Government Spending and Macroeconomic Variables

A Small NOEM Model

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Abstract

The theoretical literature based on New Open Economy Macroeconomics model has grown rapidly during recent year but also sufficiently complex within a standard model. In order to simplify the intractable model, this paper develops a small-country NOEM model with micro-foundations, price sticky and monopolistic competition to discuss the impacts of change in government spending on consumption, production, price, exchange rate and the level of welfare both under the long-run and short-run. The main findings of this paper are as follows. First, if prices are flexible, an increase in government spending will have positive effect on the domestic output, exchange rate and the domestic currency price of home goods, but negative effect on domestic

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consumption and the foreign currency price of home goods. An increase in
government spending will generates the fiscal crowding-out effect on private
consumption. Second, if prices are sticky, the consumption, price index and
exchange rate jump immediately to long-run equilibrium with a government
spending shock. Third, an increase in government spending will decrease the
domestic welfare level in a small-country case.

Key Words: Government Spending Shock, New Open Economy Macroeconomics Model, Welfare
Analysis

政府支出衝擊對經濟的影響：
小型開放經濟模型之探討

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摘要

雖然新開放總體經濟模型的理論文獻，在過去幾年中，成長的非常快速，
但其原始的模型卻是充分的複雜。為了改善模型過於複雜的缺失，本文建立一
個具有個體基礎、價格粘性與不完全競爭的小國模型，探討政府支出衝擊對消
費、產出、物價水準及匯率的長、短期效果，並且也對政府支出衝擊對一國福
利的影響進行分析。本文所得到的結論如下：第一、就長期而言，政府支出的
增加將使得本國消費、本國商品的國內價格與產出水準上升；本國商品的外國
價格與匯率會下降，本國貨幣升值。第二、就短期而言，政府支出衝擊將使得
消費、產出及匯率立即跳到長期均衡的水準，不會有過度調整的情形發生。第
三、政府支出衝擊將會造成小國的福利水準下跌。

關鍵詞：政府支出衝擊、新開放總體經濟模型、福利分析

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I. Introduction

Review the history of Macroeconomics theory in recent years, so called the "New Open Economy Macroeconomics" model (henceforth NOEM) has been widely used to reconsider the macroeconomics questions, the literatures based on the framework of NOEM have made its greatest contributions in understanding the following topics. First, the transmission of the exogenous shocks across country (see, for example, Obstfeld and Rogoff, 1995; Sutherland, 1996; Kollman, 1997; Lane, 2001; Corsetti and Pesenti, 2001; Tille, 2001). Second, the exchange rate pass-through (see, for example, Betts and Devereux, 1996; 2000b; Engel, 1999; Bergin and Feenstra, 2001). Third, the choice of change rate regime (see, for example, Devereux and Engel, 1998a; 1999; Devereux, 1999; Engel, 2000). Fourth, the international policy coordination (see, for example, Obstfeld and Rogoff, 2002; Coutinho, 2005; Canzoneri, Cumby and Diba, 2005). NOEM's genesis is the Obstfeld and Rogoff (1995) Redux model, it summarized some of the theoretical work in macroeconomics that incorporated imperfect competition, nominal rigidities, and micro-foundations in a dynamic general equilibrium open economy setting. The theoretical model is useful for us to examine the effects of the macro policy and the exogenous shock in an open economy, especially. Given the micro-foundations for intertemporal choice permits the formal welfare evaluation of the international macroeconomics policy, and the model with sticky price and imperfect competition allows us for short-run analysis of policy shock. But the weakness of traditional NOEM model is too complicated to an analytical fragmentary. Thus, differs from the existing literature in the traditional NOEM model, we want to develop a small open economy model to discuss the effects of government spending shock for analytical simplified.
Most of the contributions based on address the international transmission of monetary shock, including the standard Redux model of Obstfeld and Rogoff (1995), but there is lack of detailed studies on the effects of a fiscal shock relative to the discussion of monetary policy. Within the standard NOEM model, they found that a permanent domestic monetary shock to the home country will lead domestic households to increase their aggregate consumption demand, lead to a depreciation of the exchange rate and an increase in net domestic claims on foreigners. Although a set of results on the open economy effects of fiscal policy also can found in the standrad NOEM model (given in the Appendix), however, the traditional NOEM model is more complex in analytical process.

