IMPACT OF GOVERNMENT SPENDING ON PRIVATE CONSUMPTION USING ARDL APPROACH

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ABSTRACT

This study investigates the impact of government spending on private consumption a case study of China. We used Autoregressive Distributed Lag (ARDL) approach to estimate the long and short run effects of the model using annual data from 1985 to 2013. The results of the study revealed that government spending have positive impact on private consumption. Therefore, government spending is a very good instrument to boost economy and encourage aggregate demand in China during recession. The negative and significant Error Correction Term (ECT) suggests that Chinese economy will adjust relatively quickly in response to an external shock to the overall development.

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Keywords: Autoregressive distributed lag (ARDL), Government spending, Error correction term (ECT).

Contribution/ Originality

To the best of my knowledge, this study is first of its kind to examine long and short run effects of government spending on private consumption in China. Secondly, this study uses more efficient and less restrictive approach to co-integration (ARDL) which improves the findings on the subject not only for China but for overall literature on the relationship between government spending and private consumption.

1. INTRODUCTION

Impact of government spending on aggregate economic activities is one of the controversial issues in economics, different school of thoughts have different views on the issue. Similarly, there is no clear evidence on the impact of government spending on private consumption. Since private

consumption is one of the big components of Gross Domestic Product (GDP) and aggregate demand, it is very important to understand the impact of government spending on private consumption to boost aggregate demand when economy face recession.

Keynes's theory of Absolute income hypothesis postulated that households current consumption are response to current disposable income, thus the increase in government spending leads to increase output and employment, which further influence households aggregate consumption. But later on, neoclassical consumption theories believe that households are concerns with consumption smoothing and response to future expected income rather than current income. Both standard RBC and Keynesian models are supported that government spending have multiplier effect and increase aggregate output, however, the debate of the effectiveness of government expenditure is based on the size of multiplier, and the size of multiplier based on the response of aggregate private consumption to government spending. Keynesian model predict positive effect of government spending on private consumption while RBC model supported negative wealth effect. Blanchard and Perotti (2002); Baxter and King (1993)

Generally the sources of financing government spending are: taxes, selling bound and printing of money. The increase of government spending through raise in taxes and selling bound are associated with crowding out effects, however, increase of government spending through printing of money associate with problems of inflation and increase of interest rate. Therefore, it is still a debatable issue that weather the increase of national income is due to money supply or government spending or both are responsible for it. Thus, in this study we tried to investigate that weather private consumption and government spending is substitute or complementary to each other.

Literature on the relationship between government spending and private consumption presents mixed results. For instance, Bailey (1971) provides the evidence for substitutability between government spending and private consumption and suggested that government spending leads to crowding-out effect. Similarly, Barro (1981) assumed the utility function of typical household in form of ($U = C + \alpha G, I$)) where the impact of government spending on private consumption depend upon the coefficient of government spending. Likewise, Kormendi (1983) supported the substitutability between government spending and private consumption. On the contrary, some other empirical studies found support for positive impact of government spending on private consumption. For instance, Fatas and Mihov (2001), Heppke-Falk *et al.* (2006), found that government spending and private consumption are positively related to some extent. De Castro Fernández and Hernández De Cos (2006), investigated the short and long run effects of government spending in case of Spain and found that in the short run the expansionary fiscal policy leads to low output and high inflation while in long run it boosts output. Tagkalakis (2008) used the data of 10 OECD countries and established that to stimulate private consumption, fiscal policy is much better in recession. Linnemann and Schabert (2006) suggested that government spending is not wasteful completely and it improve the productivity of private sector. Ho (2001) re-examined the crowding out effect for 24 OECD countries by applying dynamic OLS (DOLS) and panel co-integration model. The results of the study reject permanent income hypothesis and supported the crowding out

