Multidisciplinario
de Ciencias Sociales

# Public finance and monetary policies as economic stabilizer: unique or universal across countries?

# ¿Finanzas públicas y políticas monetarias como estabilizador económico: único o universal entre los países?

*Arwiphawee Srithongrung*[1]

1 Nacionalidad: Tailandesa. Grado: Doctorado en Administración Pública. Especialización: Finanzas Públicas, Presupuesto Gubernamental y Crecimiento Económico. Adscripción: Associate Professor of Public Administration. Hugo Wall School of Public Affairs.Wichita State University. Correo electrónico: Arwiphawee.Srithongrung@wichita.edu

DOI: http://dx.doi.org/10.20983/noesis.2016.1.1

**Fecha de recepción: 13 de septiembre de 2014**
**Fecha de aceptación: 5 de diciembre de 2014**

ABSTRACT

This study examines dynamic effects of fiscal and monetary policies on growth of two distinctive groups: industrialized with high-income and non-industrialized with medium-income economies. The literature is mixed in recommending fiscal and monetary policies to stabilize a national economy, especially for non-industrialized countries. Unlike high-income and industrialized countries, in the non-industrialized countries, capital markets are imperfect; and hence, setting interest rates to target inflation or mitigate recessions will be ineffective because the level of cash flows do not reflect true investment demands, leading to failed monetization. Data were derived from 36 countries over a 31-year period. Panel Vector Auto Regression (PVAR) was used to mitigate endogeneity which is an inherent problem of panel data. The results confirm the major hypothesis.

*Keywords: Government Spending, OECD, GDP Growth, Panel Vector Auto Regression, Medium-Income Country.*

RESUMEN

En este artículo se examinan los efectos dinámicos de las políticas fiscales y monetarias en el crecimiento de dos grupos distintos: países industrializados con altos ingresos y no industrializados con economías de ingresos medios. La revisión de la literatura indica diferentes situaciones en relación al tipo de política fiscal y monetaria que debe seguirse, especialmente en aquellos países no desarrollados. A diferencia de los países de ingresos altos e industrializados, los países no industrializados tienen mercados de capital imperfectos; y por lo tanto, el establecimiento de tasas de interés para controlar la inflación o mitigar recesiones puede resultar poco efectivo debido a que los bajos niveles de flujo de efectivo no reflejan fielmente las demandas de inversión, conduciendo a un fallo en el patrón monetario. En el ánimo de comprobar lo anterior, se utilizaron datos de 36 países para un periodo de 31 años, a los que se aplicó un Panel de Vectores Autoregresivos para contrarrestar la endogeneidad. En lo general, los resultados confirman la hipótesis propuesta.

*Palabras clave: Gasto Público, OCDE, Crecimiento Económico, Panel De Vectores Autoregresivos, Países De Ingreso Medio.*

## *Introduction*

One of a government's responsibilities in public financial management is to stabilize national economic performance (Musgrave, 1959). Over the short or medium term, a country's rapid growth rates create inflation while sharply declining rates create recession. In the macroeconomic literature, monetary policy implemented through targeted nominal interest rates is viewed as the most appropriate policy tool given that a country's monetary authority can promptly execute interest rate changes (Taylor, 2000). Meanwhile, fiscal policies including taxes and deficit spending take time to remedy the economy since they need a national governing body's approval prior to implementation. This conventional view is tested in 18 Organization for Economic Cooperation and Development (OECD) countries during the period of 1920 to 2011 and empirical evidence support the view that setting nominal interest rates slightly below or above the targeted rates have positive impacts on asset prices which in turn smooth the growth rates of OECD economies (Bordo & Landon-Lane, 2013). However, to the authors' best knowledge, this view has not been systematically tested in non-industrialized countries.

The non-industrialized countries, namely the countries that are not members of The Organization for Economic Co-operation and Development (OECD), have economic structures that are distinctively different than those of OECD members. For example, the non-OECD countries have (1) low-to medium-income levels (The World Bank, 2014), (2) relatively high public debt, relatively low levels of government accountability, and relatively low levels of creditability (Fielding, 2008), (3) incomplete trading systems, opaque national account payment, and relatively high levels of government deficits (Hasan & Isgut, 2009) and (4) imperfect capital markets in which foreign transactions and regulations are arbitrary and capital inflows are mainly for speculation rather than real investment (El-Shagi, 2012). Monetary policy may not be appropriate for a country that has such economic characteristics given that capital inflows tends to fail in boosting in-

vestment causing hyperinflation or deep recession (Calvo, Leiderman, Rinehart 1996; Feildberg, 2008). When monetary policy is ineffective, fiscal policies may be the answer given that public spending and taxing alter net wealth in the society. In such non-industrialized countries, economic restructuring may be required to stabilize countries prior to adjusting interest rates as in industrialized countries.

Based on the above discussion, the central thesis for this study is that in non-OECD countries, fiscal policy measured through central government spending is effective in enhancing national economic growth. Economic agents cannot guess the future about economies due to arbitrary capital market conditions on their systems, and asymmetry of information in the levels of cash inflows. In such situations, monetary policy through central bank discount rate will likely fail for the same reason as information asymmetry. This hypothesis is systematically tested through Panel Vector Auto Regression (PVAR) in which monetary policy, national account balance and capital formation are simultaneously controlled for their effects. Testing data were derived from 19 OECD countries and 17 non-OECD countries within a 31 year-period ranging from 1980 to 2010. The testing was separated into two groups: non-OECD and OECD groups. In PVAR, endogeneity is controlled by system equations in which all endogenously determined variables in the testing models are alternately predicted based on the other variables and error terms in the models. The results support a central hypothesis: in non-OECD countries, public spending significantly enhances national productivity, while central bank discount rates do not exhibit significant impact on national productivity in the short or medium- term.

This paper is organized as follows. The following section describes normative theories and positive findings for the roles of fiscal and monetary policies when high debt levels, inflation persistence, and the degree of openness are taken into consideration. The hypotheses are specified at the end of this section. The third section describes the testing model, data, and estimator. The fourth section presents results and discussion. The final section provides a conclusion.

## *Literature*

This section reviews basic theory of the roles of fiscal and monetary policies in stabilizing an economy.

### *Fiscal and Monetary Policies and Their Basic Roles in Stabilizing an Economy*

According to IS/LM model (Mundell, 1963), in a short-run, market price does not abruptly adjust itself to fully reflect true shortage or surplus of economic output because economic agents in the private sector (i.e., households and firms) plan their investment and employment contracts in advance. A government may use fiscal or monetary policies to alleviate high inflation and deep recession resulting from an oversupply of cash or interest rates in capital markets that are above their optimal level, respectively. A country's monetary authority (hereafter referred to as the central bank) implements monetary policy to stabilize economy by setting interest rates targeting a particular level of private consumption and investment. The country's fiscal authority (i.e., national finance department) implements fiscal policy to stabilize the economy by setting public spending or tax rates that can alter net wealth of the economy.

Although both policies have the same goals in stabilizing the economy, they tend to do so through different approaches. Monetary policy stimulates the economy through direct investment and consumption. Meanwhile fiscal policy stimulates the economy through wealth alteration in the society, which in turn, reshuffles resources redistribution in economic structures. Due to different approaches, each of the policies may be effective in a country but not another depending on the countries' economic structures. Therefore, the crucial questions for developing new issues into the literature and for policy practitioners across countries are, what circumstances make monetary policy effective in stabilizing an economy? and what circumstances produce that fiscal policy be a better tool to achieve the same result?

