

THE FISCAL RESPONSIVENESS TO ECONOMIC FLUCTUATIONS

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TO ECONOMIC FLUCTUATIONS

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ABSTRACT

In this paper I investigate the pattern of the fiscal responsiveness with economic development and the determinants of the fiscal responsiveness for 79 central governments during 1972 ~ 2007. For the analysis, I estimate the dynamic panel regression, the country-by-country regression and cross sectional regression by using the gap variables of the fiscal outcomes and GDPs.

First, this study finds that as the economy develops it is more stabilized and the fiscal outcomes become less volatile. Second, the fiscal responsiveness of revenue and tax becomes less pro cyclical with economic development. The change of the pattern of the fiscal responsiveness appears to be stronger in the case of expense. The High-Income group has a counter cyclicality in expense. In case of cash surplus/deficit, the responsiveness becomes more pro cyclical with economic development. Third, the fiscal responsiveness shows different cyclicality depending on the economic situation. In addition, the Low-Income group responds more sensitively in the bad situations while the High-Income group shows more sensitive responsiveness in the good situation. Fourth, the more effective governments show more counter cyclicality in total expense and most expense components while they show more pro cyclicality in revenue and surplus/deficit.

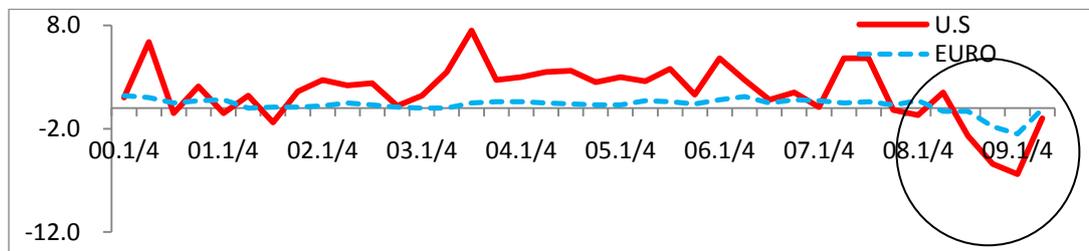
Chapter I.

Introduction

1.1. Background

The global economy has experienced a severe downturn since the subprime mortgage crisis in the United States. It is noted by several economists that the current crisis is serious enough to be compared to the Great Depression in the 1930s. The Federal Reserve chair Ben Bernanke described the situation as having “considerable uncertainty” in the semi-annual report to the Congress in February 2009. International economic organizations also announced the gloomy prospects of the world economy. International Monetary Fund (IMF) forecasted in March 2009¹ that the global economy will record a -0.5~ -1% growth rate on an annual average basis, and that advanced economies will show the “sharpest declines in the post-war era”. Organization for Economic Cooperation and Development (OECD) also reported in March 2009² that the growth rate of the world economy will be - 2.7%.

Figure 1-1 U.S and EURO Zone GDP (q-o-q annualized, %: 2000.1/4-2009.2/4)



Source: U.S Department of Commerce, Euro stat

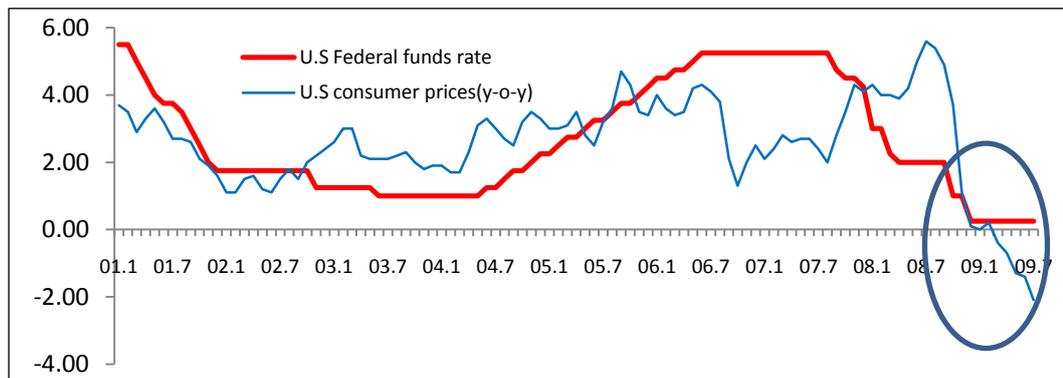
¹ IMF, “IMF Note on Global Economic Policies and Prospects”(March 19, 2009)

² OECD, “OECD Interim Economic Outlook”(March 31, 2009)

Figure 1-1 shows the severe downturn in the developed countries' economies after the subprime mortgage crisis. The growth of developed countries has declined rapidly since the second quarter of 2008.

Many countries have struggled to stabilize the economy corresponding to a rapid contraction. Many governments have tried to make full use of their policy tools including macroeconomic policies, such as monetary policy and fiscal policy, and microeconomic policies, such as industrial policy and welfare policy. Among these policies, monetary policies were the most preferred to control the total demand in developed countries. Monetary policies are mainly conducted by the central bank controlling the base interest rate while fiscal policies are operated by government expenditures and taxations. Recently most central banks are maintaining low interest rates which are allowing less room for expansionary monetary policies for governments.

Figure 1-2 U.S Federal funds rate and Consumer prices (%)



Source: U.S Federal Reserve Board and Department of Labor.

Figure 1-2 shows that the current U.S federal funds rate is at the lowest level since 2001. This places a greater importance on fiscal policies as an option for economic stabilization because monetary policies have limitations. We historically experienced the importance of fiscal policy through the “New Deal” during the Great Depression.

Recently President Barack Obama announced the new economic stimulus package to boost the economy as the first action following the inauguration. Governments in other countries also announced various stimulus packages which were accompanied with expansionary expenditures focusing on stabilizing the current economic situation.

The economic roles of the government are commonly classified into the following four categories, which are sometimes referred as the Musgrave (1999) classification: efficient allocation of resources, income redistribution, economic growth, and stabilization of the economy. As the economy grows, the economic policies of governments have a tendency to more heavily focus on economic stabilization rather than economic growth. Advanced economies have a priority of economic stabilization over economic growth. This can be explained by the convergence theory of Baumol (1986) which has a theoretical base on the Solow (1956) model. According to the convergence theory, richer countries grow more slowly than poor countries. This explains the limitation of capital accumulation and economic growth of advanced economies from which it can be concluded that advanced economies have policies focused on economic stabilization rather than economic growth.

If “convergence theory” focuses on the problem of economic growth, this paper mainly deals with economic stabilization. The main topic of this paper is fiscal policy responsiveness to economic fluctuations. The responsiveness and effectiveness of the fiscal policy can be considered as the stabilization theory, and the fiscal responsiveness can be interpreted as the behavior of the government. As the economy develops, the volatility of the economy decreases, and the fiscal policy becomes more counter cyclical. In other words, the economies of richer countries are more stabilized, and they have more counter-cyclical patterns in their fiscal policy.

In fact, when most governments make the budget, they pursue a balanced budget.

However, most governments have struggled to stabilize the economy through fiscal policy corresponding to economic fluctuations as one of the economic roles of the government. When policy makers and the Congress make the budget, they consider the economic situation or GDP growth rate, inflation, and the exchange rate as important factors.

Despite these realities, economist and researchers have not paid extensive attention to the study of fiscal responsiveness. There are three reasons for the lack of attention on fiscal stabilization policy. First, many economists and researchers have negative views of fiscal stabilizing policy. Keynesian thought traditionally emphasizes an active role in fiscal policy for economic stability throughout “aggregate demand” management. On the other hand, Classical economists have negative views of fiscal stabilizing policy. For example, we can think of the “crowding-out effect” or the “Ricardian equivalence³ (Romer 2006)”. There are many contradicting debates among these; however, it is mostly agreed that these theories illustrate the limitations of fiscal policy as a business cycle controlling tool. The failure of fiscal policies in Latin America during the 1980s and Japan during the 1990s gave a negative experience to economists for controlling business cycles by fiscal policies. Therefore, a number of recent contributions to the fiscal policy literature focus more on efficient resource allocation of public goods and equality in taxation than on macroeconomic business cycle stability. Macroeconomists also more heavily focus on studying economic growth through capital accumulation and productivity improvement. Business cycle stability has been an important monetary policy agenda. The main theoretical debate is whether the central bank should pursue a ‘pre commitment’ path or a ‘discretionary’ path as managing business cycles through interest rates.

³ An increasing government expenditure through bond finance and a tax cut do not affect the total level of demand in an economy.

Second, the business cycle stability policies conducted by controlling the aggregate demand in developed countries are mainly monetary policies but not fiscal policies⁴. Even when fiscal policies are used, they are heavily dependent on the function of an automatic stabilizer than discretionary policies in general. The primary reason that monetary policies are preferred is that fiscal policies have longer policy lags than monetary policies. The United States Federal Open Market Committee (FOMC) meets eight times a year and the Federal Reserve Bank (FRB) decides interest rates independently. For fiscal policies, the annual budgets are determined before hand, and the process of administration decisions and congressional approvals make the policy lag longer and harder to correct. In addition the weakened fiscal discipline and fiscal irreversibility gives a negative image of business cycle controlling through fiscal policies. It is hard to reduce increased government expenditures which risks mid to long term government deficit soundness and can increase uncertainties in establishing monetary policies.

Third, another reason for the lack of attention to fiscal policy is the difficulty to obtain data on fiscal outcomes. To get high quality fiscal data is difficult because each country has a different and unique fiscal accounting or budget system. This makes it difficult to get consistent data for comparing the fiscal policies. Now the government fiscal data comes mainly through the Government Finance Statistics (GFS) of the IMF or OECD⁵. The GFS does not have consistent fiscal data for a long span over the world⁶. The OECD data had a relatively longer span and higher quality. For this reason, Lane (2000) chose OECD data when he studied the cyclicity of the fiscal

⁴ “Monetary policy has been reacting more systematically to output and inflation; long expansions in the 1980s and 1990s demonstrate the effectiveness of such a policy.” (Taylor 2000)

⁵ We can also get a part of the fiscal data through the World Bank. However, the data of the WB come from the IMF, and are more restrictive than the fiscal data of the IMF.

⁶ The IMF changed the methodology from the 1986 GFSM to the 2001 GFSM. This makes it more difficult to obtain consistent data.

policy. Gavin and Perotti (1997) also pointed out the difficulties to obtain the fiscal data in their paper.

However, policy makers consider fiscal policies as important tools for controlling business cycles. As I mentioned, this can be easily seen by the fact that most of the countries responding to the recent financial crisis used stimulus packages. When the government decides budgets, government expenditures, tax revenue and budget deficit or surplus are based on macroeconomic forecasts of economic growth, inflation, and exchange rates. This shows how fiscal policies respond to forecasted business cycle fluctuation. In other words it shows how fiscal policies will actively or passively respond to stabilizing business cycles.

1.2. Research Questions

Regarding fiscal responsiveness to economic fluctuations, we may first ask how the fiscal policy responded to economic fluctuations in history. Apart from the theory, we need to examine the governments' behavior of fiscal stabilizing policy. This question can be decomposed as (1) whether the fiscal responsiveness changed as the economy developed and (2) whether different components of fiscal policy showed different responsiveness. About the fiscal responsiveness with economic development, the preceding research studies focused on comparing developed countries and developing countries. Mainly OECD countries were studied as the case of developed countries, while Latin American countries were examined as the case of developing countries. Most studies showed the fiscal policy was more counter-cyclical in developed countries than in developing countries, and especially Latin America had

strong pro cyclical behavior. Talvi and Vègh (2005) called it “puzzling behavior” and showed that the pro cyclic behavior of government consumption was a widespread phenomenon, which was not confined to Latin America. My paper categorizes countries into 3 groups by using the WB’s criterion in order to examine the change of the fiscal responsiveness with economic development. Second, about the fiscal responsiveness of different components, many preceding empirical studies are restricted to “the aggregate approach”, which focuses on total expenditure, revenue and the deficit. However, Lane (2003) used the concept of “the disaggregate approach”, and emphasized the study of the components of expenditure because the different items of government spending could off-set the other items. My paper uses the “disaggregate approach”, and even uses the data for the expense with the functional classification as well as the economic classification.

Second, we may ask if the fiscal responsiveness can differ depending on the economic situations. Governments may get more pressure to stabilize the economy in bad times rather than in good times. Even in bad times, the degree of the pressure would differ depending on the seriousness of economic situation. For example, the U.S congress approved a stimulus package which President Obama proposed in 2009. It reflects the consensus that the recent recession is very serious. However, the U.S congress rejected stimulus packages which Ex-presidents Bush Sr. and Clinton proposed in 1992 and 1993 for the recovery from the 1990-1991 recessions. Taylor (2000) pointed to the large federal budget deficit in the early 1990s as the reason for rejecting two discretionary fiscal policy proposals. However, considering that the U.S fiscal deficit still exists substantially, the seriousness of a recession might be a possible reason that the U.S Congress made different decisions on stimulus packages in the early 1990s and in 2007. Only a few researchers examined this asymmetry of

the government behaviors depending on the economic situations (Lee and Sung 2007, Gavin and Perotti 1997). These studies categorized the economy into two situations: good times or bad times based on whether the growth rate of GDP is positive or not. In order to examine the asymmetry, my paper details the economic situations: expansion, boom, contraction, and recession. My paper examines the responsiveness of fiscal policies to business cycles and focuses on analyzing the behavior of the government. However, this paper does not include the business cycle control effect of the fiscal policy or the validity of the fiscal policy⁷.

Finally, we may ask what factors affect the fiscal responsiveness. A budget can be considered as the product of the political process. In fact, the budget is considered the same as a law in some countries, for instance the U.S. and Korea. During the budget processing, interest groups take part in the budget decision, and the budget needs congressional approvals. It also depends on the institution of each country. Lane (2003) showed that the degree of power diffusion played an important role in fiscal cyclicity in OECD countries. Stein et al (1998) considered electoral and budget systems as main factors of fiscal pro cyclicity in Latin America. My paper examines the factors which can affect the fiscal responsiveness. The factors include political and institutional factors as well as economic factors. Political and institutional factors include political stability, the level of democracy, and government effectiveness. In addition, Gross National Income (GNI) per capita and government sizes are included as economic structural variables.

⁷ Blanchard and Perotti (2002) studied the effects of the tax and expenditure shocks on output, private consumption, and investment by using the structural VAR model U.S data for the postwar period. In addition, Lee & Sung (2007) studied the effectiveness of fiscal policy in stabilizing the economy

1.3. Contribution of my paper

(1) Extending empirical study with panel data

Previous studies used a limited data set because of the difficulties to obtain fiscal data. Recently Lee and Sung (2007) used a comprehensive data set which was one of their contributions. They used data for 92 countries and compared OECD countries with Non-OECD countries. However, even though they published their paper in 2007, they used the old data for the period 1972-1998. In addition, many preceding studies used the logarithmic data or the growth rate as the variables. They also analyzed correlations of fiscal variables with Gross Domestic Product (GDP) (Talvi and Vègh 2005, Sanchez de Cima 2003, Agénor et al 1999) or Ordinary Least Squares (OLS) (Lane 2003, Strawczynski and Zeira 2007, Gavin and Perotti 1997). My paper uses more comprehensive data than the previous studies by including 79 countries for the period 1972-2007. My paper analyzes two data sets: 61 countries for the period of 1972-2007 and 79 countries for the period of 1990-2007. In addition, gap variables of GDP and fiscal data obtained by de-trending are used as the main variables. Regarding the methodology, a dynamic panel regression is used as well as a county-by-country regression.

(2) The pattern of the fiscal responsiveness given economic development

Previous studies of fiscal responsiveness focused on comparing two groups, or within groups: OECD versus Non-OECD (Lee and Sung 2007); industrial versus developing countries (Talvi and Vègh, 2005); OECD (Lane 2003); European

Monetary Union (EMU) (Gali and Perotti, 2003); G-7⁸ (Fiorito 1997); Latin America (Stein, Talvi and Grisanti, 1998; Gavin and Perotti, 1997); and 12 developing countries (Agénor et al, 1999). My paper grouped countries into three categories following the World Bank's criterion: Low-income, Middle-income, and High-income. It attempts to examine the pattern of the fiscal responsiveness with economic development more clearly and systematically than previous studies. In other words, it examines how the fiscal responsiveness changes as the economy grows.

(3) Analyzing the fiscal responsiveness of components of functional expense

Most studies examined total expenditure, total revenue, and the deficit. Only a few papers used the “disaggregate approach” (Lane 2003, Lee and Sung 2007, Sanchez de Cima 2003). However, they used the data for the components of expense based on the economic classification, such as government consumption, investment, and subsidies. No studies approached the fiscal responsiveness based on functional classification of expense. My paper includes the data for the expense components based on the functional classification, such as defense, economic affairs, education, and social protection as well as based on economic classification. It is a new approach and may provide additional value for policymakers as well as other social researchers.

(4) Decomposing economic situations more in detail

Only a few papers examined the fiscal cyclicity with economic situations (Lee and Sung 2007, Gavin and Perotti 1997). However, these papers categorized the

⁸ Canada, France, Germany, Italy, Japan, UK, USA

economy into two situations: good times or bad times whether the growth rate of GDP is positive or not. My paper decomposes economic situations in more detail than previous studies: bad times, normal, and good times. This can explain the change of the magnitude of the fiscal responsiveness as well as the different pattern of the fiscal responsiveness depending on economic situations.

(5) Examining the determinants of fiscal responsiveness

A few previous empirical studies on the determinants of fiscal cyclicity exist. Lane (2003) examined five determinants of fiscal cyclicity in OECD: output volatility, power dispersion, per capita, openness, and public size. Stein et al (1998) considered the electoral system and budgetary system as determinants of fiscal pro cyclicity in Latin America. My paper uses political variables and institutional variables simultaneously as well as economic variables as structural variables: per capita income, government size, GDP volatility, government effectiveness, political stability, and the degree of democracy.

This paper is organized as follows. In Chapter II, the relate literatures are reviewed. Chapter III describes the data used: fiscal variables, GDP gap, and control variables. In Chapter IV, the models and the methodologies used to analyze the research questions are presented. The empirical test results are shown in Chapter V. Chapter VI concludes the paper.

Chapter II.

Literature Review

2.1. Review on Theoretical issues of fiscal responsiveness

Lane (2003) reviewed the Keynesian and Classical perspectives in terms of the fiscal policy. First of all, Lane introduced the concept of “optimal cyclicality in fiscal policy”. The concept of cyclicality can be considered as the responsiveness to the fluctuations of the economy. Lane also reviewed the two perspectives based on the optimal cyclicality in fiscal policy. According to him, the assumptions about the government role of fiscal policy were different between the two perspectives. Under the classical assumption, government spending was exogenous, which implied that government expenditure should be neutral. On the other hand, Keynesian considered public expenditure as a stabilizer, which meant that government expenditure should be countercyclical. Second, Lane explained the components of fiscal expenditure in terms of the cyclicality of fiscal policy. For example, the cyclicality of the government consumption could be characterized relative to private consumption. If the government spending was a substitute to the private consumption, the fiscal policy could be considered counter cyclical. If both government spending and private consumption were complements then the fiscal policy might be considered pro cyclical. If both were separable then the fiscal policy could be considered acyclical. In case of the government transfers, even though they were built-in automatic stabilizers, opposite movement of benefit rates could be offset. Lane (2003) reviewed the two

perspectives regarding the optimal cyclical policy as above. However, he just introduced the arguments about the fiscal optimal cyclical policy. He did not use the model to explain the optimal cyclical policy. Lane did not conclude which one, counter cyclical or pro cyclical, was optimal. He just showed that each component of fiscal policy had different cyclical policy by using OECD data, and that the political factor could affect the fiscal cyclical policy.

On the other hand, Taylor (2000) showed that fiscal policies had weak effects on controlling business cycles where monetary policies systematically responded to business cycles. He also illustrated that discretionary fiscal policy had the lowest effect for business cycle stability among fiscal policies, by the aggregate demand (AD) and aggregate supply (AS) framework. This followed the classical view by assuming a vertical AS. He went even further and emphasized that discretionary fiscal policy could cause confusion to the monetary policy makers when stabilizing business cycles and discretionary fiscal policies should be focused on tax reforms and social security reforms.

Anderson (2005) insisted that we should examine the effect of fiscal policies on the business cycle separately in the long run and in the short run. If a capital market was perfect, "Ricardian equivalence" would eliminate the fiscal stabilization policy. However, if a capital market was imperfect, the discretionary fiscal policy could affect aggregate demand in the short run. Hence, as long as the capital market was imperfect, an active fiscal policy had an effect to stabilize the economy in the short run.

Talvi and Végh (2005) showed that pro cyclical policy could be an optimal fiscal policy under the political distortion. They showed that the concept tax smoothing introduced by Barro (1979) was consistent with the fiscal policy only in G-7 countries, and that the fiscal policy was pro cyclical in developing countries. According to the

tax smoothing concept, the optimal tax rate should be determined by the permanent changes in government expenditure and output. Temporary changes in government expenditure and output should not affect the tax rate. Talvi and Végh (2000) developed a simple perfect foresight real model of optimal fiscal policy. They assumed that government spending consisted of an exogenous component and an endogenous component⁹. They assumed that endogenous component was a function of the primary surplus. Without political distortions, government spending could be considered as exogenous. However, with political distortions, an endogenous component should be considered. For example, when the economy was in good times, full tax smoothing would result in a large primary surplus. It could happen frequently in the case where the tax base was much more volatile. Under this circumstance, political pressures influenced the government to increase the government spending, instead of reducing it. In this case, the government could dismiss political pressures by reducing the primary surplus. It meant that the government preferred increasing government spending over decreasing it in good times. It implied that pro cyclicality of fiscal policy (i.e., government expenditure increases and taxes decreased in good times) could be optimal given the political distortions. Even though their explanation contrasted with “the prevailing orthodox”, they insisted that it could explain the pro cyclicality in developing countries.