effect. Kwan (2006) empirically investigated the relationship between government spending and private consumption for East Asia countries using panel co-integrating regression. The results of panel regression show that on average government spending and private consumption are substitute in East Asia, however, the cross-section analysis revealed that the value of elasticity of substitute is moderate for China, Hong Kong, Japan, and Korea, while high for Malaysia and Thailand and zero for Philippines. However, in case of Indonesia and Singapore it is complementary. Shupei and Zhanwei (2009) examined the fiscal expenditure and the private consumption from China opening up and stating reforms. The results of the study showed crowing out effect. Chalk (2010) investigated the effect of government social spending (i.e. spending on health and education) on private consumption of China. The results of the study revealed that a 1 RMB increase in government spending on health leads to increase urban households' consumption by 2 RMB, while education spending have no affect on households' consumption. Ramey (2011a) discovers that consumption response positively to defense spending shocks. Ramey (2011b) reviewed the recent literature on government spending multipliers based on time series and panel data. He concluded that the range of government expenditure multiplier lies between 0.8 and 1.5, however, the possible lowest and higher values of multiplier are; 0.5 and 2. Murphy (2013) examined the recent contradictory evidence to new Keynesian and neoclassical models that an increase in government spending boost aggregate private consumption. The study developed the imperfect information framework based on studies of Lucas and Robert (1972) and Lorenzoni (2009). The model of the study targeted the owners of firms that increase in government spending increase the permanent income of the firms' owners relative to future tax liabilities, when the owners of the firms are not aware about future tax liabilities in such a case government expenditure leads to increase aggregate private consumption otherwise permanent income.

Literature mentioned above points towards the importance of the relationship between government spending and private consumption, however, this area of research is relatively understudied for China.

Therefore, this study tries to investigate the effect of government spending on private consumption by using the ARDL approach to co-integration in case of China. Moreover, presently, economic growth of China has showed a declining trend and it dropped to 7% against the target of 7.4%, which is an alarming situation for government authorities. There are several plausible reasons for relatively slow economic performance; however, among them one notable obstacle is low proportion of aggregate private consumption in GDP, which is 39%[1] in China. Therefore, it is very important for China to boost aggregate private consumption to keep the high face of economic growth.

The remaining of the study is organized is as follow. Section 2 discusses methodology and data. Section 3 presents results and discussion while last section of the paper offers conclusion.

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[1] International Financial Statistics (IFS), 2013

2. METHODOLOGY

To see the effect of government spending on aggregate private consumption, for this purpose a Linnemann and Schabert (2006) and Ganelli and Tervala (2009) developed a standard theoretical framework very recently. Therefore, to develop a theoretical model for our study, we follow the proposed models of Linnemann and Schabert (2006) and Ganelli and Tervala (2009). Thus, the utility function of the typical household is:

$$U = \log(C + \alpha G) - \frac{1}{1+v} L^{1+v} + V(G) \qquad (1$$

Where:

(C)= Private consumption

(G) = Government spending

(L) = labor supplied

v = The marginal disutility of work.

V (G) = The separate impact of government spending

However, marginal utility of private consumption is:

$$\frac{\partial U}{\partial C} = \frac{1}{C + \alpha G} \qquad (2)$$

The sign of the coefficient of equation (2) depend upon the response of government spending to private consumption; it may be negative or positive depending upon the relationship between government spending and private consumption. Moreover, the budget constraint of typical household is:

$$PC = PwL - P\tau + \int_{0}^{1} D(i)di \qquad (3)$$

Where:

P= Aggregate price level

W= Real wage rate

τ = lump-sum tax

D = dividends of firm.

In equation (3) we only have lump-sum tax and government spending is fully financed by tax revenue. Thus, the household optimization model becomes:

$$\lambda = \frac{1}{P(C + \alpha G)} \qquad (4)$$

$$L^{v} = \lambda Pw \qquad (5)$$

Substituting equation (4) into (5) and we obtain equation (6), which represents consumption-leisure trade off;

$$L^v = \frac{w}{(C + \alpha G)} \tag{6}$$

The production function of typical firm becomes:

$$Y = L^\eta G^\gamma \tag{7}$$

The first order condition of profit maximization implies:

$$MC = w/(\eta L^{\eta-1} G^\gamma) \tag{8}$$

Where MC is marginal cost, in equation (8) the elasticity of government spending is positive, which shows that government spending increase private consumption.