According to the IS/LM model, for an open economy with floating exchange rates, monetary policy tends to mitigate recessions at a

lower cost compared to fiscal policy. This is because low interest rates dampen foreign investment, weakening a country's currency. This in turn induces higher net exports. By contrast, tax cuts or deficit finance will cause an influx of foreign investment, strengthening a currency and in turn dampening net exports. Fiscal policy will be efficient only in an open economy with fixed exchange rates because both deficit finance and tax cuts will stimulate demand for money which will push up interest rate ; and as a result, drawing more foreign investment.

When IS/LM model is relaxed by assuming that an open economy has high public debt accumulation, fiscal policy is more efficient than monetary policy in both fixed and floating exchange rate systems because monetary policies tend to stabilize the economy at a higher social cost than fiscal policies (Beetsma & Bovenberg, 1995; Durham, 2006; Shabert, 2004; Piergallini; 2005; Bartolomeo & Gioacchino, 2008). When monetary policy is used through interest rate setting, unemployment rates are impacted and become less than (or more than) proportionate to the targeted level of inflation (or recession) reduction (Durham, 2006). In such situations, monetary policies can generate over- (or under-) optimal social costs due to any of the following situations: 1) private economic agents can anticipate inflation strategies used by the central bank (Beetsma & Bovenberg, 1995), 2) in a finite-horizon situation economic agents consider life-cycle cost in which debt service is transferred to the next generation and money value is depreciated through high interest rate (Shabert, 2004), and 3) because of finite horizons, the fiscal authority tends to spend more than (or less than) proportionate to inflation (recession) to offset the dampened demands (overheating demands) due to inflation reduction (recession mitigation); and as such, government liabilities affect aggregate demand dynamics, which in turn generates net wealth (Piergallini, 2005; Bartolomeo & Gioacchino, 2008).

Specifically, the literature in this vein asserts that fiscal policy must be counter-cyclical while monetary policy should be cyclical. In bad times, deficit finance or tax cuts will boost private consumption, especially when lower interest rates fail to boost investment and consumption for several consecutive periods because private agents continue

cutting their investment and consumption for fear of persistent recessions (Beetsma & Bovenberg, 1995, Schabert, 2004; Durham, 2006). In good times, increasing income tax rates will deflate the economy at relatively less social cost compared to monetary policy because economic agents will not need to guess whether inflation will occur and thus there is no need to prematurely cut employment contracts, investment and spending in fear of persistent inflation (Schabert, 2004; Durham, 2006). To summarize, the literature in this group assumes that economic agents adjust to economic signals by interpreting whether the recession or inflation spell will be temporary or persistent and thus monetary policy will be ineffective.

In contrast with this view, other literature asserts that under the same conditions stated above (i.e., an open economy with relatively high debt accumulation), monetary policy is more efficient than fiscal policy in stabilizing the economy (Kirsanova, Stehn, Vines, 2005). The key is for countries to follow the Taylor rule and set the nominal interest rate to target the inflation rate and the gap between actual and potential output, and then use fiscal policy to complement the policy. So in bad times, nominal interest rates should be negative for several periods, followed by mild deficit finance at the end of a long recession to bring an economy to the new equilibrium (Romer & Romer, 1996; Kirsanova, Stehn, Vines, 2005). In good times, the interest rate should be increased for several periods, and then taxes slightly increased or spending cut mildly to reduce inflationary pressures on the economy (Clarida, Gali & Gertler, 1999; Kirsanova, Stehn, Vines, 2005).

Tax increases and budgetary surpluses in early periods of inflation dampen private investment given that economic agents expect recession in the following period (Kirsanova, Stehn, Vines, 2005). Deficit finance in early period of recession adds higher interest rates especially when public debt accumulation exists. If fiscal policy is counter-cyclical, debt accumulation in a recession period will create higher interest rates that will eventually force permanent spending cuts in the ending periods (Stehn & Vines, 2007). As a result, a government stabilizes the economy at relatively high social cost given that permanent budget cuts tend to create negative impacts on some labor groups, e.g.,

low-skill labor that would otherwise be productive if some social programs are not cut (Stehn & Vines, 2007). The models finding these results employ an infinite horizon model assuming that households and firms do not pass debt burdens to the next generation, and therefore, private agents adapt to fiscal policy changes. This creates a situation where public spending crowds out private consumption.

Clearly, the theoretical literature is mixed in predicting the impacts of fiscal and monetary policies in stabilizing growth. However, one commonality is that all of them address the relative efficiency of fiscal and monetary policy within a developed country context. In OECD countries, the following characteristics are present: 1) a perfect capital market and thus capital inflows are controllable because they are not highly sensitive to changes in domestic taxes and credit rates, 2) taxation at optimal levels, 3) relatively high human development index, 4) relatively high institutional quality,[1] and 5) relatively low fiscal burden[2] (Eicher et al, 2009). With these characteristics, monetary policy should most likely be the first tool in fighting inflation and recession, with fiscal policy used only when monetary policy is severely constrained by multiple periods of zero-bound interest rates (Mankiw, Wienzierl, Blanchard, Eggertsson, 2011; Romer & Romer, 1996). This is because deficit spending can crowd out private consumption and that the marginal social cost of public deficit may be larger than the marginal social benefit of economic stabilization (Mankiw, Wienzierl, Blanchard, Eggertsson, 2011; Christiano, Eichenbaum & Robelo, 2009). Existing empirical evidence supports the traditional views that monetary policy can stabilize OECD economies at a lower cost than fiscal policy. For example, Alesina, Silvia, Roberto & Fabio (2002) found that in 18 OECD countries (excluding Mexico and Turkey) over a 36-year period ranging from 1960 to 1996, a one-percent increase in the ratio

1 According to Eicher, Ochel, Rohn, and Rohwer (2009), institutional quality includes political stability, bureaucratic quality, law and order, property rights and legal structure, corruption, and transparency in economic policy and legal decisions.

2 According to Eicher et al (2009), fiscal burden refers to the ratio of total tax revenue to total GDP. For OECD countries the mean fiscal burden ranges between 25% to 34% between 1965 and 2011 period (OECD Statistics Extract).

of government spending to total GDP significantly reduces private investment for 0.15 percent in the first year and an accumulated 0.75 percent over a five-year period. Tax increases also generate similar effects on private investment although with a slightly smaller effect size (Alesina et al, 2002).

*The Role of Fiscal and Monetary Policies on Economic Growth*

In a closed economy, long-term economic stabilization and stable growth rates can be achieved if the economy applies strategic coordination between fiscal and monetary policies which can effectively influence investment and consumption levels to move production forward, and hence expand outputs. Warren Smith (1957) proposed that in a year in which full employment[3] and full production capacity is achieved, private investment —which expands production and outputs in the following year— must be larger than the tax burden (measured by the current-year ratio of net government receipts to national income). If this condition occurs, the economy achieves structural balance in resource allocation between public and private activities fostering long-term economic growth; business cycles that generate temporarily random shocks due to price changes will not interrupt the long-term growth path. However, this situation may not occur because current-year investment depends on current-year profits, the levying of taxes on profit (i.e., tax structure) and government consumption (i.e., tax level). If one of these factors alters the level of current-year investment to the point that it is over (or under) the optimal level asserted in the ideal situation, inflation (or recession) occurs depending on the real domestic growth rate (Smith 1957).

