

**Private consumption and government spending: Markov-switching autoregressive
model**

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Abstract

Fiscal policy becomes a vigorous debate among scholars about what the influence of government expenditure on private consumption is. This study mainly derives a conclusion from the empirical literature review. The result shows that there is a non-linear effect of government spending on private consumption owing to different reasons (i.e., the magnitude and structure of fiscal adjustment, initial fiscal status, and personal characteristics of commodities and market).

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1 Introduction

The government can intervene in the economy via the provision of public goods (fiscal policy), and this government intervention may respond to market failures. Scholars have debated the fiscal policy's multiplier effect (i.e., a reduction in or an increase in government expenditure leads to a change in output with some value of multiplication (Jahan et al. 2014)) over a lengthy period. Thus, it also contributes to the consumption multiplier (i.e., a response of private consumption to the improvement of aggregate demand). There are two popular theories, which argue about the impact of government spending on private consumption (households' consumption). Keynesian theory under the assumption of rigid wages and prices suggests that a significant fraction of the population is liquidity constrained (i.e., a positive change in personal income raise high consumption rather than saving (Beznoska–Ochmann 2012, Hayashi 1982)) or short-sighted, thereby being a high marginal propensity to consume (MPC) out of current disposable income. In terms of initially underemployed economic resources, an increase in national income creates a second round of effects popularized as the Keynesian multiplier (i.e., the value of multiplier effect of government spending on output is higher than one). The incremental income of workers also follows these rounds, thus promoting consumption with an immense value of multiplication. On the contrary, the new-Keynesian theory has four key assumptions. (1) Nominal wage is sticky in the short run because it slowly increases or decreases in response to a shortage in labor or a high level of unemployment, respectively. Another reason is that a significant fraction of workers makes a labor contract. (2)

Under monopolistic competition, private agents set a price to optimize their profits, which leads to the stickiness of the nominal prices. Some firms can be restricted in adjusting the sale prices in the current time. The adjustment of sale prices can increase the costs of some firms because there are two kinds of producers (i.e., final goods and intermediate goods producers) in the market. An increase in the price of intermediate goods harms the costs of production for final goods due to intermediate products as the input of firms that produce final products. (3) Firms and households hold rational expectations to maximize profits and utility, respectively. The present behavior influences the future environment. Households typically involve in credit market not to disrupt future consumption. (4) The nominal interest rate shock of monetary policy in the short run exists. If the model takes into account the households' feature of involvement in the credit market to smooth future consumption, expansionary government spending spurs aggregate demand and consumption multiplier. In terms of this phenomenon, an elastic interest rate in credit market affects investment incentives. One question is raised about how many magnitudes of government spending drive out investment. Anyway, households take a loan to make their expenditures, thus enhancing the consumption multiplier. However, the consumption multiplier diminishes in response to a higher level of the interest rate.

Most of the research only focuses on a linear relationship between government expenditure and private consumption. Some of them found that there is a positive reaction of private consumption to the expansion of government spending (Ambler et al. 2017, Bouakez--Rebei 2007, Karras 1994, Murphy 2015). Some of the scholars indicated that the substitution between them exist in their analysis (Ahmed 1986, Amano--Wirjanto 1997, Aschauer 1985, Ho 2001). However, little research explores the non-linear influence of government spending on private consumption with the exception of Amano and Wirjanto (1998), Alesina and Ardagna (1998), Höppner and Wesche (2000), Aarle and Garretsen (2003), and Wang and Gao (2011).

This paper aims to examine what the reaction of households' consumption decisions to changes in government spending is. The hypothesis predicts that there is a non-linear effect (i.e., both negative and positive effects exist in a certain period) of government expenditure on private consumption. Section 2 describes empirical literature about the linkage between government spending and private consumption. Section 3 proposes the method. Section 4 is a conclusion based on empirical literature.