On the other hand, Gali, Gertler and López-Salido (2005) and Gali (2005) showed that the counter cyclical responsiveness was the optimal policy based on the Keynesian view. They provided a theoretical justification for counter cyclicality. They

⁹ Government spending: $g_t = \bar{g} + f(PS_t)$, $PS_t = \phi_t \times c_t + Z_t - g_t$

where \bar{g} is the exogenous component, and PS_t is the primary surplus that satisfies $f(\cdot) > 0$, $f'(\cdot) > 0$, $f''(\cdot) > 0$. ϕ_t is the consumption tax rate, c_t is consumption at period t, z_t is an endowment flow from natural resources.

approached the welfare costs of business cycles in terms of a new Keynesian perspective. They interpreted business cycles as inefficient allocations of the aggregate resources while neo classical economists considered business cycles as optimal responses of the economy to shocks. From the new Keynesian perspective, inefficient allocations could be continued over time. They started their arguments with the definition of the gap between MRS^{10} and MPN^{11} . According to them, the gap denoted the deviation from the steady state, which implied an inefficient economy. From this point, there was room for intervention of the government. The government could play a role to decrease the deviation, or to make the distorted economy the efficient state. They connected this theoretical approach to some empirical evidence¹². By using EMU data for the period 1980-2002, they showed that discretionary fiscal policy in a counter cyclical way reduced the GDP volatility among industrialized countries.

2.2. Review on the fiscal responsiveness to the economic fluctuations.

Previous studies of the responsiveness of fiscal policy could be divided into two groups: cross sectional studies and single country studies. In the case of cross sectional studies, most studies showed three important things. First, the fiscal policy had more counter cyclic responsiveness in the developed countries than in the developing countries. Second, as the economy developed over time, the fiscal responsiveness became more counter cyclical. Third, the different components of fiscal policy had different responsiveness. Most studies showed that government

¹⁰ the (log) marginal rate of substitution between consumption and leisure

¹¹ the (log) marginal product of labor

¹² Gali and Perotti (2003)

expenditure was more counter cyclical than tax revenue.

There were lots of studies comparing two groups or within groups. One approach was to compare the fiscal responsiveness in the developed countries with the developing countries or under developed countries: OECD versus Non-OECD (Lee and Sung 2007) and industrial versus developing countries (Talvi and Végh, 2000). The other approach was to analyze the fiscal responsiveness within groups: OECD (Lane 2003), EMU (Gali and Perotti, 2003), G-7 (Fiorito 1997), and Latin America (Stein, Talvi and Grisanti, 1998; Gavin and Perotti, 1997), and 12 developing countries (Agenor, McDermott and Prasad, 1999).

Lee and Sung (2007) compared OECD countries with Non OECD countries. Their study was the most recent one about fiscal responsiveness¹³, and they used a more comprehensive data set of 94 countries. The data consisted of 22 OECD countries and 72 non-OECD countries for 27 years from 1972 to 1998, which were gathered from the World Bank's World Development Indicators (WDI). They used the word "business cycle" instead of the fluctuation of the economy. As a methodology, they used instrumental variable (IV) estimation to reduce the omitted variable bias of OLS. They showed that OLS regression method understated the fiscal responsiveness. They assumed that the trends in fiscal positions and GDP are second-order polynomial functions of time t ¹⁴. They emphasized that they de-trended the fiscal variables and GDP by using second-order polynomial functions¹⁵. They used the neighboring countries' GDP growth rate as an instrument variable. They showed that fiscal policy,

¹³ Lee and Sung (2007) analyzed the effectiveness of fiscal policy in stabilizing the economy as well as the responsiveness of the fiscal position to business cycle.

¹⁴ Lee and Sung (2007) noted that using a third or fourth order polynomial function delivered very similar empirical results.

¹⁵ $\Delta \ln G_{it} = \beta_0 + \beta_1 \Delta \ln Y_{it} + \beta_2 t + \sum_{j \neq i} \gamma_j D_j + \sum_{s \neq i} \delta_s T_s + \varepsilon_{it}$, where, G_{it} is fiscal position of

country i at time t , D_j is a country dummy for country j , T_s is the year dummy of year s .

both expenditure and revenue, responded much more counter-cyclically in OECD countries than in non-OECD countries. In case of total expenditure, both OECD and non-OECD had counter cyclic fiscal policy. However, the coefficients for OECD were two or three times less than for non-OECD. In other words, total expenditure was more counter cyclical in OECD than in non-OECD. In the case of total revenue, the coefficient for OECD was counter cyclic while that for non-OECD was pro cyclical. Comparing total government expenditures with total revenue, expenditures were much more responsive than taxes, and taxes responded significantly only in OECD countries. Among the components of fiscal policy, current expenditure was strongly counter cyclical, especially in OECD countries, and subsidies and transfers in OECD countries were counter-cyclical while capital expenditures were pro cyclical. Subsidies and transfers in non-OECD countries are not significantly associated with the business cycle. This finding suggested that social welfare systems in OECD countries worked as automatic stabilizers, and that non-OECD countries tended to rely on discretionary expenditures as their economic stabilization policy measure. All three taxes (income, commodity, and social security) were pro cyclical. Counter cyclical subsidies and transfers, and pro cyclical income and social taxes implied that the fiscal policy played a role of auto stabilizer in both OECD and non-OECD countries. They insisted that their results confirmed previous studies (Fiorito, 1997; Sorensen, Wu and Yosha, 2001; Lane 2003) of the fiscal responsiveness in OECD. In addition, they insisted that their study reduced the bias of OLS by using an IV method and that the counter cyclicity of the fiscal policy in their study was much stronger than that in previous studies.

Talvi and Végh (2005) also compared two groups. They used the data of 56 countries for 25 years (1970-1994), which consisted of 20 industrial countries and 36

developing countries. They showed the difference of government behavior in the tax base between industrial countries and developing countries by using the Hodrick-Prescott (HP) filtering method. According to them, taxes in industrial countries, especially in the G-7 case, showed a counter cyclical pattern while in developing countries government expenditure and taxes were pretty much pro cyclical (i.e., increasing government expenditure and decreasing taxes during boom). They called it “puzzling behavior”. In order to explain this puzzling behavior, they set up the optimal fiscal policy model in which political distortion was included. The political distortion meant that the budget surplus generated political pressure to increase government spending. Given this political distortion, if government spending was a positive function of the budget surplus, the government would choose lower taxes and larger government spending in good times. It implied that the optimal fiscal policy could be pro cyclical given the political distortion. This political distortion was used to explain many cases of pro cyclicity in developing countries.

Lane (2003) used the data of 22 traditional OECD members mainly because of a longer span of data and higher quality data. The data were converted into real terms by using the GDP deflator. The unique contribution was that Lane estimated fiscal cyclicity in two steps: country-by-country and a cross sectional regression. As a first step, he estimated the country-by-country regression by OLS with a correction for first-order serial correlation in the error term¹⁶. Lane used the “disaggregated approach” because the aggregate approach could generate misleading results due to offset. Lane decomposed the expenditure variables into several components, such as government investment, government consumption, and transfers. Government consumption was further categorized into wage consumption, non-wage consumption,

¹⁶ $\Delta(\ln G_{it}) = \alpha_i + \beta_{Gi} * \Delta(\ln Y_{it}) + \epsilon_{it}$,

where G was fiscal spending, Y was GDP, and i was the category of fiscal spending.

public sector employment and public sector real wages. The main results of the country-by-country regression showed that government investment was the most pro cyclical. Government consumption and primary surplus were pro cyclical. However, current government consumption and transfers were counter cyclical. Therefore, total government spending was acyclical. However, total government spending excluding debt interest payment was counter cyclical. Moreover Denmark, Iceland, Ireland, and Norway had positive signs, which meant pro cyclical fiscal policy. In estimation of these components of government consumption, public sector wage and wage consumption were typically pro cyclical while other fiscal variables could be thought as acyclic. As a second step, Lane estimated a cross sectional regression by using the cyclicity estimators obtained¹⁷. Lane examined the determinants' impact on the fiscal cyclicity. When Lane estimated the cross sectional model, he used several control variables: output volatility, output per capita, an index of power dispersion, trade openness, and public size. The results of the cross sectional regression showed that the joint of significance of output volatility and political system was very high, especially in total government spending, but not in government consumption and investment. Power dispersion made primary surplus and current spending more pro cyclical. Openness had a stronger positive sign in government investment than the other components. In the decomposition of government consumption, output volatility and political system were more important for pro cyclicity of wage consumption. Output per capita had a negative sign, which implied that the fiscal variables of richer countries were less pro cyclical. Openness was acyclic in government consumption. Public size was more pro cyclical in wage consumption than the other components of

¹⁷ $\hat{\beta}_i = \alpha + \lambda Z_i + v_i$, where $\hat{\beta}_i$ was the set of estimated parameters, and Z_i was the set of control variables.

government consumption, which implied that political factors were important to determine the fiscal cyclicity in OECD countries, especially through wage government consumption. The “disaggregate approach” and the test of country-by-country and cross sectional models could be considered key contributions of this work.

Gali and Perotti (2003) analyzed the stabilizing fiscal ability of EU government due to integration in Europe. They estimated a discretionary fiscal policy rule by using the primary deficit, especially the fiscal policy before and after the Maastricht treaty in EMU countries¹⁸. They compared EMU countries with other EMU countries, such as non-EMU EU countries and other non-EU OECD countries, over the period 1980-2002. They found that discretionary fiscal policy in EMU countries has become more counter cyclical over time, as the same in other industrial countries. In addition, they pointed out that public investment has declined over the last decade in the EMU and worldwide.

Fiorito (1997) examined the stylized facts of government finance in the G-7. He used seasonally adjusted quarterly data for the period 1970-1995 with the Kydland-Prescott (1990) methodology. He found that government revenue was pro cyclically lagging, and that government outlays behaved as a counter cyclical stabilizer. Government spending was pro cyclical only for nonwage consumption and fixed investment. Government transfers, in particular, behaved as lagging countercyclical stabilizers in G-7 countries. He also found that government deficits were strongly counter-cyclical, though there was little evidence that stabilization was equally successful in stimulating the economy.

¹⁸ $d_t^* = \phi_0 + \phi_x E_{t-1}(x_t) + \phi_b Dummy E_{t-1}(x_t) + \phi_b b_{t-1} + \phi_d d_{t-1}^* + U_t$

where d_t^* is the cyclically adjusted deficit for the year t (as measured as a share of potential GDP), $E_{t-1}(x_t)$ is the year t-1 forecast of output gap for year t (% deviation of GDP from potential), Dummy is 1 for post-Maastricht period (1992-2002), and b_{t-1} is the amount of outstanding debt (relative potential GDP) in year t-1.

The studies about under developed countries focused on Latin America. Gavin and Perotti (1997) analyzed data from 13 Latin American countries for the period 1968-1995 by the OLS methodology. They included local government and nonfinancial public enterprises as well as central government. They examined the volatility and cyclicity of fiscal variables. First, they found that in the 1980s the volatility of fiscal outcomes increased dramatically in Latin America and that fiscal outcomes were more volatile in Latin than in industrial countries. They also found that interest payments, transfers, and capital expenditures were highly volatile while total expenditure and revenue were mildly volatile, and surplus was relatively stable in Latin America. Second, the fiscal policy in Latin America was more pro cyclical than in the industrial countries. Fiscal policy is particularly pro cyclical in bad times in Latin America. In addition, government expenditure was more pro cyclical than tax revenue. Capital expenditure was the most pro cyclical component. Regarding the components of spending, Gavin and Perotti (1997) suggested that transfer payments comprised a much lower share of government expenditures in Latin America than the case in OECD countries. This implied a reflection of their underdeveloped social welfare systems.

Agénor, McDermott, and Prasad (1999) studied the stylized features of macroeconomic fluctuations for 12 developing countries. They used quarterly data for 1978-1995 and computed correlations with output to examine the relationships between output business cycle and fiscal policy. They found that the fiscal impulse, which was defined as the ratio of government spending to government revenues, was negatively correlated with the business cycle. This implied counter cyclical fiscal policy. In case of government expenditure, it was counter cyclical in four developing countries: Chile, Korea, Mexico and the Philippines. Government revenues were

counter cyclical in Korea, the Philippines and Uruguay while they were acyclical in Mexico.

In case of single country studies, most studies showed pro cyclicality of the fiscal policy (Lane, 2003; Sorenson, Wu, and Yosha, 2001, Strawczynski and Zeira, 2007, Sanchez de Cima, 2003). Lane (2003) pointed out that the fiscal policy in Ireland was found to be pro cyclical based on time series data. Sorenson et al (2001) studied the fiscal cyclicalities across US states and local governments. Their study was based on data from 48 mainland states for the period 1978-1994. The main variables were surplus revenue and expenditure of state and local government. They tested the fiscal cyclicalities using first differencing regression¹⁹. According to their study, all fiscal variables showed a pro cyclical pattern. U.S. state and local governments exhibited pro cyclical budget surpluses over both short and medium term horizon. The pro cyclical budget surplus came from strongly pro cyclical revenue and weakly pro cyclical expenditure. They pointed out that pro cyclical federal grants enlarged the cyclicalities of state and local governments.

Strawczynski and Zeira (2007) analyzed the fiscal cyclicalities in Israel. They used the data of GDP, public expenditure, income and deficit over the period 1960-2005 by using the OLS method following Lane (2003). They found that the government deficit was mildly counter cyclical while government expenditures, especially public investment, were strongly pro cyclical. They also showed that the pro cyclicalities in Israel were weakened in case of long run trends of output and fiscal policy. However,

¹⁹ Short term : $S_{it} (or \Delta EXP_{it}, or \Delta REV_{it}) = \alpha_{is} + \gamma_{it} + \beta_s \Delta GSP_{it} + \varepsilon_{its}$

where S is surplus, EXP is government expenditure, REV is revenue, α_{is} is “state fixed effect”, γ_{it} is “time fixed effect”, and GSP is gross state product. State government surplus can be broken down as: federal grants, own revenue, and expenditure: $S_{it} = GRANTS_{it} + REV_{it} - EXP_{it}$.

Medium term: using time lag

$$\Delta EXP_{it} = \alpha_{itE} + \beta_{0E} \Delta GSP_{it} + \beta_{1E} \Delta GSP_{i,t-1} + \dots + \beta_{5E} \Delta GSP_{i,t-5} + \varepsilon_{itE}$$

the fiscal policy was still pro cyclical though weakened. Another important finding was that the fiscal cyclicity changed over time. After 1985, the government deficit became more counter cyclical, and the pro cyclicity of government expenditure became much less significant. The reason that 1985 was meaningful is the U.S transferred a large sum to Israel to help “the Stabilization Program” in 1985.

Sanchez de Cima (2003) analyzed the Mexico case using data for 1970-1988. He measured cyclicity by using correlations between HP filtered fiscal variables and output, which was the same way as Agenor et al (1999), Stein et al (1999), and Talvi and Vegh (2000). He found that Mexico showed a pro cyclical fiscal policy during that period. Regarding the components of the government expenditure, federal government capital spending and spending on education tended to be mildly pro cyclical. Federal government current spending, transfers and social spending were more pro cyclical than government spending on education. Public sector current spending and government investment were the most pro cyclical. Government revenue had a positive correlation with real GDP (i.e., pro cyclical) which supported Talvi and Végh (2000). Table 2-1 summarizes the main previous empirical studies.

2.3 Review on the asymmetry of fiscal responsiveness

Some studies examined the asymmetry of the government behaviors depending on the economic situations. The fiscal policy responded pro cyclically during booms, while it responded counter cyclically during recession. This different behavior could be called the asymmetry of fiscal responsiveness. The asymmetry of responsiveness implied that deficit and government size could become large over business cycles.

<Table 2-1> Summary of the Main Previous Studies

Author(year)	Data set	Model	Main Findings
< Comparison developed countries and developing countries>			
Lee and Sung (2007)	94 (22 OECD, 72 non-OECD), 1972-1998	OLS, IV	<ul style="list-style-type: none"> ● More counter cyclical in OECD than in non-OECD ● OLS understates estimates
Talvi and Végh (2005)	56 (20 industrial, 36 Developing countries), 1970-1994	Correlations	<ul style="list-style-type: none"> ● Revenue: pro cyclical in the two groups ● Expenditure: highly pro cyclical in developing.
< Developed countries>			
Fiorito (1997)	G-7	HP	<ul style="list-style-type: none"> ● Counter cyclical policy
Lane (2003)	22 OECD, 1960-1998	OLS	<ul style="list-style-type: none"> ● Expenditure's components: different cyclicality ● Government spending: less pro cyclical in richer countries
Gali and Perotti (2003)	19 (11 EMU, 3 EU, 5 OECD), 1980-2002	IV	<ul style="list-style-type: none"> ● Fiscal policy in EMU: more counter cyclical after 1992
< Developing countries>			
Agénor et al (1999)	12 developing, 1978Q1-1995Q4	Cross correlation	<ul style="list-style-type: none"> ● Counter cyclical in some countries
Stein et al (1997)	26 Latin America	OLS, Cross-section	<ul style="list-style-type: none"> ● Electoral and Budget system affected pro cyclicality
Gavin and Perotti (1997)	13 Latin America	OLS	<ul style="list-style-type: none"> ● Pro cyclical, especially in bad times in Latin America
<Single country>			
Sorenson et al (2001)	U.S. state (48) and local government, 1960-2005	Fixed effect	<ul style="list-style-type: none"> ● Budget surplus: pro cyclical, ● Revenue: strongly pro cyclical. ● Expense: weakly pro cyclical.
Sanchez de Cima (2003)	Mexico, 1970-1988	Correlations	<ul style="list-style-type: none"> ● Pro cyclical in Mexico
Strawczynski & Zeira (2007)	Israel, 1960-2005	OLS	<ul style="list-style-type: none"> ● Pro cyclical in Israel, but less pro cyclical after 1985

Lee and Sung (2007) showed that fiscal policy was asymmetric over economic fluctuations. They showed that fiscal variables, such as government expenditure and tax revenue, responded differently depending on the economic situations. They divided the economic situations depending on the sign of the real GDP growth rates. They assumed that the positive GDP growth rate indicated boom while the negative growth denoted recession. They found that government expenditure was counter cyclic during recessions while it was pro cyclic during booms. In other words, when the economy was in bad times, the government spending expanded strongly, however, when the economy was in good times, the government spending was not tighten. This asymmetric behavior was found in both OECD and non-OECD countries. However, the magnitude of the asymmetry was bigger in non-OECD countries than in OECD countries. During booms, the government spending in OECD countries increased proportionally while the government spending in non-OECD countries increased progressively. On the other hand, during recessions, the role of the government spending to stabilize the economy was stronger in OECD than in non-OECD countries. In case of taxes, only OECD showed counter cyclical response in good times. Asymmetric behavior over economic fluctuations has the important implication that budget deficits or government size can become larger over business cycles

Gavin and Perotti (1997) also classified the economic situations. They defined “bad times” as years during which a country’s real GDP growth rate was less than its average real GDP growth rate minus one standard deviation, and “good times” as all other times. They insisted that the asymmetry observed in the industrial countries was not observed in Latin America. They explained the asymmetry in terms of the relationship between the fiscal balance and output fluctuation. The fiscal balance was more sensitive to output fluctuations in industrial countries than in Latin America. For

example, in the industrial countries, during good times, the change in fiscal surplus increased less than the change in increasing GDP. However, during bad times, the change in fiscal deficit increased as much as the decreasing changes in GDP. During deep recessions, the fiscal deficit increased a lot to stabilize the economy in industrial countries. In contrast to industrial countries, the fiscal policy responded less sensitively to the business cycle during bad times. On the contrary, the fiscal surplus increased in Latin America during recessions. It implied that the fiscal policy in Latin America was pro cyclic especially in bad times. It was this “puzzling behavior” which Talvi and Végh (2005) explained by the relationship between optimal fiscal cyclicity and political distortions.

Lane (2003) explained the fiscal cyclicity related to the political economy. Lane used the concept of the “pro cyclical bias”. During booms, fiscal competition increased, which meant spending could grow more than the growth rate of income, and was called the “voracity effect”. On the other hand, during recessions, there could be the “chilling effect” in fiscal competition. Lane pointed out that these were related to the political systems. The degree of power diffusion played an important role in fiscal cyclicity. The diffused power system had fiscal pro cyclicity. On the other hand, the unitary system had the more counter cyclicity.

2.4 Review on the determinants of fiscal responsiveness

As mentioned above, Talvi and Végh (2005) pointed out that political distortions made pro cyclical fiscal policy in Latin America. Lane (2003) considered five variables (output volatility, output per capita, an index of power dispersion, trade openness, and public size) as determinants of fiscal cyclicity. Lane emphasized that

political factors, such as power dispersion, were important to determine the fiscal cyclicity in OECD countries especially through wage government consumption.

Stein et al (1998) analyzed the relationship between institutional systems and pro cyclicity in Latin America. They examined the fiscal performance of 26 countries in Latin America for the period 1990-1995 by using the data of the consolidated public sector. They studied the impact of two institutional systems (electoral system, budgetary system) on fiscal performances. The fiscal responsiveness was one factor of the fiscal performance²⁰. According to their study, government spending and tax rates in Latin America were pro cyclical. They investigated the relationship between government consumption and output. The results showed that Costa Rica, Mexico, Peru, and Venezuela had the highest pro cyclicity among Latin America. In addition, the electoral system's characteristics could affect the fiscal responsiveness. The electoral system with large district magnitude and a large number of parties could make larger government expenditures and deficits and more pro cyclical fiscal responsiveness. Another finding was that more transparent and hierarchical budget procedures resulted in lower deficits and debt.

As well as political factors, corruptions could affect the fiscal cyclicity mainly through government investment. The government investment may be the most discretionary component among the components of government expenditure. For example, "New Deal Policy" may have helped to overcome the Great Depression. It implies that the government can use the government investment to stabilize the economy as well to grow the economy (Blanchard and Perotti (2002)). However, some previous studies showed that government investment was the most pro cyclical among the components of government expenditures (Lane 2003, Lee and Sung 2007,

²⁰ Stein et al (1998) considered four measures of fiscal performance: the level of government expenditures, the size of fiscal deficit and debt, and the fiscal responsiveness to economy fluctuations.

Sanchez de Cima 2003). On the other hand, it was found that the more corrupted government would likely have a higher proportion of government investment to government expenditure (Mauro 1998). According to Keefer (2007), the governments which are more corrupt have a higher ratio of government investment to government expenditure.