Later, David Smith (1960) relaxes Warren Smith's (1957) assumption that in an open economy, fiscal policy may be relatively ineffective given that in addition to domestic investment and consumption, the balance of payments (due to a country's levels of export, import and

3 According to Smith (1957), full employment and production capacity (i.e., technological progress is fully utilized and no slack capital or human resources remain in the economy).

disposable income) will also determine output expansion and contraction. Furthermore, the open economy is subject to foreign domestic growth and decline through the level of openness; therefore for open economies, maintaining the balance of payments is key to stabilize the economy. Smith (1960) proposes that direct policy tools including tariff taxes, import controls and periodic exchange rate devaluations can be used since they directly control the balance of payments. Smith (1960) also notes that to enhance domestic economic growth, monetary policy can also be used as a tool to indirectly maintain the balance of payments through the level of investment, especially when the economy faces foreign growth. To expand economic output, reducing interest rates can generate investment incentives while increasing tax rates can free up domestic resources from consumption (Smith, 1960). An exception for the use of those direct policy tools to alter economic outputs is when the tax rate is fixed or when the current account balance does not readily adjust to reflect capital inflows (i.e., imperfect capital markets). In cases with imperfect capital markets, fiscal policy is more appropriate (Smith, 1960) compared to monetary policy. Based on the above literature, the first hypothesis of this paper follows.

*Hypothesis 1: In developed countries fiscal policy is relatively ineffective in promoting economic growth compared to monetary policy*

The logic of hypothesis 1 is that in developed countries, which have more complete capital markets, monetary policy is effective by creating incentives for private investment, whereas fiscal policy is relatively ineffective due to crowding out effects. Therefore, in a situation of high inflation or recession, the optimal policy is to first increase (decrease) interest rates and then later if the problem persists, raise (lower) taxes or decrease (increase) public spending.

### *Fiscal and Monetary Policies in Imperfect Capital Markets*

Direct applications of the IS/LM and Smith (1960) models to developing countries that tend to lack effective capital markets may cause more harm than good for two main reasons. First, such countries have relatively low to medium per capita income and relatively low levels of direct taxation compared to those of developed countries. As a result, private sector income cannot be monetized by the central bank (Fielding, 2008). This failure induces low domestic currency demands and national saving rates, and as a result, the interest rate has little effect on cash flows (Fielding, 2008). Second, for these countries, due to relatively high public debt accumulation, hyperinflation, and weak government accountability as well as low creditability, central banks fail to effectively fight inflation in good times. When this situation occurs, public debt fails to absorb inflation unless the interest rate is much higher than inflation, requiring tax rates high enough to reduce investment and consumption.

El-Shagi (2012) created an index of capital market controls for more than 200 countries around the world, using an innovative approach in which capital inflows and outflows as well as institutional quality are incorporated. Based on the new database, El-Shagi (2012) asserts that it is not the intensity of capital market controls, but the quality and intention of capital market regulations that determine a country's economic growth. For example, in western industrialized countries, capital market restrictions are designed to limit exposure to foreign risks instead of enhancing local currency supplies. In such countries, the level of capital inflow regulations is relatively compatible with those of outflow. Capital market transaction approvals are not subject to arbitrary decisions by a government agency[4] (See El-Shagi's (2012) statistics in p. 291). In non-industrialized countries, capi-

4 El-Shagi (2012) concludes that for developing and transitioning countries that are not in the first group, capital market regulation tends to be abused by either a) requiring special approvals for a government agency for transaction (e.g., a country in Latin America) or b) having capital outflow controls that are stronger than inflows (e.g., Middle East, Sub-Saharan and North African countries).

tal market regulations are abused and used to enhance domestic cash supply rather than to forfeit capital supply. If this is the case, monetary policies are unlikely to be effective since central bank discount rates must be excessively high or low compared to the real interest rate to fight economic volatility. When the central bank has to set interest rates at extreme levels, society pays relatively high social costs resulting from unemployment rates which are too high or too low.

Uncontrollable capital inflows can create either negative or positive effects to an economy depending on government capacity and the quality of institutions designed to handle rising inflows. Capital inflows tend to raise demand for a country's currency and to respond to this situation, a government would intervene by increasing the money supply through policies allowing foreigners to invest in capital markets that can generate long-term economic growth. This process has been termed monetization (Calvo, Leiderman, Reinhart, 1996). In other cases, monetization results in inflation pressure followed by the appreciation rate of the domestic currency exchange, which in turn, dampens exports, creating trade deficits (Calvo, Leiderman and Reinhart, 1996). In most countries, rising capital inflows occur in good times because of government's budget surplus and better credit rating and rising outflows occur in bad times because of public debt payments (Kaninsky, Rienhart & Vegh, 2004). In industrialized countries, monetary policy tends to be counter-cyclical; and hence, the interest rates are an effective tool to slow down inflation and recession (Mankiw, Wienzierl, Blanchard, Eggertsson, 2011). In non-industrialized countries, fiscal policy tends to be cyclical. When this practice is coupled with the incomplete capital market problems in developing countries, their economies are relatively volatile compared to industrialized ones (Kaninsky, Rienhart & Vegh, 2004). For this reason, Easterly and Schmidt-Hebbel (1993) argue that in developing countries, good public financial management through well-planned taxing and spending leads to growth. This is because private investment is highly responsive to interest rates that can be kept at relatively low levels through domestic borrowing and good fiscal management discipline, rather than creating foreign debts.

In addition to underdeveloped capital markets, developing countries tend to have incomplete trade openness, opaque capital accounts, and relatively high government deficits (Hasan & Isgut, 2009). When the capital market is not fully open due to uncertain rules for foreign transactions, monetary policy will lose power because it cannot directly control stocks of foreign currency circulating in the economy (Hasan & Isgut, 2009). Based on the above results, the second hypothesis for the study is:

*Hypothesis 2: In developing countries with imperfect capital markets, fiscal policy is effective in stabilizing economies, while monetary policy is relatively ineffective.*

### *Methodology And Data*

Fischer (1993) defines a stable economy conducing growth as the economy whose inflation is low and predictable, real interest rate is at the optimal level, fiscal policy is stable and sustainable, real exchange rate is competitive and predictable, and balance of payments is perceived as viable (p. 4.) Fischer's conceptualization is that high inflation negatively affects capital accumulation while the balance of payments positively affects capital accumulation; both are transmitted to economic growth rates through national saving, monetary and fiscal policies (i.e., interest rates and government spending). In Fischer's formulation economic growth ($Y$) is a function of the inflation rate ($\pi$), the current account balance ($b$), government spending ($g$), interest rates ($r$) and capital accumulation ($k$):

$$Y = A(\pi, b, g, r, k) \tag{1}$$

Equation (1) can be estimated through a standard Ordinary Least Square (OLS) method, however, there will be an endogeneity problem in which each of the independent variables ($\pi$, $b$, $g$, $r$, $k$) are endogenously determined by both the dependent variable ($y$) and other independent variables. The Two-Stage Least Square method

(2SLS) which uses a set of instrumental variables to estimate the values of the four endogenous variables is an appropriate method to address endogeneity. However, in practice, it is impractical to find a set of multiple instrumental variables that robustly explain the endogenous variables while at the same time are not influenced by other variables (Stock & Watson, 2001). Furthermore, in panel data, error terms of the first and second stages of analysis can be correlated (Hsiao, 1999). For this reason, the theoretical model proposed by Kirsanova, Stehn and Vines (2005) is used because the model is a system equation in which each variable is simultaneously affected by other variables and their stochastic errors.

