrepreneurs

Each entrepreneur e, from the population of entrepreneur distributed over a unit interval and indexed $e\ \varepsilon\ (0,1)$, produces a homogeneous good that is sold in a perfectly competitive market. She hires labor from households and chooses level of capital to maximize the expected discounted value of her lifetime profits. Entrepreneurs, also borrow from different commercial banks to pay part of their wage bill and to finance a part of their investment. Entrepreneurs minimize their borrowing cost given their overall loan demand, where they exhibits deep habits in borrowing from commercial banks.

This second optimization problem faced by the entrepreneurs gives rise to lending relationships due to the presence of deep habits [Melina and Villa (2014), Aliaga-Diaz and Olivero (2011) and Aksoy et al. (2009)]. The representative entrepreneur minimizes her total borrowing cost $\int_0^1 R_{b,t}^L L_{bt}^e db$ subject to her demand for loans augmented by lending relationships X_t^{Le} given below:

$$X_t^{L^e} = \left[\int_0^1 \left(L_{b,t}^e - \theta^{L^e} S_{b,t-1}^{L^e}\right)^{\frac{\eta^{L^e}-1}{\eta^{L^e}}} db\right]^{\frac{\eta^{L^e}}{\eta^{L^e}-1}} \quad (23)$$

where

$$S_{b,t}^{L^e} = \rho^{L^e} S_{b,t-1}^{L^e} + (1-\rho^{L^e}) L_{b,t}^e \quad (24)$$

The solution of this optimization problem gives the following credit demand curve of the e^{th} entrepreneur

from b^{th} bank.

$$L_{b,t}^{e} = \left(\frac{R_{b,t}^{L^e}}{R_{t}^{L^e}} \right)^{-\eta^L} X_{t}^{L^e} + \theta^{L^e} S_{b,t-1}^{L^e} \qquad (25)$$

by simple manipulation we can write as:

$$L_{t}^{e} = X_{t}^{L^e} + \Omega_{t}^{L^e} \qquad (26)$$

where $\Omega_{t}^{L^e} = \theta^{L^e} \int_{0}^{1} \frac{R_{b,t}^{L^e}}{R_{t}^{L^e} P} S_{b,t-1}^{L^e} db$

The parameter θ^{L^e} determines how relevant previous level of loans are in determining the current demand of loans from individual bank b. Higher value of θ^{L^e} implies that a higher portion of the loan demand is interest rate insensitive, leading to higher switching cost for the firm. Entrepreneur e also maximizes her inter-temporal profit given below:

$$\underset{H_t^e, K_t^e}{Max} \sum_{s=0}^{\infty} \Lambda_{t,t+s} \left\{ P_t A_t F\left(H_{t+s}^{e} K_{t+s}^{e}\right) - W_{t+s}^{e} H_{t+s}^{e} - I_{t+s}^{e} + X_{t+s}^{L^e} - \int_{0}^{1} \left(1 + R_{bt+s-1}^{L^e}\right) L_{t+s-1}^{e} db + \Omega_{t}^{L^e} \right\} \qquad (27)$$

subject to

$$K_{t+1}^{e} = I_{t}^{e} + (1-\delta) K_{t}^{e} \qquad (28)$$

and

$$\int_{0}^{1} L_{b,t}^{e} db = \varphi I_{t}^{e} + \kappa W_{t}^{e} H_{t}^{e} \qquad (29)$$

The production function $F\left(H_{t+s}^{e} K_{t+s}^{e}\right)$ is increasing and concave in both capital and labor, P_t is the competitive price at which the intermediate good is sold, $\Lambda_{t,t+s}$ is the stochastic discount factor, K_t^e is capital stock, I_t^e is investment and δ is the capital depreciation rate.

Also, the term $W_t h_t$ in equation (27) is the wage bill, I_t is the investment expenditure, X_t is loan inflows, while the last term represents what the entrepreneur repay to banks. Equations (28) and (29) represent capital accumulation and financial constraints respectively. Differentiation with respect to K_t^e and H_t^e gives following first order conditions:

$$P_{e,t} A_t F_{H,t} = W_t E_t \left[1 - \kappa \{ 1 - \Lambda_{t,t+1} (1 + R_t^{L^e}) \} \right] \qquad (30)$$

$$P_{e,t} A_t F_{K,t} = \delta(1-\varphi) + (1 + R_t^{L^e})\varphi + E_t[\varphi(1-\delta)\left(1 + R_{t+1}^{L^e}\right)\Lambda_{t,t+1}] \qquad (31)$$

Equation (30) equates the value of labors marginal product to its marginal cost i.e. the wage rate, while equation (31) equates the value of the marginal product of capital to unit rental cost. Marginal cost can be expressed as:

$$MC_t = P_{e,t} = \frac{W_t E_t \left[1-\kappa\{1-\Lambda_{t,t+1}(1+R_t^{L^e})\}\right]}{A_t F_{H,t}} \qquad (32)$$