In the Appendix of Redux model of Obstfeld and Rogoff (1995), the findings show that a permanent rise in home government spending raises steady-state domestic output and reduces the domestic consumption, because agents respond by substituting into work and out of leisure, the demand of money falls due to consumption decrease, so leads to a depreciation of currency, and a temporary rise in home government spending leads to an immediate fall in relative home consumption; relative home output goes up, but not enough to offset the rise in the taxes, lower consumption implies lower money demand, so there also produce a depreciation of the currency. Further, Corsetti and Pesenti (2001) incorporated the features of the home bias in government spending and market are incomplete into the Redux model, the main found is that an increasing in government spending leads to a reduction of consumption and a depreciation of the exchange rate. Ganelli (2003) took the government spending into the utility function as substitute for private consumption, the results are the same as the Corsetti and Pesenti (2001)
model. Pitterle and Steffen (2004) extended the Rudux model with home bias in consumption, incomplete pass-through and money in the model with the cash in advance constraint, and finds that a government spending implies an appreciation of the exchange rate.

Even though the above-mention literatures have examined the effects of government shock, in fact, it is not enough relative to the discussion of monetary shock. Moreover, all of those papers are based on traditional NOEM model, leads to a complicated in analytical process. Thus, the main purpose of this paper is to develop a small open economy model to investigate the effect of changes of government spending on the exchange rate, consumption, output, price and the level of welfare for simplify the analysis.¹

The main findings of this paper are as follows. First, in the long-run, an increase in government spending will have positive effect on the domestic output, exchange rate and the domestic currency price of home goods, but negative effect on domestic consumption and the foreign currency price of home goods. An increase in government spending will generates the fiscal crowding-out effect on private consumption. Second, in the short-run, the consumption, price index and exchange rate will jump immediately to long-run equilibrium with a government spending shock. Third, an increase in government spending will decrease the domestic welfare level in a small-country case.

The rest of the paper is divided into four sections. In section 2, I brief outline the basic model and solve for the long-run equilibrium with a log-linearized version of the model. In sections 3, we analyze the effects of a government spending shock in the long-run and short-run. In sections 4, we

¹ In fact, Lane (1997, 2001) had used the small-country model to examine the effect of monetary shock.
discuss the welfare effect on a government spending shock. Finally in section 5, I conclude the paper.

**II. The Analytical Framework**

We make some assumptions as follows. Suppose that there are only two countries in the world, home and foreign country. Home country is the relative small country to the foreign country. It is expressed that asterisks denote foreign. The small country (home country) consumes only a single imported goods and produces a single export goods over which it has some monopoly power, the large country (foreign country) can consumes both of the imported goods and export goods. Suppose that labor is the only production factor in the model and government spending shock is the only exogenous shock.

1. The Basic Model

**Household**

Assume that all of households have identical preferences over a consumption (C), real money balance \( \frac{M}{P} \), and production level (y). Higher consumption and real money balance make more utility, and higher production level means less leisure, makes the utility decrease. The intertemporal utility function of domestic household \( z \) is given by

\[
U_t = \sum_{s=t}^{\infty} \beta^{s-t} \left[ \log C_s + \frac{\chi}{1-\varepsilon} \left( \frac{M_s}{P_s} \right)^{1-\varepsilon} - \frac{k}{2} y_s(z)^2 \right] \quad \varepsilon > 0 \quad (1)
\]

Where \( \beta \) is the subjective discount rate \( (0 < \beta < 1) \), \( \varepsilon \) is the elasticity of marginal utility of real money balance \( (\varepsilon > 0) \), \( \chi \) and \( k \) means the important degree of the real money balance and output on utility, respectively. \( z \) denote

\[2\] The definition of the elasticity of marginal utility with real money balance is the percentage change of responsiveness of the marginal utility of real money balance to a one percent change in real money balance, that is \( \frac{d(M/P)}{d(M/P)} \).
the product $z$.