$$
\begin{aligned}
Y_{i,t} &= \alpha_{10} + \propto_{11} Y_{i,t-1} + \alpha_{12} R_{i,t} + \alpha_{13} K_{i,t} + \alpha_{14} G_{i,t} + \alpha_{15} B_{i,t} + \propto_{16} R_{i,t-1} + \propto_{17} K_{i,t-1} \\
&\quad + \propto_{18} G_{i,t-1} + \propto_{19} B_{i,t-1} + \varepsilon_{1t} \\
R_{i,t} &= \alpha_{20} + \propto_{21} R_{i,t-1} + \alpha_{22} Y_{i,t} + \alpha_{23} K_{i,t} + \alpha_{24} G_{i,t} + \alpha_{25} B_{i,t} + \propto_{26} Y_{i,t-1} + \propto_{27} K_{i,t-1} \\
&\quad + \propto_{28} G_{i,t-1} + \propto_{29} B_{i,t-1} + \varepsilon_{2t} \\
K_{i,t} &= \alpha_{30} + \propto_{31} K_{i,t-1} + \alpha_{32} R_{i,t} + \alpha_{33} Y_{i,t} + \alpha_{34} G_{i,t} + \alpha_{35} B_{i,t} + \propto_{36} R_{i,t-1} + \propto_{37} Y_{i,t-1} \\
&\quad + \propto_{38} G_{i,t-1} + \propto_{39} B_{i,t-1} + \varepsilon_{3t} \\
G_{i,t} &= \alpha_{40} + \propto_{41} G_{i,t-1} + \alpha_{42} R_{i,t} + \alpha_{43} K_{i,t} + \alpha_{44} Y_{i,t} + \alpha_{45} B_{i,t} + \propto_{46} R_{i,t-1} + \propto_{47} K_{i,t-1} \\
&\quad + \propto_{48} Y_{i,t-1} + \propto_{49} B_{i,t-1} + \varepsilon_{4t} \\
B_{i,t} &= \alpha_{50} + \propto_{51} B_{i,t-1} + \alpha_{52} R_{i,t} + \alpha_{53} K_{i,t} + \alpha_{54} G_{i,t} + \alpha_{55} Y_{i,t} + \propto_{56} R_{i,t-1} + \propto_{57} K_{i,t-1} \\
&\quad + \propto_{58} G_{i,t-1} + \propto_{59} Y_{i,t-1} + \varepsilon_{5t}
\end{aligned}
\qquad (2)
$$

where $Y_{i,t}$ is per capita real GDP at time t in country *i* (values are in purchasing power constant dollar), $R_{i,t}$ is the central bank's discount rate at time *t* in country *I*, $K_{i,t}$ is the ratio of capital stock to GDP at time *t* in country *I*, $G_{i,t}$ is the ratio of government consumption to

GDP at time *t* in country *I*, and $B_{i,t}$ is the ratio of national account balance to GDP at time *t* in country *i*.

Kirsanova *et al.* (2005) define current year per capita GDP as a function of previous year growth rate, previous and current year discount rate, previous and current year account balance value, and previous and current year government spending rate. Given that all of the variables in equation (2) are explained by previous and current year variables of the model, we chose to employ Panel Vector Auto Regression (PVAR), a system equation for panel data to mitigate the endogeneity problem. Standard panel data analysis is unlikely valid and reliable because the data contains fixed effects of each country's characteristics. Because of this, the residuals from each equation in the system are likely to be correlated and may result in biased coefficients (Kennedy, 2008; Hsiao, 1999). To solve the potential problem of residual correlation across equations in PVAR system, a mean differencing procedure (i.e., the Helmert procedure; see Arellano & Bover, 1995) was used to transform the data, and the PVAR system equations are finally estimated through the general method of moments (GMM). Because per capita GDP is measured in constant dollars, inflation ( as defined in equation (1) is dropped from the model to save the degree of freedom. The resulting PVAR model has five endogenous variables including real per capita GDP (), current account balance (), central bank discount rate (), government spending rate () and capital formation rate ().

**Table 1. Sample Countries**

| OECD Member Countries (19) | Non-OECD Member Countries (17) |
|---|---|
| Belgium, Canada, Denmark, Finland, France, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States | Algeria, Barbados, Fiji, Hong Kong, Jordan, Kuwait, Mauritius, Pakistan, Paraguay, Peru, Philippines, South Africa, Sri Lanka, Thailand, Trinidad & Tobacco, Uruguay, Venezuela |

Table 1 presents the list of sample countries. Testing data were derived from 36 countries over a 31-year period ranging from 1980 to 2010. The 36 countries were selected based on the availability of financial and economic data. To control for capital market characteristics, we divided the sample into two groups, OECD (developed) and non-OECD (developing) countries. Turkey, Mexico and Hungary were omitted from the OECD group because the three countries do not have capital market characteristics that are compatible to those of OECD group; instead their capital market characteristics are more similar to those in the non-OECD group (Table 2, see El-Shagi (2012) for methodology used in calculating the indices of capital market controls).[5] This is also suggested by the findings of Eicher, Ochel, Rohn, & Rohwer ( 2009, p. 27) that Turkey and Mexico ranked the lowest at the 23rd and 24th, respectively, in term of the quality for capital market control. The results in which the three countries samples were included in OECD group are available up request.

5 As presented in Table 2, capital market control index (which is ranging from 0 to 1, 0 is the least controlling system and 1 is the most controlling system) for 17 non-OECD group countries is at 0.35 on average. Turkey, Hungary and Mexico control index is about 0.34 on the average. Meanwhile the control index for 19 OECD countries is 0.06 on average. The control index in this table suggests that the three countries' capital market are more similar to those in non-OECD countries. For bureaucratic control, data in the same table suggests that on average, bureaucratic control for capital transaction approvals in the 17 non-OECD countries is about 0.30 on average. The bureaucratic control for capital transaction approvals in the 19 OECD countries is about 0.15 on average. The bureaucratic control in Turkey, Mexico and Hungary is about 0.40 on average. The bureaucratic index in this table also suggests that the three countries' capital market are more similar to those in non-OECD countries than those in OECD countries.

**Table 2. Mean capital market controls by statute and bureaucratic approval requirements from 1998 to 2009 (0 = the least restrictive; 1= the most restrictive)**

| | Controls | Bureaucracy |
|---|---|---|
| OECD group (19 countries as listed in Table 1) | 0.06 | 0.15 |
| Non-OECD group (17 countries as listed in Table 1) | 0.35 | 0.30 |
| Hungary, Turkey and Mexico (excluded from OECD group) | 0.34 | 0.40 |

Data Source: El-Shagi, M. (2012).

