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The Effects of a Government Expenditures Shock*

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Abstract

Government expenditure shocks increase output and do not decrease consumption. We argue this is due to the behavior of the central bank. A basic RBC model is able to deliver this result as long as the central bank behaves as the empirical evidence suggests.

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1 Introduction

The recent evidence suggests that either consumption is unchanged or rises in response to an unanticipated increase in government spending. There is no evidence in the literature of a significative negative consumption response. Most of the evidence is obtained from structural vector autoregressive (VAR) models, with different papers using one of two basic different identification techniques. Blanchard and Perotti (2002), Fatás and Mihov (2001) and Gali et al (2004) identify exogenous shocks to government spending by assuming that this variable is predetermined with respect to the other variables. They find that private consumption rises significantly and persistently after an unanticipated increase in government purchases. In the same methodological vein, Perotti (2004) finds that this result is pretty robust to a sample of five OECD countries. Mountford and Uhlig (2002) identify the policy shocks using sign and near-zero restrictions on the impulse response functions and obtain that government expenditure shocks stimulate the economy but do not change private consumption. Perotti (1999) studies the comovement of consumption and government spending and finds out that only during fiscal consolidation episodes, characterized by large spending cuts, private consumption and output rise, but in all other experiences the opposite happens, private consumption moves together with government spending. Others, like Edelberg, Eichenbaum and Fisher (1999), and Burnside, Eichenbaum and Fisher (2003) use additional information such as timing of wars to identify the fiscal policy shock. They

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consider three military build-up episodes in the US as their exogenous government expenditure shocks.[1] Within this approach, the dynamic effects of the government spending shock are traced as the responses to innovations in the dummies corresponding to each of the three episodes. This alternative methodology leads to the conclusion that the fiscal policy has no noticeable impact on private consumption. Edelberg, Eichenbaum and Fisher (1999) finds a small and delayed fall in the consumption of nondurables and services, though durables consumption increases on impact. Burnside, Eichenbaum and Fisher (2003) find a flat response of aggregate consumption in the short run, followed by a small (and insignificant) rise in that variable several quarters after the shock.

Thus, the evidence appears not to support a strong negative comovement between private consumption and government expenditure, except for the large movements in government expenditure like fiscal consolidation episodes or wars. Although consistent with the Keynesian multiplier theory, this result stands in stark contrast with the prediction of the standard real business cycle (RBC) model. That is because in the standard RBC model an increase in government expenditure raises the present value of the stream of taxes over time which generates a negative wealth effect that brings down consumption. This prediction of the RBC model is described in Christiano and Eichenbaum (1992) and Baxter and King (1993), among others. This contradiction led researchers to search for features that could be introduced in a RBC model in order to account for the empirical finding that consumption responds positively to fiscal spending shocks. Linnemann and Schabert (2003) consider a sticky price model where government expenditures provide utility to households. Private consumption is crowded in by a positive government expenditures shock as long as the elasticity of substitution between the private and the public good is sufficiently small. Devereux, Head and Lapham (1996) have a production function of the final good with constant returns on the quantity employed of intermediate goods but increasing returns to an expansion of variety holding constant the quantity employed of each intermediate good. An increase in government spending will create an opportunity for profits, inducing more firms to enter which will increase the variety of intermediate goods produced. If the degree of increasing returns is sufficiently high the real wage will increase as well as consumption. The negative wealth effect of increased taxation on households is more than offset by the increase in factor productivity due to the entry of new firms. Rotemberg and Woodford (1992) consider a model in which firms in each industry collude on the pricing path and deviators are punished if they follow a different path. Since demand increases if there is an increase in government expenditures the relative size of the punishment (the forgone future profits) decreases. As a result each firm in each oligopolistic industry charges a lower price, the mark-ups decrease and the real wage and hours increase. Gali, Lopez-Salido and Valles (2004) modify substantially the

[1] Rotemberg and Woodford (1992) treat innovations in military spending in an autoregressive model as the exogenous shock that are uncorrelated with any other shocks. They obtain that the responses of output, hours and real wage to a military spending shock is positive.

RBC model by including imperfect competition, price-setting and wage-setting frictions, lump-sum taxation, investment adjustment costs and also non-Ricardian rule-of-thumb consumers, which are consumers that consume all their available disposable income in each period, to obtain the result that under deficit financing, consumption does rise in the wake of a spending shock.