In equation (1), because of the home country (small country) consumes only a single imported good, we can express the representative consumer's consumption index and domestic price index as follows:

\[ C = c(z^*) \]  \hspace{1cm} (2)
\[ P = q(z^*) \]  \hspace{1cm} (3)

Where $c(z^*)$ is the home representative agent's consumption of the foreign good $z^*$, $q(z^*)$ is the domestic currency price of foreign goods $z^*$.

For the foreign country (large country), assume the representative consumer's consumption index is constant elasticity of substitution (CES) form that aggregates across the available varieties of goods:

\[ C^* = \left\{ [c^*(z)]^{\frac{\theta-1}{\theta}} + [c^*(z^*)]^{\frac{\theta-1}{\theta}} \right\}^{\frac{1}{\theta-1}}, \theta > 1 \]  \hspace{1cm} (4)

Where $c^*(z)$ is the foreign representative agent's consumption of the domestic good $z$, and $c^*(z^*)$ is the foreign representative agent's consumption of the foreign good $z^*$, $\theta$ is the elasticity of substitution between the varieties ($\theta > 1$).

The domestic price index can be obtained corresponding to equation (4):³

\[ P^* = \left\{ [p^*(z)]^{1-\theta} + [q^*(z^*)]^{1-\theta} \right\}^{\frac{1}{1-\theta}} \]  \hspace{1cm} (5)

where $p^*(z)$ is the foreign currency price of home goods $z$, $q^*(z^*)$ is the domestic and foreign currency price of foreign goods $z^*$.

The pricing assumption follows that the "Law of One Price" held for every good, $0<z<1$:

³ The foreign price index can be derived from the minimal expenditure of foreign money needed to purchase a unit of $C^*$. 
\[ p(z) = E p^*(z) ; q(z^*) = E q^*(z^*) \]  \hspace{1cm} (6)

In equation (6), \( E \) is the nominal exchange rate.

Given the equations (4) and (5), we can derive the foreign individual's demand for the domestic goods \( z \) and foreign goods \( z^* \) as

\[ c^*(z) = \left[ \frac{p^*(z)}{P} \right]^{\theta} C^* \]  \hspace{1cm} (7)

\[ c^*(z^*) = \left[ \frac{q^*(z^*)}{P^*} \right]^{\theta} C^* \]  \hspace{1cm} (8)

**The Government**

Suppose that the home (small country) government and the households have the same preferences. The government purchases is

\[ G = g(z^*) \]  \hspace{1cm} (9)

The government purchase is financed by lump-sum tax and seigniorage. The budget constraint of the home government is\(^4\)

\[ G_t = T_t + \frac{M_t - M_{t-1}}{P_t} \]  \hspace{1cm} (10)

**Budget constraints**

The budget constraint for a representative home individual is set as:

\[ M_t = M_{t-1} + p_t(z)y_t(z) - P_tC_t - P_tT_t \]  \hspace{1cm} (11)

From (11), the source of income in period \( t \) include: the real money balance in last period \( (M_{t-1}) \) and the output income in period \( t(p_t(z)y_t(z)) \). Representative home individual can spend it in consumption \( (P_tC_t) \), tax payment \( (P_tT_t) \), and currency hold \( (M_t) \) in period \( t \).