**Table 3. Summary Statistics for OECD Member Countries**

| Variables | Mean | Standard Deviation | Min. | Max. |
|---|---|---|---|---|
| Current Account Balance (% to GDP) ($b_{i,t}$) | -0.3 | 5.2 | -28.4 | 16.5 |
| Gross Fixed Capital Formation rate (% to GDP) ($k_{i,t}$) | 21.3 | 3.5 | 12.0 | 34.5 |
| Per Capital Real GDP (Constant $ value) ($y_{i,t}$) | 27,814 | 7,579 | 10,806 | 51,792 |
| Government Spending Rate (% to GDP) ($g_{i,t}$) | 7.1 | 1.6 | 3.0 | 11.3 |
| Central Bank Discount Rate ($r_{i,t}$) | 7.5 | 6.0 | 0.0 | 49.0 |
| Annual Change Central Bank Discount Rate ($\Delta r_{i,t1-t}$) | -0.3 | 2.7 | -25.0 | 28.0 |
| Annual Change Per Capita Real GDP ($\Delta y_{i,t1-t}$) | 429 | 846 | -5609 | 4308 |
| Annual Change Government Spending Rate (% to GDP) ($\Delta g_{i,t1-t}$) | 0.0 | 0.3 | -1.4 | 1.8 |
| Annual Change Gross fixed capital Formation rate (% to GDP) ($\Delta k_{i,t1-t}$) | -0.2 | 1.4 | -10.5 | 6.2 |
| Annual Change Current Account Balance (% to GDP) ($\Delta b_{i,t1-t}$) | 0.1 | 2.2 | -12.6 | 16.8 |

**Table 4. Summary Statistics for Non-OECD Member Countries**

| Variables | Mean | Standard Deviation | Min. | Max. |
|---|---|---|---|---|
| Current Account Balance (% to GDP) ($b_{i,t}$) | 0.41 | 14.35 | -242.19 | 54.57 |
| Gross Fixed Capital Formation rate (% to GDP) ($k_{i,t}$) | 21.7 | 5.81 | 9.5 | 43.2 |
| Per Capita Real GDP (Constant $ value) ($y_{i,t}$) | 9,617 | 10,382 | 1,170 | 52,502 |
| Government Spending Rate (% to GDP) ($g_{i,t}$) | 7.76 | 3.45 | 2.82 | 29.40 |
| Central Bank Discount Rate ($r_{i,t}$) | 21.96 | 61.03 | 0.00 | 866.00 |
| Annual Change Central Bank Discount Rate ($\Delta r_{i,t1-t}$) | -0.17 | 47.60 | -576.00 | 718.00 |
| Annual Change Per Capita Real GDP ($\Delta y_{i,t1-t}$) | 158 | 1,172 | -10,315 | 9,690 |
| Annual Change Government Spending Rate (% to GDP) ($\Delta g_{i,t1-t}$) | -0.01 | 1.20 | -11.15 | 11.62 |
| Annual Change Gross fixed capital Formation rate (% to GDP) ($\Delta k_{i,t1-t}$) | -0.17 | 3.27 | -19.40 | 21.30 |
| Annual Change Current Account Balance (% to GDP) ($\Delta b_{i,t1-t}$) | 0.06 | 16.70 | -262.53 | 239.92 |

Tables 3 and 4 present summary statistics for OECD and non-OECD groups, respectively. The total observation for the OECD group is 589 (19 countries * 31 years). The total observation for the non-OECD group is 527 (17 countries * 31 years). Current account balance and gross fixed capital formation data were derived from International Monetary Fund (IMF). Per capita real Gross Domestic Product (GDP) and government spending data were taken from Penn World Statistics 7.1. Central bank discount rate data comes from the CIA Fact Book in various years.

As presented in Tables 3 and 4, the average per capita real GDP for the OECD and non-OECD groups is $27,814 and $9,617 respectively. The average values of central bank discount rate for OECD and non-OECD groups is are approximately 7.5% and 22%, respectively. The average value for account balance for OECD and non-

OECD groups is -0.3% and +0.41%, respectively. The average value of gross fixed capital formation for OECD and non-OECD groups is 21.3% and 21.7%, respectively. The mean government spending rate for OECD and non-OECD groups is 7.1% and 7.8%, respectively.

The summary statistics for GDP levels, account balance levels and interest rate indicate that the two groups are distinctively different in terms of their real productivity levels, interest rates and national account balance. The summary statistics in Tables 3 and 4 show that capital stocks and government spending for both OECD and non-OECD groups are similar, regardless of economy size and openness structure. Interestingly, the relatively high interest rates for non-OECD countries support El-Shagi's (2012) notion that the interest rate in developing countries with imperfect capital markets tends be set at a relatively high level in order to increase cash supply rather than enhance economic investment.

### *Empirical Results And Discussion*

I used the PVAR system estimator as discussed above to obtain estimates of the coefficients. Joint significance tests of the null hypothesis confirmed the coefficients were not zero for all current and lagged values of one variable on another variable. Lag length tests using the Schwarz Bayesian Information Criterion (BIC) suggested that a four-period lag and a three-period lag were an appropriate lag length for OECD and non-OECD groups, respectively. The F-statistic indicated that each of the variables was jointly significant for the system equations.

The coefficients of PVAR models are consistent, but the standard errors of individual coefficients tend to be inflated due to the heavy parameterization of the model. For this reason, the statistical significance test through probability value (i.e., p-value) traditionally used in OLS estimation is not very useful to decide whether the effects of the independent variables in the model are statistically significant (Kennedy, 2008). Therefore, most often the analysis of PVAR models proceeds through an analysis of simulated shocks to the system using

the coefficient estimates and residuals of the model (i.e., impulse response functions) (Stock & Watson, 2001).

*Impulse Response of Real Per Capita GDP to Fiscal and Monetary Policy in OECD Countries*

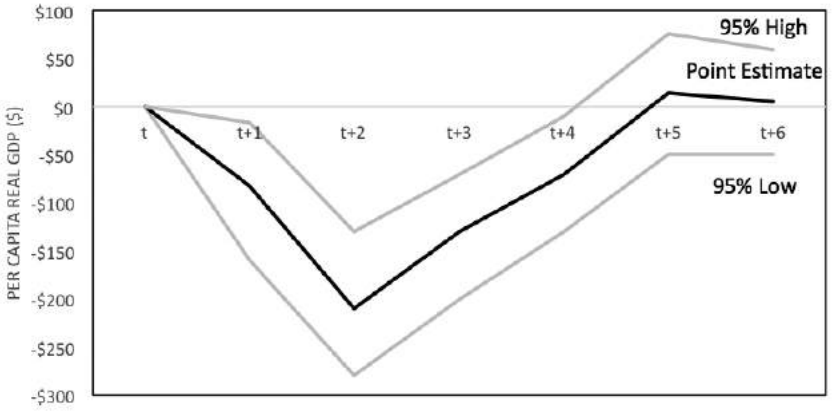
Table 5 presents PVAR estimates of the response of per capita real GDP change to government spending, central bank discount rate, capital stock and national account balance for OECD countries. Figures 1 through 4 present a graphic version for PVAR impulse response for real per capita GDP change to a standard deviation shock of central bank discount rate, government spending, capital stock, and balance payment, respectively, for OECD country group. As seen across the second row of Table 4, real per capita GDP exhibits strong trends across a six-year period. A one standard deviation ($ 846) increase in real per capita GDP results in $707, $395, $107, $142, $108, $66, $51 increase in real per capita income for the current year, one-year, two-year, three-year, four-year, five-year, and six-year after the productivity change, respectively. All of these effects are statistically significant at .05 level given that the upper and lower-bound of each estimated value does not cover zero, and hence, the point estimated of the effect is statistically significant within 95% confident interval. These results confirm autocorrelation within a country's real GDP, and thus, PVAR is an appropriate method.