Keefer (2007) explained public investment in the context of insecure property and rent seeking. He used the data of 80 countries for 1974-1998. According to Keefer, it is the fact that the ratio of public investment to national income is much higher in countries with insecure property rights than secure property rights. Public investment was increased by government rent seeking in countries with insecure property rights more than countries with secure property rights.

Mauro (1998) showed that corrupt politicians can affect the composition of government expenditure. In particular, education spending has a negative relationship with corruption. In other words, the corrupted government would reduce the ratio of education to government expenditure. He showed strong evidence that education spending was negatively associated with the corruption. The reason was, according to Mauro, that education was the least attractive to a rent seeker than other items. Mauro agreed with Keefer that corruption could affect the component of government spending, including government investment.

Chapter III.

Data

3.1. Data Sources

The sources of the main variables and information were the IMF's GFS (Government Finance Statistics) and the World Bank's WDI (World Development Indicators). The data on fiscal variables are from the IMF's GFS. The data in the GFS is derived from two frameworks. The data for 1972-1989 are based on the Government Finance Statistics Manual of 1986 (GFSM 1986). The other one is the Government Finance Statistics Manual of 2001 (GFSM 2001) which covers the data for 1990-present. There are some differences²¹ between GFSM 1986 and GFSM 2001. The categories and definitions of fiscal variables are different between these two manuals. Another important difference is the accounting method. The 2001 GFSM is basically conceived from an accrual accounting method instead of the cash-based method of the 1986 GFSM.

Regarding the national account data, the nominal GDP data mainly comes from the IMF, and the GDP deflator and the GNI per capita are obtained mainly from WDI. For the analysis of determinants of the fiscal responsiveness, control variables such as political stability, and government effectiveness are obtained from WGI²² (World Governance Indicators) of the WB. In addition, the Polity 2 data on the degree of democracy is obtained from George Mason University.

²¹ See Appendix 1

²² WGI contains six aggregate indicators of governance for the periods 1996-2008: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. The index ranges from +2.5 (excellence) to -2.5 (worst).

3.2. Data Description

Grouping countries

This paper studies 79 countries. The countries are divided into three groups according to GNI per capita: Low-income (24 countries), Middle-income (21 countries), and High-income (34 countries). The classification in this paper basically follows the WB's criterion²³ except for low-income countries (24) which is composed of low income (4) and lower-middle income countries (20) of the WB's classification together. The reason for the modification is to avoid the problem associated with the insufficient number of observations.

Two data sets

This paper uses annual data from 1972 to 2007 in two data sets. The first one includes 61 countries for 1972-2007. Among the 79 countries, the data for 18 countries are not available for 1972-1989. The second one includes all 79 countries for 1990-2007. In addition, the IMF changed the method of GFS to accrual basis, and it varies in the years which the countries adopted this method. Even some countries still report the fiscal data following the old manual, such as the cash based method. Table 3-1 shows the name of countries in detail.

²³ The World Bank has data for 210 economies. The World Bank categorized the economies into four groups according to GNI per capita, (Atlas method of the WB 2008): low income, \$975 or less; lower-middle income \$976-3,855; upper-middle income, \$3,856-11,905; and high income, \$11,906 or more (See Appendix 2).

<Table 3-1> Classification of income groups

Low-income (1990-2007: 24 countries) (1972-2007: 17 countries)	Middle-income (1990-2007: 21 countries) (1972-2007: 15 countries)	High-income (1990-2007: 34 countries) (1972-2007: 29 countries)
Bhutan Bolivia Côte d'Ivoire* Egypt El Salvador* Georgia* India Indonesia Iran, I.R Lesotho Madagascar* Maldives Moldova* Mongolia* Morocco Myanmar Nepal Nicaragua Pakistan Syrian Arab Rep. Thailand Tunisia Ukraine* Zimbabwe	Argentina Belarus* Bulgaria* Chile Costa Rica Dominican Republic Jamaica Kazakhstan* Lithuania* Malaysia Mauritius Mexico Panama Peru* Poland Romania Russia* Seychelles South Africa Uruguay Venezuela, RB	Australia Austria Bahrain Belgium Canada Croatia* Cyprus Czech Republic* Denmark Estonia* Finland France Germany Greece Hungary Iceland Ireland Israel Italy Korea, Rep Kuwait Luxembourg Malta Netherlands New Zealand* Norway Portugal Singapore Slovak Rep* Spain Sweden Switzerland United Kingdom United States

* 18 countries, denoted with *, do not have the data for 1972-1989

Government level

The GFS system includes several levels of government. The main focus of the coverage of the GFSM 2001 is the general government. The general government includes subsectors: central; state, provincial or regional; and local. Not all countries have all three levels. Some may have only a central government. Other countries may have more or less than three levels. Therefore, this paper focuses on the central government.

The central government is also classified by the source of the finance as Budgetary Central Government, Extra budgetary Central Government, Social Security Central Government, Consolidation Central Government and Consolidated Central Government. This paper uses the data of the consolidated central government for several reasons. First, the central government is a large and complex government unit in most countries. In addition, most countries report the fiscal data of the central government. Second, the central government plays a particularly important role to stabilize the economy through its economic operations, such as monetary or fiscal policies. Third, the central government typically is responsible for providing collective services, such as national defense, public order and safety, and the efficient operation of the social and economic system of the country. Finally, based on the reasons above, the consolidated central government is the most comprehensive form among the classification of central governments.

Fiscal Variables

This paper studies twenty fiscal variables that are parts of whole fiscal sectors²⁴. Six variables related to revenue mainly focused on taxes. In the case of expenses, there are thirteen variables studied in this paper. There are two classifications of expenses: an economic classification and a functional classification. From the economic classification, five variables are analyzed. From the functional classification, seven variables are considered in this paper. Finally, a cash surplus/deficit variable is also analyzed. In addition, the data for 1972-1989, based on the classification of the 1986 GFSM, are converted into the classification of the 2001 GFSM, following IMF's formula²⁵. The fiscal variables for this paper are shown in Table 3-2.

<Table 3-2> Fiscal variables

Variable	Coverage
Revenue (6)	
Revenue	Increase in net worth resulting from a transaction.
Taxes	Revenue minus social security contributions. Grouped into six categories: taxes on income, profits and capital gains; taxes on payroll and workforce; taxes on property; taxes on goods and services; taxes on international trade and transactions; other taxes
Taxes on income, profits, and capital gains	Payable by individuals and payable by corporations and other enterprises.
Taxes on property	Various taxes on property and wealth: Recurrent taxes on immovable property; Recurrent taxes on net wealth; Estate, inheritance, gift taxes; Taxes on financial and capital transactions; and other non recurrent taxes on property.

²⁴ This paper doesn't cover all fiscal variables. This paper does not use fiscal variables which have many missing or zero values, such as taxes on payroll and work force, taxes on international trade and transaction, and environment protection. See Appendix 3.

²⁵ See Appendix 4.

Taxes on goods and Services	Various taxes on goods and services: General taxes on goods and services; Excises; Profits of fiscal monopolies; Taxes on specific services; Taxes on use of goods and on permission to use goods or perform activities; other taxes on goods and services.
Social contribution	Actual or imputed receipts either from employers on behalf of their employees or from employees, self employed, or non employed persons on their own behalf that secure entitlement to social benefits for the contributors, their dependents, or their survivors.

Expense (13): Economic classification (6)

Expense	Decrease in net worth resulting from transaction in order to provide selected goods and services to the community on a nonmarket basis and to redistribute income and wealth by means of transfer payments.
Employee Compensation	Wages and salaries, and social contributions.
Use of goods and services	All goods and services consumed by a government unit to produce nonmarket goods and services
Interest	Interests to nonresidents, residents other than general government units, and general government units.
Subsidies	Subsidies to public corporations, and private enterprises
Social benefits	Social security benefits, social assistance benefits, and government employee social benefits

Expense: Functional classification (7)

Defense	Military defense, civil defense, foreign military aid, and R&D defense.
Economic affairs	Labor, industrial, and R&D affairs: General economic, commercial, and labor affairs; Agriculture, forestry, fishing, and hunting; Fuel and energy; Mining, manufacturing, and construction; Transport; Communication; other industries; R&D economic affairs.
Housing and community amenities	Housing development, community development, water supply, street lighting, and R&D housing and community amenities.
Health	Medical products, appliances, and equipment, outpatient services, hospital services, public health services, and R&D health.

Recreation, culture, and Religion	Recreational and sporting services, cultural services, broadcasting and publishing services, religious and other community services, and R&D recreation, culture, and religion.
Education	Pre-primary and primary education, secondary education, postsecondary non tertiary education, tertiary education, education not definable by level, and R&D education.
Social protection	Various supports to the disabled and the weakness: sickness and disability; old age; survivors; family and children; unemployment; housing; social exclusion; and R&D protection.
Cash surplus/deficit (1)	
Cash surplus/deficit	Net cash inflow from operating activities minus the net cash outflow from investments in nonfinancial assets. In the 1986 GFSM nonfinancial assets were included under revenue and expenditure in gross terms. This cash surplus or deficit is closest to the earlier overall budget balance (still missing is lending minus repayments, which are now a financing item under net acquisition of financial assets).

Source: IMF

Control variables

Control variables are used to analyze the determinants of fiscal responsiveness. This paper uses different variables between broad categories and the components of expenses. Lane (2003) used the same control variables for broad categories and government expenditure components.

For the analysis of the determinants of broad categories such as revenue, expense and surplus/deficit, the following variables are used: Volatility, GDP, public size, government effectiveness, and politics. Volatility represents an economic volatility, measured as the standard deviation of the GDP gap for 1990-2007. GDP represents an economic size, measured as the average GDP for the 2000s at current U.S billion dollars. The public size is the ratio of the government sector to GDP. In the case of

revenue (or expenses), the public size is measured as the average ratio of revenue (or expenses) to GDP for 1990-2007. The Revenue/GDP variable is used to analyze the impacts of determinants on revenue variables, and the expense/GDP variable is used to examine the impacts on the expense variables. The effectiveness variable represents the quality of government activities. The politics variable represents the degree of political stability. These two indexes are calculated as the average over the period 2000-2008. The range of the two indexes is from +2.5 to -2.5.

For the analysis of the determinants of the expense components, the following variables are used: GDP, public size, effectiveness, share, and democracy. The GDP, the public size, and effectiveness are same as in the broad category case. The share is the ratio of the expense components to total expenses. The democracy variable represents the Polity 2 index, which measures the development of democracy. It ranges from +10 (strongly democratic) to -10 (strongly autocratic). The reason to use the share and democracy variables rather than volatility and politics is that the share and democracy variables can explain the components' characteristics more significantly than GDP volatility and political stability. Table 3-3 summarizes the control variables.

Data management

This paper uses fiscal variables based on the classification of the 2001 GFSM. The data for 1972-1989, based on the classification of the 1986 GFSM, are converted into the classification of the 2001 GFSM following IMF's document²⁶.

²⁶ "Classification of GFSM 1986 Data to the GFSM 2001 Framework", available on the IMF's website

<Table 3-3> Summary of Control variables

Variable	Obs	Mean	S. D	Min	Max
Volatility	61 (79)	0.0549 (0.0687)	0.0433 (0.059)	0.0111 (0.0111)	0.2674 (0.2807)
GDP	61 (79)	512.4587 (413.3282)	1572.921 (1393.943)	0.7938 (0.7938)	11859.29 (11859.29)
Effectiveness	61 (79)	0.6775 (0.5136)	1.023 (1.0209)	-1.4915 (-1.4915)	2.2725 (2.2725)
Politics	61 (79)	0.2716 (0.2207)	0.8898 (0.8736)	-1.8217 (-1.9206)	1.5496 (1.5496)
Democracy	56 (73)	5.8243 (5.8575)	6.318 (5.9677)	-8 (-8)	10 (10)
Public size					
Revenue/GDP	60 (72)	0.2780 (0.2742)	0.1426 (0.1349)	0.0002 (0.0002)	0.8159 (815.9147)
Expense/GDP	58 (67)	0.2889 (0.2868)	0.1746 (0.1661)	0.0002 (0.0002)	0.9180 (0.9180)
Share					
cem/expense	58 (76)	0.233 (-0.225)	0.129 (-0.1282)	0.0459 (-0.0459)	0.5845 (-0.5845)
ugs/expense	58 (76)	0.1593 (0.16993)	0.1088 (0.1008)	0.0374 (0.0374)	0.7021 (0.7021)
int/expense	59 (77)	0.1184 (0.1104)	0.0729 (0.0714)	0.0046 (0.0047)	0.3495 (0.3495)
sub/expense	54 (72)	0.0555 (0.0556)	0.0548 (0.0517)	0.0002 (0.0002)	0.3009 (0.3009)
scb/expense	54 (71)	0.271 (0.2847)	0.1566 (0.1513)	0.0143 (0.0143)	0.5312 (0.5312)
def/expense	57 (73)	0.0868 (0.0832)	0.0838 (0.0768)	0.00003 (0.0003)	0.4535 (0.4535)
eca/expense	60 (76)	0.1459 (0.1459)	0.1273 (0.1182)	0.00005 (0.00005)	0.8212 (0.8212)
hus/expense	60 (76)	0.0361 (0.0327)	0.036 (0.0344)	0 (0)	0.1987 (0.1987)
hel/expense	60 (76)	0.0872 (0.0896)	0.0605 (0.0599)	0.0001 (0.0001)	0.2574 (0.2574)
edu/expense	60 (76)	0.123 (0.1166)	0.0759 (0.0732)	0.00009 (0.00009)	0.2506 (0.2506)
rec/expense	57 (73)	0.0151 (0.016)	0.0209 (0.0192)	0.00001 (0.00001)	0.1443 (0.1443)
spt/expense	58 (74)	0.2358 (0.2545)	0.16669 (0.1581)	0.0004 (0.0004)	0.5964 (0.5964)

Note: Volatility is the volatility of GDP, measured as standard deviation of GDP gap for the period 1990-2007. GDP is the amount of GDP, measured as the average of GDP for the period 2000s at current U.S billion dollar. Public size is the average ratio of expense (or revenue)/GDP for 1990-1995. Share is the ratio of the expense component to total expenses. Effectiveness is the quality of public services, the degree of its independence from political pressures (+2.5=excellent, -2.5 = worst governance). Politics is the degree of stability and violence (+2.5=stabilized, -2.5=destabilized). Democracy is “Polity 2” index (+10=strongly democratic;-10=strongly autocratic). def=defense, eca=economic affairs, hus=housing and community amenities, hel=health, rec=recreation & culture & religion, edu=education, spt=social protection. () denotes the data for 79 countries for 1990-2007.

All fiscal variables are reported based on local currencies. Since they are nominal values, they are converted into real values (constant prices in 2000) using the GDP deflator²⁷. Nominal GDPs are also converted into real values in 2000. Even though we can get the data for real GDP from WDI, the base year varies for each country. So, in some cases (i.e. high inflation) fiscal values can be larger than real GDP. Therefore, this paper converts nominal GDP data into real GDP by using the GDP deflator.

There exist many data points with zero values. In some cases, countries did not report the data due to the difference in the fiscal system. In these cases, zero values are considered as missing data.

In the regression of the fiscal responsiveness, the gap of government spending (or revenue) and the output gap of GDP are used. These gap data are defined as the gap between actual values and trended values. The trended values for fiscal variables are derived by linear de-trending for each interval: 1972-1989, cash-based, and accrual based.

Linear de-trending: $g = \{1, t\}$

$$g_t = g_t^* + u_t$$

where g is an actual fiscal variable: expense, revenue and surplus/deficit, g^* is a trended fiscal variable, and u_t is a residual. On the other hand, the trended values for the GDP variable are derived by quadratic de-trending. The quadratic de-trending makes the data stationary.

Quadratic de-trending: $y = \{1, t, t^2\}$

$$y_t = y_t^* + u_t$$

where y is an actual output, y^* is a trended output, and u_t is a residual.

²⁷ (Current fiscal value* GDP deflator in 2000)/GDP deflator in current year.

3.3. Description of key variables

3.3.1. Definition of key variables

This paper defines the explanatory and dependent variables in the regression of the fiscal responsiveness as follows:

- a. Explanatory variable: \tilde{y}_t

$$\tilde{y}_t = \frac{y_t - y_t^*}{y_t^*}$$

where \tilde{y}_t is the output gap of GDP, y_t is the real GDP and y_t^* is the de-trended GDP which is computed by quadratic de-trending.

- b. Dependent variable

- b.1. Expense or Revenue: \tilde{g}_t

$$\tilde{g}_t = \frac{g_t - g_t^*}{g_t^*}$$

where \tilde{g}_t is the gap of the government expense (or revenue), measured as the fraction of the real trended government expense (or revenue), g_t is the real current government spending (or revenue), g_t^* is the real de-trended government spending (or revenue) by linear de-trending.

- b.2. Cash surplus/deficit: \tilde{d}_t

$$\tilde{d}_t = \frac{d_t - d_t^*}{y_t}$$

where \tilde{d}_t is the gap of the real cash surplus/deficit, measured as the fraction the real GDP (y_t), and d_t^* is the real de-trended surplus/deficit by linear de-trending. In this case, the denominator is the GDP data instead of the real de trended cash

surplus/deficit because of the sign problem. The real de trended cash surplus/deficit can be negative, which makes the result reverse. Therefore, this paper uses the real GDP as the denominator.

The above “gap approach” has some benefits over using growth rates and logged variables. This approach can increase the observation numbers, given by the data based on the amount. The fiscal data has two structural breaks and three intervals: 1972-1989, cash-based, and accrual-based. So, there exists at least one kinked or shifted point. However, the gap data can be obtained based on the different slopes over each interval without losing the consistency.

3.3.2. Volatility of key variables

Table 3-4 reports summary statistics of the key variables and GDP. Table 3-4(a) covers the period 1972-2007 for 61 countries. The number of GDP observations is 2,093, and the number of observations of the fiscal variables is 32,916. Table 3-4(b) covers the periods 1990-2007 for 79 countries. In this case, the number of GDP observations is 1,388, and the number of observations of fiscal variables is 21,516. In Table 3-4, the variables denote the gap measured as the proportion of de trended value (or fitted value), following the above definitions. The stated Mean represents the average of the mean for each country by income group. The Mean in each country comes from the average of the residuals from de-trending. Hence, it should be close to zero.

<Table 3-4> Summary of key variables

(a) 61 countries (1972-2007)

		gdp	rev	tax	tip	top	tgs	scn	exp	cem	ugs	int	sub	scb	def	eca	hus	hel	edu	rec	spt	csd
All	N	2093	1881	1934	1913	1731	1899	1619	1841	1747	1745	1797	983	985	1545	1625	1623	1641	1647	1513	1568	1679
	MIN	-	-0.679	-2.171	-29.082	-11.353	-6.435	-16.106	-14.132	-0.541	-9.865	-63.989	-42.681	-2.243	-1.571	-12.550	-14.027	-2.764	-0.737	-2.426	-33.900	-195.017
	MAX	51.713	4.788	2.767	4.285	7.984	70.283	19.787	2.325	37.905	4.716	71.938	30.283	10.263	1.266	1.962	166.322	14.114	4.215	6.939	21.495	268.667
	MEAN	0.035	0.006	0.000	-0.024	-0.004	0.047	0.004	-0.008	0.028	-0.006	-0.028	-0.083	0.012	-0.001	-0.003	0.147	0.011	0.007	0.012	-0.008	-0.010
	S.D	0.348	0.107	0.118	0.321	0.557	0.439	0.279	0.130	0.235	0.206	1.025	0.798	0.176	0.143	0.226	1.484	0.263	0.142	0.341	0.433	2.033
Low income	N	577	504	514	509	441	514	302	445	386	383	428	186	153	413	444	447	449	449	361	369	498
	MIN	-0.312	-0.485	-0.593	-29.082	-10.490	-6.435	-16.106	-14.132	-0.541	-9.865	-63.989	-5.252	-0.668	-1.571	-0.842	-6.209	-0.529	-0.570	-0.837	-11.072	-0.276
	MAX	4.688	4.788	1.970	4.285	6.323	5.768	19.787	2.325	37.905	4.716	71.938	11.629	1.729	1.227	1.160	166.322	3.255	4.215	5.929	21.495	0.220
	MEAN	0.039	0.016	0.009	-0.066	-0.034	0.008	0.011	-0.031	0.106	-0.035	-0.059	-0.134	0.019	-0.008	0.005	0.333	0.018	0.018	0.045	0.017	0.000
	S.D	0.232	0.175	0.161	0.720	0.652	0.337	0.686	0.276	0.648	0.403	2.146	0.977	0.213	0.211	0.249	2.546	0.241	0.199	0.468	0.684	0.028
Middle income	N	488	419	428	413	349	409	410	422	408	408	412	207	229	284	316	307	318	320	279	322	423
	MIN	-0.339	-0.421	-0.442	-0.542	-4.096	-3.275	-0.714	-0.328	-0.502	-0.524	-18.896	-42.681	-2.243	-0.452	-0.630	-14.027	-1.779	-0.737	-2.426	-33.900	-195.017
	MAX	2.531	2.185	2.767	2.279	7.984	1.645	2.034	0.402	3.251	1.348	2.530	1.559	10.263	0.940	1.962	105.943	14.114	0.886	2.318	1.178	268.667
	MEAN	0.011	0.005	0.005	0.007	0.024	-0.017	0.004	0.001	0.008	0.004	-0.077	-0.403	0.033	0.001	0.006	0.238	0.026	0.001	-0.023	-0.090	-0.012
	S.D	0.137	0.118	0.129	0.204	0.831	0.212	0.188	0.099	0.158	0.188	0.638	1.316	0.374	0.145	0.221	2.170	0.354	0.143	0.372	0.606	4.900
High income	N	1028	958	992	991	941	976	907	974	953	954	957	590	603	848	865	869	874	878	873	877	758
	MIN	-	-0.679	-2.171	-6.008	-11.353	-1.574	-4.203	-0.325	-0.374	-0.620	-13.353	-0.739	-0.707	-0.425	-12.550	-13.438	-2.764	-0.522	-0.890	-0.815	-87.800
	MAX	51.713	0.415	0.946	1.047	6.449	70.283	2.681	1.108	0.781	2.646	17.458	30.283	0.847	1.266	1.402	4.807	3.479	1.632	6.939	15.388	50.768
	MEAN	0.045	0.001	-0.009	-0.015	-0.003	0.104	0.001	0.001	0.001	0.004	0.013	0.089	0.000	0.002	-0.012	-0.009	0.000	0.003	0.011	0.021	-0.015
	S.D	0.524	0.060	0.087	0.148	0.363	0.616	0.134	0.060	0.076	0.119	0.645	0.474	0.067	0.105	0.216	0.506	0.229	0.108	0.256	0.205	1.726