3.3. Final Good Producing Firms

Final good producing firm i, from a continuum of firms indexed by $i \ \varepsilon \ (0,1)$, buys intermediate goods from entrepreneurs at the price $P_{e,t}$, differentiates it and sells it in a monopolistic competitive market at price $P_{i,t}$. The competitive price at which final good producing firm purchases wholesale good represents the marginal cost i.e. $MC_t = P_{e,t}$. The final good producing firm maximizes the flow of discounted profits by choosing $C_{i,t}$, $S_{i,t}^C$, $G_{i,t}$, $S_{i,t}^g$ and $P_{i,t}$. Hence, the profit maximization problem can be presented as:

$$\underset{C_{i,t+s},S_{i,t+s}^C,G_{i,t+s},S_{i,t+s}^g,P_{i,t+s}}{Max} \sum_{s=0}^{\infty}\Lambda_{t,t+s}\begin{Bmatrix}[(P_{i,t+s}-MC_{t+s})(C_{i,t+s}+G_{i,t+s}+I_{i,t+s})]+\\ \upsilon_{t+s}^C[(p_{i,t+s}^{-\eta^C}X_{t+s}^C+\theta^C S_{i,t+s-1}^C-C_{i,t+s})]+\\ \lambda_{t+s}^C[(\rho^C S_{i,t+s}^C-S_{i,t+s-1}^C+(1-\rho^C)C_{i,t+s})]\\ \upsilon_{t+s}^g[(p^{-\eta^g}X_{t+s}^g+\theta^g S_{i,t+s-1}^g-G_{i,t+s})]+\\ \lambda_{t+s}^g[(\rho^g S_{i,t+s}^g-S_{i,t+s-1}^g+(1-\rho^g)G_{i,t+s})]\end{Bmatrix} \qquad (33)$$

where $p_{it} = P_{i,t}/P_t$ and $\upsilon_t^C, \upsilon_t^g, \lambda_t^C, \lambda_t^g$ are the lagrange multipliers

The term in first square bracket of equation (33) is profit of the firm, while terms in preceding brackets are constraints given by equations (4),(3), (18) and (17) respectively.

The first order conditions with respect to $C_{i,t}$, $S_{i,t}^C$, $G_{i,t}$, $S_{i,t}^g$ and $P_{i,t}$ associated with this optimization problem are given below:

$$(P_{i,t}-MC_t)+\lambda_t^C(1-\rho^C)=\upsilon_t^C \qquad (34)$$

$$E_t[\Lambda_{t,t+1}\{\theta^C\upsilon_{t+1}^C+\rho^C\lambda_{t+s}^C\}]=\lambda_t^C \qquad (35)$$

$$(P_{i,t}-MC_t)+\lambda_{t+s}^g((1-\rho^g)=\upsilon_t^g \qquad (36)$$

$$E_t[\Lambda_{t,t+1}\{\theta^g\upsilon_{t+1}^g+\rho^g\lambda_{t+s}^g\}]=\lambda_t^g \qquad (37)$$

$$P_t(C_{i,t}+G_{i,t}+I_{i,t})=\eta^C\upsilon_t^C p_{i,t}^{-1-\eta}X_t^C+\eta^g\upsilon_t^g p_{i,t}^{-1-\eta}X_t^g \qquad (38)$$

From equations (34) and (35) we get,

$$(P_t-MC_t)-\upsilon_t^c=[\Lambda_{t,t+1}\{\theta^c\upsilon_{t+1}^c(\rho^c-1)+\rho^c\{(P_{t+1}-MC_{t+1})-\upsilon_{t+1}^c\}\}] \qquad (39)$$

Similarly from equations (36) and (37) we can write the following equation

$$(P_t-MC_t)-\upsilon_t^g=[\Lambda_{t,t+1}\{\theta^g\upsilon_{t+1}^g(\rho^g-1)+\rho^g\{(P_{t+1}-MC_{t+1})-\upsilon_{t+1}^g\}\}] \qquad (40)$$

Equations (39) and (40) equate respectively the shadow value of an extra unit of private consumption good and government consumption good in the current period to the current profit (price markup) plus the expected future profits arising from firm-customer relationship.

3.4. Commercial Banks

There is a continuum of commercial banks indexed by $b\varepsilon(0,1)$. Each variety of loans/financial services is produced by a bank operating in a monopolistically competitive loan market. On the other hand, banks operate in a competitive market for deposits. In each period, *t*, bank b chooses its demand for deposits $D_{b,t}$ and the interest rate to charge on loans ($R^L_{b,t}$) to maximize the expected present discounted value of his lifetime profits. Each bank b maximizes the following profit function:

$$\underset{L^e_{b,t},L^g_{b,t},R^L_{b,t},S^{L^e}_{b,t},S^{L^g}_{b,t}}{Max} \sum_{t=0}^{\infty}\Lambda_{t,t+1}\{R^L_{b,t}(L^e_{b,t}+L^g_{b,t})-R^D_t D_{b,t}\} \quad (41)$$

subject to constraints given in equation (20), (21), (24) ,(25) and the following balance sheet of the commercial bank.

$$L^e_{b,t}+L^g_{b,t}=D_{b,t} \quad (42)$$

where maximization with respect to $L^e_{b,t}, L^g_{b,t}, r^L_{b,t}, S^{L^e}_{b,t}, S^{L^g}_{b,t}$ gives following first order conditions

$$(R^L_{b,t}-R^D_t)-\upsilon^{L^e}_t+(1-\rho^{L^e})\lambda^{L^e}_t=0 \quad (43)$$

$$(R^L_{b,t}-R^D_t)-\upsilon^{L^g}_t+(1-\rho^{L^g})\lambda^{L^g}_t=0 \quad (44)$$

$$E_t[\Lambda_{t,t+1}\left\{\theta^{L^e}\upsilon^{L^e}_t+\rho\lambda^{L^e}_{t+1}\right\}]=\lambda^{L^e}_t \quad (45)$$

$$E_t[\Lambda_{t,t+1}\left\{\theta^{L^g}\upsilon^{L^g}_t+\rho\lambda^{L^g}_{t+1}\right\}]=\lambda^{L^g}_t \quad (46)$$

$$L^e_{b,t}+L^g_{b,t}=\upsilon^{L^e}_t\eta^{L^e}\frac{X^{L^e}_t}{R^L_{b,t}}+\upsilon^{L^g}_t\eta^{L^g}\frac{X^{L^g}_t}{R^L_{b,t}} \quad (47)$$

where $\lambda^{L^e}_t, \lambda^{L^g}_t, \upsilon^{L^e}_t$ and $\upsilon^{L^g}_t$ are the Lagrange multipliers.