3. ESTIMATION METHOD

Econometrics literature provides various alternatives to examine the long run relationships among variables. For example, Engel Robert and Granger (1987) and FMOLS procedures of Phillips and Hansen (1990) are popular for univariate analysis, while Johansen (1988); and Johansen (1995) are popular for multivariate analysis. Autoregressive Distributed Lag Model (ARDL), are relatively new estimation technique introduced by Pesaran and Shin (1995, 1998); Pesaran *et al.* (2001), has some advantages over previous methods,. For example, for small samples ARDL gives relatively more robust results. Moreover, ARDL approach is applicable irrespective of the order of integration i.e. I(0)/I(1)/I(0)and I(1). ARDL equation takes the following form;

$$\alpha(L, p) y_t = \alpha_o + \sum_{i=1}^{k} \beta_i (L,q) x_{it} + \lambda^{.} w_t + \varepsilon_t$$
$$\forall t = 1,............,n \tag{9}$$

Where:

$$\alpha(L, p) = 1 - \alpha_1 L - \alpha_2 L^2 - .... - \alpha_p L^p$$

$$\beta_1(L, q) = \beta_o - \beta_{i1} L - \beta_{i2} L^2 - .... - \beta_{ipq} L^q \forall_i = 1,2....,k$$

Where: (y_t) is the exogenous variable, (α) is constant, (L) is lag operator

$(Ly_t = y_t - 1), w_t$ is $s \times 1$ vector of deterministic trend, intercept and exogenous variables.

Thus the long run equation of ARDL approach is:

$$y = \alpha_0 + \alpha t + \sum_{i=1}^{k} \beta_i x_i + \gamma w_t + \eta_t$$
$$where : \alpha = \frac{\alpha_0}{\alpha^{(1,P)}} \tag{10}$$

The long run elasticities are represented by:

$$\phi_i = \frac{\hat{\beta}_i(1,\hat{q})}{\alpha(1,\hat{p})} = \frac{\hat{\beta}_i + \hat{\beta}_{i1} + \text{...........} + \hat{\beta}_{i\hat{q}}}{1 - \hat{\alpha}_1 - \hat{\alpha}_2 - \text{.....} - \hat{\alpha}_p} \quad \forall_i = 1,2,\text{.......},k \qquad (11)$$

However, the long run coefficients can be written as:

$$\pi = \frac{\hat{\lambda}(\hat{p},\hat{q}_1,\hat{q}_2\text{......}\hat{q}_k)}{1 - \hat{\alpha}_1 - \hat{\alpha}_2 - \text{....} - \hat{\alpha}} \qquad (12)$$

Where: $\hat{\lambda}(\hat{p},\hat{q}_1,\hat{q}_2,\text{........},\hat{q}_k)$ represents the ordinary least square (OLS) estimates of λ in equation (9). Thus, the ARDL equation is:

$$\Delta y_t = c_0 + c_1 t + \pi_{yy} y_{t-1} + \pi_{yx.x} x_{t-1} + \sum_{i=1}^{p-1} \psi_i' \Delta z_{t-1} + w' \Delta X_t + \mu_i \qquad (13)$$

Where the hypotheses of co-integration are: $H_0 : \pi_{yy} = \pi_{yx.x} = 0$ and $H_0 : \pi_{yy} \neq \pi_{yx.x} \neq 0$. Keeping in view the objective of our study, the mathematical and econometrics form of our study are given below respectively:

$$c_t = \theta_0 + \theta_y y_t + \theta_g g_t \qquad (14)$$

$$c_t = \theta_0 + \theta_y y_t + \theta_g g_t + \varepsilon_i \qquad (15)$$

Where: (c_t) is private consumption, (y_t) is real GDP,(g_t) is government expenditure,(ε_t) random error. However, the ARDL structure of equation (15) is as follow:

$$\Delta c_t = \theta_0 + \theta_t t + \theta_c c_{t-1} + \theta_y y_{t-1} + \theta_g g_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta c_{t-i} + \sum_{j=0}^{n} \alpha_j \Delta y_{t-j} + \sum_{k=o}^{p} \alpha_k \Delta g_{t-k} + \varepsilon_i \ (16)$$