(b) 79 countries (1990-2007)

		gdp	rev	tax	Tip	top	tgs	scn	exp	cem	ugs	int	sub	scb	def	eca	hus	hel	edu	rec	spt	csd
All	N	1388	1212	1233	1230	1014	1212	1032	1166	1168	1167	1191	983	1002	972	1025	994	1023	1025	944	982	986
	MIN	-0.699	-0.721	-0.932	-10.435	-10.490	-3.275	-16.106	-14.132	-0.712	-4.789	-5.690	-42.681	-5.613	-2.240	-0.710	-43.562	-10.761	-7.607	-2.426	-33.900	-17.221
	MAX	0.663	4.788	2.084	4.285	13.737	2.369	19.787	2.325	37.905	4.716	8.653	30.283	10.263	2.964	1.961	166.322	53.023	2.583	6.939	21.495	6.830
	MEAN	0.001	0.008	0.005	-0.009	-0.037	-0.001	-0.005	-0.009	0.038	0.001	-0.008	-0.075	-0.003	-0.009	0.004	0.059	0.048	-0.002	0.011	-0.014	0.000
	S.D	0.069	0.111	0.110	0.265	0.575	0.143	0.261	0.128	0.239	0.183	0.256	0.806	0.199	0.151	0.201	1.219	0.476	0.163	0.275	0.451	0.224
Low income	N	416	346	346	345	269	346	215	283	290	285	313	218	187	274	291	276	291	291	236	249	329
	MIN	-0.255	-0.721	-0.689	-10.435	-10.490	-0.713	-16.106	-14.132	-0.712	-4.789	-1.720	-5.252	-5.613	-2.240	-0.710	-6.209	-10.761	-7.607	-0.800	-11.072	-0.276
	MAX	0.542	4.788	2.084	4.285	13.737	2.369	19.787	2.325	37.905	4.716	1.142	11.629	1.729	2.964	1.396	166.322	53.023	2.583	5.444	21.495	0.200
	MEAN	0.003	0.025	0.011	-0.024	-0.029	0.010	-0.003	-0.052	0.148	-0.007	-0.024	-0.002	-0.041	-0.017	0.010	0.562	0.145	-0.010	0.021	0.048	0.000
	S.D	0.094	0.329	0.205	0.877	1.244	0.252	1.784	0.885	2.240	0.498	0.347	1.209	0.567	0.341	0.291	10.051	3.224	0.530	0.466	1.643	0.032
Middle income	N	386	333	339	338	246	332	315	342	337	339	338	266	304	243	266	254	266	266	240	266	340
	MIN	-0.699	-0.272	-0.344	-2.712	-4.096	-3.275	-0.545	-0.440	-0.418	-0.524	-5.690	-42.681	-2.243	-0.441	-0.580	-43.562	-0.778	-0.737	-2.426	-33.900	-0.164
	MAX	0.663	0.834	0.647	2.780	7.984	1.645	0.722	0.627	3.472	1.348	1.965	7.522	10.263	0.791	1.961	6.279	4.358	1.376	2.060	1.178	0.127
	MEAN	0.001	0.002	0.002	0.005	-0.037	-0.014	0.001	0.001	0.018	0.005	-0.011	-0.207	0.032	0.003	0.007	-0.239	0.023	0.006	0.002	-0.137	0.000
	S.D	0.097	0.123	0.125	0.320	1.088	0.294	0.145	0.114	0.253	0.225	0.421	2.761	0.656	0.174	0.260	3.005	0.359	0.222	0.338	2.093	0.026
High income	N	586	533	548	547	499	534	502	541	541	543	540	499	511	455	468	464	466	468	468	467	317
	MIN	-0.425	-0.679	-0.932	-0.835	-1.633	-0.623	-4.203	-0.274	-0.374	-0.524	-3.505	-0.763	-0.707	-0.389	-0.609	-13.438	-2.764	-0.435	-0.890	-0.815	-17.221
	MAX	0.615	0.304	0.673	0.987	3.581	0.898	1.856	0.370	0.781	1.006	8.653	30.283	0.847	1.266	0.887	4.807	3.321	1.632	6.939	15.388	6.830
	MEAN	0.000	0.000	0.001	0.002	-0.007	0.000	-0.004	0.001	0.001	0.001	0.004	0.070	0.000	0.001	-0.001	-0.035	0.004	0.003	0.015	0.035	-0.001
	STD	0.071	0.067	0.086	0.128	0.339	0.092	0.229	0.051	0.081	0.124	0.444	1.377	0.096	0.125	0.170	0.895	0.354	0.126	0.491	0.740	1.180

Note: gdp= GDP, rev=revenue, tax=taxes, tip=tax on income & profits & capital gains, tgs=taxes on goods & services, top=taxes on property, scn=social contribution, exp=expense, cem=compensation of employees, ugs= use of goods and services, int=interest, sub=subsidies, scb=social benefits, def=defense, eca=economic affairs, hus=housing and community amenities, hel=health, rec=recreation & culture & religion, edu=education, spt=social protection, csd=cash surplus/deficit. MEAN is the average of mean of countries in each income group, and S.D is the average of standard deviations of countries in each income group.

From Table 3-4, we need to focus on S.D (standard deviation) because it can be considered as the degree of volatility of the variable. S.D is measured as the average of standard deviations of countries by income groups. In the case of GDP, Table 3-4(a) shows that the S.D of the High-Income group is the largest. However, we should be careful that S.D represents the average of S.Ds by income groups. We can find a pattern from Figure 3-1. In Figure 3-1, the X axis represents country by GNI per capita, measured as the average of GNI per capita for 2000-2007. For example, 0 denotes the poorest country (Madagascar), and 79 is the richest country (Luxembourg). Figure 3-1(a) shows that the values of S.D in the High-Income group are less than in the other groups. In other words, the economies of the High-Income group are more stabilized than the economies of the Low-Income and Middle-Income groups.

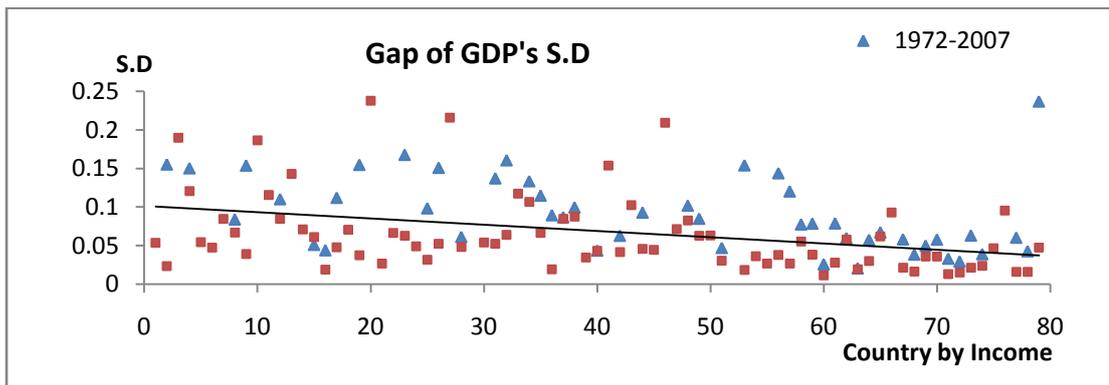
In the case of revenue, both Table 3-4(a) and Table 3-4(b) show that revenue has become less volatile with economic development. We can also see this pattern in Figure 3-1(b), which supports Gavin and Perotti (1997) who found that fiscal outcomes were more volatile in Latin America than in industrial countries. In the case of taxes, both Table 3-4(a) and Table 3-4(b) show that as the economy develops the volatility of taxes decreases. We can also see this pattern in Figure 3-1(c), which supports Talvi and Végh (2005) who found that the volatility of the tax base was higher in developing countries than in industrial countries. For most of the components of revenue, the Middle-Income group has smaller S.Ds than the Low-Income group, except taxes on property in Table 3-4(a) and taxes on goods and services in Table 3-4(b). In addition, the High-Income group has smaller S.Ds than the Middle-Income group, except taxes on goods and services in Table 3-4(b).

Expenses exhibit a similar pattern to revenue. Table 3-4 and Figure 3-1(d) show that the High-Income group has smaller volatility than the other groups. In other words, expenses become less volatile with economic development, which also supports Gavin and Perotti (1997). Regarding components of expenses, in the case of compensation of employees and usage of goods and services, the higher income group has smaller S.Ds than the lower income group. However, in the case of interest payments, the higher income group has larger S.Ds than the lower income group. Regarding this, we need to account for cash surplus/deficit, and we conjecture that the inability of the government of the Low-Income group to borrow money for public finance results in less volatility in interest payments. In the case of subsidies and social benefits, the Middle-Income group has larger S.D than the Low-Income group. However, the High-Income group has smaller S.D than the Middle-Income group.

In the case of functional components of expenses, it might be generally considered that the higher income group has smaller S.Ds than the lower income groups. In the case of defense, economic affairs, housing and community amenities, and education expenses, the higher income group has smaller S.Ds than the lower income group in both Table 3-4(a) and Table 3-4(b). However, in the case of health affairs, and social protection, the Middle-Income group has larger S.Ds than the Low-Income group in Table 3-4(a) (1972-2007, 61 countries). Regarding this, we conjecture the reason that the Middle-Income group starts to spend budget for social welfare policy while the Low-Income group cannot afford to spend budget for social welfare policy. In the case of recreation and religion affairs, Table 3-4 shows that the volatility becomes smaller with economic development (except for the High-Income group in Table 3-4(b)).

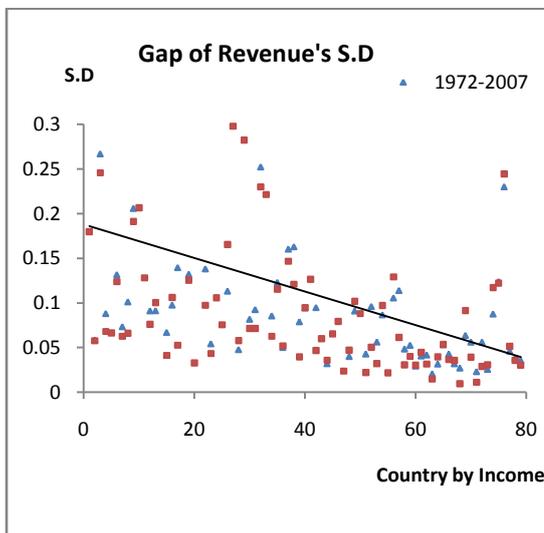
In the case of cash surplus/deficit, the results between Table 3-4(a) and Table 3-4(b) do not show a clear pattern. However, considering that the High-Income group has higher S.Ds than the Low-Income group in both Table 3-4(a) and Table 3-4 (b), the Low-Income group might be considered relatively less volatile even though the results do not show it clearly. We can think of the reason, as Gavin and Perotti (1997) mentioned, that the governments of the Low-Income group have the constraints to borrow money for public finance, which implies the limitation of a deficit makes the surplus/deficit less volatile.

Figure 3-1 Volatility with economic development

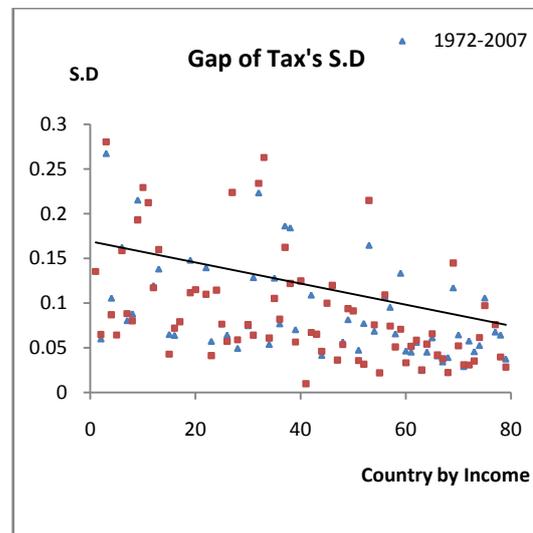


*0 represents the poorest country (Madagascar), and 79 is the richest country (Luxembourg), based on GNI per capita PPP(Purchasing Power Parity) measured as the average of 2000-2008.

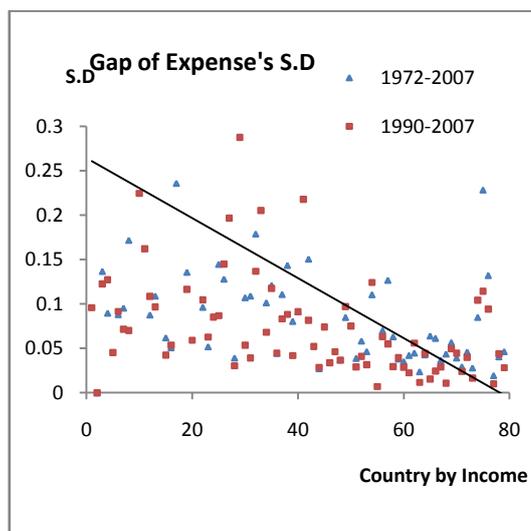
(a) GDP's volatility



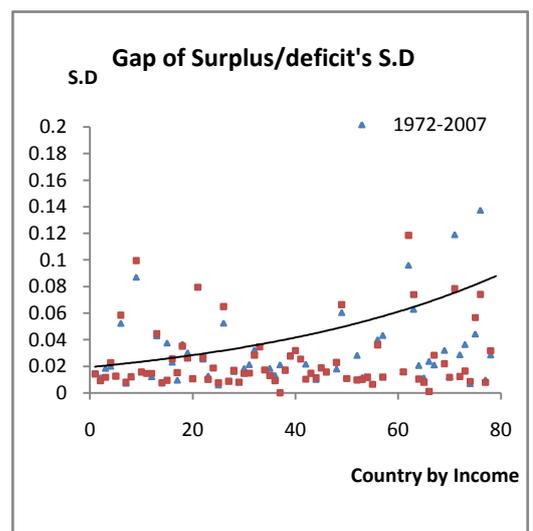
(b) Revenue's volatility



(c) Tax's volatility



(d) Expense's volatility



(e) Surplus/deficit's volatility

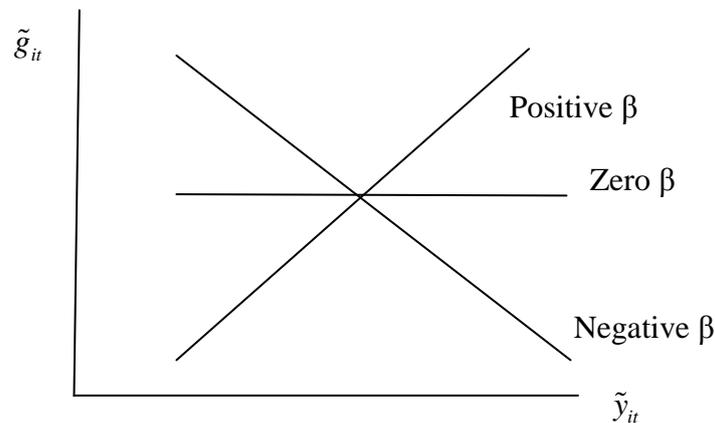
Chapter IV.

Methodology

4.1 Basic concept

The basic concept of the fiscal responsiveness in this paper is as follows:

$$\text{Fiscal data gap } (\tilde{g}_{it}) = \beta \text{ GDP gap } (\tilde{y}_{it}) + \text{error term}$$



The coefficient “ β ” of the GDP gap represents the fiscal responsiveness to economic fluctuations. The positive β means a pro cyclical fiscal responsiveness. The negative β represents a counter-cyclical responsiveness. Zero β means acyclical. In terms of stabilizing the economy, the coefficient β should be negative for the government expenses, positive for the revenue and surplus/deficit. For example, when the economy is in an expansion phase, the government should decrease expenses and increase tax revenues to prevent the economy from being overheated. Decreasing expenses and increasing tax revenues also make the fiscal balance a surplus. On the other hand, when the economy is in a contraction phase, the government should

increase expenses and reduce revenues including taxes to raise the effective demand. It also makes the fiscal balance a deficit. Regarding taxes, this paper focuses on tax revenue, instead of the tax rate²⁸. Increasing tax revenues (positive β) means a pro cyclical response while decreasing tax revenues (negative β) is a counter cyclical response during an expansion.

4.2 Empirical model for the fiscal responsiveness

4.2.1. Country-by-country regression model

Lane (2003) used OLS with AR(1) correction model to examine the fiscal cyclicity of 22 OECD countries. The model he estimated is

$$\Delta(\ln G_{it}) = \alpha_i + \beta_{Gi} * \Delta(\ln Y_{it}) + \varepsilon_{it},$$

where G is the fiscal spending, Y is GDP, and i is the category of fiscal spending.

He noted that the coefficient β_G represented the elasticity of government expenditure with respect to GDP growth, and that a positive value implied pro cyclical behavior; a value above one implied a more than proportionate response to output fluctuations. In addition, he added in a footnote that HP-filtered data delivered very similar results, and that there was little difference if they used the actual output growth rate or the difference between actual output growth and potential output growth rate. He mentioned in his paper that this model was also used in preceding studies²⁹. After Lane (2003), Strawczynski and Zeira (2007) also used this model.

²⁸ When Talvi and Végh (2005) defined a pro cyclical policy regarding to taxes, they used tax rates. Increasing the tax rate during recession and reductions during expansion was considered as a pro cyclical policy.

²⁹ Arreaza et al (1999), Sorenson et al(2001)

This paper modifies the Lane (2003) model as follows:

$$\tilde{g}_t = \beta_0 + \beta_1 \tilde{y}_t + u_t$$

where \tilde{g}_t is the gap of the government spending (or revenue), measured as the fraction of the de trended government spending (or revenue), \tilde{y}_t is the output gap of GDP, measured as the fraction of the real de trended GDP the gap of fiscal spending, and u_t is an error term.

This paper uses the gap variables instead of logged variables. In this model, the coefficient can be interpreted directly as the responsiveness regardless of unit. This paper estimates the above equation by OLS with a correction for first-order serial correlation in the error term, which is the same method as Lane (2003) used. Even though Lane (2003) did not mention the AR (1) correction, we can use the Yule-Walker estimates to make the estimator more efficient. I find that the Durbin-Watson statistics become closer to two through the Yule-Walker estimation.

4.2.2. Dynamic panel regression model

Lee and Sung (2007) derived their specification by assuming that the fiscal positions and GDP had a second-order polynomial trend at time t ³⁰. From this assumption, after taking the first difference and adding country fixed effects and year effects, they derived their model specification as follows:

$$\Delta \ln(Z_{it}) = \alpha_0 + \alpha_1 \Delta \ln(GDP_{it}) + \alpha_2 t + \sum_{j=1}^n \gamma_j D_j + \sum_{s=1}^T \delta_s T_s + \varepsilon_{it}$$

where Z_{it} is the fiscal position of country i at time t , D_j is the country dummy of country j and T_s is the year dummy of year s .

³⁰ $\ln(Z_{it}) - (a_2 t^2 + a_1 t + a_0) = \alpha_0 + \alpha_1 [\ln(GDP_{it}) - (b_2 t^2 + b_1 t + b_0)]$ They insisted in the footnote that using a third or fourth –order polynomial function showed very similar results.

This paper modifies Lee and Sung (2007) by using the gap variables instead of logged variables. The gap variables used in the paper are obtained by linear (for the fiscal variable) or quadratic de-trending (for the GDP variable). In addition, to control the reverse causal relationship to the business cycle, this paper adopts the lagged fiscal variable as an explanatory variable. Therefore, the dynamic panel regression model is considered. The basic specification to estimate the fiscal responsiveness using panel data is

$$\tilde{g}_{it} = \beta_0 + \beta_1 \tilde{g}_{it-1} + \beta_2 \tilde{g}_{it-2} + \beta_3 \tilde{y}_{it} + \alpha_i + u_{it}$$

where \tilde{g}_{it} is the gap of fiscal variable of country i at time t , \tilde{g}_{it-1} and \tilde{g}_{it-2} are the lagged gap of the fiscal variables, \tilde{y}_{it} is the output gap, α_i is a fixed effect, and u_{it} is the error term.

In order to investigate the pattern of the fiscal responsiveness with economic development, dummy variables for income group are added to the basic specification.

$$\tilde{g}_{it} = \beta_0 + \beta_1 \tilde{g}_{it-1} + \beta_2 \tilde{g}_{it-2} + \beta_3 \tilde{y}_{it} + \beta_4 Mid * \tilde{y}_{it} + \beta_5 High * \tilde{y}_{it} + Mid_i + High_i + \alpha_i + u_{it}$$

where Mid denotes the Middle-Income group, and $High$ represents the High-Income group. In this model, the base group is the Low-Income group. So β_3 represents the fiscal responsiveness of the Low-Income group, and β_4 (β_5) is the coefficient of slope dummy variable, which means the difference of the fiscal responsiveness between the Middle-Income group (the High-Income group) and the Low-Income group. For example, positive β_4 (β_5) implies that the Middle-Income group (the High-Income group) responds more pro cyclically than the Low-Income group.

In addition, in order to examine the difference of the fiscal responsiveness with

economic situations, dummy variables which represent the economic situations are included in the model.

$$\tilde{g}_{it} = \beta_0 + \beta_1 bad_i + \beta_2 good + \beta_3 \tilde{g}_{it-1} + \beta_4 \tilde{g}_{it-2} + \beta_5 \tilde{y}_{it} + \beta_6 bad * \tilde{y}_{it} + \beta_7 good * \tilde{y}_{it} + \alpha_i + u_{it}$$

where bad denotes the bad situation, and good represents the good situation.