Solving equations (43) and (45) we get,

$$MARKUP_t-\upsilon^{L^e}_t=\Lambda_{t,t+1}\left[\theta^{L^e}\upsilon^{L^e}_{t+1}(\rho^{L^e}-1)+\rho^{L^e}(MARKUP_{t+1}-\upsilon^{L^e}_{t+1})\right] \quad (48)$$

and solving equations (44) and (46) we get the following new equation:

$$MARKUP_t-\upsilon^{L^g}_t=\Lambda_{t,t+1}\left[\theta^{L^g}\upsilon^{L^g}_{t+1}(\rho^{L^g}-1)+\rho^{L^g}(MARKUP_{t+1}-\upsilon^{L^g}_{t+1})\right] \quad (49)$$

Equations (48) and (49) equate the shadow value of an extra unit of lending to firms and government in the current period to the profit in terms of interest spread plus the expected future profits arising from lending relationship respectively .

3.5. Monetary Authority

Finally we close the model by assuming a simple Taylor rule for interest rate setting where monetary authority responds to any deviations of inflation and output from their steady states in the following way:

$$R_t^{CB} = \left(R_{t-1}^{CB}\right)^{\rho_R}\left[\left(\frac{\pi_t}{\pi}\right)^{\rho_\pi}\left(\frac{y_t}{y}\right)^{\rho_y}\right]^{(1-\rho_R)}\varepsilon_t^m \qquad (50)$$

This equation is important for closing the model as the central bank sets the indicative rate for both commercial banks and households. Therefore, the behavior of central bank has significant implications for the market for deposits as well the lending behavior of the commercial banks. This in turn has significant implications for the production sector of our economy.

4. Calibration

In this section, we assign values to different parameters of the model. The major challenge in case of emerging economies is unavailability of required data and parameters values essential for DSGE modeling. So mostly we have to rely on crude information or literature on advance economies. The values we have used are presented in Table 2.

Table 2: Structural Parameters

Parameter	Description	Value
β	Discount factor	0.96
δ	Capital Depreciation rate	0.018
σ	Inter-temporal Elasticity of substitution	2
α	Share of capital in production	0.50
η^C	Elasticity of substitution in private consumption composite	1
η^G	Elasticity of substitution in government consumption composite	1
θ^C	Deep habits in private consumption	0.90
θ^G	Deep habits in government consumption	0.90
ρ^C	Private consumption habit persistence	0.65
ρ^G	Government consumption habit persistence	0.65
θ^{Le}	Deep habits in lending (Firms)	0.20
θ^{Lg}	Deep habits in lending (Government)	0.30
ρ^{Le}	Persistence of lending relationships(Firms)	0.65
ρ^{Lg}	Persistence of lending relationships (government)	0.70
κ	Share of wage bill paid using borrowed money from banks	0.025
ϕ	Share of borrowed money from banks for investment	set to match steady state values of investment share of GDP=0.15
γ	Coefficient on leisure	1.3
χ	Frisch elasticity of labor supply	To match the steady state share of working hours to 0.30.
η^{Le}	Elasticity of substitution in Bank lending (Firms) [9]	425
η^{LG}	Elasticity of substitution in Bank lending (Government)	set to target spread = 0.0125

We set the subjective discount factor, β, equal to 0.96, closer to but slightly lower than estimated by Ahmed et al. (2012) for Pakistan. The value of capital depreciation rate, δ, is set equal to 0.018 per quarter following Ahmed et al. (2014). Furthermore, we set the share of capital in production, α, equal to 0.50,

[9] Melina & Villa (2014)

which is the average for developing countries as reported by Liu (2008). We set the parameter of inter-temporal elasticity of substitution σ to 2 following Melina and Villa (2014). The coefficient on leisure, γ, is 1.3 and Frisch elasticity of labor supply, χ is set to match the steady state share of working hours to 0.30.

The deep habit parameters, θ^C, and θ^G, are equal to 0.90, slightly higher than values in literature on advance economies, see Melina and Villa (2014), Aliaga-Diaz and Olivero (2011).[10] Habit persistence parameters in private consumption ρ^C, and government consumption, ρ^G are set equal to 0.65. The elasticity of substitution across different varieties of consumption, η^C, and government consumption, η^G, are set equal to 1. The share of investment financed through borrowing, φ, is set to match steady state values of investment share of GDP. The share of wage bill paid using borrowed money from banks[11], κ, is set equal to 0.025. This parameters is estimated using data on total credit to private sector as a percentage of total private investment (11%) and data on composition of firms' loans from banks taken from corporate loans database of Credit Information Bureau of SBP. We set the elasticities of substitution in the banking sector, η^{Le} to 425 following Melina and Villa (2014) and the parameter η^{Lg}, to match a gross spread between the lending rate and the deposits rate of 0.0125 (500 basis points per year). For the parameters representing deep habits in lending relationships, θ^{Le}, and θ^{Lg}, we use values of 0.20 and 0.30 respectively, again on the basis of corporate loans database of Credit Information Bureau. Average bank-firm lending duration in Pakistan is 2 years (Choudhary et al. 2012), which is very short compared to advanced economies (11 years for US and 10 years for EU)[12]. While for the persistence parameters in the lending relationships, ρ^{Le}, and ρ^{Lg}, we set values equal to 0.65 and 0.70 respectively. The persistence parameters of fiscal shocks are set at 0.65. The share of steady state consumption s_c is set equal to 0.75, while the share of steady state investment s_i is set equal to 0.15.