\(^4\) For simplicity, we suppose that the tariff revenue have already included in lump-sum tax in the equation (10), so the tariff revenue does not appear directly in the government and private constraints.
Aggregate demand

From equation (7), we can obtain the total demand for home goods is

\[ y^d(z) = c^*(z) + g^*(z) = \left( \frac{p^*(z)}{P^*_t} \right)^\theta (C^* + G^*) \]  

(12)

First Order Conditions

For the domestic household, substitute the budget constraint (10) into the lifetime utility function (1) to transform the problem into an unconstrained dynamic optimization problem. The first-order conditions with respect to C, M, y, respectively, to gives

\[ C_{t+1} = C_t \]  

(13)

\[ \frac{M_t}{P_t} = (\chi C_t)^\frac{1}{\theta} \]  

(14)

\[ y_t(z) = \theta \frac{1}{k\theta} C_t^{\theta - 1} (C_t^W)^\frac{1}{\theta} \]  

(15)

Equation (13) is called the standard consumption Euler equation with describe the behavior of intertemporal consumption. Equation (14) is the function of money demand, it represents the relationships between money demand and consumption. Equation (15) is the function of labor supply, it expresses the trade-off between labor supply and consumption. \( C_t^W \) denotes the world consumption.

2. Solve the Equilibrium

Now, I will examine the effects of macroeconomics aggregates with an

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5 By Purchasing Power Parity and Law of One Price (equation (6)), equation (12) can be rewritten as

\[ y^d(z) = \left( \frac{p(z)}{P} \right)^\theta (C^* + G^*) \].
exogenous tariff shock in the long-run. Let's solve the steady state of the economy at first.

**The Steady state**

Steady state describes the state of the economy converge following a shock. All variables are constant in the steady state. Substituting the equation (10) into (11), you can get the private budget constraint in the steady state

$$C_t = \frac{p_t(z)y_t(z)}{P_t} - G_t$$  \hspace{1cm} (16)

**Log-linearization**

In order to obtain a tractable solution, we log-linearize the equilibrium conditions around the 0-steady state. Following, let the variables with superscript "^*" to represent the aggregate variables value after log-linearization, e.g., \(\hat{X}_t\) means the variable \(X_t\) after log-linearizing around \(X_0\), and \(\hat{X}_t = \frac{X_t - X_0}{X_0} = \frac{dX_t}{X_0} = \ln \left(\frac{X_t}{X_0}\right)\). It is worth us to notice that all of the foreign variables (e.g., \(P^*, C^*, y^*(z^*), q^*(z^*)\)) are exogenous for home country, and \(C^W\) is also exogenous because of the small country has no effect on any world aggregate variables.

(1) log-linearizing the price index

Log-linearizing the equation (3) and (6), and using \(\hat{q}^*(z^*) = 0\), to gives

$$\hat{p}_t = \hat{q}(z^*) = \hat{E}_t$$  \hspace{1cm} (17)

(2) log-linearizing the demand function

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6 0-steady state is the initial state of the economy. In fact, you can define and derive the level of macroeconomics variables in the 0-steady state. However, we neglect the process for simplicity. Also see Obstfeld and Rogoff (1995).
Log-linearizing equation (12), and using equation (6) and (17), we have

\[ \hat{y}_i(z) = -\theta[p_i(z) - P_i] \] (18)

(3) log-linearizing labor supply function

Log-linearizing the labor supply equation (15), yield

\[ (1 + \theta)\hat{y}_i(z) = -\theta \hat{C}_t \] (19)

(4) log-linearizing the consumption Euler Equation

Log-linearizing the consumption Euler equation (13), yield

\[ \hat{C}_{t+1} = \hat{C}_t \] (20)

(5) log-linearizing the money demand function

Log-linearizing the money demand function (14) gives

\[ \hat{M}_t - \hat{P}_t = \frac{1}{\varepsilon} \hat{C}_t \] (21)

(6) log-linearizing the private budget constraint

Log-linearizing the private budget constraint (16) yield

\[ \hat{C}_t = \hat{p}_t(z) + \hat{y}_t(z) - \hat{P}_t - \hat{G}_t \] (22)

For distinguish the variables under long and short-run, respectively. Let the variables with a subscript "_t" represent the short-run variables, and no subscript represent the long-run variables, e.g., \( \hat{C} \) and \( \hat{C}_t \) denote the change of consumption under long-run and short-run, respectively. Note that the equations (17) to (21) will hold for every period, hence the subscript "_t" can be removed.
Solve for the equilibrium in the steady state