The economic situations are defined as the degree of deviations from zero of the output gap. If the output gap is zero it implies that the economy is on the de-trended path. For example, the normal situation is defined to be within \pm one standard deviation from zero value of the output gap. The good situation is above one standard deviation from zero while the bad situation is below one standard deviation from zero value of the output gap. In the model, the base situation is the normal situation. So, β_1 and β_2 represent the differences in intercepts between the bad situation and the good situation relative to the normal situation. β_6 (β_7) is the coefficient of the dummy interaction variable, which means the difference of the fiscal responsiveness between the bad situation (the good situation) and the normal situation. For example, negative β_6 (β_7) implies that the fiscal responsiveness become more counter cyclical in the bad situation (the good situation) than in the normal situation.

In the dynamic panel regression model, the lagged dependent variable is included with the regressors. The lagged dependent variable might be correlated with unobservable fixed effects, which may lead to dynamic panel biases. To solve this problem, this paper considers estimation of a fixed-effects model for panels. In addition, consistent estimators can be obtained by IV estimation of the parameters. The Arellano-Bond estimator uses appropriate lags of the regressors as the instruments. The Arellano-Bond IV estimation can be performed easily by using

specialized software. This paper uses `xtabond` command in STATA. By using this command, the number of lags can be easily defined, and the regressors can be declared in different ways depending on the type of regressors.

The Arellano-Bond IV estimation method for dynamic panel model follows the Generalized Method of Moments (GMM). We can obtain the GMM estimator of β to minimize the sample moment as follows

$$\min_b \left[\sum_{i=1}^N Z_i' (y_i - X_i b) \right]' \hat{W} \left[\sum_{i=1}^N Z_i' (y_i - X_i b) \right]$$

where Z_i is the matrix of instrument variables, \hat{W} is weighting matrix, y_i is the dependent variable, and X_i is the explanatory variable matrix.

The consistent GMM estimator is $\hat{\beta} = (X'Z\hat{W}Z'X)^{-1}(X'Z\hat{W}Z'Y)$ if the number of instruments is suitably large to identify the model. In order to obtain the efficient GMM estimator, finding the optimal weighting matrix is important. The process of estimating an optimal weighting matrix is composed of two steps. The first step is to obtain a one-step GMM estimator by using an arbitrary weighting matrix under the homoskedasticity assumption on the error term. The one-step GMM is the same as the 2SLS estimator. The next step is to obtain a general consistent estimator of the weighting matrix based on the residuals which are acquired from the one-step GMM estimator. Finally we obtain the two-step GMM estimator by using the general consistent estimator of the weighting matrix. This is the asymptotically optimal GMM estimator.

4.3 Empirical model for determinants of fiscal responsiveness

After we estimate the country-by-country regression for each fiscal variable by using OLS estimation, we estimate the cross-sectional regression by using the set of estimated parameters and the set of control variables to examine the cross-country variation.

$$\hat{\beta}_i = \alpha + \lambda Z_i + u_i$$

where $\hat{\beta}_i$ is the set of estimated parameters from the country-by-country regression and Z_i is the set of control variables. For the analysis of the determinants of revenue, expense and surplus/deficit, Z_i includes volatility of GDP, the amount of GDP, public size, government effectiveness, and political stability. On the other hand, for the analysis of the determinants of expense's components, Z_i includes the amount of GDP, public size, the share of each component in expenses, government effectiveness, and democracy. These control variables represent characteristics of the countries. Through this regression, we can examine how some factors affect the fiscal responsiveness. This paper uses heteroskedasticity robust estimation to control for heteroskedasticity³¹, which is not the same as the Lane (2003) methodology. He mentioned that he used weighted least squares estimation (WLS). In his model, he used the same control variables for broad categories and government expenditure components. However, this paper uses different variables as mentioned above.

³¹ This paper uses the STATA command "vce(robust)". The Stata manual (Microeconometrics Using stats, Cameron A.C, Trivedi, P.K, 2009, Stata Press pp150), says "Under this option, the form of heteroskedasticity has no interest for the investigators who only wants to report correct standard errors, t statistics, and p-values"

Chapter V.

Empirical Results

5.1 Country-by-country regression

5.1.1. Overall

Table 5-1 reports the coefficients (β_1) in the country-by-country regression: $\tilde{g}_t = \beta_0 + \beta_1 \tilde{y}_t + u_t$. Table 5-1 summarizes the results of revenue, expenses, and cash surplus/deficit. From this table, n represents the number of countries in each group. Max is the largest coefficient in each group while Min is the smallest coefficient in each group. Mean is the average of the coefficients (β_1) by income group, and we interpret these values as the fiscal responsiveness of each group. We focus on the Mean values. Median denotes the middle value in each group. S.D represents the standard deviation of the coefficients in each group.

(1) Revenue

All groups have positive coefficients for revenue, which implies that all groups have pro cyclical policies. In addition, the responsiveness for the 1990-2007 data set are more pro cyclical than for the 1972-2007 data set in all income groups. Comparing the results by income groups, the two data sets show different results. For 1972-2007, the Middle-Income group has a larger coefficient than the other groups.

However, for 1990-2007, the Low-Income group has a larger coefficient than other groups. In order to analyze the pattern with economic development, we refer to Figure 5-1(a) rather than Table 5-1. The black line represents the trend for the 1972-2007 data while the red line is the trend for 1990-2007. From the two lines, the Low-Income and Middle-Income groups have more pro cyclical policy than the High-Income group in revenue even though it is not strong. In addition, the 1990-2007 data shows that the Low-Income group has more pro cyclical policy than the High-Income group.

(2) Expenses

Table 5-1 shows that the High-Income group has counter cyclical policy in both 1972-2007 and 1990-2007. In fact, the Low-Income group also has a negative sign for 1990-2007. However, there is an outlier (Minimum value -28.4439), and we can conclude that the Low-Income and Middle income groups have pro cyclical policies in expenses. We can see this pattern more clearly through Figure 6-1(b). Many countries in the High-Income group have counter cyclical policy while many countries in the Low-Income group have pro cyclical policy. This pattern implies that the fiscal policy becomes more counter cyclical as the economy develops.

(3) Cash surplus/deficit

The Low-Income group has acyclical policy in both data sets. The coefficients are close to zero: 0.0084 (1972-2007) and -0.0034 (1990-2007). The Middle-Income group has positive signs in both data sets. However, it is not strong. On the other hand, the High-Income group has a positive sign for the period 1972-2007 while it has a

negative sign for the period 1990-2007. In both data sets, outliers might affect the result seriously. From Figure 5-1(c), we can see the pattern more clearly that the responsiveness becomes more pro cyclical with economic developments.

Regarding these results, there are several things to note. First, we conjecture that the governments prefer expenses to revenue for stabilizing the economy, probably because revising the tax system (including the tax rate) is more difficult than adjusting expenses. Second, these results support previous studies of Latin America (Gavin and Perotti, 1997, Stein et al, 1998). Most countries in Latin America have pro cyclicality in expenses (see Appendix 5). Third, the interesting result is that especially many European countries have counter cyclical fiscal policy (see Appendix 5). I conjecture that European countries prefer fiscal policies for stabilizing the economy than the other countries. Fourth, these results support Sanchez de Cima (2003), who studied the Mexico case for 1970-1988. They found that Mexico followed pro cyclical policy during that period. In my paper (see Appendix 5), the responsiveness of expenses in the 1972-2007 data is pro cyclical. In the case of revenue, the result is also consistent with Sanchez de Cima (2003). Fifth, these results do not support Strawczynski and Zeira (2007) who studied the fiscal cyclical policy in Israel for 1960-2005. They insisted that the fiscal policy was pro cyclical, and that the pro cyclicality declined after 1985 in Israel. In my paper (see Appendix 5), the results were different. For 1972-2007, the coefficient of expense in Israel is -0.369. It means that Israel has counter cyclical fiscal policy. However, for 1990-2007, the coefficient is 0.197, which implies pro cyclical policy.

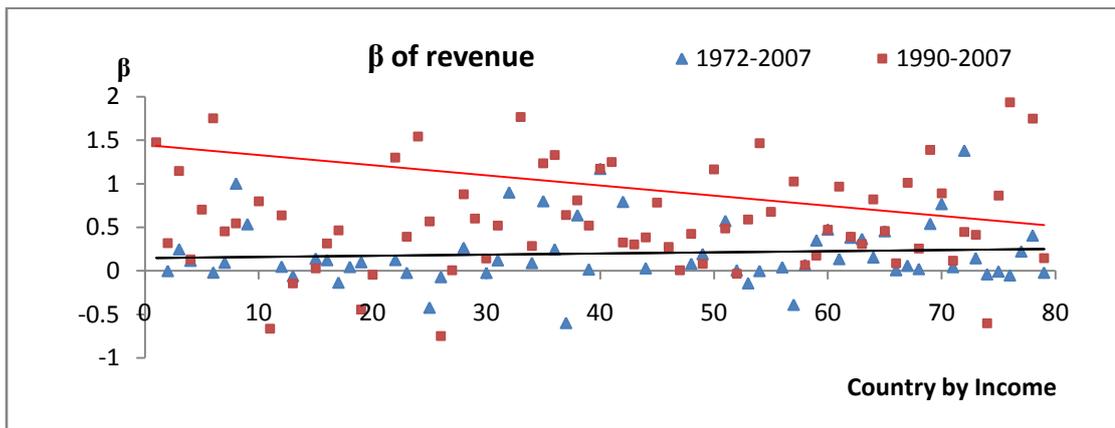
< Table 5-1 > Fiscal responsiveness of Aggregate Variables

Group		1972-2007 (61 countries)			1990-2007 (79 countries)		
		rev	exp	csd	Rev	exp	csd
All	n	61	61	61	79	78	79
	Max	1.3797	1.6406	516.4446	14.8263	7.3225	21.7084
	Min	-0.5983	-0.8733	-0.5236	-0.7480	-28.4439	-58.5062
	Mean	0.2046	0.0376	9.3594	0.9796	-0.0369	-0.1742
	Median	0.0993	0.0185	0.0307	0.5455	0.0746	0.0916
	S.D	0.3630	0.3857	66.0928	1.8814	3.4706	7.1795
Low- Income	n	17	17	17	24	23	24
	Max	1.0012	1.6406	0.4559	14.8263	7.3225	0.8667
	Min	-0.1353	-0.4902	-0.1303	-0.6632	-28.4439	-1.2083
	Mean	0.1900	0.2268	0.0084	1.6693	-0.3008	-0.0034
	Median	0.0993	0.0555	-0.0096	0.5916	0.4235	-0.0168
	S.D	0.3217	0.5117	0.1228	3.2183	6.4015	0.3504
Middle- Income	n	15	15	15	21	21	21
	Max	1.1709	0.7608	4.7181	1.7649	1.6009	0.4265
	Min	-0.5983	-0.4635	-0.5236	-0.7480	-0.6337	-0.8223
	Mean	0.2160	0.1199	0.3049	0.6481	0.3962	0.0759
	Median	0.1211	0.0904	-0.0049	0.5660	0.3572	0.0802
	S.D	0.4689	0.3067	1.2347	0.5906	0.5842	0.2399
High- Income	n	29	29	29	34	34	34
	Max	1.3797	0.3302	516.4446	2.2532	1.0236	21.7084
	Min	-0.3895	-0.8733	-0.0539	-0.6033	-2.0085	-58.5062
	Mean	0.2073	-0.1157	19.5243	0.6975	-0.1260	-0.4492
	Median	0.0803	-0.0431	0.1001	0.4781	-0.0831	0.2645
	S.D	0.3363	0.2691	95.6858	0.6620	0.6349	11.0260

*Yule-Walker estimates ** Some countries have shorter data interval.

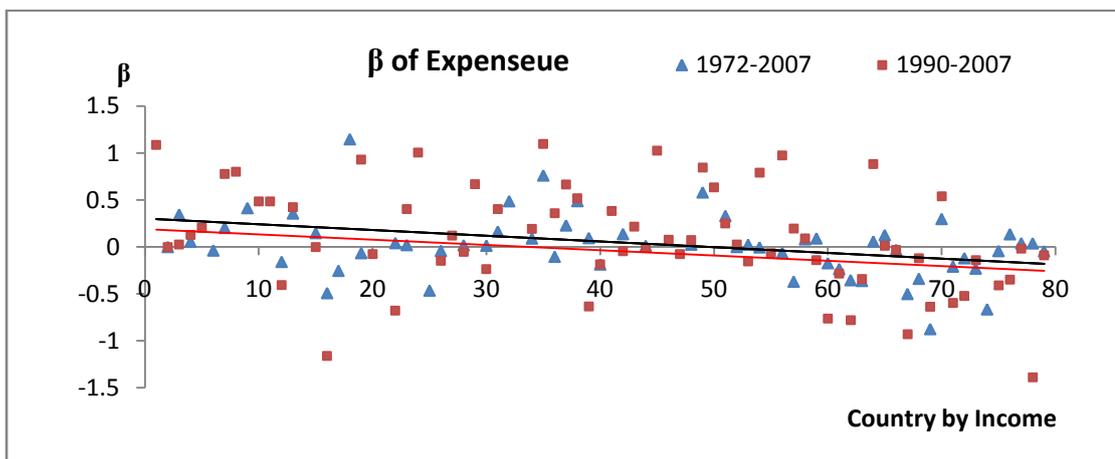
** csd=cash surplus/deficit. rev=revenue. exp=expense.

Figure 5-1 Fiscal responsiveness with economic development

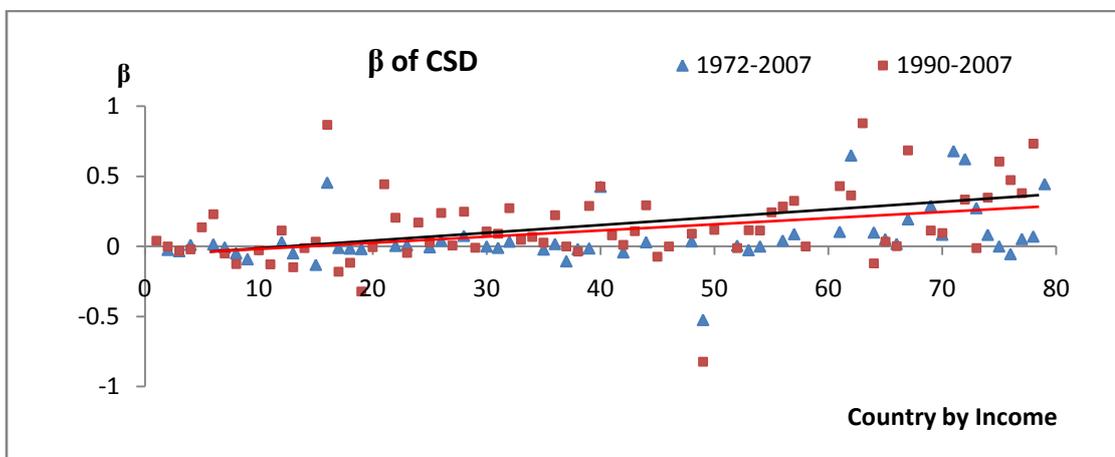


*0 represents the poorest country (Madagascar), and 79 is the richest country (Luxembourg), based on GNI per capita PPP(Purchasing Power Parity) measured as the average of 2000-2008.

(a) Fiscal responsiveness of Revenue



(b) Fiscal responsiveness of Expense



(c) Fiscal responsiveness of cash surplus/deficit

5.1.2 Fiscal responsiveness of revenue components

(1) Taxes

Table 5-2(a) and Table 5-2(b) report the fiscal responsiveness of the revenue components. In the case of taxes, the pattern is similar to revenue. All groups have positive coefficients for taxes, which means that all groups have pro cyclical policy. In addition, the responsiveness for the 1990-2007 data set are more pro cyclical than for the 1972-2007 data set in all income groups. Comparing the results by income groups, the two data sets show different results. For 1972-2007, the High-Income group has more pro cyclical policy than the other groups. However, for 1990-2007, the Low-Income group has much stronger pro cyclical policy than the other groups. Therefore, it can be concluded that the Low-Income and Middle-income groups have more pro cyclical policy than the High-Income group in tax revenue even though it is not strong, which is the same as the revenue case (See Figure 5-2(a)). It is reasonable considering taxes represent a large part of revenue. It is also consistent with Talvi and Végh (2005) and Lee and Sung (2007). Regarding this, Talvi and Végh (2005) mentioned that both the Keynesian and Classical views would support the pro cyclical tax revenue for different reasons. The reason was that Keynesian economists would think of increasing taxes to reduce the effective demand during expansions while Classical economists would consider increasing tax revenues as the result of the economic expansion without the intervention of the governments. They also pointed to the volatility of the tax base as the reason. They insisted that the tax base was much more volatile in developing countries, and the political pressure for increasing the government spending could be stronger in a more volatile tax base. From the volatility of the tax base, they argued for optimal pro cyclical policy in developing countries.

Lee and Sung (2007) called it a “somewhat puzzling finding”, and explained their reasons. They insisted that some factors should be taken into consideration, such as the progressivity of the tax system, tax reporting behavior, institutions, tax composition, and the size of the unofficial economy. Even though a progressive tax system can make tax revenue more pro cyclical, tax reporting behavior can offset pro cyclical. For example, when tax payers smooth their reported income, tax revenues become less pro cyclical. In OECD countries, tax payers show more smoothing of their reported income, which implies that tax revenue is less pro cyclical in OECD countries. They also explained the “voracity effect” (Tornell and Lane, 1999). If developing countries are defined as economies without a strong legal-political-institutional infrastructure, those governments may increase taxes more than proportionally in response to a positive productivity shock. This conjecture can explain more pro cyclicality of taxes in the Low-Income and Middle-Income groups than in the High-Income group. Lane (2003) insisted that the aggregate approach could mislead the results. From Figure 5-2, we can see that income and wealth taxes become more pro cyclical with economic development (see Figure 5-2(b) and (c)). In addition, these taxes show more sensitivity and pro cyclicality than sales taxes, such as taxes on goods and services. Therefore, we can think that the progressive system is working better for income and wealth taxes than for sales taxes. However, in the case of taxes on goods and services, it is more pro cyclical in the Low-Income and Middle-Income groups than in the High-Income group. If we combine progressive income and wealth taxes and flat rate sales taxes, the responsiveness of sales taxes can offset the responsiveness of progressive income taxes in terms of the responsiveness of total taxes.

(2) Social contributions

Table 5-2(a) and Table 5-2(b) show different results. For 1972-2007 (Table 5-2(a)), the High-Income group has a larger coefficient than the other groups. However, for 1990-2007 (Table 5-2(b)), the High-Income group has a much smaller coefficient than the other groups. From Figure 5-2(e), we can see that the Low-Income and Middle-Income groups show more pro cyclicality than the High-Income group.

< Table 5-2 > Fiscal responsiveness of revenue components

(a) 61 countries (1972-2007)

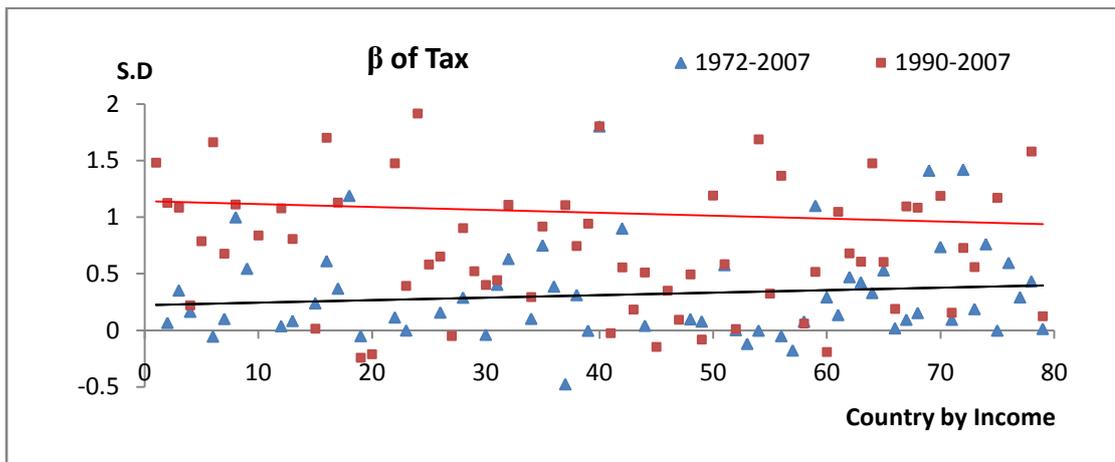
		1972-2007 (61 countries)				
		Tax	tgS	tip	top	scn
All	N	61	61	61	60	57
	MAX	1.8021	5.8118	4.6806	6.1935	7.6344
	MIN	-0.6764	-5.2654	-19.9873	-4.0564	-3.9313
	MEAN	0.3171	0.2823	0.0897	0.5863	0.2581
	MEDIAN	0.1653	0.2180	0.1831	0.3314	0.0209
	S.D	0.4457	1.4726	2.7362	1.7175	1.4473
Low Income	N	17	17	17	16	13
	MAX	1.1890	5.8118	4.6806	3.2123	5.7043
	MIN	-0.0543	-2.2712	-19.9873	-4.0564	-3.9313
	MEAN	0.3179	0.7335	-0.5612	0.1071	0.2671
	MEDIAN	0.1653	0.2212	0.2680	0.2299	0.1197
	S.D	0.3668	1.8149	5.1417	1.5578	2.0055
Middle Income	N	15	15	15	15	15
	MAX	1.8021	2.8393	1.3543	6.1935	1.0827
	MIN	-0.6764	-5.2654	-0.5812	-3.0674	-1.3759
	MEAN	0.2689	0.1078	0.2434	1.1641	0.1532
	MEDIAN	0.1580	0.3380	0.0827	0.5468	0.2673
	S.D	0.5830	1.6894	0.5300	2.5346	0.6147
High Income	N	29	29	29	29	29
	MAX	1.4191	1.7971	2.8313	4.5440	7.6344
	MIN	-0.1772	-5.1101	-0.2453	-2.5368	-0.7142
	MEAN	0.3416	0.1080	0.3918	0.5519	0.3121
	MEDIAN	0.1885	0.2061	0.1054	0.3961	-0.0041
	S.D	0.4206	1.0801	0.6567	1.1798	1.5104

(b) 79 countries (1990-2007)