5. Results

This section presents the impulse response function of our model. Figure 3 shows the response of different variables to a positive technology shock interpreted as an upswing in the economy. It is evident that output (y), consumption (c) and investment (i) all increases while government borrowing (L^g) declines and hence loan markups also fall as a result. This is consistent with the empirical evidence presented in Section 2. This is partially due to counter cyclical nature of government borrowing from the commercial banks and partially due to habit persistence in firm borrowing.

Since government revenues increase in a boom period while government spending grows less than proportionally and fiscal gap shrinks. Inflation (denoted by *gp*) reduces on impact but increases slightly before turning to its steady state value. Labor hours and real wages both fall below their steady state values. The reduction in real wage is counter intuitive, a possible explanation could be the substitution effect due to lower markup charged by the banks.

[10] The value for habits parameters on private and government consumption are set higher than such values for advance economies on the basis of fact that there are limited options on the varieties of consumption goods available in emerging economies due to low income.

[11] 23% of which is used for working capital.

[12] See Angelini et al., (1998), Degryse & Van Cayseele, (2000), and Kim et al., (2003), for Italy, Belgium and Norway. See Petersen and Rajan (1994) for US.

Figure 3: Impulse Response Functions in Response to a Technology Shock

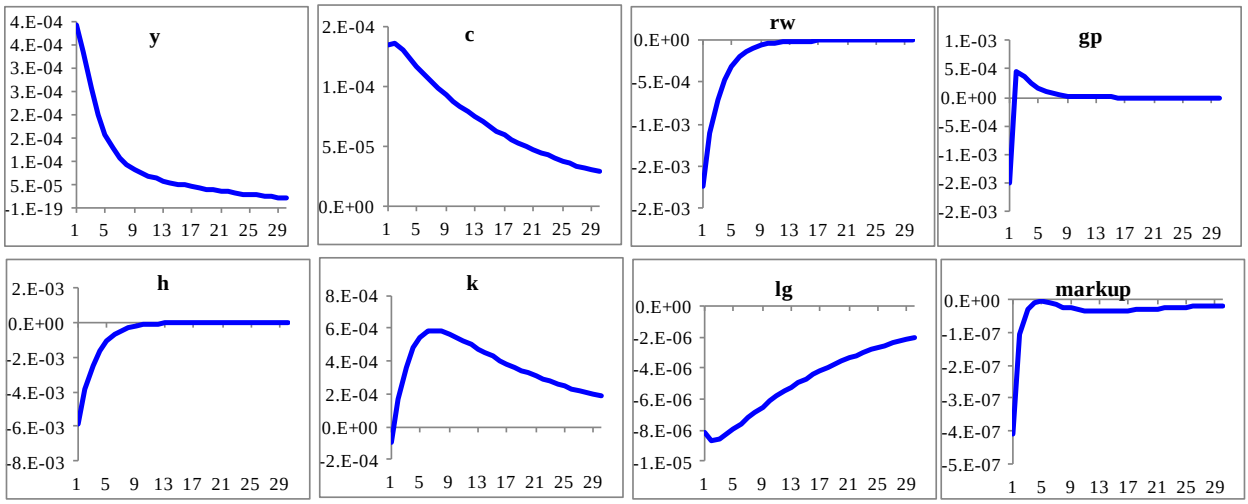
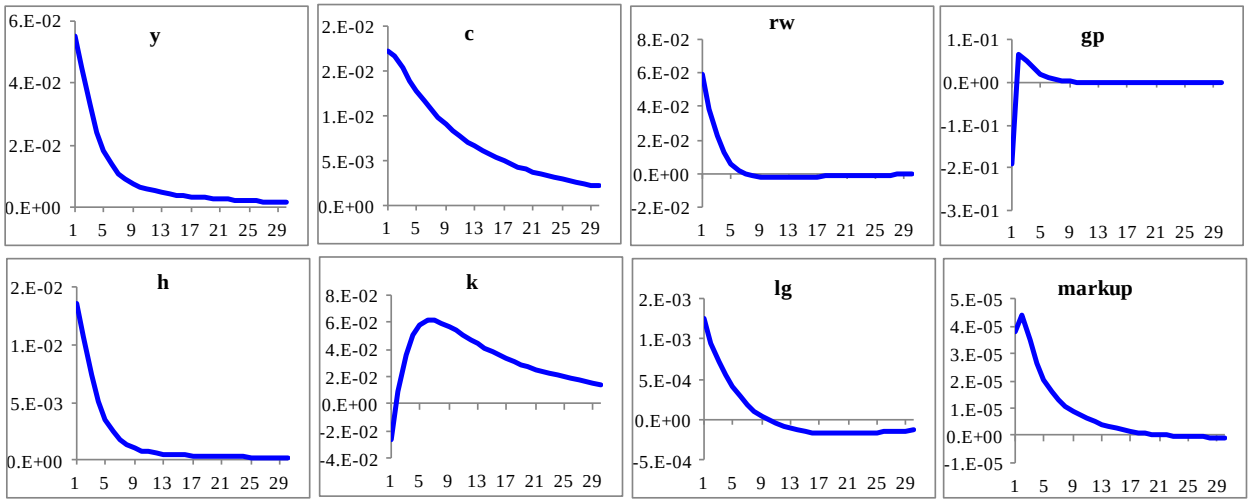


Figure 4 shows the impact of a positive government spending shock. All variables of interest respond positively to a positive fiscal shock except inflation and investment which declines first but show an increase after the first quarter. The impact of this fiscal expansion gets transmitted through various channels. First a standard negative wealth effects i.e. the present value of taxes increases that makes consumption and leisure less affordable. The labor supply increases, real wages decline that has further negative substitution effect on consumption. The output can move in either way (positively due to increased labor supply and negatively due to increased present value of taxes). The initial decline in inflation is explained by reduced real wage and a lower markup at impact (lower cost of production).