**Table 5. OECD Countries: Impulse Response Function for Real Per Capita GDP (in real dollar value) to a Standard Deviation Change in the variable indicated (various lag periods)***

| Variable | Per Capita GDP Response Size | Year t | Year t+1 | Year t+2 | Year t+3 | Year t+4 | Year t+5 | Year t+6 | Cumulative Effect Across Time |
|---|---|---|---|---|---|---|---|---|---|
| ($\Delta y_{i,t1-t}$) | Lower Bound (95% CI) | 665.4 | 326.4 | 10.5 | 13.4 | 9.6 | -38.3 | -32.4 | $ 1,025 |
| ($846) | Point Estimated | 706.6 | 394.8 | 106.8 | 142.2 | 108.4 | 65.9 | 50.6 | $ 1,459 |
| | Upper Bound (95% CI) | 746.6 | 469.7 | 218.1 | 259.8 | 215.4 | 175.7 | 149.7 | $ 1,910 |
| ($\Delta r_{i,t1-t}$) | Lower Bound (95% CI) | 0 | -160 | -280 | -200 | -130 | -49.7 | -49.5 | $ (770) |
| (2.7%) | Point Estimated | 0 | -82.8 | -210 | -130 | -70.8 | 13.8 | 5.3 | $(494) |
| | Upper Bound (95% CI) | 0 | -16.2 | -130 | -70.3 | -9.7 | 76.3 | 59.1 | $(226) |
| ($\Delta g_{i,t1-t}$) | Lower Bound (95% CI) | 0 | -47.7 | -18.8 | 17 | -25.4 | -21.9 | -48.8 | $0 |
| (.3%) | Point Estimated | 0 | 4.3 | 41 | 84.3 | 45.9 | 31.4 | 9.3 | $0 |
| | Upper Bound (95% CI) | 0 | 54.8 | 102.1 | 151.3 | 111.2 | 91 | 66.3 | $0 |
| ($\Delta k_{i,t1-t}$) | Lower Bound (95% CI) | 0 | -32.3 | -160 | -260 | -220 | -170 | -120 | $0 |
| (1.4%) | Point Estimated | 0 | 58.9 | -64.3 | -160 | -130 | -110 | -50.4 | $0 |
| | Upper Bound (95% CI) | 0 | 163.5 | 19.2 | -45.4 | -45.7 | -36.8 | 11.6 | $0 |
| ($\Delta b_{i,t1-t}$) | Lower Bound (95% CI) | 0 | -210 | -120 | -58.2 | -120 | -92.2 | -83.5 | $0 |
| (2.2%) | Point Estimated | 0 | -150 | -38.5 | 56.1 | -28.7 | -7 | -17 | $0 |
| | Upper Bound (95% CI) | 0 | -85.5 | 56.5 | 145.4 | 48.1 | 61.3 | 42.1 | $0 |

* Note: The number in each cell indicates responses of real per capita GDP to a standard deviation shock in the model variables listed in the first column at different periods ranging from year *t* to year *t+6*. Standard deviation value for each variable shocks are reported in parenthesis below each variable's name in the first column. For significance test in impulse response statistics, if the point estimation and the lower and upper bound estimation within 95% confident interval does not cover zero value, the point estimated is statistically significant at .05 level. Net and cumulative effects are found by adding significant responses for each row and are reported in the last column. Lag length test was performed and for the Non-OECD group, 4 lags were found to be appropriate lag length.

**Figure 1. Impulse Response of Real Per Capita GDP to One Standard Deviation Shock of Central Bank Discount Rate in OECD Countries**




As seen across the third row of Table 5 and Figure 1 above, a standard deviation increase in central bank discount rate (2.7) results in $83, $210, $130, and $71 *decrease* in real per capital GDP one-year, two-year, three-year and four-year after the monetary policy change, respectively. These monetary policy effects are statistically significant at .05 level across four-year period given that the upper and lower-bound of each point estimated value does not cover zero; and hence, the point estimated of the effect is statistically significant at .05 level. Note that the central bank discount rate does not have a statistically significant effect on real per capita GDP in the same year as the monetary policy was introduced (i.e., year t or column 3 of the Table). Furthermore, as seen in Table 5 and Figure 1, the effect of monetary policy on real per capita GDP is persistent across four years after the policy was implemented. Once again, these results empirically confirm the first hypothesis that in OECD countries, monetary policy is effective because a lower interest rate induces incentives for investment, while fiscal policy (i.e., government spending variable in the

test) is not relatively effective given that the spending does not have a significant effect on growth when monetary policy is controlled.

As presented in the last column of Table 5, the cumulative effect of monetary policy across the four-year period is $494—that is, for every 2.7% central bank discount rate dropped by the monetary policy authority, the economy is advanced about $494 real per capita GDP across four-year period. Furthermore, the effects of monetary policy can be seen across the four-year period starting from the first year after the interest rate reduction (i.e., year t+1, t+2, t+3, and t+4 columns in the table). This result again empirically supports the first hypothesis that in OECD countries where capital markets are relatively controllable, monetary policy is effective in enhancing economic growth. The possible reason is that interest rate works directly in increasing investment incentive, while fiscal policy tends to be less effective because the private sector can speculate future economy.

**Figure 2. Impulse Response of Real Per Capita GDP to One Standard Deviation Shock of Government Spending in OECD Countries**

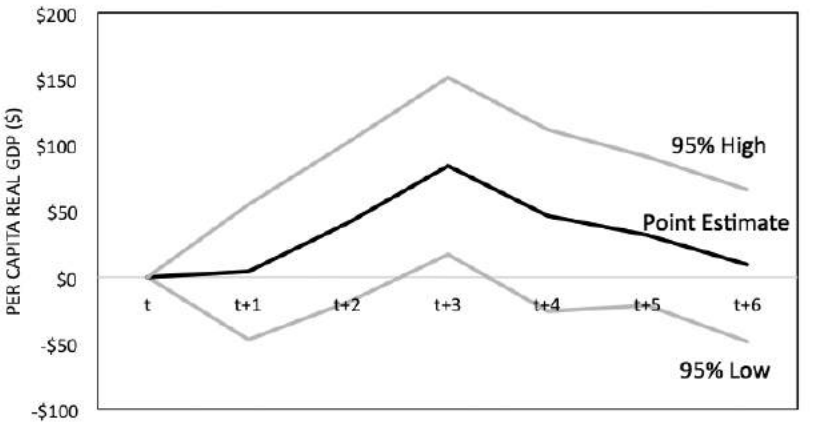


**Figure 3. Impulse Response of Real Per Capita GDP to One Standard Deviation Shock of Capital Formation in OECD Countries**