Equation (16) contains both short and long run information, to test the null and alternative hypothesis of co-integration for equation (16) is: $H_0 = \theta_c = \theta_y = \theta_g = 0$ while alternative is $H_0 = \theta_c \neq \theta_y \neq \theta_g \neq 0$.We used the bound test procedure to test null and alternative hypothesis of co-integration. Annual data on the variables of private consumption and GDP and government spending are extracted from International Financial Statistics (IFS) different issues, all of the variables are used in real values.

4. RESULTS AND DISCUSSION

The concept of co-integration revolves around long-run trends embodied in the macro time series. It is therefore necessary to test variables for unit-root. We used Augmented Dickey Fuller (ADF) and Dicky- Fuller Generalized Least Square (DF-GLS) tests to test for unit-root. Table 01 presents the results of the ADF and DF-GLS tests. The results of these tests confirmed that all variables had unit-root. In other words, all of the variables in the model are integrated of I(1) i.e. private consumption, real GDP and government expenditure. Results of ADF and DF-GLS tests were consistent. However, ADF reported that private consumption and real GDP is not stationary without trend at the first difference while DF-GLS results revealed that both variables are stationary with and without trend at first difference.

Table-1. Stationarity Tests on First Difference

Variables	ADF		DF-GLS	
	c,0	c,t	c,0	c,t
Δ Con	-2.37(0.542)	-3.55 (0.081)	-2.27(0.021)	-3.71(0.000)
Δ GDP	-2.54 (0.481)	-4.40 (0.001)	-2.47(0.048)	-4.53(0.000)
Δ GE	-4.44 (0.041)	-4.34(0.000)	-4.55(0.017)	-4.52 (0.001)

Note: where: (c) intercept (constant) and (t) time trend, P-values are in parenthesis.

Table-2. Co-integration Test

F- Sta: Tabulated	LB at 95%	UB at 95%	LU at 90%	UB at 90%
13.45	3.0981	4.3260	2.3708	3.4597

Note: Lower Bound (LB) and Upper Bound (UB)

Tables 2 presents the results of ARDL bound approach to co-integration. The results of the bound test revealed that the F- statistic tabulated value is 13.45 which is great than UB at 95% and 90% respectively. This shows that there is a long run relationship among variables in the model. After the existence of long run relationship among variables, now we move to next step, to estimate the long and short run parameters of the variables through ARDL approach

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Table-3. Long Run Results of ARDL

	ARDL (1,0,1) SELECTED BASED AIC	
Variables	Coefficients	P- Values
GDP	0.444	0.025
GE	0.5824	0.015

Table 3 reported long run results of ARDL approach. In the long run, both coefficients of GDP and government spending are statistically significant and having correct signs. The coefficient of GDP is 0.444 which shows that a one unit increases in GDP will leads to amplify the aggregate private consumption by 44.4%. Similarly, a one unit change in government spending will augment private consumption by 58.2% on average. The short run results of ARDL are reported in table 4,

where the coefficient of GDP is statistically significant while the coefficient of government spending is not. The Error Correction Term (ECT) shows the speed of adjustment from disequilibrium to equilibrium in next period. The value of the ECT is negative and statistically significant which indicates that private consumption will approach to equilibrium with speed of -0.269 from disequilibrium to equilibrium.

Table-4. Short Run Result of ARDL

	ARDL (1,0,1) SELECTED BASED AIC	
Variables	**Coefficients**	**P- Values**
Δ **GDP**	0.120	0.047
Δ **GE**	0.569	0.600
ECT (-1)	-0.269	0.092
R-square		0.56
F-statistic		9.32
DW		1.85
DIAGNOSTIC TEST OF THE MODEL		
LM test for Serial Correlation, CHSQ(1)		0.0828(0.773)
Heteroscedasticity Test of Residuals, CHSQ(1)		0.1132(0.734)
JB Normality Test, CHSQ(1)		1.3861(0.421)
Ramsey RESET Test CHSQ (1)		0.2400(0.522)

We also applied standard diagnostic test and stability test for goodness of fit of the model. The diagnostic tests used in this study are to test for the problems of non-normality of residuals, heteroscedasticty, serial correlation and functional form of the model. Results of diagnostic tests suggest that our results are free from above mentioned econometric issues. Moreover, for stability of the model we employed CUSUM and CUCUMsq, it can be seen from Appendix 01, that the plot of CUSUM and CUSUMsq falls within critical bound of 5% and confirmed the long run association among variables as well as stability of the coefficients in the model.