Figure 4: Impulse Response Functions in Response to a Government Spending Shock



Secondly, as in our model government competes with the private sector for credit from the commercial banks, therefore any fiscal indiscipline increases government borrowing which results into higher markup, reducing investment, output, consumption, labor demand and real wages. Finally fiscal expansion may have crowding in impacts. For some firms have to meet increased demand of their products without increasing prices, labor demand increases and real wages also rise. This in turn has a positive impact on consumption, investment and aggregate demand. In addition the model also embeds deep habits in private consumption so the positive substitution effect is large enough to offset the negative wealth effect and overall consumption rises in response to a government spending shock. Besides, expansion in output increases government

revenues which moderates the increase in government borrowing and hence banks markup, which is evident from Figure 4.

Figure 5: Impulse Response Functions in Response to a Monetary Policy Shock

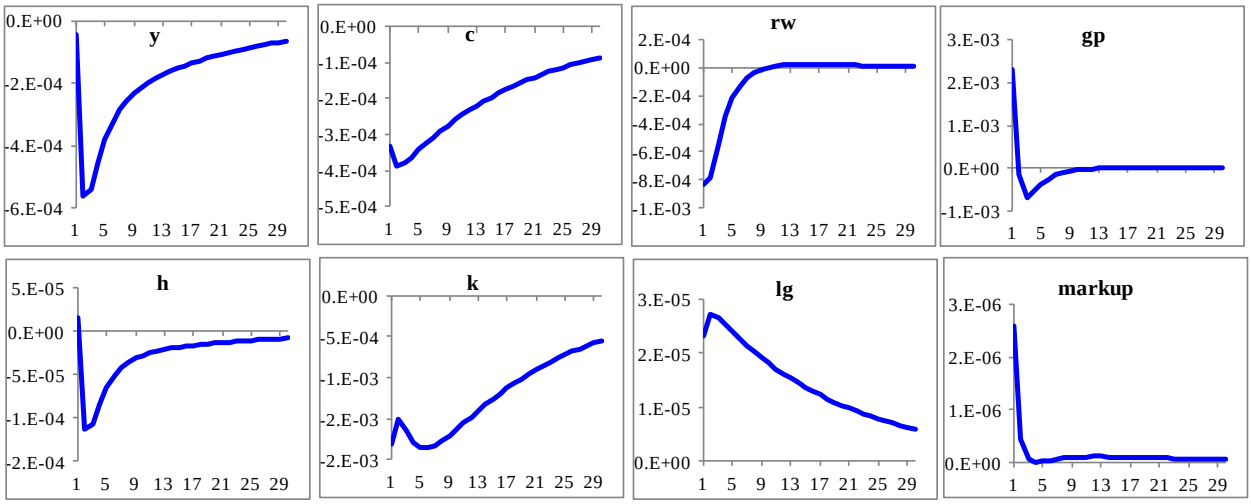


Figure 5 describes the response of different variables in response to a monetary policy shock i.e. a positive shock to interest rate. The output, consumption, real wages, labor hours, and investment all fall below their steady states values. The impact on consumption is small but prolonged as compared to output. This is due to deep habits embedded in consumption. The fall in labor hours is quite negligible and short lived as compared to capital. This is because of the substitution effect as the real wage goes down and interest rate rises making labor relatively cheaper. The government borrowing, inflation, and markup increase above the steady state values. The impact is, however, small in magnitude and is of shorter duration for inflation and markup. This small impact is due to two opposite forces affecting the markup simulatenously, i.e. a lower demand from the private sector putting downwards pressure on the markup, however increased government borrowing from commercial banks leading to an increase in the credit spread. The rise in inflation, due to the cost channel active in the model, is in conformity with VAR results for Pakistan. The increase in the markup shows the existence of the financial accelerator phenomena. In case of monetary contraction when output, real wages and consumption fall, the government borrowing from commercial banks increases as the sources of revenues dry up.

Figure 6 illustrates the impacts of a positive shock to the tax rate on wage earnings. The output, consumption, labor hours, investment and government borrowings fall below their respective steady state values. On the other hand, real wages, inflation, and markup climb up for a short duration. Over all impacts on various variables are of small magnitude.

The higher real wages is the result of reduction in labor supply originated from reduction in after tax wage (lower marginal return on labor). This rise in wages also appears in prices i.e. firms pass on some of the increased cost to the consumers. There is intratemporal

substitution effect leading to consumption and labor falling due to a low return on labor. The increase in wage tax rate also causes the return on capital to fall due to its effects on labor supply, investment falls as a result. Furthermore, the degree of deep habit formation in private consumption also leads to a shift of demand from investment to consumption good. That is why the fall in consumption is less than proportionate fall in output and investment. The increase in markup is counter intuitive here.