2 Empirical Literature

This literature can be organized according to the various effect of government expenditure on private consumption. A broad range of recent empirical research suggests that private consumption goes up in response to the extension of government expenditure (Blanchard–Perotti 2002, Ganelli–Tervala 2009, Perotti 2007, Ramey 2011b). This notion appears consistent with some neo-Keynesian models. In line with the neoclassical model subject to imperfect competition and increasing return due to specialization and monopolistic competition, Devereux et al. (1996) investigated the contribution of a government expenditure shock to private consumption. There are two types of producers (i.e., final goods producers and intermediate goods producers) in the market subject to monopolistic competitions with free entry. The extension of government spending encourages firms to enter the market, thereby increasing the aggregate demand. In terms of a sector as a whole, the new entries (new firms) generate labor's high productivity in response to a rise in employment because of an increase in the relative price of intermediate goods. The expansion of government spending enhances capital stock and output, thereby leading to an increasing number of hours worked in response to a rise in the capital. Under increasing return to specialization, a positive government spending shock generates an increase in both capital stock and output, which is more than a change in hours worked. As a result, we can conclude that the elasticity of hours with respect to government spending (i.e., a degree of returns to specialization) is less than one. The wage-hour locus is a curve, which implies the connection between wages and hours worked. The set of possible intersection points between labor supply and labor demand produces this curve. According to the wage-hour locus and its effect on the aggregate labor market, a sufficient degree of increasing return to specialization leads to a positive co-movement between wages and hours worked. Alternatively, an increase in capital over a positive change in hours worked must lead to the improvement of long-run real wages at any degree of increasing returns to specialization. They, therefore, indicated that the extension of government spending raises the capital stock and aggregate productivity of the economy. Sufficient growth in real wages reacts to the improvement of aggregate productivity and generates the substitution of consumption for leisure. As a result, it is conclusive that the stimulation of government spending enhances private consumption.

Karras (1994) investigated the reaction of private consumption to an increase in government expenditure on goods and services across several countries. Annual data derived from International Financial Statistics, IMF are unbalanced data of thirty countries from 1950 to 1987.

Hall's random walk model (i.e., maximum consumption following a random walk) was applied to estimate the linkage between government spending and private consumption in the individual countries. His research indicated that government expenditure and private consumption complement each other because a rise in government expenditure generates a higher marginal utility of private consumption. A higher value of government expenditure creates a lower degree of complementarity. The specific tests in his study also imply that there is the robustness of this complementarity. It is more common for expansionary public policy to crowd in rather than to crowd out private consumption.

Bouakez and Rebei (2007) examine the elasticity of substitution between government spending and private consumption as Edgeworth complements and employ the Real Business Cycle (RBC) model subject to preferences (i.e., private consumption, public spending, and households with habit formation). Habit formation can be defined as a notion of households' past consumption, which influences household utility generated by present consumption (Alessie–Teppa 2010, Iwamoto 2011). Under Edgeworth complements, a positive government spending shock improves the marginal utility of consumption, thereby enhancing motivation for households to increase hours worked. More hours worked of households, therefore, reduces the negative wealth effect. The wealth effect can be identified as more or less wealth (i.e., more encouragement or discouragement to households to consume) due to a change in the price level, interest rate, or disposable income. Consumption at equilibrium increases in response to a sufficiently strong complementarity effect. Under habit formation, the model produces an incessantly non-monotonic reaction of consumption, which is similar to consumption response in the VAR model. Maximum-likelihood (ML) was used to run on USA data. They found that private consumption is strongly complementary to government spending, so private consumption increases in response to the stimulation of government spending. Murphy (2015) designs a neoclassical model subject to key assumptions (i.e., the rigidity of real wage and price and imperfect information). The result reveals that healthy private consumption reacts to a positive government spending shock due to the perception of the improvement of permanent income levels. Based on basic conception, a subset of firms is financed through government spending and charged tax liabilities. Firm owners' expectation about an increase in permanent income significantly grows in response to expansionary government expenditure on each firm if the owners perceive that a fraction of the government spending on their firms is larger than per capita aggregate government spending. The firms' shareholders gain a higher income from the government expenditure relative to tax liabilities. If workers have imperfect information