5. CONCLUSION

The results of study revealed that government spending has positive relationship with private consumption in China. Moreover, government spending has almost the same impact on private consumption in both long and short run, but the coefficient of government spending is statistically insignificant in the short run. Furthermore, the value of ECT is quite high and statistically significant with negative signs, which shows the speed of adjustment from disequilibrium to equilibrium. Presently, the GDP growth of China become little slow, therefore, in case of China government spending is a very good instrument to boost economy and encourage aggregate demand to keep the high face of economic growth.

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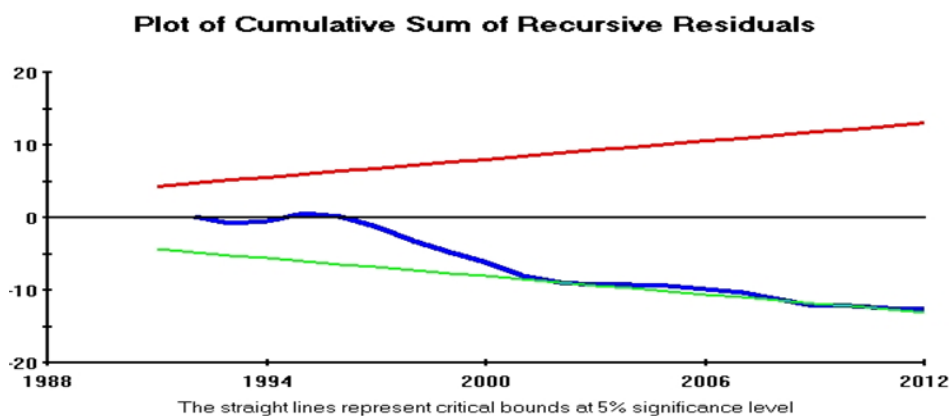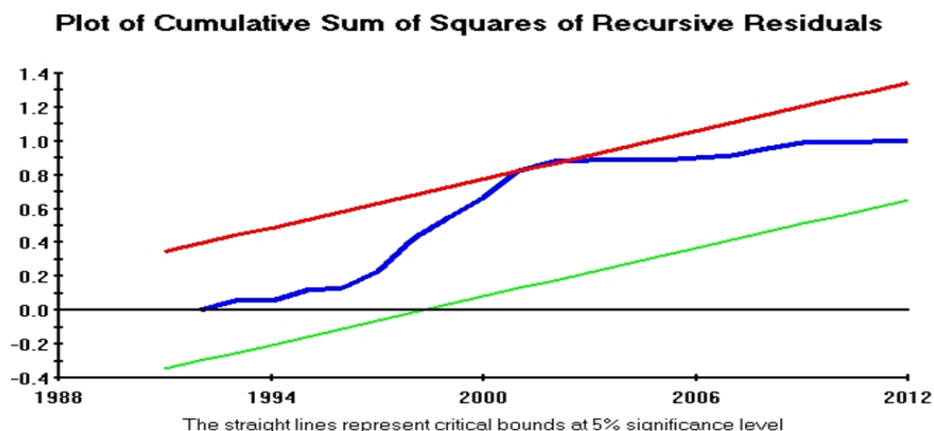
APPENDIX-1.

Plot of Cumulative Sum of Recursive Residuals

The straight lines represent critical bounds at 5% significance level

Figure-1.

Plot of Cumulative Sum of Squares of Recursive Residuals

The straight lines represent critical bounds at 5% significance level

Figure-2.