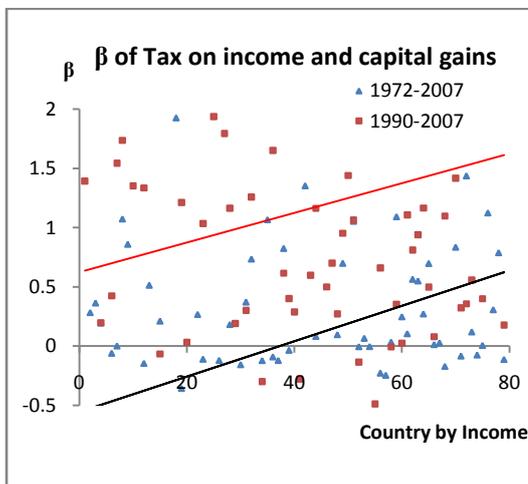
		1990-2007 (79 countries)				
		tax	tg	tip	top	scn
All	N	79	79	74	79	70
	MAX	7.1310	8.4027	14.3930	7.1960	24.7045
	MIN	-2.1066	-12.6501	-17.7749	-5.0745	-19.2224
	MEAN	1.0381	1.1233	1.5143	0.6976	0.5260
	MEDIAN	0.8081	1.0973	0.9048	0.5609	0.3357
	S.D	1.1923	2.7527	4.9959	1.4913	4.0089
Low Ncome	N	24	24	22	24	17
	MAX	7.1310	7.2079	14.3930	7.1960	24.7045
	MIN	-2.1066	-12.6501	-6.6874	-4.8911	-19.2224
	MEAN	1.3418	0.5783	1.7964	1.0390	1.4692
	MEDIAN	1.0953	1.3434	1.9692	0.8566	0.6004
	S.D	1.7861	4.2266	4.5324	2.0204	7.8851
Middle Income	N	21	21	19	21	21
	MAX	2.1739	7.1364	12.4807	4.3425	2.2426
	MIN	-0.0811	-1.7849	-7.5775	-5.0745	-1.2255
	MEAN	0.7874	1.2340	1.6809	0.6702	0.5480
	MEDIAN	0.5825	0.9514	0.3692	0.6109	0.6262
	S.D	0.6788	1.8702	5.4634	1.7509	0.7722
High Income	N	34	34	33	34	32
	MAX	3.3198	8.4027	11.9208	1.9062	4.9984
	MIN	-0.1903	-0.4874	-17.7749	-1.2514	-4.3915
	MEAN	0.9786	1.4396	1.2303	0.4736	0.0105
	MEDIAN	0.7042	0.8746	0.8379	0.4612	0.0985
	S.D	0.8642	1.7359	5.1489	0.6456	1.5918

Note: Yule-Walker estimates ** Some countries have a shorter data interval, tax=taxes, tg= taxes on goods & services, tip=tax on income & profits & capital gains, top=taxes on property, scn=social contribution

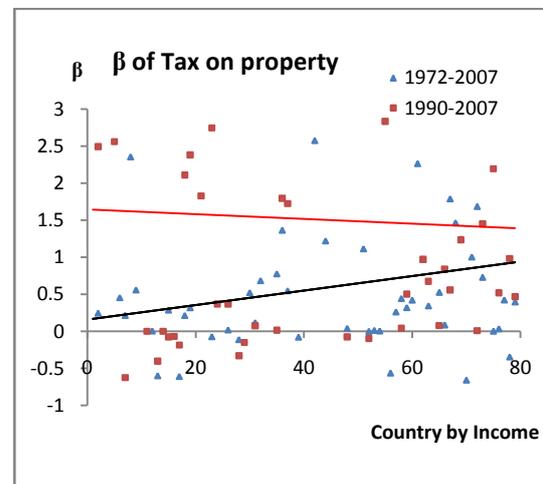
Figure 5-2 Fiscal responsiveness of revenue components



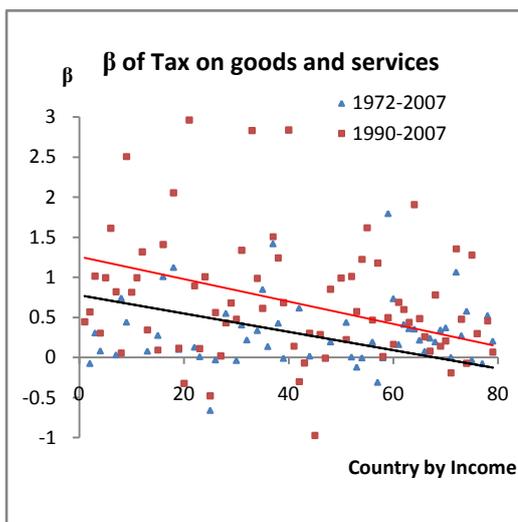
(a) Fiscal responsiveness of Taxes



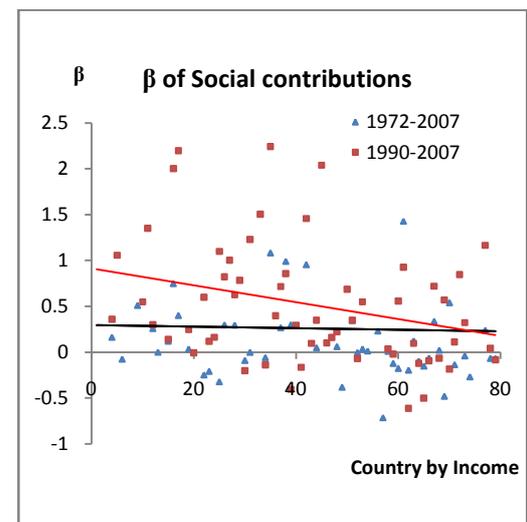
(b) Taxes on income and capital gains



(c) Taxes on property



(d) Taxes on goods and services



(e) Social contributions

5.1.3 Fiscal responsiveness of expense components by economic classification

(1) Compensation of employees and usage of goods and service

Table 5-3 reports the fiscal responsiveness of expenses by components, based on economic classification. In the case of employee's salaries, Table 5-3 shows different results. For 1972-2007, the Middle-Income group has pro cyclical policy while the High-Income group has acyclical policy, based on Mean and Median. However, for 1990-2007, the Low-Income group is much more pro cyclical than the other groups probably because of the outlier (maximum). Excluding the outliers, we can see that most countries in the Low-Income group have pro cyclical policy and the trend line is U-shaped. In the case of usage of goods and services, the High-Income group has less pro cyclical policy than the other groups in both data sets. Comparing the Middle-Income group with the Low-Income group, the Middle-Income group responds more pro cyclically than the Low-Income group.

(2) Interest payments

The Low-Income and Middle-Income groups have counter cyclical policy in both data sets. The High-Income group also responds counter cyclically for 1972-2007, which means that when the economy is in expansion, governments decrease the expense for the interest payment and governments increase the expense for interest payment during recessions. The result is somewhat puzzling, and we conjecture that during recessions governments prefer spending to boost the economy rather than to pay interest.

(3) Subsidies

The High-Income and Middle-Income groups have negative signs in both data sets, which means that many countries in those groups have counter cyclical fiscal policies in subsidies. On the other hand, the Low-Income group has positive signs in both data sets. Considering that subsidies are an expense that helps public corporations or private enterprises, when the economy is in bad times, the governments of the developed countries can have more fiscal abilities to help public or private institutions than the Low-Income countries.

(4) Social benefits

In the case of social benefits, the High-Income group has negative signs in both data sets, and all of the highest income countries have negative signs (see Figure 6-3 (e)). It implies that in developed countries the social security system plays a role as an auto-stabilizer. The Middle-Income group has a negative sign for 1990-2007 while it has a positive sign for 1972-2007. The Low-Income group has a negative sign for 1972-2007 while it has a positive sign for 1990-2007, which may reflect that many countries in the two groups have not established a mature social security system.

**< Table 5-3 > Fiscal responsiveness of expense components
by economic classification**

(a) 61 countries (1972-2007)

		1972-2007 (61 countries)				
		cem	ugs	int	sub	scb
All	N	59	59	59	56	54
	MAX	1.6351	3.0794	6.7015	1083.5402	3.9333
	MIN	-2.8872	-1.4492	-80.2293	-19.8983	-2.1342
	MEAN	0.1076	0.1607	-2.8656	19.4082	0.0814
	MEDIAN	0.0325	0.0582	-0.0929	0.0211	-0.0325
	S.D	0.5961	0.5606	12.1029	147.5810	0.9449
	Low Income	N	15	15	15	14
MAX		1.1146	3.0794	2.3120	1083.5402	0.5285
MIN		-2.8872	-1.4492	-80.2293	-5.7234	-0.9040
MEAN		0.0367	0.2589	-9.1001	82.5158	-0.0757
MEDIAN		0.1915	0.1591	-1.4584	-0.2702	0.0260
S.D		1.0075	0.9443	22.5362	300.7794	0.4381
Middle Income		N	15	15	15	13
	MAX	1.6351	0.8469	1.6612	1.4911	3.9333
	MIN	-0.4703	-0.5804	-10.0728	-8.5817	-2.1308
	MEAN	0.2390	0.2213	-0.9410	-0.3897	0.7860
	MEDIAN	0.0817	0.2284	0.0113	0.1691	0.5697
	S.D	0.5442	0.3552	2.8613	2.5471	1.4649
	High Income	N	29	29	29	29
MAX		1.1840	1.1886	6.7015	5.3342	0.9417
MIN		-0.3131	-0.5004	-16.1481	-19.8983	-2.1342
MEAN		0.0739	0.0819	-0.6364	-0.6998	-0.1992
MEDIAN		-0.0123	-0.0053	0.0048	0.0882	-0.1186
S.D		0.3018	0.3866	4.1754	4.1348	0.5345

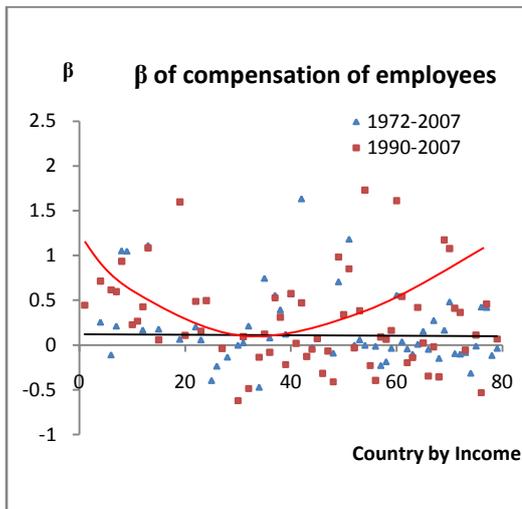
Note: Yule-Walker estimates. Some countries have shorter data interval. cem=compensation of employees, ugs= use of goods and services, int=interest, sub=subsidies, scb=social benefits

(b) 79 countries (1990-2007)

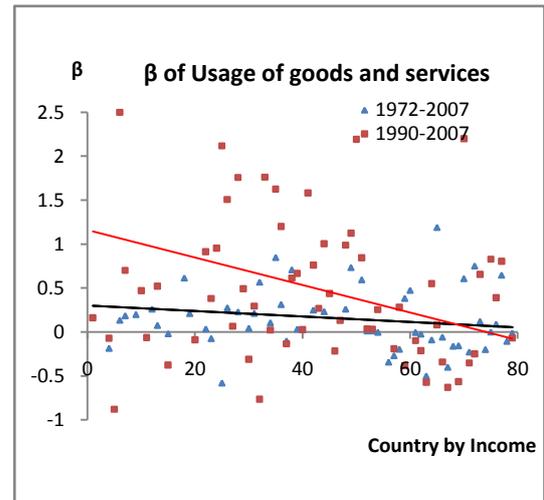
		1990-2007 (79 countries)				
		cem	ugs	int	sub	scb
All	N	76	76	77	72	71
	MAX	89.0595	9.5261	13.6344	31.2940	18.3374
	MIN	-3.0483	-7.9567	-9.3130	-81.8552	-10.9052
	MEAN	1.5830	0.5140	-0.2987	-0.9532	0.2774
	MEDIAN	0.1390	0.2871	-0.1616	-0.0051	-0.0729
	S.D	10.2770	2.0885	2.6572	12.8847	2.9625
Low Income	N	21	21	22	20	17
	MAX	89.0595	9.5261	3.6005	31.2940	18.3374
	MIN	-2.1509	-7.9567	-9.3130	-25.1839	-1.0914
	MEAN	5.2034	0.7516	-0.9128	1.0696	1.6980
	MEDIAN	0.4866	0.3820	-0.4372	-0.2828	0.2354
	S.D	19.3285	3.4726	2.5157	12.2926	4.6279
Middle Income	N	21	21	21	19	20
	MAX	4.5921	2.1176	2.3122	3.6777	3.8724
	MIN	-1.8826	-0.3099	-6.1134	-81.8552	-10.9052
	MEAN	0.4610	0.8289	-0.7067	-3.7956	-0.1489
	MEDIAN	0.0927	0.7623	-0.5402	0.4824	0.4208
	S.D	1.4203	0.7149	1.9638	18.9734	3.1141
High Income	N	34	34	34	33	34
	MAX	1.7292	4.6783	13.6344	8.8790	3.3633
	MIN	-3.0483	-3.6625	-8.3579	-44.6756	-2.1570
	MEAN	0.0398	0.1727	0.3507	-0.5427	-0.1821
	MEDIAN	0.0656	0.0330	-0.0347	0.3234	-0.2743
	S.D	0.8941	1.4408	3.0174	8.2828	1.1320

Note: Yule-Walker estimates. Some countries have shorter data interval. cem=compensation of employees, ugs= use of goods and services, int=interest, sub=subsidies, scb=social benefits

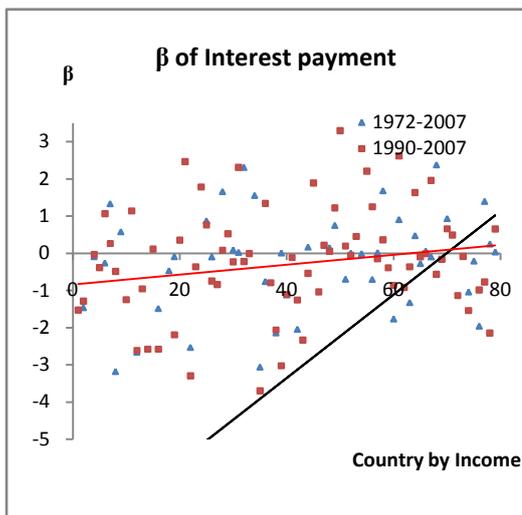
Figure 5-3 Fiscal responsiveness of expense components by economic classification



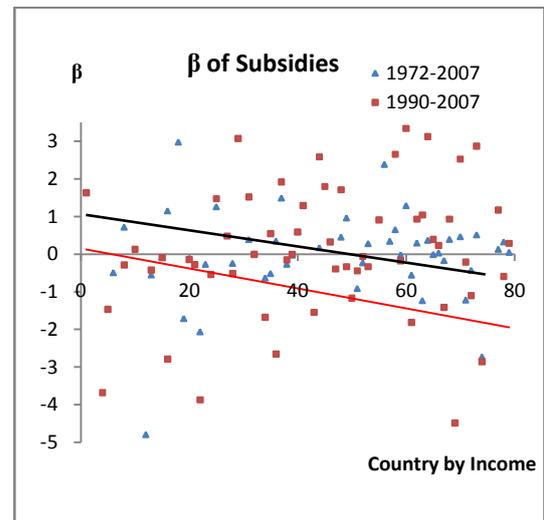
(a) Compensation of employees



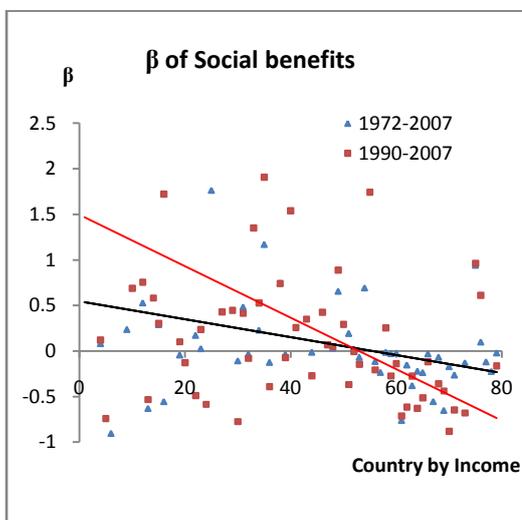
(b) Usage of goods and services



(c) Interest payments



(d) subsidies



(e) Social benefits

5.1.4 Fiscal responsiveness of expense components by functional classification

Table 5-4 reports the fiscal responsiveness of the expense components based on the functional classification. Generally speaking, most components show more counter cyclical or less pro cyclical responsiveness with economic developments.

(1) Defense

The High-Income group has a negative sign for 1990-2007, and a smaller coefficient than the other groups. The Low-Income and Middle-Income have positive signs in both data sets. In addition, the magnitude of fiscal responsiveness is much larger than for the High-Income group, which implies that the expense for defense responds pro cyclically to economic situations in the Low-Income and Middle-Income groups.

(2) Economic Affairs

The High-Income group has negative signs in both data sets while the other two groups have positive signs. Economic affairs include industrial policies, so many governments in the High-Income group use industrial policies for stabilizing the economy. It also implies that the governments in the Low-Income and Middle-Income groups spend the budget for industry pro cyclically.

(3) Housing & Community amenities

The High-Income group also has counter cyclical responsiveness in both data sets. The Middle-Income group has a counter cyclical policy for 1972-2007 while it has a pro cyclical policy for 1990-2007. On the other hand, the Low-Income group has pro cyclical policy in both data sets. Therefore, as the economy develops, the responsiveness of housing policy becomes more counter cyclical or less pro cyclical response.

(4) Health Affairs

In the case of health affairs, the Low-Income group has negative signs in both data sets. On the other hand, the Middle-Income group has positive signs in both data sets. The High-Income group has a positive sign for 1972-2007 while it has a negative sign for 1990-2007. The overall pattern is not obvious, but more countries have pro cyclical policy (see Figure 5-4 (d)).

(5) Education

The Middle-Income and Low-Income groups have positive signs in both data sets, which implies that the countries in those groups spend the budget pro cyclically for education. On the other hand, the High-Income group has negative signs in both data sets, but those values are close to zero. Effectively, the countries in the High-Income group have acyclical fiscal policy in education.

(6) Recreation and religion affairs

All groups have positive signs in both data sets, which means that most governments spend the budget for recreation and religion pro cyclically. In other words, when the economy is in good times, the governments increase the expenses for the recreation and religion. Regarding the magnitude, as the economy develops, the fiscal policy becomes less pro cyclical.

(7) Social protection

The High-Income group has a negative sign for 1972-2007 while it has a positive sign for 1990-2007. However, for 1990-2007, the positive sign results from an outlier, (i.e. maximum is 24.4067). In addition, Figure 5-4(b)(g) shows that many countries in the High-Income group have negative signs. It can be concluded that many countries in the High-Income group have counter cyclical policy in social protection, which plays a role as an auto-stabilizer. The Low-Income group also has negative signs in both data sets. However, we need to consider that only a small number of countries in the Low-Income group report the data for social protection, and there exist outliers. The Middle-Income group has positive signs in both data sets. Figure 5-4(b)(g) shows that many countries in the Low-Income and Middle-Income groups have positive signs. Therefore, as the economy develops, the fiscal policy in social protection becomes more counter cyclical.

**< Table 5-4 > Fiscal responsiveness of expense components
by functional classification**

(a) 61 countries (1972-2007)

		1972-2007 (61 countries)						
		def	eca	hus	hel	edu	rec	spt
All	N	60	61	61	61	61	59	59
	MAX	3.2851	4.2388	30.7879	1.9046	2.6792	11.9152	21.3028
	MIN	-1.6315	-4.5625	-28.7819	-7.1193	-1.2113	-1.0506	-4.3188
	MEAN	0.2023	0.0671	0.1087	-0.0814	0.1767	0.7282	0.4090
	MEDIAN	0.0446	0.0638	0.0578	0.0438	0.0888	0.1090	-0.0060
	S.D	0.6480	1.1031	6.3895	1.2181	0.5554	2.0638	2.9806
	Low Income	N	16	17	17	17	17	16
MAX	1.3141	4.2388	30.7879	1.9046	2.6792	11.9152	2.4741	
MIN	-0.3711	-1.6494	-1.7063	-7.1193	-0.1930	-0.6353	-4.3188	
MEAN	0.2741	0.3074	3.7197	-0.1594	0.3739	1.4019	-0.0994	
MEDIAN	0.1908	0.0389	0.7411	0.0454	0.1369	0.2388	-0.0060	
S.D	0.4717	1.1530	7.9669	1.8629	0.6931	3.1870	1.4565	
Middle Income	N	15	15	15	15	15	14	15
MAX	3.2851	1.9279	3.6629	0.9235	2.0788	7.1641	21.3028	
MIN	-0.7137	-0.5306	-28.7819	-1.0717	-0.4264	-0.5813	-1.1008	
MEAN	0.4326	0.5461	-1.9806	0.1421	0.2954	0.9131	1.9935	
MEDIAN	0.1343	0.3188	0.1594	0.0998	0.1861	0.4300	0.2228	
S.D	0.9335	0.7636	7.6450	0.4713	0.5824	1.9268	5.5409	
High Income	N	29	29	29	29	29	29	29
MAX	1.4351	0.7610	3.0075	1.7598	0.7821	4.5124	0.8198	
MIN	-1.6315	-4.5625	-15.8231	-3.8330	-1.2113	-1.0506	-1.0619	
MEAN	0.0436	-0.3215	-0.9275	-0.1512	-0.0003	0.2672	-0.1475	
MEDIAN	0.0085	-0.0065	-0.0908	-0.0020	-0.0108	0.0347	-0.0969	
S.D	0.5220	1.1144	3.2593	1.0247	0.3917	1.0777	0.4318	

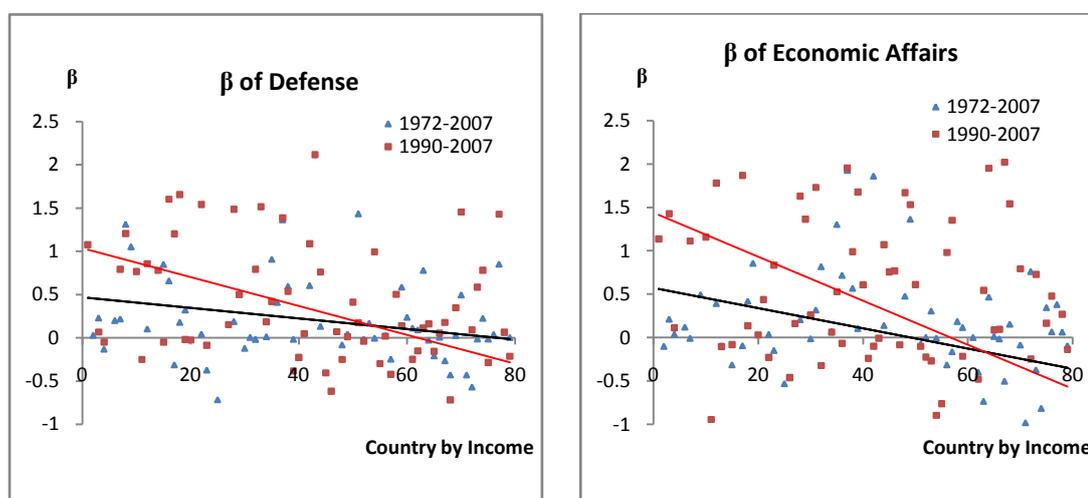
Note: Yule-Walker estimates. Some countries have shorter data interval. def=defense, eca=economic affairs, hus=housing and community amenities, hel=health, rec=recreation & culture & religion, edu=education, spt=social protection.