Rather than using a complex model, full of frictions, what we propose in this paper is a simple RBC model without capital but with three added features. First, we give money a role in transactions by introducing a cash-in-advance constraint for households, as in Lucas and Stockey (1987). Second, monetary policy has a liquidity effect like in Fuerst (1992) and Lucas (1990). Third, we assume that the monetary authority reacts to government spending innovations. The first modification places the interest rate in the consumption-leisure margin. The second assumption as to do with the way the central bank conducts policy. It is assumed that policy is conducted by changing the money supply which changes the interest rate due to the fact that the agents choose their portfolio of assets in advance. The third assumption allows, whenever there is a government expenditure shock, for the consumption-leisure margin to be affected directly through changes in the interest rate.

The most recent literature considers that money is just a unit of account, see Woodford (2003). In this literature, monetary policy is conducted with the interest rate and it affects the economy because there is a friction in the economy that alters the path of the real interest rate and thus affects the intertemporal choices of consumption and leisure. Instead we consider that the interest rate enters in the intra marginal rate of substitution between leisure and consumption which gives the monetary policy additional power to influence the economy.

Naturally, the sign of the response of consumption to the spending shock will necessarily depend on the direction of the reaction of the monetary authority. By itself the government spending shock will have a negative wealth effect which will drive down both consumption and leisure. What can monetary policy achieve in this setup? If mechanically we set monetary policy to be expansionary after a government spending shock, then one could in principle get an expansion in consumption. But this expansion will be due entirely to the monetary easing rather than fiscal policy.

It has been thought that there cannot be a positive response in consumption as long as monetary policy is conducted in a reasonable manner. The common wisdom has been that the reasonable monetary policy will amplify the consumption response, as the government shock will create inflationary pressures and the anti-inflationay central bank will increase the interest rate in order to control inflation expectations and in that way it will decrease further the consumption. To obtain the reverse result, i.e. that the sign of the monetary policy is of opposite sign and overcompensates the effect of the expenditure shock it will require that the monetary policy be specified so that the central bank will react by increasing the money supply. In doing that the central bank would be due to the rigidity in the adjustment of portfolios, varying the path of

the interest rates, decreasing them in the short-run and increasing them in the long run.

Since we do not have any a priori or any hard evidence on how the central bank reacts to a government shock, we take this matter to the data by conducting our own empirical analysis in a structural VAR framework. As it turns out, we estimate that a government expenditure shock triggers an accommodating reaction by the monetary authorities by which the real money supply rises and the nominal interest rate decreases. In the context of our model, that affects the consumption-leisure margin in such a way that an increase in consumption and a decrease in leisure of private individuals is possible. As a consequence output raises also.

The rest of the paper is organized as follows. Section 2 presents the empirical evidence and Section 3 presents the model. Section 4 concludes.

2 Empirical Evidence

In this section we describe in detail our empirical analysis. We do a VAR and use the more traditional identification procedure, the one that takes government expenditure as predetermined relative the other variables in the VAR. In doing so, we use a longer sample than do any of the contributions that employed the same identification methodology mentioned above, which imparts added robustness to the results. Moreover, we include money and the interest rate in order to test empirically the predictions of our model.

2.1 Identification of the Government Expenditure Shock

In the context of structural VARs, Blanchard and Perotti (2002) developed a methodology to identify fundamental government spending shocks as well as their dynamic effects on a set of macroeconomic variables. Their identification strategy bears on the insight that the institutional framework that lies behind fiscal policy decisions is such so to render public spending essentially exogenous. In practice, this means assuming that government expenditure is predetermined with respect to the other variables in their VAR. For our purposes, we follow the strategy of Blanchard and Perotti (2002) with an added twist needed to make our identification strategy consistent with the feature of the model of section 3 by which the central bank reacts to innovations in government spending by changing the money supply. So, apart from assuming that the government expenditure is predetermined relative to all the other variables in our VAR, we also impose the supplementary identifying restriction that money supply reacts contemporaneously only to shocks to itself and to government spending. The reason for imposing that the money supply reacts contemporaneously only to government spending is to ensure that the response, on impact, of money to a government expenditure shock is being driven by that shock directly and not indirectly through the dynamic response of the remaining variables in the VAR. As it will become apparent below, this identification strategy amounts to using a Choleski-type decomposition with a couple of ordering restrictions.