Figure 6: Impulse Response Functions in Response to a Wage Tax Shock

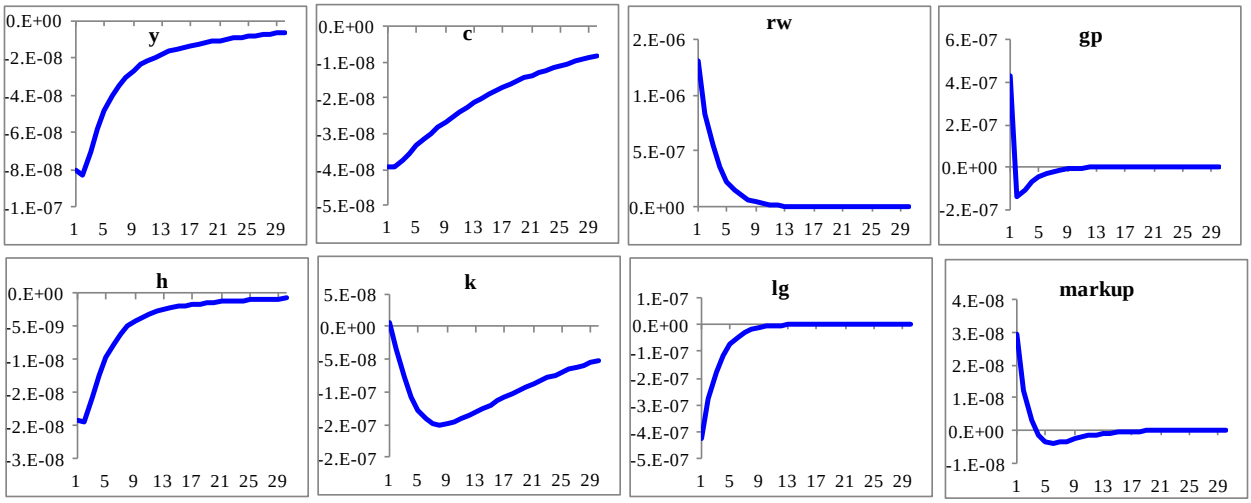
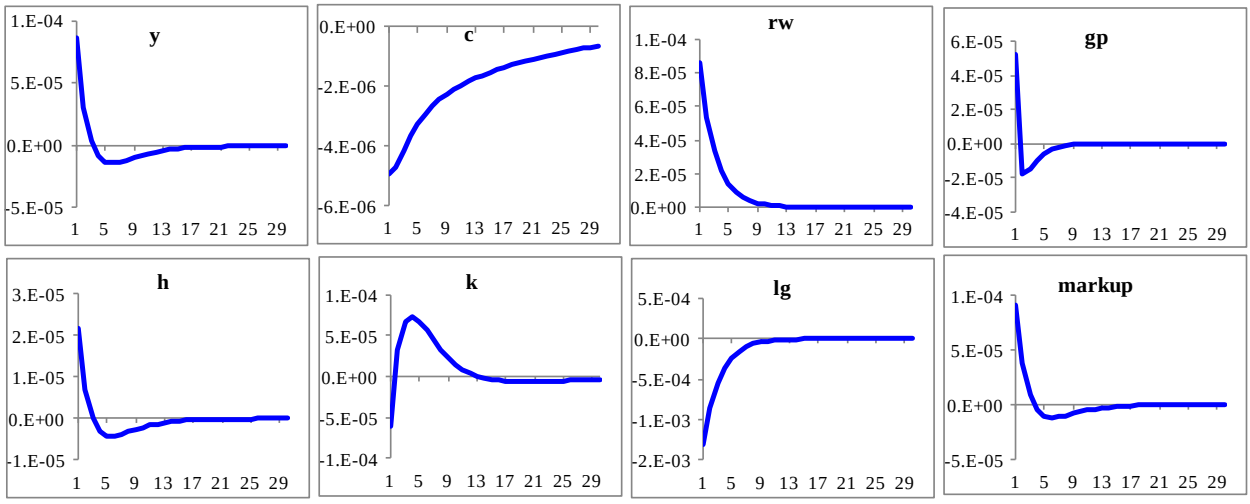


Figure 7 portrays that all variables, except consumption and government borrowing, go up in response to a positive shock to a tax rate on consumption. The increase in tax rate on consumption makes consumption costly, households saving and hence investment increases as a result. This leads to an increase in the credit spread and output as well. Labor demand increases and input prices i.e. wage rate and markup also go up due to the increased input demand. The markup also rises due to increase in households savings that reduce deposit rate. Inflation also rises due to expanded demand but this rise is short lived and small in magnitude. The rapid convergence of inflation to its steady state value is due to the fall in consumption. The fall in consumption is prolonged due to deep habits embedded in consumption. These results suggest that both type of taxes are inflationary, however, the increase in consumption tax is better option as it results into higher output and employment while opposite is the case for tax rate on labor income.

Figure 7: Impulse Response Functions in Response to a Consumption Tax Shock



6. Conclusion

In this paper, we extend Melina and Villa (2014) and allow the government to compete with the private borrowers (firms) for the bank credit in monopolistically competitive banking industry to the extent that it may end up becoming the dominant borrower for banks- a feature having important implications. This scenario is more likely in a recessionary phase where the government has limited options to raise finance but to resort to banks to finance the budgetary gap. As a result interest rate spread increases and private investment decreases. This makes the recessionary phase even deeper and longer than previously thought. Surprisingly, we find surface level evidence that some other developing and emerging economies also share this feature with Pakistan along with the fact that they too have an under developed financial markets.

This result stands in contrast with Melina and Villa (2014), where an expansion in government spending increases the availability of loan to private firms via reduction in bank spreads due to lending relationships. Thus, fiscal stimulus boosts economic activity thus helping mitigate a recession.

Our main arguments are also borne out by a VAR analysis. These findings suggest that too many expectations from fiscal stimulus would be an error in emerging economies with limited resources and poor institutional framework.

As an alternative policy choice to resorting to dominant-borrower syndrome, our impulse response functions (IRF) also show that increase in consumption tax rate would be a better option to finance the expansion in government spending especially during recessionary periods.