(b) 79 countries (1990-2007)

		1990-2007 (79 countries)						
		def	eca	hus	hel	edu	rec	spt
All	N	74	77	77	77	76	74	75
	MAX	5.1265	9.8005	29.5639	13.1341	7.0718	11.0271	59.2362
	MIN	-6.3838	-11.2143	-117.4064	-26.0058	-5.8388	-10.0593	-28.4237
	MEAN	0.3459	0.4064	-2.4790	0.0615	0.2430	0.8547	0.9235
	MEDIAN	0.1563	0.2608	-0.0171	0.4280	0.0920	0.4014	0.0259
	S.D	1.5118	2.5950	18.2698	4.9942	1.5371	2.8753	8.9790
Low Income	N	22	23	23	23	22	21	21
	MAX	5.1265	9.8005	29.5639	10.1906	7.0718	9.0208	26.0014
	MIN	-6.3838	-3.4103	-20.5861	-26.0058	-5.8388	-1.1775	-28.4237
	MEAN	0.7767	1.0059	0.3326	-1.4363	0.5769	1.8151	-0.4285
	MEDIAN	0.7926	0.4366	0.1366	0.5844	0.3570	0.8844	0.2013
	S.D	2.0728	2.6629	8.9433	7.8382	2.2514	2.6054	9.5799
Middle Income	N	18	20	20	20	20	19	20
	MAX	3.3700	4.5514	22.9353	7.6281	3.7779	7.4180	59.2362
	MIN	-1.3194	-1.0627	-5.4171	-0.1743	-1.9279	-1.8223	-3.5507
	MEAN	0.8004	0.8087	1.0674	1.1135	0.3633	0.9595	3.4107
	MEDIAN	0.5200	0.5677	0.1182	0.6381	0.1807	0.4316	0.6074
	S.D	1.1582	1.2224	5.6099	1.7085	1.1033	2.1017	13.2375
High Income	N	34	34	34	34	34	34	34
	MAX	1.4550	8.5549	11.3847	13.1341	2.3202	11.0271	24.4067
	MIN	-3.9978	-11.2143	-117.4064	-9.4295	-2.4666	-10.0593	-2.9862
	MEAN	-0.1735	-0.2357	-6.4672	0.4559	-0.0439	0.2030	0.2955
	MEDIAN	0.0361	0.0910	-0.3748	0.0296	-0.0490	0.1241	-0.3430
	S.D	1.0564	3.0246	25.8411	3.5227	1.1293	3.2762	4.3540

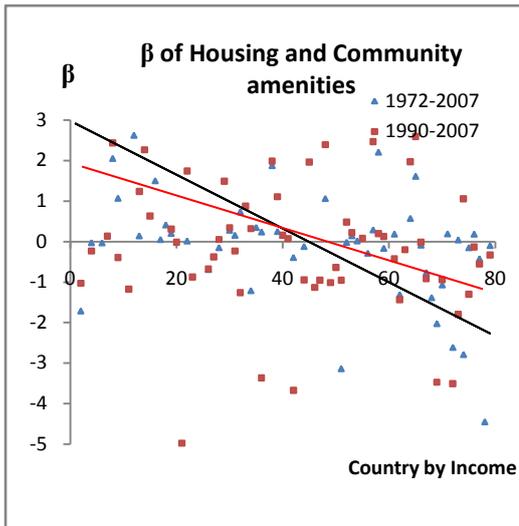
Note: Yule-Walker estimates. Some countries have shorter data interval. def=defense, eca=economic affairs, hus=housing and community amenities, hel=health, rec=recreation & culture & religion, edu=education, spt=social protection.

Figure 5-4 Fiscal responsiveness of expense components by functional classification

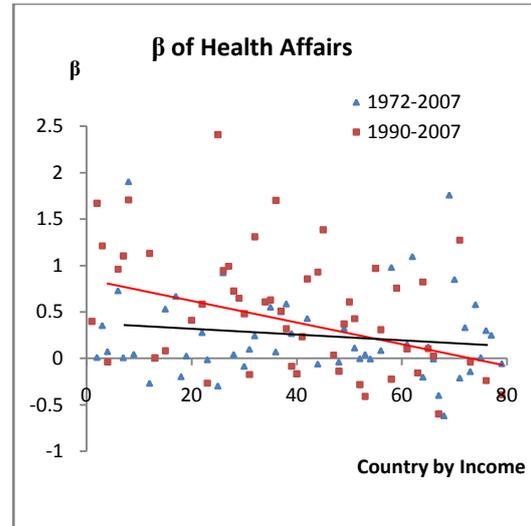


(a) Defense

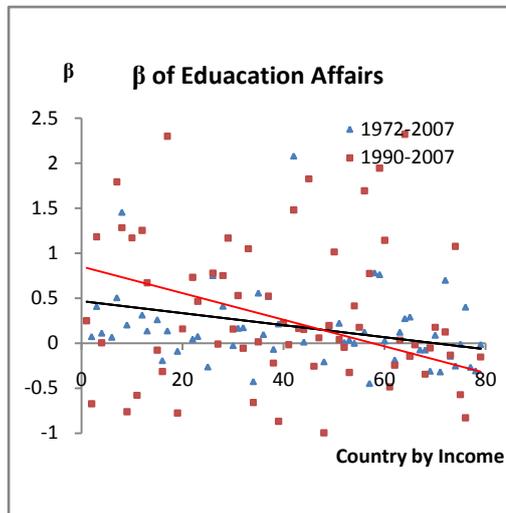
(b) Economic Affairs



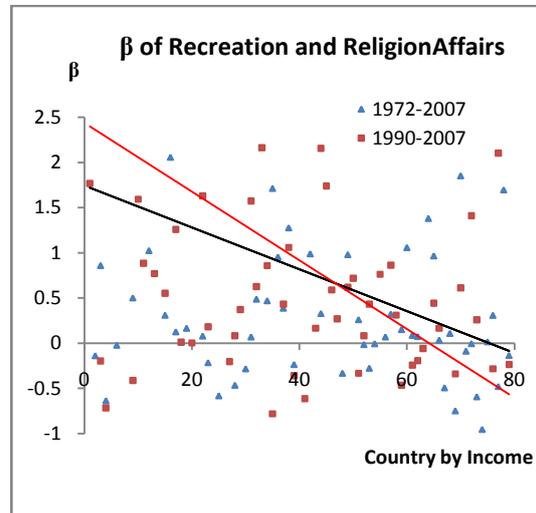
(c) Housing and community amenities



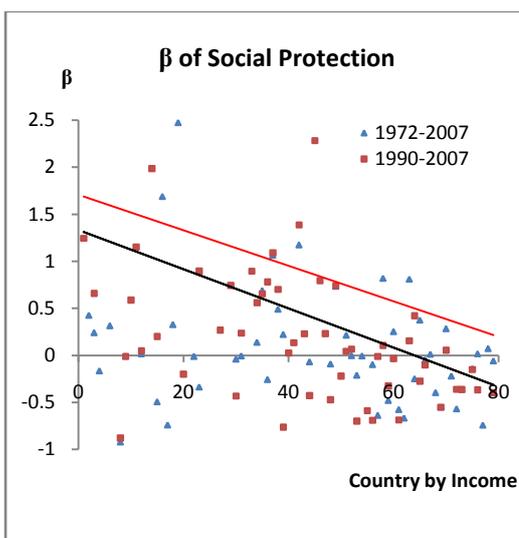
(d) Health affairs



(e) Education Affairs



(f) Recreation and religion affairs



(g) Social protection

5.2 Dynamic panel regression

5.2.1. Overall

In the dynamic panel regression, the coefficients represent the Arellano-Bond IV estimates. In the regression, the fiscal gap is the dependent variable and appears with two lags on the right-hand side. Before I analyze the difference of the fiscal responsiveness by income groups, I test whether the output gap is endogenous in the model. In order to test the endogeneity, I use the Durbin-Wu-Hausman (DWH) specification test³² which compares two models: the one model considers the output gap as exogenous and the other model considers the output gap as endogenous. The null hypothesis is that the coefficients of two models are same (i.e. $\beta^{\text{exogenous}} = \beta^{\text{endogenous}}$). Table 5-5 reports the Arellano-bond estimates and the results of the Hausman test for all countries. In the revenue case, the fiscal responsiveness is more pro cyclical for 1990-2007 than for 1972-2007 in both models. Regarding the endogeneity issue, it can be concluded that we reject exogeneity of the output variable. In the expense case, the fiscal responsiveness is more pro cyclical for 1990-2007 than for 1972-2007 in both models. Regarding the endogeneity issue, the two data sets show different results. For 1972-2007, the null hypothesis is not rejected while it is rejected for 1990-2007. In the cash surplus/deficit case, the fiscal responsiveness is more pro cyclical for 1972-2007 than for 1990-2007 in both models. Regarding the endogeneity issue, the null hypothesis is rejected in both data sets.

³² Sometimes it is called the Hausman test.

<Table 5-5> Fiscal responsiveness for all countries

(a) 61 countries (1972-2007)

	rev		exp		csd	
	(1)	(2)	(1)	(2)	(1)	(2)
L1	0.4611 (0.0251)***	0.4574 (0.0249)***	0.0079 (0.0253)	0.0109 (0.0252)	-0.4473 (0.0245)***	-0.4771 (0.0245)***
L2	-0.0876 (0.0233)***	-0.0937 (0.0232)***	-0.1197 (0.0252)***	-0.1179 (0.0251)***	-0.3533 (0.0244)***	-0.3531 (0.0244)***
gdp	0.1393 (0.0499)***	0.0736 (0.0355)**	0.2806 (0.1423)**	0.1990 (0.0969)**	3.5338 (3.8967)	1.4213 (2.4575)
C	0.0050 (0.0035)	0.0043 (0.0035)	-0.0077 (0.0092)	-0.0085 (0.0092)	0.0744 (0.2490)	0.0419 (0.2447)
$\chi^2 < \text{prob}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hausman $\chi^2 < \text{prob}$	0.0194, reject H_0		0.8768, fail to reject H_0		0.9747, fail to reject	

(b) 79 countries (1990-2007)

	rev		exp		csd	
	(1)	(2)	(1)	(2)	(1)	(2)
L1	0.3329 (0.0339)***	0.3510 (0.0323)***	-0.1368 (0.0046)***	-0.1368 (0.0045)***	-0.7198 (0.0147)***	-0.7192 (0.0147)***
L2	0.0004 (0.0174)	-0.0071 (0.0171)	-0.0555 (0.0045)***	-0.0560 (0.0045)***	-0.9023 (0.0131)***	-0.9019 (0.0131)***
gdp	0.6221 (0.0604)***	0.4352 (0.0466)***	0.5867 (0.0484)***	0.4484 (0.0380)***	0.4674 (0.1902)**	0.2345 (0.1415)*
C	0.0016 (0.0025)	0.0004 (0.0025)	-0.0044 (0.0021)	-0.0053 (0.0021)***	-0.0363 (0.0084)	-0.0383 (0.0083)***
$\chi^2 < \text{prob}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hausman $\chi^2 < \text{prob}$	0.0000, reject H_0		0.0003, reject H_0		0.4989, fail to reject	

Note: Arellano-Bond dynamic panel estimates. (1) represents the model which considers the output gap as exogenous, and (2) represents the model which considers the output gap as endogenous. L1 (L2) is one (two) year lagged variable for each dependent variable, and c is a constant term

(1) Revenue

Table 5-6 reports the difference of the fiscal responsiveness by income group. The results are obtained through controlling the endogeneity of the output gap in the cases of revenue and expense. In the regression model, the base group is the Low-Income group. The coefficients of the dummy interaction terms represent the difference in slope of the output gap of GDP (\tilde{y}) between the Mid-Income group and the High-Income group relative to the Low-Income group. The intercept terms of the group dummy variables are dropped because they are time invariant and are eliminated in the Arellano-Bond procedure. So, they are not reported in the table. From this table, we focus on the slope coefficients of the output gap of GDP. We interpret these values as the fiscal responsiveness.

The Low-Income and the Middle groups have pro cyclical policies for revenue in both data sets. However, the High-Income group has pro cyclicity only for 1990-2007 data set. In the 1972-2007 data sets, the High-Income group shows counter cyclicity. In addition, the responsiveness for the 1990-2007 data set are more pro cyclical than for the 1972-2007 data set in all income groups.

Comparing the results by income groups, the two data sets show the same results. The difference in slope of the output gap of GDP (\tilde{y}) between the Mid-Income group and the High-Income group relative to the Low-Income group show negative signs in both data sets. It means that the Low-Income group has a larger coefficient than the other groups in the two data sets. In addition, the magnitude of the negative signs is larger for the High-Income group than for the Middle-Income group. As the economy develops, the fiscal responsiveness in revenue becomes less pro cyclical.

Comparing the results with the country-by-country regression results, the two

regressions show similar results. First, the revenue responsiveness for the 1990-2007 data set are more pro cyclical than for the 1972-2007 data set. Second, the Low-Income and Middle-Income groups have more pro cyclical than the High-Income group in revenue. However, the dynamic panel regression shows more clearly the change in the pattern of the responsiveness with economic development than the country-by-country regression.

(2) Expenses

The Low-Income and the Middle groups have pro cyclical for expenses in both data sets. However, the High-Income group has counter cyclical for 1972-2007 and close to acyclical response for 1990-2007 data set. It implies that the High-Income group shows counter cyclical or almost acyclical policy. The responsiveness for the 1990-2007 data set are more pro cyclical than for the 1972-2007 in all income groups.

Comparing the results by income groups, the two data sets show same results. The difference in slope of the output gap of GDP (\tilde{y}) between the Mid-Income group (and the High-Income group) and the Low-Income group show negative signs in both data sets. It means that the Low-Income group has a larger coefficient than the other groups in the two data sets. In addition, the magnitude of the negative signs is larger for the High-Income group than for the Middle-Income group. As the economy develops, the fiscal responsiveness in revenue becomes less pro cyclical.

Comparing the results with the country-by-country regression results, the result that the fiscal responsiveness in expenses becomes less pro cyclical is similar in the two regressions. However, the dynamic regression shows that the expenses responsiveness for the 1990-2007 data set is more pro cyclical than for the 1972-2007

data set while the country-by-country regression does not show this. From Figure 5-1 (b), the red line and the black line intersect. In addition, the coefficients for the High-Income group in the country-by-county regression are negative in both data sets.

(3) Cash surplus/deficit

The Low-Income group has pro cyclical for surplus/deficit in both data sets. However, the magnitudes of the coefficients for surplus/deficit are relatively smaller than for revenue and for expenses. The Middle-Income group and the High-Income group have also positive coefficients in both data sets. However, in these two groups the magnitudes of the coefficients for surplus/deficit are relatively larger than for revenue and for expenses.

Comparing the results by income groups, the two data sets show different results. The difference in slope of the output gap of GDP between the Mid-Income group and the Low-Income group shows a positive sign for 1972-2007 while it has a negative sign for 1990-2007. On the other hand, the difference in slope of the output gap of GDP between the High-Income group and the Low-Income group shows positive signs in both data sets, which means that the Low-Income group has a smaller coefficient than the High-Income group. In addition, the magnitude of the negative signs is larger for the Middle-Income group than for the High-Income group in 1972-2007. However, we note that the coefficients in most cases are insignificant.

Comparing the results with the country-by-country regression results, we find that the result that the fiscal responsiveness of surplus/deficit for the Higher-Income group is more pro cyclical than for the Low-Income group and is similar in the two regressions.

<Table 5-6> Fiscal responsiveness of aggregate variables by income group

	1972-2007 (61 countries)			1990-2007 (79 countries)		
	rev	exp	csd	rev	exp	csd
L1	0.4629 (0.0250)***	-0.0001 (0.0252)	-0.4770 (0.0243)***	0.2979 (0.1726)*	-0.1356 (0.0046)***	-0.7216 (0.0147)***
L2	-0.0904 (0.0230)***	-0.1281 (0.0251)***	-0.3531 (0.0242)***	-0.0003 (0.0618)	-0.0549 (0.0045)***	-0.9035 (0.0131)***
gdp	0.2285 (0.0765)***	0.9795 (0.2501)***	0.1858 (6.0530)	0.8030 (0.2242)***	1.1083 (0.1072)***	0.0884 (0.3452)
Mid*gdp	-0.1154 (0.1291)	-0.8253 (0.3561)**	1.2858 (9.3292)	-0.3875 (0.2083)*	-0.4138 (0.1313)***	-0.0354 (0.4461)
High*gdp	-0.2328 (0.0787)***	-0.9804 (0.2540)***	0.0624 (6.1438)	-0.6707 (0.2400)***	-1.0813 (0.1388)***	1.1462 (0.4810)**
C	0.0040 (0.0034)	-0.0109 (0.0090)	0.0241 (0.2394)	-0.0001 (0.0017)	-0.0046 (0.0021)***	-0.0366 (0.0084)***
$\chi^2 < \text{prob}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: Arellano-Bond dynamic panel estimates. L1 (L2) is one (two) year lagged variable for each dependent variable, and c is a constant term. Mid*gdp (High*gdp) is the difference in slope of gdp gap between the Mid-Income group (the High-Income group) and the Low-Income group. csd=cash surplus/deficit. rev=revenue. exp=expense.

5.2.2. Fiscal responsiveness of revenue components by income group

(1) Tax

Table 5-7 reports the fiscal responsiveness of the revenue components. In the case of taxes, the pattern is similar to revenue, and all groups have pro cyclical for taxes. However, the High-Income group shows almost acyclical response for 1972-2007. In addition, the responsiveness for the 1990-2007 data set are more pro cyclical than for the 1972-2007 data set in all income groups.

Comparing the results by income groups, the two data sets show the same results. The difference in slope of the output gap of GDP (\tilde{y}) between the Mid-Income group and the High-Income group relative to the Low-Income group show negative signs in

both data sets. It means that the Low-Income group has a larger coefficient than the other groups in the two data sets. In addition, the magnitude of the negative signs is larger for the High-Income group than for the Middle-Income group. As the economy develops, the fiscal responsiveness in revenue becomes less pro cyclical. It is the same as the revenue case.

Comparing the results with the country-by-country regression results, the two regressions show similar results. First, the revenue responsiveness for the 1990-2007 data set are more pro cyclical than for the 1972-2007 data set. Second, the Low-Income and Middle-Income groups have more pro cyclicity than the High-Income group in revenue. Third, its results are similar to the revenue case in the two regressions. Considering that taxes represent the large share of revenue, the similar pattern is reasonable.

(2) Tax on goods and services

The Low-Income group has counter cyclicity for 1972-2007 while it has pro cyclicity for 1990-2007. The Middle-Income groups have pro cyclicity for taxes on goods and services in both data sets. However, the High-Income group has a counter cyclicity for 1972-2007.

Comparing the results by income groups, the two data sets show different results. For 1972-2007, the Middle-Income group has a more pro cyclical policy than the other groups. However, for 1990-2007, the High-Income group has stronger pro cyclicity than the other groups. Therefore, it can be concluded that the dynamic regression does not show any change of the responsiveness with economic development. However, we note that most coefficients are insignificant.

(3) Tax on income and profits and capital gains

All groups have pro cyclical for taxes on income. However, the High-Income group shows almost acyclicity for 1972-2007. In addition, the responsiveness for 1990-2007 are more pro cyclical than for 1972-2007 in all income groups.

Comparing the results by income groups, the two data sets show the same results. The difference in slope of the output gap of GDP between the Mid-Income group and the Low-Income group shows positive signs in both data sets. On the other hand, the difference in slope between the High-Income group and the Low-Income group shows negative signs in both data sets. It means that the Middle-Income group has a larger coefficient than the other groups in the two data sets so that the Middle-Income group has more pro cyclical than the other groups. However, we note that the coefficients for the Middle-Income group are insignificant in the two data sets.

Comparing the results with country-by-country regression based on significant coefficients, the result that the revenue responsiveness for the 1990-2007 data set are more pro cyclical than for the 1972-2007 data set is the same in the two regressions. However, the Low-Income group has more pro cyclical than the High-Income group in the dynamic regression while the Low-income group is less pro cyclical in the country-by-country regression.

(4) Tax on property

The Low-Income and the High-Income groups have pro cyclical for taxes on property in both data sets. However, the Middle-income group has pro cyclical for 1972-2007 and counter cyclical for 1990-2007.

Comparing the results by income groups, the differences in slope of the output gap

of GDP show negative signs in both data sets. However, the magnitude of the Middle-Income group is larger than the High-Income group for 1990-2007 while it is opposite for 1972-2007. In fact, the Middle-income group has counter cyclical policy for 1990-2007. Based on the significant coefficients, it can be concluded that the Low-Income group has more pro cyclical policy than the High-Income group.

Comparing the results with the country-by-country regression based on significant coefficients, the two regressions show similar results. The Low-Income group has more pro cyclical policy than the High-Income group for 1990-2007.