The analysis is based on the following reduced-form VAR,

$$Y_t = \eta + B(L)\, Y_{t-1} + u_t,\; Eu_t u_t^{'} = V \tag{1}$$

where $Y_t \equiv [G_t, M1_t, GDP_t, C_t, T_t, P_t, R_t, W_t]$ is the vector of the endogenous variables comprising the following variables: real government spending, real money supply, real GDP, real private consumption, real net taxes, GDP deflator, nominal interest rate and real wage. $B(L)$ is a polynomial of order q in the lag operator, L, and u_t is the vector of the one-step-ahead forecast errors to Y_t with invariant variance matrix V.

The VAR can alternatively be represented by the structural form:

$$A_0 Y_t = A(L)\, Y_{t-1} + e_t. \tag{2}$$

where the structural shocks, e_t, which are unobservable, are assumed to be mutually independent and related linearly to the one-step-ahead forecast errors, u_t:

$$u_t = Ce_t, \qquad Ee_t e_t^{'} = I.$$

The parameters of the structural form are therefore linked to those of the reduced form by:

$$C = A_0^{-1}, B(L) = A_0^{-1} A(L) \tag{3}$$

where the first column of C is the object we need to uniquely identify in order to compute the impulse responses pertaining to a government expenditure shock. Moreover, given (3),

$$A_0^{-1} \left(A_0^{-1}\right)^{'} = V \tag{4}$$

Let, for notational convenience, the vector of the VAR variables be re-written as:

$$Y_t \equiv [G_t, M1_t, X_t] \tag{5}$$

where X_t includes all variables apart from government spending and the money supply. In this context, our identification strategy imposes not only that condition (4) be satisfied but also the following block-recursive structure to the matrix A_0:

$$A_0 = \begin{bmatrix} \underbrace{A_0^{1,1}}_{(1\times1)} & \underbrace{0}_{(1\times1)} & \underbrace{0}_{(1\times6)} \\ \underbrace{A_0^{2,1}}_{(1\times1)} & \underbrace{A_0^{2,2}}_{(1\times1)} & \underbrace{0}_{(1\times6)} \\ \underbrace{A_0^{3,1}}_{(6\times1)} & \underbrace{A_0^{3,2}}_{(6\times1)} & \underbrace{A_0^{3,3}}_{(6\times6)} \end{bmatrix} \tag{6}$$

where A_0 is partitioned conformably with Y_t in (5). The first row of A_0 reflects the assumption that government spending is predetermined with respective to all other variables in the VAR.

The second row reflects the assumption that the money supply is predetermined with respect to all other variables but government spending. The absence of restrictions on the elements of the third row is just reflecting that we are not imposing any structure on the coefficients of the last six equations of our VAR. This means that the elements of the third row in (6) are not identified. That, however, does not constitute a problem for our purposes because the block-recursiveness implied by our identification strategy is enough to uniquely pin down the dynamic responses of all the variables to a government expenditure shock.[2]

It can be shown without any loss of generality that, first, the dynamic responses of the variables in Y_t are uniquely identified if one adopts the normalization that A_0 is lower-triangular with positive diagonal elements and, second, that adopting that normalization, the dynamic responses are invariant to an arbitrary change in the ordering of the variables in X_t[3]. This implies that we can uniquely identify the impulse responses pertaining to a government expenditure shocks by setting A_0 equal to the inverse of the Choleski factor of the V matrix[4], without worrying about the order in which the variables in X_t appear in the reduced-form VAR.

2.2 Data Description

The statistical series used to measure the variables in our VAR come in quarterly frequency, and cover the period 1948:I-2004:III, which is the longest available sample for the United States. We took the same definitions of government expenditure and revenue as Blanchard and Perotti (2002). For government spending (G) we took the item real government consumption expenditures and gross investment from the National Income and Product Accounts (NIPA) tables of the Bureau of Economic Analysis (BEA). The measure for nominal net taxes is defined as current government receipts less current transfer payments and interest payments. Net taxes measured in real terms were obtained by dividing the nominal net taxes measure by the GDP deflator. The real GDP (Y) and GDP deflator (P) series were extracted from the NIPA tables, BEA. The consumption variable (C), was taken from the item real personal consumption expenditures of the NIPA tables, BEA. The series for nominal money supply ($M1$) was taken from the FRED database of the Federal Reserve Bank of St. Louis in monthly frequency and transformed into quarterly series by simple averaging. The variable R was proxied by the secondary market

[2] The results do not change much if $M1_t$ and R_t interchange positions, i.e. if instead of having $M1_t$ as the second element of Y_t we have R_t as the second element of Y_t and $M1_t$ as one more variable in X_t. Moreover, the results are robust to throwing out one of the two monetary variables from Y_t. That is if we take out R_t from the X_t or if we do not consider $M1_t$ in the regression and instead consider R_t as the second element of Y_t the main results still hold.