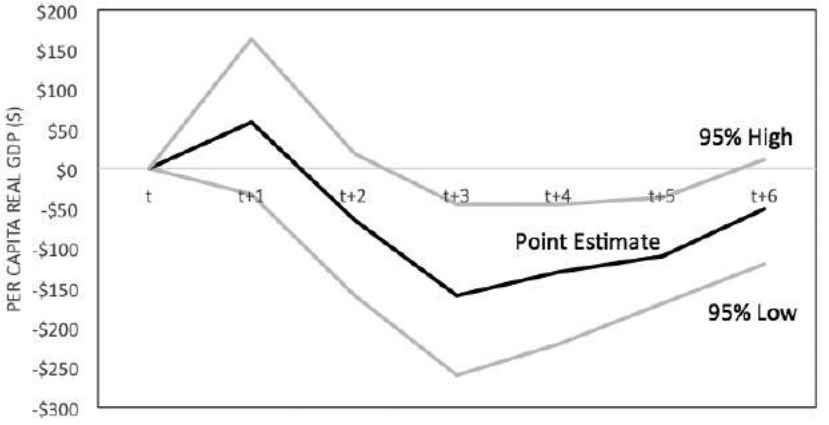
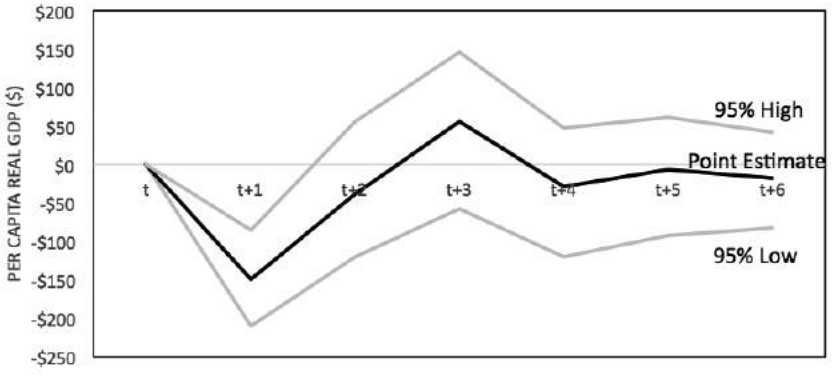



**Figure 4. Impulse Response of Real Per Capita GDP to One Standard Deviation Shock of National Account Balance in OECD Countries**



As presented in rows four, five and six of Table 5 and Figures 2 through 4, government spending, gross fixed capital formation, and national account balance do not significantly affect OECD economies. These results are sensible given that annual government spending rate, cumulative capital stock formation and account balance changes are at about 0, -0.2, and 0.1 per year on average as shown by summary statistics in Table 3. Furthermore, for relatively stable economies, like those in OECD countries, monetary policies tend to be easily predicted by private economic agents; and hence none of these variables is useful in stimulating growth in the OECD economies. Future studies should examine these tentative assumptions to understand the roles of fiscal and monetary policies in well-structured economies such as those in OECD group.

*Impulse Response of Real Per Capita GDP to Fiscal and Monetary Policy in non-OECD Countries*

Table 6 presents estimates of the response of per capita real GDP change to government spending, central bank discount rate, private capital stock and national account balance in non-OECD countries. Figures 5 through 8 present impulse response function of per capita GDP to government spending, central bank discount rate, private capital stock and national account balance in a graphic form.

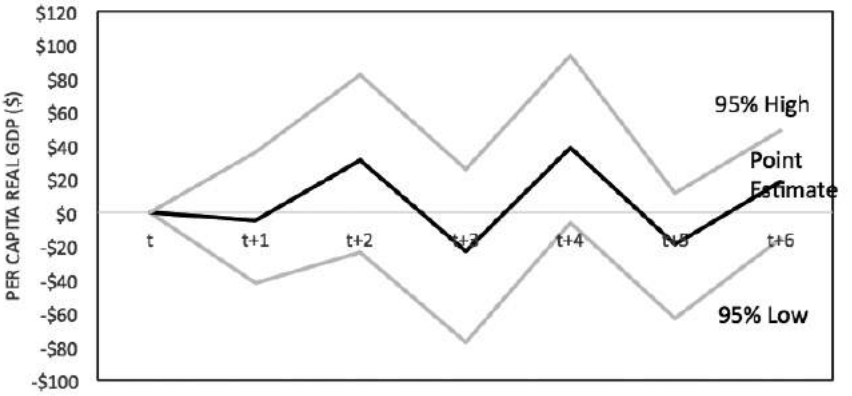
As seen across the second row of Table 6, real per capita GDP exhibits a relatively weak effect compared to those in OECD countries. A one standard deviation ($ 1,172 ) increase in real per capita GDP results in $962, $293, and $176 increase in real per capita income for the current year, two-year, and four-year after the productivity change occurs, respectively. These effects are statistically significant at the .05 level. Again, this confirms that PVAR is an appropriate method given that autocorrelation in GDP data occurs.

**Table 6. Impulse Response of Real Per Capita GDP to Fiscal and Monetary Policy Variables in non-OECD Country***

| Variable | Per Capita GDP Response Size | Year t | Year t+1 | Year t+2 | Year t+3 | Year t+4 | Year t+5 | Year t+6 | Cumulative Effect Across Time |
|---|---|---|---|---|---|---|---|---|---|
| ($\Delta y_{i,t1-t}$) ($1,172) | Lower Bound (95% CI) | 901 | -36.9 | 172.7 | -190 | 21.3 | -74.2 | -37.3 | $ 1,095 |
| | Point Estimated | 962.4 | 209.8 | 292.8 | -9.9 | 176.5 | 56.8 | 44.8 | $ 1,432 |
| | Upper Bound (95% CI) | 1000 | 439.2 | 481.2 | 168.1 | 341.7 | 204.6 | 202.1 | $ 1,823 |
| ($\Delta r_{i,t1-t}$) (48%) | Lower Bound (95% CI) | 0 | -41.9 | -23.6 | -77.4 | -6 | -63.3 | -15.8 | $ 0 |
| | Point Estimated | 0 | -4.5 | 31 | -23.1 | 38.4 | -19 | 18 | $ 0 |
| | Upper Bound (95% CI) | 0 | 35.7 | 82.2 | 25.6 | 93.8 | 11.6 | 48.7 | $ 0 |
| ($\Delta g_{i,t1-t}$) (1.2%) | Lower Bound (95% CI) | 0 | 207.7 | 87 | 15.3 | 5.5 | 6.4 | 3 | $ 325 |
| | Point Estimated | 0 | 348.3 | 256.1 | 141.4 | 99.3 | 98.6 | 82.4 | $ 1,026 |
| | Upper Bound (95% CI) | 0 | 507.6 | 453.9 | 367.6 | 267.2 | 269.9 | 240.7 | $ 2,107 |
| ($\Delta k_{i,t1-t}$) (3.3%) | Lower Bound (95% CI) | 0 | -150 | -61.9 | -390 | -88.8 | -140 | -43.3 | $(390) |
| | Point Estimated | 0 | -10.6 | 41.4 | -230 | -27.6 | -50.1 | 8.5 | $ (230) |
| | Upper Bound (95% CI) | 0 | 134.3 | 145.6 | -55.3 | 50.8 | 13.8 | 70.5 | $ (55) |
| ($\Delta b_{i,t1-t}$) (16.7%) | Lower Bound (95% CI) | 0 | -200 | 2 | -92.3 | -74.4 | -62.4 | -16.1 | $(198) |
| | Point Estimated | 0 | -110 | 124.3 | -24 | -11.3 | -13.2 | 20.6 | $ 14 |
| | Upper Bound (95% CI) | 0 | -23.8 | 249 | 45.9 | 42.2 | 37.9 | 72 | $ 225 |

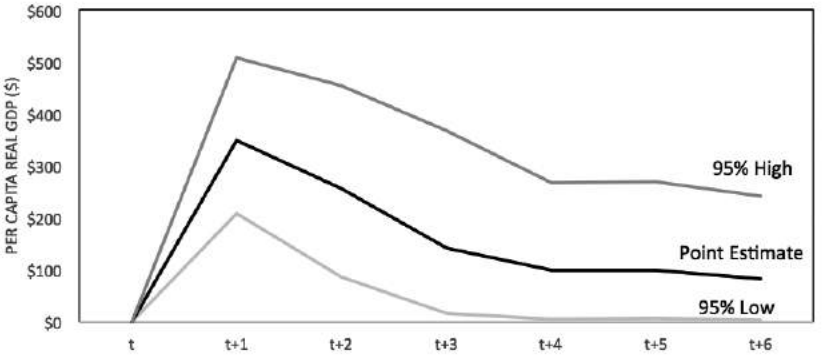
*Note: The number in each cell indicates responses of real per capita GDP to a standard deviation shock in the model variables listed in the first column at different periods ranging from year t to year t+6. Standard deviation value for each variable shocks are reported in parenthesis below each variable's name in the first column. For significance test in impulse response statistics, if the point estimation and the lower and upper bound estimation within 95% confident interval does not cover zero value, the point estimated is statistically significant at .05 level. Net and cumulative effects are found by adding significant responses for each row and are reported in the last column. Lag length test was performed and for the Non-OECD group, 3 lags were found to be appropriate lag length.