about a future value of tax liabilities and a signed contract between government and firms, their desirable consumption stays constant at the given price. Galí et al. (2007) recall the New Keynesian model, which assumes sticky prices and wages set by a union. Households intend to meet the firms' labor demand at the wage rate determined by a union. This model takes away the assumption about optimizing households. Households (non-Ricardian households), therefore, consume their current disposable income in each period. Non-Ricardian households can be defined as households who make their consumption based on current income but do not take a loan from the financial market to smooth their consumption (Céspedes et al. 2012, Coenen–Straub 2005, Marto 2014). In terms of price stickiness, expansionary government spending spurs aggregate demand, thereby increasing firms' labor demand. Wage rises in response to an increase in firms' labor demand under the monopolistic feature of the labor market. In terms of a sufficiently large fraction of non-Ricardian consumers, the model creates a positive reaction of private consumption (i.e., crowding-in effect) to a positive government spending shock. Ambler et al. (2017) examined the dynamic co-movement between government spending and private consumption with a standard RBC model based on the assumption of optimizing agents (i.e., private agents and the government). An interim government optimizes the wealth of the representative private agents (i.e., firms and households) under the expansionary public spending. The optimal level of public spending relies on the dynamic inconsistency problem. The policy of government consumption and public investment has been announced without precommitment. The dynamic programming methods are applied to estimate time-consistent policies. The current economy determines the interaction between government and private agents. Markov-perfect equilibrium examines the macroeconomic equilibrium in the model. The taxes on labor and capital income are used to finance a part of government spending. Distortionary taxes and discrete lump-sum taxes balance a budget in the long run and the short run, respectively, thereby not achieving the first-best optimum. The result of vector autoregressions (VARs), which runs on artificial data, shows that crowding in private consumption and real wage responds to the simulation of government spending. This impulse response function of this performed VAR highlights quantitatively and qualitatively similarity to studies in the empirical literature. Cooley and Dwyer (1998) apply a structural vector autoregression (SVARs) approach for the Business Cycle. This approach has two types of restrictions (i.e., atheoretical and theoretical). Atheoretical restriction refers to restrictions on structural shocks (i.e., monetary stocks and supply and demand shocks). Theoretical restriction can be identified as theories explaining those shocks. A temporary Government spending shock is run with the approach mentioned above. Households' utility

function depends on consumption and leisure affected by a temporary government spending shock. The production function of firms respects constant return to scale with a government spending shock. They also suggested that the real wage rises in response to a positive government spending shock. Their result is consistent with the finding conducted by Blanchard and Quah (1989) under a different approach (i.e., Blanchard and Quah approach are based on the relative significance of demand and supply shocks).

Other empirical research delivers the opposite result. Bailey (1971) highlighted a notable signal that a degree of substitutability between private consumption and government expenditure probably takes place. The extension of government expenditure crowds out private consumption. Aschauer (1985) investigated the reaction of private consumption to a positive government spending shock, which is based on the permanent-income approach. The quarterly data for the USA are collected during the period from 1948Q1 to 1981Q4. The result shows that private consumption on nondurables and services declines in the range of 23 to 42 percent in response to the expansion of government spending. Notably, his finding is entirely consistent with the research conducted by Kormendi (1983). Ahmed (1986) examined the influence of the United Kingdom's (UK) government spending on household expenditures in an intertemporal substitution model during the period from 1908 to 1980. He found that private consumption is crowded out by rising government spending.

Amano and Wirjanto (1997) employed a two-good permanent-income model and relative price approach to estimate the effect of government spending on private consumption in the USA. The quarterly data from 1953Q1 to 1994Q4 are derived from Data Resources Inc. They found that the intratemporal substitution between government expenditure and private consumption is approximately 0.9. That is, the boost in government spending cuts down private consumption. Chiu (2001) investigated a dynamic co-movement between public and private consumption in Taiwan and used the same approach as Amano and Wirjanto (1997). He indicated that an intratemporal substitution between public and private consumption is approximately 1.1. It is conclusive that the improvement of public consumption crowds out private consumption.

Ho (2001) examined the impact of government spending on private consumption in 24 OECD countries and employed the panel Dynamic Ordinary Least Square (DOLS) model. The data from 1981 to 1997 are taken from AREMOS/OECD. He found that the crowding-out effect of government expenditure on private consumption exists. In the case of perfect knowledge and rational expectation, households reduce their spending in response to expansionary government spending because they anticipate that the government raises the present value of taxes to finance

its expenditure and has an intention to balance a budget. The real disposable income taken into account in the analysis leads to a significant degree of substitutability between government spending and private consumption. That is, real disposable income plays a crucial role in the specification of a regression model. RBC and New Keynesian models cannot predict the positive effect of public spending on private consumption while the higher taxes, which is proposed to finance the higher government spending, cause a decline in private wealth and consumption (Ganelli–Tervala 2009).

Some studies impose that the impact of government expenditure on private consumption is non-linear. Giavazzi and Pagano (1990) highlight that Keynesian influence exists in the typical time, but the non-Keynesian effect occurs in response to the high level of debt. Amano and Wirjanto (1998) follow a two-good permanent-income model to examine the impact of government expenditure on private consumption. The outcome based on the USA data and the generalized method of moments (GMM) showed that government spending and private consumption are complements, substitution, or no relation—that is, the non-linear effect on private consumption exist on government spending. Alesina and Ardagna (1998) 's outcome, anchored in a probit model to run on panel data of OECD countries, reflected that the effect of fiscal policy on private consumption is non-linear. The two main factors (magnitude and structure of fiscal adjustment) cause the occurrence of this non-linearity.