[3] Although the identification strategy pursued in this paper differs from the one discussed in Christiano, Eichenbaum and Evans (1999), the proof of the statements in this paragraph is analogous to the one presented in Christiano, Eichenbaum and Evans (1999) section 4.1. We, therefore, omit the proof to conserve on space.

[4] Notice that, since the Choleski factor of V is unique, this particular choice of A_0 corresponds to the unique lower-triangular matrix that satisfies our identification assumptions summarized in (4) and (6).

yield of the three-month Treasury Bill as published by the Board of Governors of the Federal Reserve System. This series was transformed from monthly frequency into quarterly frequency through simple averaging. The real wage variable (W) was computed by dividing the nominal hourly compensation of the non-farm business sector published by the Bureau of Labor Statistics (BLS), by the GDP deflator. All variables, except R are expressed in log levels and seasonally adjusted. For R we have used the level. All quantity variables were normalized by the size of the working age population as measured by the series $P16$ published by the BLS.

2.3 Impulse Responses

Our VAR analysis is conducted for the period 1949:I-2004:III, since we have to drop the first four observations to account for the fact that we set the VAR lag-length to four ($q = 4$). The plots of the impulse response to a government expenditure shock, measured in percentage deviations[5], are displayed in figure 1. The dashed lines correspond to 95% confidence bands constructed using standard error estimates of impulse responses obtained from 2,000 bootstrap simulations. The shock induces a significant and protracted rise in both government spending and real GDP. The government spending multiplier on real GDP was estimated to be of 0.7 and 1.5 after one and two years, respectively[6], which are in line with Blanchard and Perotti (2002) and Gali et al (2004). The results of figure 1 are compatible with the monetary authority accommodating the government expenditure shock by raising the money supply and decreasing the nominal interest rate. This combined with the result, also obtained in the literature, that private consumption does not drop with the spending shock, is consistent with the results of our model by which the fall in the interest rate that follows the spending shocks enacts a change in the consumption margin that causes the consumption to rise. The response of prices to a government spending shock is negative. This result is found in many other papers, for instance Edelberg, Eichenbaum and Fisher (1999), Fatás and Mihov (2001) and Mountford and Uhlig (2002).

3 The Model

Here we present a simple model economy, similar in structure to Christiano, Eichenbaum and Evans (1995), that is able to replicate the main features of the data. The economy consists of a representative household, a representative firm, a representative financial intermediary and a government. We consider shocks to government consumption and money supply. The set of all possible shocks in period t is denoted by S_t, the history of these shocks up to period t, which we call state at t, $(s_0, s_1, ..., s_t)$, is denoted by s^t, and the set of all possible states in period t is denoted by S^t. The initial realization s_0 is given. To simplify the exposition, we assume that

[5] Except for R, which is measured in changes in basis points.

[6] In these calculations we used the sample mean of the share of G in Y, which is around 24%.

the history of shocks has a discrete distribution. Given history s^{t-1}, the number of all possible shocks in period t is $\#\left(S_t|s^{t-1}\right)$ and the number of all possible states in period t is $\#S^t$.

3.1 Government:

The government gets revenues from lump-sum taxes T_t, makes government expenditures expenditures g_t and supplies money M_t^s. Government expenditures are a purely random variable. Since there are lump-sum taxes government debt plays no role. Taxes are an endogenous variable. The central bank makes a lump-sum monetary transfer X_t to the representative financial intermediary at each date $t = 0, 1, 2, ...$ The money supply evolves according to $M_t^s = M_{t-1}^s + X_t$. The central bank increases the money supply whenever there is a positive government shock.

3.2 Financial Intermediary:

The financial intermediary receives deposits L_t from the households and lends them out to the firm. The gross nominal interest rate on the deposits and on the loans to the firm is R_t. The financial intermediary receives from the monetary authority the transfer of money X_t, that is also lent out to the firms.

3.3 Household

The preferences are described by the expected utility function:

$$U = E_0 \left\{ \sum_{t=0}^{\infty} \beta^t u\left(C_t, 1 - N_t\right) \right\}$$

where β is a discount factor, C_t is consumption and $1 - N_t$ is leisure.