The model is given by a log-linearized version of equation (18), (19), (22), three equations in three unknown endogenous variables \( \hat{C}, \hat{y}, \hat{p}(z) - \hat{P} \).

\[
\begin{align*}
\hat{y}(z) &= -\theta[p(z) - P] \quad (18)'
\end{align*}
\]

\[
\begin{align*}
(1 + \theta)\hat{y}(z) &= -\theta\hat{C}_t \quad (19)'
\end{align*}
\]

\[
\begin{align*}
\hat{C} &= \hat{p}(z) + \hat{y}(z) - \hat{P} - \hat{G} \quad (22)
\end{align*}
\]

We can solve the three equations and get the solutions in the steady state as follows:

\[
\begin{align*}
\hat{C} &= -\frac{(1 + \theta)}{2\theta} \hat{G} \quad (23)
\end{align*}
\]

\[
\begin{align*}
\hat{y}(z) &= \frac{\hat{G}}{2} \quad (24)
\end{align*}
\]

\[
\begin{align*}
\hat{p}(z) - \hat{P} &= -\frac{\hat{G}}{2\theta} \quad (25)
\end{align*}
\]

Where equation (22) is the change of domestic consumption equation (23) given the change of the domestic production, equation (24) is the difference of the change of the price of product \( z \) and price index in the home country.

III. The Effect of a Government Spending Shock in the Long-Run and Short-Run

1. Response in the Long-Run

(A) The impact of the exchange rate with a government spending shock

Substituting (23) into (21), and using the equations (17), yield

\[
\begin{align*}
\hat{E} = \hat{P} = \hat{M} + \frac{1 + \theta}{2\theta\epsilon} \hat{G} 
\end{align*}
\]
Equation (26) shows that an increase in government spending by home country raises the exchange rate, and lead to the home currency depreciates in the long-run.

(B) The impact of the consumption with a government spending shock

From the equation (23), it is easy to get an increase in government spending by home country will reduce the domestic consumption.

(C) The impact of the output with a government spending shock

By the equations (24), you can see that an increase in government spending by home country will raise the domestic output.

(D) The impact of the domestic currency price of home goods z with a government spending shock

Substituting (26) into (25), you have

$$\hat{p}(z) = \hat{M} + \frac{\hat{G}}{2\theta} \left( \frac{1+\theta}{\varepsilon} - 1 \right)$$

From the equation (27), you are able to know that an increase in government spending by home country will increase the domestic currency price of home goods z.

(E) The impact of the foreign currency price of home goods z with a government spending shock

Log-linearizing the equation (6), and using the equations (26) and (25), yield

$$\hat{p}^*(z) = \frac{-\hat{G}}{2\theta}$$

From the equation (28), we can find that there will decline the foreign currency price of home goods z with a government spending shock by home country.
The explanations of the long-run in our findings are as follows: an increase in home government spending is a resource absorption which makes the agents poorer, hence households will increase in work effort and decrease in leisure. Thus, the steady-state domestic output will rise and the domestic consumption falls. An increase in government spending will generates the fiscal crowding-out effect on private consumption. On the other hand, the demand of money falls due to consumption decrease, and leads to a depreciation of currency, domestic currency price of home goods will increase, and the foreign currency price of home goods will decrease. This paper focuses on the role of exchange rate in explaining the macroeconomic effect on a government spending shock, an increase in tariff rates will affect the aggregate variables by the channel of exchange rate pass-through. While the traditional NOEM model had been adopted widely in recent years, we can also use a small open NOEM model to derive some interesting intuitions.

2. Response in the Short-Run

We assume that there is only one-period price rigidity in the model which the prices of domestic goods \((p_r(z))\) and foreign goods \((q^*(z^*))\) are set one period in advance in the producer’s currency. The prices cannot be changed within the period due to one-period price rigidity \((\hat{p_r}(z) = \hat{q}^*(z^*) = 0)\), but are fully adjustable after one period. We can now turn to derive the short-run analysis on a government spending shock.