**Figure 5. Impulse Response of Real Per Capita GDP to One Standard Deviation Shock of Central Bank Discount Rate in non-OECD Countries**




As seen across the third row of Table 6 and Figure 5, in non-OECD countries, the central bank discount rate does not have a statistically significant effect on developing economies across the testing time period including the same year as the monetary policy was introduced (i.e., year t or column 3 of the Table). In non-OECD countries, the average value of the central bank discount rate is 21.7% (see Table 4), while those in OECD countries is only 7.5% (see Table 3). These statistical data implies that the cost of investment (i.e., discount rate) in the non-OECD countries are relatively large compared to OECD. The results support the El-Shagi (2012) assumption that governance and transparency is the key to decide whether monetary policy should be used in stabilizing economies.

**Figure 6. Impulse Response of Real Per Capita GDP to One Standard Deviation Shock of Government Spending in non-OECD Countries**




In contrast to monetary policy, the PVAR results indicate that fiscal policy is effective in enhancing growth in the non-OECD economies. As presented in the fourth row of Table 6 and Figure 6, fiscal policy is statistically significant to growth across six-year period. A standard deviation increase in government spending (1.2% of GDP as presented in Table 3) results in $348, $256, $141, $99, $99, and $82 increase in real per capita GDP one-year, two-year, three-year, four-year, five-year and six-year after the government spending is implemented, respectively. As shown in Figure 6, these fiscal policy effects are statistically significant at the .05 level across six-year period. Note that the government spending does not have a statistically significant effect on real per capita GDP in the same year as the fiscal policy was introduced (i.e., year t in the Table).

Furthermore, as seen across row three of Table 6 and Figure 6, the effects of government spending on real per capita GDP are persistent across six years after the policy was implemented. The last column of Table 6 indicates that the cumulative effect of fiscal policy is $1,026—that is, for every 1.2% of government spending increase in the first year, economic growth increases by about $1,026 accumulated through the entire period. These positive effects can be seen across the six-year

period starting from the first year after the government spending was introduced (i.e., year t+1, t+2, t+3, t+4, t+5, t+6 columns in the table). Once again, these results empirically confirm the second hypothesis that in non-OECD countries, fiscal policy is better than monetary policy in stimulating economic growth. The potential reason is that in incomplete capital markets, future economies are unpredictable and economic agents interact with fiscal policy.

**Figure 7. Impulse Response of Real Per Capita GDP to One Standard Deviation Shock of Capital Formation in non-OECD Countries**

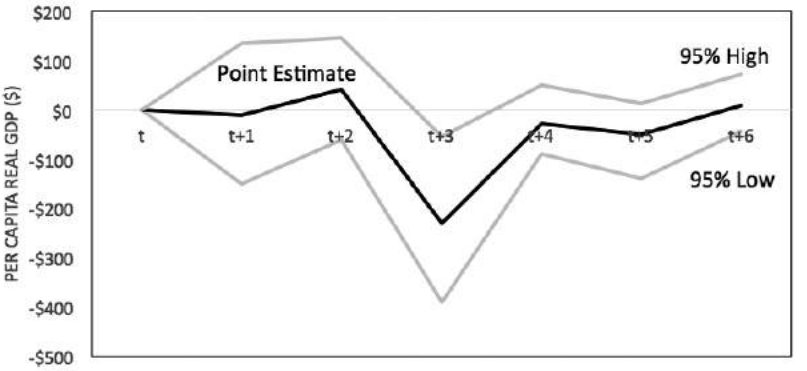
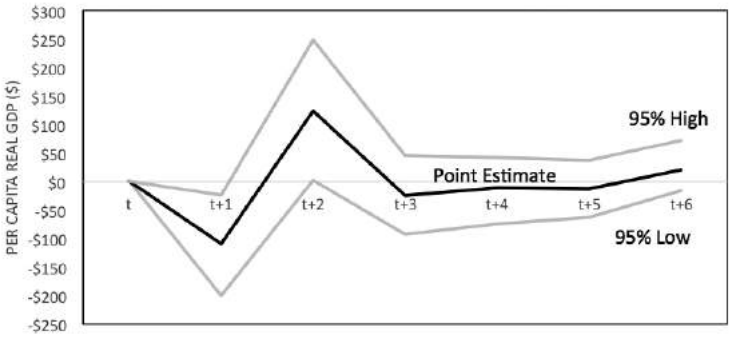



**Figure 8. Impulse Response of Real Per Capita GDP to One Standard Deviation Shock of National Account Balance in non-OECD Countries**



As presented in rows five and six of Table 6 and Figures 7 and 8 above, capital stock and current account balances do not significantly affect non-OECD economies. As shown in summary statistics table (See Table 4), in non-OECD group, the average value of gross fixed capital formation is 21.7% and its national account balance in these countries is 0.41%. The capital investment rate and account balance rate in the non-OECD countries are similar to those of OECD (21.3% and -.03% for capital formation and national balance rates, respectively, see Table 3). These statistical data imply that export and import activities in the non-OECD countries are not helpful in enhancing the economies in both OECD and non-OECD groups.

***Conclusion***

This study empirically examines the effect of fiscal and monetary policies on economic growth measured by the change in real per capita GDP. Fiscal and monetary policies stabilize an economy through different approaches. Monetary policy uses interest rates to stimulate an economy through investment and consumption levels. Meanwhile fiscal policy uses public spending or taxes or both to stimulate an economy through wealth alteration between public and private sectors, and hence, reshuffles the economic structure rather than simply altering production levels.

The study uses PVAR to estimate a system equation of economic growth and macro-economic policies. The results confirm the major hypotheses: public spending enhances productivity in non-OECD countries across a six-year period while central bank discount rate enhances productivity in OECD countries across four-year period. The cumulative effect of reducing central bank discount rate by 2.7% is a $494 increase in real per capita GDP for OECD group. The cumulative effect of increasing government spending by 1.2 % is a $1,026 increase in real per capita GDP for non-OECD group.

The findings add to the international public policy literature that developing and developed countries need different policy tools. This additional knowledge is vitally important for developing countries in which economic growth process is vaguely understood. The study is

somewhat limited in that the variables of perfect and imperfect capital market are not directly tested by the model, but controlled by running the models of separate groups of countries. A future study should address this limitation by incorporating estimates of capital market features to see how the macro-economic policies interact with capital markets and indirectly generate the effects on national productivity through private investment levels.

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