The good market is open at the beginning of each period and the asset market at the end of each period. At the end of period $t-1$ the household has wealth $\mathcal{W}_{t-1}$, part of it he decides to maintain as cash to carry out transactions in period t and the remaining he decides to deposit at the intermediary. The household starts period t with outstanding money balances, M_t^h, and outstanding deposits at the financial intermediary, L_t. Thus,

$$L_t + M_t^h \leq \mathcal{W}_{t-1} \tag{7}$$

The household receives the labor income, $W_t N_t$, where W_t is the wage rate and where N_t is hours of work. The wage is paid in advance and can be used to purchase consumption in the same period. The purchases of consumption goods are such that,

$$P_t C_t \leq M_t^h + W_t N_t. \tag{8}$$

At the end of the period, the households receive the gross returns on the loans $R_t L_t$ and pay taxes T_t. Thus the cash holdings for the household at period t are

$$\mathcal{W}_t = M_t^h + W_t N_t - P_t C_t - T_t + R_t L_t. \tag{9}$$

Taking together (7) and (9) get

$$L_{t+1} + M_{t+1}^h = M_t^h + W_t N_t - P_t C_t - T_t + R_t L_t. \tag{10}$$

Let the state variables be M_t^h and L_t and let V be the value function of the household. The household's problem can be written as follows:

$$V(M_t^h, L_t, s_t) = \max_{\left\{C_t, N_t, L_{t+1}, M_{t+1}^h\right\}} \left\{ u\left(C_t, 1 - N_t\right) + \beta E_t V(M_{t+1}^h, L_{t+1}, s_{t+1}) \right\}$$

subject to

$$P_t C_t \leq M_t^h + W_t N_t,$$

$$M_{t+1}^h + L_{t+1} \leq M_t^h - P_t C_t - T_t + W_t N_t + R_t L_t,$$

and M_0^h and L_0 as given

Among the first order conditions we have,

$$E_t \frac{R_{t+1} u_{1-N}(t+1)}{W_{t+1}} = E_t \frac{u_C(t+1)}{P_{t+1}}$$

and

$$\frac{u_{1-N}(t)}{W_t} = \beta E_t \frac{R_{t+1} u_{1-N}(t+1)}{W_{t+1}}$$

The first condition is the intratemporal condition in expected value, since the household must decide his portfolio in advance. The second condition is the intertemporal condition between two time consecutive leisure levels.

3.4 Firm

The problem of the firm is to choose the price in order to maximize profits that can be used for consumption in period $t+1$. As such the firm solves the problem

$$\max E_t \frac{\beta u_{Ct+1}}{P_{t+1}} \Pi_t$$

where

$$\Pi_t = P_t y_t - W_t n_t - (R_t - 1) M_t^f$$

subject to the technology

$$y_t \leq A_t n_t,$$

where A_t is the level of technology, and subject to the cash-in-advance restriction

$$W_t n_t \leq M_t^f.$$

Since the technology and cash-in-advance restrictions will be both satisfied with equality, the profits can be written as

$$\Pi_t = P_t y_t - R_t W_t \frac{y_t}{A_t}.$$

The first order condition of this problem is

$$P_t = \frac{W_t R_t}{A_t}. \tag{11}$$

3.5 Market clearing:

The clearing conditions for the deposits, good, labor and money markets are:

$$L_t + X_t = M_t^f = W_t n_t$$

$$c_t + g_t = y_t$$

$$N_t = n_t$$

and

$$M_t^S = M_t^f + M_t^h$$

3.6 Equilibrium allocations:

The equilibrium allocations in this environment can be summarized by the following equations:

$$E_{t-1}\frac{R_t u_h(t)}{W_t} = E_{t-1}\frac{u_C(t)}{P_t} \tag{12}$$

$$\frac{u_h(t-1)}{W_{t-1}} = \beta E_{t-1}\frac{R_t u_h(t)}{W_t} \tag{13}$$

$$\frac{W_t}{P_t} = \frac{A_t}{R_t} \tag{14}$$

$$C_t = A_t N_t - g_t \tag{15}$$

$$P_t C_t = M_t^h + W_t N_t \tag{16}$$

$$X_t + L_t = W_t N_t \tag{17}$$

$$M_t^h + L_t = M_{t-1}^S \tag{18}$$

Next we show how the monetary instruments can be chosen in order to get a unique equilibrium. We assume that all variables determined at $t-1$ are given, and study how to choose the money supply and interest rate so that all variables that are decided at date t become determined uniquely. A policy that achieves uniqueness is one where the central bank chooses, for a given history, s^{t-1}, $\#\left(S_t|s^{t-1}\right)$ money injections, X_t and $\#\left(S_t|s^{t-1}\right) - 1$ interest rates, R_t. Under this policy the variables that need to be determined in (12)-(18) are: $\#\left(S_t|s^{t-1}\right)$ values for P_t,