(1) The impact of the consumption, price level and exchange rate with a government spending

The first order conditions of consumption with derived by the utility maximization were described the optimal intertemporal behavior of consumers.
No matter in the long-run or short-run, the consumers' behavior will follow the first order conditions. That is to say, equations (19) ~ (21) will hold for every period in the model.

From equation (20), we can know that the change of consumption in the short-run is the same as it in the long-run. Substituting it into (21) and using equation (25), it is easy to see that the consumption, price level and exchange rate will jump immediately to its long-run equilibrium following a government spending shock.

(2) The impact of the domestic output with a government spending shock In the short-run, the domestic output can be get by equation (18), as

\[ \hat{y}_t(z) = \theta P_t \]

(18)''

substituting (26) into (18)'', it is easy to get the domestic output in the short-run

\[ \hat{y}_t(z) = \theta \hat{M} + \frac{1+\theta}{2\varepsilon} \hat{G} \]

(29)

From the equation (29), we are able to show that an increase in home government spending will decrease the domestic output.

(3) The impact of the foreign currency price of home goods with a positive government spending Log-linearizing the equation (6), using equation (26) and \( \hat{p}_t(z) = \hat{q}^*(z^*) = 0 \), to get

\[ \hat{p}^*(z) = -\hat{M} - \frac{(1+\theta)}{2\varepsilon} \hat{G} \]

(30)

The equation (30) shows that an increase in home government spending will decrease the foreign currency price of home goods.

From the results which above-derived, we can see that the consumption, output and exchange rate will jump immediately to its long-run equilibrium following a government spending shock. The intuition for the immediate
adjustment is apparent from equations (20) and (21). If money-supply and consumption differentials are both expected to be constant, then the exchange rate must be expected to be constant as well. However, although the prices of goods are fixed in own currency in the short-run, but the domestic price level and the foreign currency price of home goods can change if the exchange rate changes or government spending is changed. Thus, the output and consumption will change in the short-run.

IV. Welfare Analysis

Using the equations (1), we can know that the utility function are composed with three components that consumption (C), real money balance (M/P) and output level (y), we can express as follow:

\[ u_t = u^C_t + u^M_t + u^y_t \]

Where \( u^C_t = \sum_{j=0}^{\infty} \beta^j \ln(C_{t+j}) \) ; \( u^M_t = \frac{\chi}{1-\varepsilon} \sum_{j=0}^{\infty} \beta^j \left( \frac{M_{t+j}}{P_{t+j}} \right)^{1-\varepsilon} \) ; \( u^y_t = -\frac{k}{2} \sum_{j=0}^{\infty} \beta^j y_{t+j}^2 \)

Under the assumption of Obstfeld & Rogoff (1995). Suppose that the impact of utility on real money balance is sufficiency small (\( \chi \rightarrow 0 \)). Hence we just need to analyze the impact of consumption and output on a government spending shock.

Consumption

According to the form of utility function, it is easy to get the positive utility of consumption before a government spending shock is

\[ u^C_{t-1} = \ln(C_0) + \frac{\beta}{1-\beta} \ln(C_0) \]
The positive utility of consumption after a government spending shock can be expressed as

\[ u_t^C = \ln(C_t) + \frac{\beta}{1-\beta} \ln(C) \]

Substituting the above two equations, the change if utility due to changes in consumption is

\[ \Delta u_t^C = \dot{C}_t + \frac{\beta}{1-\beta} \dot{C} \]  

(31)

Output

Analogously, it is easy to get the negative utility output before a government spending shock is

\[ u_{t-1}^y = -\frac{k}{2} [y_0^2 + \frac{\beta}{1-\beta} y_0^2] \]

The negative utility of output after a government spending shock is

\[ u_t^y = -\frac{k}{2} [y_t^2 + \frac{\beta}{1-\beta} y^2] \]