The main caveats of the paper are that it ignores the external sector- an important feature for small open emerging economy. The inclusion of external sector will not change the main impact discussed here, unless of course the government replaces dominant-borrower syndrome with external finances. Second, the model does not feature price discrimination between the two types of agent: government and the private sector.

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Appendix A

Vector Autoregression (VAR)

To study the dynamic response of key macroeconomic variables to independent fiscal and interest rate shocks, we estimated VAR(s) on Pakistani quarterly data from 2000(3) -2012(4). The following data series, with mnemonic in parenthesis, were used in VAR analysis: gdp_t ; real gross domestic product, g_t ; government expenditure, $crps_t$; credit to private sector, s_t ; interest rate spread , $gbbs_t$; government borrowing from commercial banks, r_t : interest rate and π_t ; CPI inflation rate. Natural logarithms are taken for each of the variable except inflation, interest rate and spread. Series are seasonally adjusted. In employing the VAR methodology our starting point is a reduced form model, which can be written in matrix form as:

$$X_t = \mu_0 + \mu_1 t + A(L)X_{t-1} + \varepsilon_t$$

where μ_0 is a constant, t is a linear time trend, X_t is vector of model variables, $A(L)$ is a second order lag polynomial and ε_t is a 6-dimensional vector of reduced-form disturbances with $E[\varepsilon_t] = 0$, $E[\varepsilon_t \varepsilon_t'] = \Sigma_{\varepsilon_t}$ and $E[\varepsilon_t \varepsilon_t'] = \Sigma_{\varepsilon_t}$ for $s \neq t$. Given the relatively short sample size, we opted to present the results based on the more parsimonious versions of the model. We choose a lag length of two quarters. Since variables are seasonally adjusted therefore we have not used the seasonal dummy variables. Some of the variables like gdp_t, exhibit a possibly non-stationary behavior. Nonetheless, we estimate the system in levels, with no restriction of cointegrating relations. Doing so we incur some loss due to the reduced efficiency of estimation but at no cost in terms of consistency of estimators (Sims, Stock and Watson (1990), Hendry D.F (1996)). As the reduced-form disturbances will in general be correlated it is necessary to transform the reduced-form model into a structural model. Pre-multiplying the above equation by the (6x6) matrix A_0 gives the structural form:

$$A_0 X_t = A_0\mu_0 + A_0\mu_1 t + A_0 A(L)X_{t-1} + Be_t$$

Where $A_0 \ddot{I}\mu_t = Be_t$, describes the relation between the structural disturbances e_t and the reduced-form disturbances ε_t. We assumed that the structural disturbances e_t are uncorrelated with each other. The matrix A_0 describes the contemporaneous relation among the variables collected in the vector X_t. To identify the structural model we need to impose restriction on matrices A_0 and B. In literature we have different identification approaches. For example sign restriction approach, recursive approach or The Blanchard-Perotti approach etc. Since neither we have any proper institutional information about government spending process nor we have any prior study who calculated respective elasticities therefore we simply use recursive approach in the analysis. The recursive approach implies a causal ordering of the model variables. Note that there are $k!$ possible ordering in total.

Since we are studying different independent shocks e.g. fiscal and monetary shocks, therefore we have used different variable ordering in VAR. For the fiscal shock, we order the variables as follows:

$$[g_t, gbcb_t, s_t, psc_t, \pi_t, gdp_t]$$

The assumptions on the contemporaneous relation between the variables can be justified as follows: A sudden positive movement in government spending cannot be financed by taxes; therefore the federal government borrows from the commercial banks to compensate budgetary expenditures. Government borrowing contemporaneously inflates the spread. A high government borrowing coupled with inflated spread crowd out the private sector investment in turn might influence prices and real GDP. For the monetary shock, we order the variables as follows:

$$[gdp_t, pc_t, inv_t, r_t, \pi_t, psc_t, s_t, gbcb_t]$$

Figure A1: VAR Impulse Response Functions to a Positive Government Spending Shock