$\#\left(S_t|s^{t-1}\right)$ values for W_t, $\#\left(S_t|s^{t-1}\right)$ values for C_t, $\#\left(S_t|s^{t-1}\right)$ values for N_t, one R_t, one M_t^h and one L_t. For a given s^{t-1}, the number of equations (12)-(18) is exactly equal to the number of unknowns. Thus, we get uniqueness of the equilibrium if the central bank sets its policy in the manner just described.

4 The government shock

Here we assume that the economy is in its deterministic steady state when it receives a positive permanent government shock in period T and the central bank responds by decreasing the interest rate, through an increase in the money supply. We simplify the exposition by taking a particular utility function, $u\left(C_t, N_t\right) = \frac{1}{1-\sigma}\left(C_t - \frac{(N_t)^{1+\chi}}{1+\chi}\right)^{1-\sigma}$, $\frac{M_t^S}{M_{t-1}^S} = 1$ for $t < T$ and $t > T+1$.

The economy before the shock in period T is in its deterministic steady state and as it takes only one period to adjust, in period $T+1$ the economy goes to the new steady state. The deterministic steady state for $t < T$ and for $t > T$ is characterized by the following equations

$$R_t = \beta^{-1}$$
$$N_t^{\chi} = \frac{A}{R_t^2}$$
$$\frac{W_t}{P_t} = \frac{A}{R_t}$$
$$C_t = AN_t - g_t$$

and

$$\frac{P_t}{P_{t-1}} = \frac{W_t}{W_{t-1}} = 1.$$

The relevant equations in period T are

$$\frac{W_T}{P_T} = \frac{A}{R_T}$$
$$C_T = AN_T - g_T$$
$$N_T = \frac{A^{\frac{1}{\chi}}}{R_T^{\frac{2}{\chi}}}$$

It can be seen from the last two equations that if the value for χ is sufficiently small then N_T will increase more than the government expenditures and consumption will increase in period T.

Now we verify that the decrease in the interest rate can only be attained through a increase in the stock of money, X_T. Using the various market clearing conditions we can write

$$\begin{aligned}\frac{M_T^h + W_T N_T}{X_T + L_T} &= \frac{M_T^h}{X_T + L_T} + 1 = \frac{P_T C_T}{W_T N_T} = \frac{R_T}{A_T}\frac{A_T N_T - g_T}{N_T} = R_T\left(1 - \frac{g_T}{AN_T}\right) \\ &= R_T\left(1 - \frac{g_T}{A\left(\frac{A}{R_T^2}\right)^{\frac{1}{\chi}}}\right) = R_T - \frac{g_T}{R_T^{\frac{2}{\chi}-1}A^{1+\frac{1}{\chi}}}.\end{aligned}$$

Since R_T decreases and $\frac{g_T}{R_T^{\frac{2}{\chi}-1}A^{1+\frac{1}{\chi}}}$ increases then the ratio $\frac{M_T^h}{X_T+L_T}$ goes down. Thus, X_T must go up since M_T^h and L_T were chosen in advance.

5 Final Remarks

Past researchers have obtained evidence that indicate that a government expenditure shock raises output and does not decrease consumption. This evidence is difficult to reconcile with the RBC model. In the standard RBC model a positive government expenditure, no matter how it is financed, leads to smaller consumption. The literature as proceeded by complicating the RBC model in such a way that it can satisfy the evidence. Instead of building a model with a large number of frictions that can deliver this result we follow a different and simpler route. We study if the central bank reacts to the government expenditure in such way that its effect over the consumption is opposite and dominates the initial effect of the government expenditure shock.

We do a VAR with alternative variables and equations for a long time span that confirms that a government expenditure shock raises output and consumption but also that the central bank reacts to the government consumption shock by increasing money supply and decreasing the interest rate. A standard RBC model with portfolios chosen in advance is used to argue that this type of reaction by the central bank can explain the behavior of consumption after a government expenditure shock. We do not discuss or offer an explanation of why the central bank reacts in this way to the government expenditure shock. The reaction of the central bank is taken as exogenous, like if it was a monetary rule. We do not know why the central bank may react in this way, but we think it is an important topic that deserves more research.

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Figure 1: Dynamic Responses to a Government Expenditure Shock