Substituting the above two equations, we can get the change in utility due to changes in output is

\[ \Delta u_t^y = -\frac{k}{2} [(y_t^2 - y_0^2) + \frac{\beta}{1-\beta} (y^2 - y_0^2)] \]

Using the first-order approximation, \( y_t^2 = y_0^2 + 2y_0(y_t - y_0) \), it follows that

\[ \Delta u_t^y = -k[y_0^2 \hat{y}_t + \frac{\beta}{1-\beta} (y_0^2 \hat{y})] \]

Where \( \hat{y}_t = \frac{y_t - y_0}{y_0} \); \( \hat{y} = \frac{y - y_0}{y_0} \)
Now, using the equation that $y_0 = \left(\frac{\theta - 1}{k\theta}\right)^2 = C_0 = C_0^W$, to get

$$\Delta u_i^\gamma = \left(\frac{\theta - 1}{\theta}\right)\hat{y}_i + \frac{\beta}{1 - \beta} \hat{y}$$  \hspace{1cm} (32)

Add the equations (29) and (30) together, to gives

$$\Delta u_i^C + \Delta u_i^\gamma = \hat{C}_i - \left(\frac{\theta - 1}{\theta}\right)\hat{y}_i + \frac{\beta}{1 - \beta} (\hat{C} - \frac{\theta - 1}{\theta} \hat{y})$$  \hspace{1cm} (33)

Substituting (23), (24) and (29) into (33), we can get

$$\Delta u_i^C + \Delta u_i^\gamma = -(\theta - 1)\hat{M} + \left(\frac{\beta}{1 - \beta} \frac{1 - \theta}{2\theta} - \frac{1}{1 - \beta} \frac{1 + \theta}{2\theta} - \frac{\theta - 1(1 + \theta)}{2\theta e}\right)\hat{C}$$  \hspace{1cm} (34)

From equation (34), we can see that an increase in government spending will decrease the domestic welfare level in a small-country case.

V. Conclusions

NOEM model is a leading development in international economics starting in the middle of 1990s, it provides a new theoretical framework for open economy analysis of policy design and exogenous shocks. The model usually used to examine the fluctuations of macro variables on three underlying shocks. First, monetary shocks (see, for example, Obstfeld and Rogoff, 1995; Lane, 2001). Second, demand shocks (see, for example, Corsetti and Pesenti, 2001; Ganelli, 2003). Third, labor supply shocks (see, for example, Bailey, Millard and Wells, 2001; Cavallo and Ghironi, 2002). Differ from the shocks that above-mentioned, the paper would focus on the effects of government spending shock.

\[ \text{The equations is derived from equation (15), see also Obstfeld and Rogoff (1995).} \]
This article develops a dynamic small-country model with micro-foundations, price sticky and imperfect competition to examine the effect of macroeconomic variables on a government spending shock both under the long-run and short-run. The variables that we have examined include the level of consumption, output, price, exchange rate and the level of welfare.

The main findings of this paper are as follows. First, in the long-run, an increase in government spending will have positive effect on the domestic output, exchange rate and the domestic currency price of home goods, but negative effect on domestic consumption and the foreign currency price of home goods. An increase in government spending will generates the fiscal crowding-out effect on private consumption. Second, in the short-run, the consumption, price index and exchange rate jump immediately to long-run equilibrium with a government spending shock. Third, an increase in government spending will decrease the domestic welfare level in a small-country case. Our paper's contribution was to develop a dynamic small-country general model for illustrate the macro effects on government spending shock, not only provide the long-run and short-run analysis, but also offer welfare evaluation with a government spending shock. The findings are thus hoped to provide important reference to policy design for the government.

Finally, I list two research directions that worth working in the future as follow. First, we just offer a theoretical analysis on the effects of government spending shock, and then get some interesting conclusions. However, do the findings match reality? It is the research extension in the future for the econometrics scholars. Second, incorporate the non-traded goods or price-to-market into the model, will or not to change the conclusions is also a work in the future.