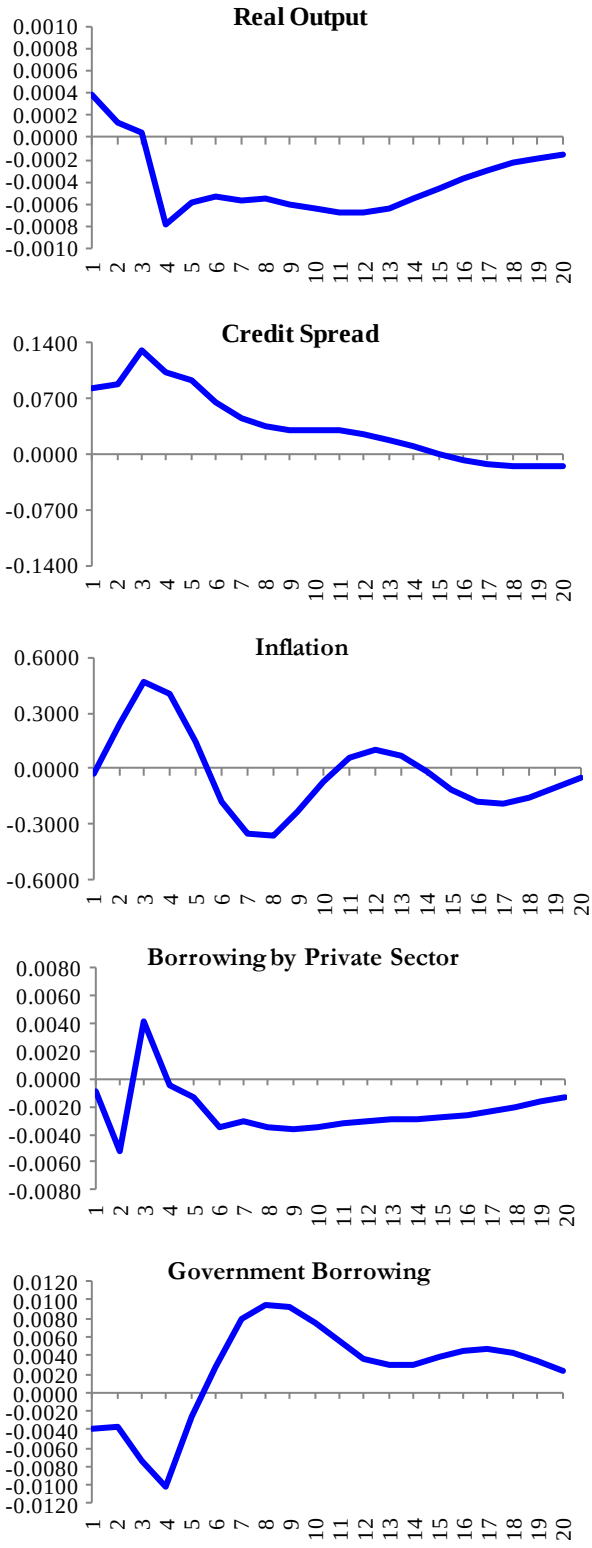
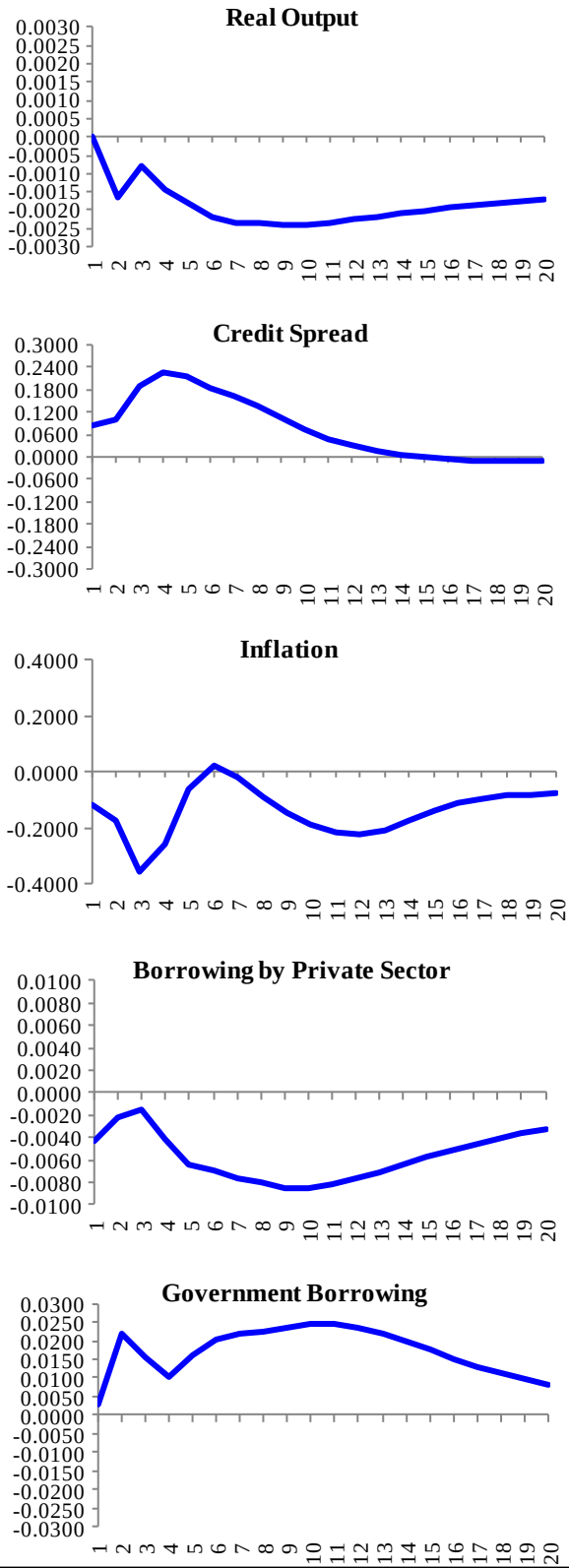


Figure A2: VAR Impulse Response Functions to a Monetary Policy Shock



Appendix B

Table B1: Correlation between Credit Spread and Public Share (Pakistan)

Lead/Lag	***Correlation Coefficient***
(Credit Spread$_{t-18}$, Public Share$_t$)	0.26
(Credit Spread$_{t-15}$, Public Share$_t$)	0.44
(Credit Spread$_{t-12}$, Public Share$_t$)	0.52
(Credit Spread$_{t-9}$, Public Share$_t$)	0.55
(Credit Spread$_{t-6}$, Public Share$_t$)	0.54
(Credit Spread$_{t-3}$, Public Share$_t$)	0.52
(Credit Spread$_t$, Public Share$_t$)	0.48
(Credit Spread$_{t+3}$, Public Share$_t$)	0.37
(Credit Spread$_{t+6}$, Public Share$_t$)	0.16
(Credit Spread$_{t+9}$, Public Share$_t$)	0.00
(Credit Spread$_{t+12}$, Public Share$_t$)	-0.11
(Credit Spread$_{t+15}$, Public Share$_t$)	-0.13
(Credit Spread$_{t+18}$, Public Share$_t$)	-0.03