Höppner and Wesche (2000) examined the non-linearity between government expenditure and private consumption in Germany under quarterly data during the period from 1970:Q1 to 1998:Q4. The consumption function of their study includes four independent variables (i.e., government spending, tax revenues, personal disposable income, and lagged error correction term). The first two explanatory variables are allowed to rely on the regimes. Their result based on the Markov-switching model revealed that the lagged error correction term has a negative relation with private consumption. The increase in personal disposable income encourages household spending. The non-linear impact on private consumption exists on government spending and tax revenue. The non-Keynesian effect occurred during the periods 1973-1974, 1982-1983, and 1991-1992. Also, The possible existence of non-Keynesian impact improves in response to the soaring budget deficit.

Aarle and Garretsen (2003) studied the non-linear impact of government spending on private consumption in 14 European Union (EU) countries during the period from 1970 to 2000. The consumption function of their study relies on explanatory variables (i.e., government expenditure, direct taxes, national income, transfers, and fiscal regime indicator as dummy

variables). The result based on a panel data approach indicated that there is the occurrence of the non-linear effect of fiscal adjustment on private consumption due to the magnitude of fiscal change and the initial fiscal status. For example, high initial government spending negatively impacts household (agent) expectation because households anticipate that the government will raise future taxes to finance own expenditure. As a result, households save their money to make expenditures in the future.

Wang and Gao (2011) investigated the non-linear influence of government spending (i.e., government investment and consumption) on private consumption. The regression model takes into account five explanatory variables (i.e., disposable income, income distribution, tax revenues, government purchases, and public investment). There are only three independent variables (public investment and consumption and tax revenues), which depend on the switching states (regimes). The data analysis of China's annual data from 1978 to 2008 is based on the Markov-switching model. They found that a drop in disposable income or high-income inequality lead to cut down private consumption. The tax revenues have a non-linear effect on private consumption. The impact of government investment on private consumption is linear and positive, but not symmetrical. The government purchases non-linearly influence private consumption. The periods of the occurrence of the non-Keynesian effect are 1978-1980 and 1984-1997. This non-linear impact of the fiscal policy in China does not associate with the initial fiscal status or the magnitude of fiscal consolidation, but it is in connection with the own characteristics of commodity and labor markets.

In summary, the effect of government spending on private consumption is non-linear because there are various reasons, such as the initial fiscal status, the magnitude of fiscal change, the structure of fiscal adjustment, or the own characteristics of commodity and labor markets. If initial government spending is high, households anticipate that the government may increase future taxes to finance its expenditures. As a result, they reduce their current expenditures and save for future consumption. High magnitude of fiscal adjustment may cause high government debt because the government may borrow money via issuing government bonds, thereby leading to higher interest rates in the market and thus negative response of household consumption. If the government raises the present taxes to finance its current spending, it will cut down the disposable income of each household and raise the price level.

3 Method

Markov-switching autoregressive (MSAR) model is an appreciate method for analyzing the non-linear impact of government spending on private consumption because this method

classifies the sample size into a number of groups (regimes). Each group contains a number of observations, which have a similar effect. The AR (autoregression) term in the MSAR model means that the dependent variable relies on the lagged value of the regime (s). Neglecting the endogeneity in the regime-switching causes a substantial bias and a loss of valuable information (Chang et al., 2017). MSAR model can be written as follows:

$$y_t = \mu_{it} + \sum_{\tau=1}^p \varphi_{\tau i} (y_{t-\tau} - \mu_{it-\tau}) + \varepsilon_{it} \quad (1)$$

where i and p refers to a number of regimes and autoregressions, respectively. μ_{it} focuses on independent variables, which depend on the regime, at the time t . $\varphi_{\tau i}$ represents the coefficient of AR term in the regime i . ε_{it} refers to the error term of the regime i and has a normal white noise process. The optimal number of autoregressions is selected according to the minimum value of BIC (Bayesian Information Criterion) proposed by Schwarz (1978). The value of BIC can be defined with the formula:

$$BIC = -2 \log L + k \log N \quad (2)$$

where L refers to the likelihood of the data. k and N represent the number of parameters and observations, respectively.

4 Conclusion

The effect of fiscal policy has called the attention of economists, policymakers, and scholars since the global crisis in 2008. The result based on empirical literature review reveals that the non-linear impact of government expenditure on private consumption exists. There are different sources, which cause this non-linearity. These main sources are initial fiscal status, the size and structure of fiscal change, and personal characteristics of commodities and market. This study contributes to economists and policymakers, who can define characteristics reducing the effectiveness of the fiscal policy. For the next step of this study, we will collect data and analyze it with the proposed method (MSAR model).

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