(5) Social contribution

The Low-Income group has counter cyclical policy in both data sets, and the Middle-Income group has pro cyclical policy in both data sets. On the other hand, the High-Income groups have different cyclical policy in the two data sets. For 1972-2007, the responsiveness of the Middle-Income group is pro cyclical while it is counter cyclical for 1990-2007.

Comparing the results by income groups, the differences in slope of the output gap of GDP show positive signs in the two data sets. It implies that the Low-Income group has more counter cyclical policy than the other groups. However, the coefficients are significant for the Low-Income and the Middle-Income groups for 1990-2007.

Comparing the results with the country-by-country regression based on significant coefficients, the two regressions show opposite results. The Low-Income group has more counter cyclical policy than the Middle-Income group in the dynamic regression while the Low-Income group has more pro cyclical policy in the country-by-country regression for 1990-2007.

<Table 5-7> Fiscal responsiveness of revenue components by income group

(a) 61 countries (1972-2007)

	1972-2007 (61 countries)				
	tax	tgs	tip	top	scn
L1	0.3939 (0.0238)***	-0.1692 (0.0106)***	-0.0561 (0.0245)**	0.1086 (0.0240)***	0.0655 (0.0162)***
L2	-0.0832 (0.0191)***	-0.1687 (0.0094)***	-0.0414 (0.0110)***	-0.0490 (0.0204)**	0.0230 (0.0274)
gdp	0.3727 (0.0586)***	-0.0918 (0.3094)	0.6188 (0.1763)***	0.7147 (0.3812)*	-0.2917 (1.2223)
Mid*gdp	-0.2396 (0.1007)**	0.2444 (0.3529)	0.0188 (0.3045)	-0.4192 (0.5766)	0.4459 (1.2227)
High*gdp	-0.3703 (0.0599)***	-0.6027 (1.0018)	-0.6073 (0.1797)***	-0.7019 (0.3851)*	0.3910 (1.2222)
C	-0.0010 (0.0026)	0.0349 (0.0438)	-0.0042 (0.0080)	-0.0147 (0.0138)	-0.0025 (0.0189)
$\chi^2 < \text{prob}$	0.0000	0.0000	0.0000	0.0000	0.0000

(b) 79 countries (1990-2007)

	1990-2007 (79 countries)				
	tax	tgs	tip	top	scn
L1	0.4625 (0.1119)***	0.1424 (0.1610)	0.3925 (0.0456)***	0.0211 (0.0857)	0.0788 (0.0286)***
L2	-0.1154 (0.0567)***	-0.0525 (0.0407)	-0.0097 (0.0181)	-0.0433 (0.0309)	0.0579 (0.0183)***
gdp	0.8087 (0.1739)***	0.6193 (0.3070)**	0.9480 (0.2594)***	2.3704 (0.8233)***	-1.3232 (0.7545)*
Mid*gdp	-0.3461 (0.1874)***	-0.3271 (0.4269)	0.1491 (0.3588)	-2.5383 (1.0498)**	1.5241 (0.8917)*
High*gdp	-0.6721 (0.1852)***	0.1473 (0.3466)	-0.8483 (0.2916)***	-2.3123 (0.8435)***	1.2985 (0.9972)
C	0.0014 (0.0014)***	0.0026 (0.0027)	-0.0008 (0.0038)	-0.0394 (0.0216)***	-0.0237 (0.0156)
$\chi^2 < \text{prob}$	0.0000	0.0000	0.0000	0.0485	0.0006

Note: Arellano-Bond dynamic panel estimates. L1 (L2) is one (two) year lagged variable for each dependent variable, and c is a constant term. Mid*gdp (High*gdp) is the difference in slope of gdp gap between the Mid-Income group (the High-Income group) and the Low-Income group. tax=taxes, tgs=taxes on goods & services, tip=tax on income & profits & capital gains, top=taxes on property, scn=social contribution

5.2.3. Fiscal responsiveness of expense by economic component and income group

(1) Compensation of employees

Table 5-8 reports the fiscal responsiveness of expenses by components, based on economic classification. In the case of employee's salaries, Table 5-8 shows different results in the two data sets. The Low-Income group has opposite signs in the two data sets. For 1972-2007, it has counter cyclicality while it has pro cyclicality for 1990-2007. The Middle-Income group has counter cyclicality for 1972-2007 while it has pro cyclicality for 1990-2007. The responsiveness of the High-Income groups is pro cyclical in both data sets.

Comparing the results by income groups, the two data sets show different results. The coefficients of the dummy interaction terms show positive signs for 1972-2007 while they are negative signs for 1990-2007. In other words, the Low-Income group has more counter cyclical policy than the other groups for 1972-2007. On the other hand, the Low-Income group has more pro cyclical policy than the other groups. However, we note that only the coefficients for 1990-2007 are significant. Based on significant coefficients, as the economy develops the fiscal responsiveness in employee's salaries becomes less pro cyclical.

Comparing the results with the country-by-country regression based on significant, the two regressions show similar results. The Low-Income and Middle-Income groups have more pro cyclicality than the High-Income group for 1990-2007. The High-Income group shows acyclical responsiveness in employee's salaries.

(2) Usage of goods and services

All groups have pro cyclical policy for usage of goods and services. In addition, the responsiveness for 1990-2007 are more pro cyclical than for 1972-2007 in all income groups.

Comparing the results by income groups, the Low-Income group has more pro cyclical policy than the other groups. For 1972-2007, the Middle-Income group has more pro cyclical policy than the High-Income group. However, the Middle-Income group has less pro cyclical policy than the High-Income group for 1990-2007.

Comparing the results with the country-by-country regression based on significant coefficients, the two regressions show similar results. The Low-Income group has more pro cyclical policy than the other groups. The difference between the Middle-Income group and the High-Income group is small. So, it can be concluded that the responsiveness becomes less pro cyclical with economic development.

(3) Interest payments

The Low-Income group has different cyclical policy in the two data sets while the Middle-Income and the High-Income groups have counter cyclical policy in both data sets.

Comparing the results by income groups, the two data sets show different results. For 1972-2007, the Low-Income group has more pro cyclical policy than the other groups while the Low-Income group has less pro cyclical policy than the other groups for 1990-2007. However, we note that all coefficients are insignificant. Therefore, we cannot say the pattern of the responsiveness varies significantly with economic development.

(4) Subsidies

The Low-Income group has counter cyclical while the High-income group has pro cyclical for subsidies in both data sets. The responsiveness of the Middle-Income group is counter cyclical for 1972-2007 while it is pro cyclical for 1990-2007.

Comparing the results by income groups, the Low-Income group has more counter cyclical than the other groups for 1990-2007. In fact, the Middle-income and the High-income groups have pro cyclical policies. The High-Income group has more pro cyclical policy than the other group in both data sets. However, we note that the coefficients are only significant for 1990-2007.

Comparing the results with the country-by-country regression based on significant coefficients for 1990-2007, the two regressions show opposite results. The Low-Income group has more counter cyclical than the other groups in the dynamic regression while the Low-Income group has more pro cyclical in the country-by-country regression for 1990-2007.

(5) Social benefits

The Middle-income and the High-Income groups have pro cyclical in both data sets. For 1972-2007, the Low-income group has counter cyclical while it has pro cyclical for 1990-2007. The Low-Income group is more counter cyclical than the other groups for 1972-2007 while the High-Income group is less pro cyclical. However, we note that all coefficients of GDP gap are insignificant. In this case, the only significant coefficients are those of the lagged dependent variables.

**<Table 5-8> Fiscal responsiveness of expense by economic components
and income group**

(a) 61countries (1972-2007)

	1972-2007 (61 countries)				
	cem	ugs	int	Sub	scb
L1	0.0205 (0.0109)*	0.0580 (0.1427)	0.0417 (0.0086)*	-0.1172 (0.0358)***	0.0516 (0.0152)***
L2	-0.0260 (0.0070)***	-0.0891 (0.0709)	-0.0024 (0.0027)	-0.0876 (0.0540)*	-0.0637 (0.0209)***
gdp	-1.2623 (1.4774)	0.4339 (0.1916)**	0.3424 (0.5360)	-1.5348 (1.5135)	-0.1239 (0.1740)
Mid*gdp	1.4967 (1.4836)	-0.2660 (0.2108)	-0.5626 (0.5994)	-1.5131 (3.4484)	0.4878 (0.3258)
High*gdp	1.2580 (1.4776)	-0.3904 (0.1924)**	-0.7892 (0.5724)	2.0415 (1.5640)	0.0741 (0.1775)
C	0.0264 (0.0232)	0.0010 (0.0038)	-0.0236 (0.0118)***	-0.1044 (0.0914)	0.0177 (0.0120)
$\chi^2 < \text{prob}$	0.0000	0.0000	0.0859	0.0000	0.0001

(b) 79 countries (1990-2007)

	1990-2007 (61 countries)				
	cem	ugs	int	sub	scb
L1	0.3630 (0.0285)***	-0.1048 (0.0177)***	0.2469 (0.0900)***	-0.0337 (0.0341)	0.1175 (0.0809)
L2	-0.0021 (0.0033)	-0.0881 (0.0164)***	0.0078 (0.0210)	-0.0106 (0.0265)	-0.1004 (0.0393)***
gdp	0.6806 (0.1464)***	2.2638 (0.2065)***	-0.2849 (0.4422)	-5.1391 (2.4773)**	0.2070 (0.2512)
Mid*gdp	-0.3671 (0.1772)**	-1.8210 (0.2657)***	0.2085 (0.5146)	5.4324 (2.8544)*	-0.0696 (0.4304)
High*gdp	-0.5974 (0.2003)***	-1.7671 (0.2849)***	0.0904 (0.5288)	6.7129 (3.7205)*	-0.1119 (0.2916)
C	-0.0019 (0.0032)	0.0038 (0.0047)	-0.0127 (0.0079)*	-0.0963 (0.0442)**	0.0008 (0.0169)
$\chi^2 < \text{prob}$	0.0000	0.0000	0.0003	0.0000	0.0001

Note: Arellano-Bond dynamic panel estimates. L1 (L2) is one (two) year lagged variable for each dependent variable, and c is a constant term. Mid*gdp (High*gdp) is the difference in slope of gdp gap between the Mid-Income group (the High-Income group) and the Low-Income group. cem=compensation of employees, ugs= use of goods and services, int=interest, sub=subsidies, scb=social benefits

5.2.4. Fiscal responsiveness of expense by functional components and income group

(1) Defense

Table 5-9 reports the fiscal responsiveness of expenses by components, based on functional classification. In the case of defense, the Low-Income and the Middle-Income groups have pro cyclical in both data sets. On the other hand, the High-Income group has counter cyclical for 1972-2007 while it has almost acyclical for 1990-2007.

Comparing the results by income groups, the High-Income group has more counter cyclical or less pro cyclical than the other groups in the two data sets. In fact, only the High-Income group has counter cyclical in defense. The cyclical between the Middle-Income group and the Low-Income group shows different results in the two sets. For 1972-2007, the responsiveness of the Low-Income group is less pro cyclical while it is more pro cyclical for 1990-2007. However, we note that the coefficients are significant for 1990-2007. Based on significant coefficients, the High-Income group has less pro cyclical policy than the Low-income group for 1990-2007.

Comparing the results with the country-by-country regression based on significant coefficients, the two regressions show similar results. The Low-Income group has more pro cyclical than the High-Income group. The High-Income has counter cyclical especially for 1972-2007 and almost acyclical for 1990-2007 in defense.

(2) Economic Affairs

The Low-Income and the Middle-Income groups have pro cyclical in both data sets. On the other hand, the High-Income group has counter cyclical for 1972-2007

while it has pro cyclical policy for 1990-2007. In addition, the responsiveness for 1990-2007 are more pro cyclical than for 1972-2007 in all income groups.

Comparing the results by income groups, the Low-Income group has more pro cyclical policy than the other groups for 1990-2007. For 1972-2007, the responsiveness of the Middle-Income group is more pro cyclical. However, the difference between the Low-Income group and the Middle-Income group is small. In addition, the Middle-Income group has more pro cyclical policy than the High-Income group. In fact, the High-Income group shows counter cyclical policy for 1972-2007.

Comparing the results with the country-by-country regression, the two regressions show similar results. First, the Low-Income group has more pro cyclical policy than the other groups. Second, only the High-Income group shows counter cyclical policy. As the economy develops, the responsiveness becomes less pro cyclical or more counter cyclical.

(3) Housing and community amenities

The Low-Income and the High-Income groups have pro cyclical policy in both data sets. The Low-Income group shows strongly pro cyclical policy while the High-Income group shows weak pro cyclical policy. On the other hand, the Middle-Income group has opposite signs in the two sets. For 1972-2007, it has counter cyclical policy while it has pro cyclical policy for 1990-2007.

Comparing the results by income groups, the two data sets show the same results. The Low-Income group shows much more pro cyclical policy than the other groups. The Middle-income group shows more counter cyclical policy or less pro cyclical

policy than the other groups.

Comparing the results with the country-by-country regression, the two regressions show similar results for 1972-2007. The Middle-income and the High-Income groups shows more counter cyclical policy or less pro cyclical policy than the Low-Income group. In the country-by-country regression for 1990-2007, the High-Income group shows counter cyclical policy in housing. Combining the results of the two regressions, it can be concluded that as the economy develops the responsiveness becomes more counter cyclical in the housing case

(4) Health Affairs

The Low-Income and the Middle groups have pro cyclicality while the High-income group has counter cyclicality for health case in both data sets.

Comparing the results by income groups, the coefficients of the dummy intersection terms are negative signs for the Middle-Income and the High-Income groups in both data sets. It means that the responsiveness of the Low-Income group is more pro cyclical than the other groups. In fact, the High-Income group shows counter cyclical policy in both data sets. We note that the coefficients of the Middle-Income group are insignificant in both groups.

Comparing the results with the country-by-country regression based on significant coefficients, the two regressions show similar results. The High-Income group has more counter cyclicality or less pro cyclicality than the Low-Income group in the dynamic regression as well as in the country-by-country regression.

(5) Education

The Low-income and the Middle-Income groups have pro cyclicality in both data sets. However, the High-Income group shows counter cyclicality in both data sets. The Middle-Income group is more pro cyclical than the other groups in both data sets. However, we note that the coefficients for 1990-2007 are significant.

Comparing the results with the country-by-country regression based on significant coefficients, the two regressions show similar results. The High-Income group has less pro cyclicality than the Low-Income group in the dynamic regression. In the country-by-country regression, the High-Income group shows counter cyclicality while the Low-Income group shows pro cyclicality.

(6) Recreation and Religion Affairs

The Low-Income and the Middle groups have pro cyclicality while the High-income group has counter cyclicality for recreation and religion case in both data sets.

Comparing the results by income groups, the Middle-Income group is more pro cyclical than the High-Income group for 1972-2007 while the Middle-Income group is less pro cyclical than the High-Income group for 1990-2007. However, we note that only the coefficients of the Low-Income and the High-Income groups for 1990-2007 are significant.

Comparing the results with the country-by-country regression based on significant coefficients, the two regressions show similar results. It can be concluded that the High-Income group has less cyclicality or more counter cyclicality than the Low-Income group. The cyclicality of the High-Income group is different in the two

regressions. In the dynamic regression, the High-Income group shows counter cyclical while it shows pro cyclical in the country-by-country regression.

(7) Social protection

The Low-Income has counter cyclical for 1972-2007 while it has pro cyclical for 1990-2007. The Middle-Income group has pro cyclical in both data sets. On the other hand, the High-Income group has counter cyclical for 1972-2007 while it has pro cyclical for 1990-2007.

Comparing the results by income groups, the Middle-Income group is more pro cyclical than the other groups in both data sets. The cyclical between the High-Income group and the Low-Income group is different in the two sets. For 1972-2007, the High-Income group is less counter cyclical than the Low-Income group while it is less pro cyclical than the Low-Income group for 1990-2007. However, we note that most coefficients are insignificant.

**< Table 5-9> Fiscal responsiveness of expense by functional components
and income groups**

(a) 61 countries (1972-2007)

	1972-2007 (61 countries)						
	Def	eca	hus	hel	Edu	rec	spt
L1	0.3636 (0.0814)***	0.4107 (0.0461)***	-0.1659 (0.0241)***	0.1040 (0.0146)***	0.5878 (0.1099)***	0.1451 (0.0580)**	0.0153 (0.0258)
L2	-0.0504 (0.0286)*	-0.0982 (0.0251)***	-0.0215 (0.0394)	0.0080 (0.0145)	-0.1571 (0.0509)***	-0.0874 (0.0143)***	-0.0564 (0.0207)*
gdp	0.0259 (0.0530)	0.2142 (0.0952)**	21.3321 (2.7751)***	0.3628 (0.1575)**	0.0313 (0.0864)	0.1804 (0.2034)	-0.5720 (0.8737)
Mid*gdp	0.1220 (0.1024)	0.0021 (0.1499)	-21.6277 (4.3231)***	-0.0633 (0.2328)	0.0649 (0.1030)	0.0971 (0.2727)	1.9146 (1.5850)
High*gdp	-0.0386 (0.0529)	-0.2368 (0.1112)**	-21.2267 (2.8060)***	-0.3682 (0.1613)**	-0.0532 (0.0955)	-0.3058 (0.2569)	0.3121 (0.9005)
C	-0.0002 (0.0025)	0.0045 (0.0021)	0.1954 (0.1157)*	0.0024 (0.0067)	0.0030 (0.0024)	0.0026 (0.0049)	-0.0059 (0.0437)
$\chi^2 < \text{prob}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(b) 79 countries (1990-2007)

	1990-2007 (79 countries)						
	Def	eca	hus	hel	edu	rec	spt
L1	-0.1433 (0.1696)	0.3310 (0.0663)***	-0.1498 (0.0549)***	0.1753 (0.1755)	0.3679 (0.0738)***	0.0709 (0.0722)	-0.0051 (0.0181)
L2	-0.1502 (0.0813)*	-0.0994 (0.0352)***	0.0516 (0.0908)	0.0043 (0.0082)	-0.0457 (0.0111)***	-0.0657 (0.0328)**	-0.0043 (0.0152)
gdp	0.9257 (0.3573)***	0.7180 (0.2259)***	30.0574 (25.5522)***	0.9931 (0.4065)**	0.7966 (0.2925)***	0.9107 (0.3583)***	0.4775 (0.5427)
Mid*gdp	-0.3569 (0.4620)	-0.0771 (0.3782)	-27.0385 (25.1542)***	-0.1792 (0.4847)	0.0517 (0.3425)	-0.2546 (0.4434)	0.1016 (0.5696)
High*gdp	-0.8365 (0.3353)**	-0.6611 (0.2214)***	-29.7688 (25.6570)***	-1.1731 (0.4345)***	-0.8263 (0.3079)***	-1.2722 (0.6167)**	-0.4238 (0.5382)
C	-0.0106 (0.0056)	0.0005 (0.0035)	0.3010 (0.3200)*	-0.0143 (0.0046)***	-0.0014 (0.0033)	-0.0016 (0.0057)	-0.0135 (0.0082)
$\chi^2 < \text{prob}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0699

Note: Arellano-Bond dynamic panel estimates. L1 (L2) is one (two) year lagged variable for each dependent variable, and c is a constant term. Mid*gdp (High*gdp) is the difference in slope of gdp gap between the Mid-Income group (the High-Income group) and the Low-Income group. def=defense, eca=economic affairs, hus=housing and community amenities, hel=health, rec=recreation & culture & religion, edu=education, spt=social protection.

5.3 Fiscal responsiveness depending on economic situations

Table 5-10 reports the coefficients including economic situations in the dynamic panel regression by income group. The coefficients represent the Arellano-Bond IV estimates. In the regression, the fiscal gap is the dependent variable and appears with two lags on the right-hand side. In the regression, the economic situations are grouped into three categories: normal, bad, and good situations. The base condition is a normal situation. The normal situation is defined as the range within two standard deviations of zero from the output gap by income group. The bad situation is the case that the output gap deviates negatively one standard deviation from zero. On the other hand, the good situation is above one standard deviation of the output gap from zero. From Table 5-10, bad (good) represents the difference in intercept of the output gap of GDP (\tilde{y}) between the bad situation and the good situation relative to the normal situation. The coefficients for the dummy interaction terms represent the difference in slope of the output gap of GDP between the bad situation and the good situation relative to the normal situation. We focus on the slope coefficients of the output gap which represents the fiscal responsiveness.

(1) Revenue

When the economy is normal, the Low-income group shows pro cyclical in both data sets. In addition, the responsiveness for 1990-2007 are more pro cyclical than for 1972-2007. However, when the economy is in bad or good situations, the two data sets report different results. For 1972-2007, the revenue becomes more pro cyclical in the bad and good situations than under the normal situation. On the other

hand, for 1990-2007, revenue responds with less pro cyclical in the good situation while it responds with counter cyclical in the bad situation. In addition, the revenue responds more sensitively in bad situations than in good situations in both data sets. However, we note that the coefficients are only significant for 1990-2007.

In case of the Middle-Income group, when the economy is normal, we find different results in the two data sets. The Middle-Income group responds counter cyclically for 1972-2007 while it responds pro cyclically for 1990-2007. In addition, the responsiveness for 1990-2007 are more pro cyclical than for 1972-2007 like the Low-Income group case. However, when the economy is in bad or good situations, the two data sets report different results like the Low-Income group case. For 1972-2007, the revenue becomes more pro cyclical in the bad and good situations than the normal situation. On the other hand, for 1990-2007, the revenue responds more counter cyclically in the good and bad situations. In addition, the revenue responds more sensitively in good situations than in bad situations for 1972-2007 while it is opposite for 1990-2007. This is a different result from the Low-Income group case. However, we note that the coefficients are only significant for 1990-2007.

In the case of the High-Income group, when the economy is normal, the High-Income group shows pro cyclical in both data sets. In addition, the responsiveness for 1990-2007 are more pro cyclical than for 1972-2007 like the other groups. However, when the economy is in the bad situation, the two data sets report different results. For 1972-2007, the revenue becomes more pro cyclical while it responds more counter cyclically. When the economy is in the good situation, the responsiveness becomes more counter cyclical in both data sets. In fact, it is counter cyclical in the good situation. In addition, the revenue responds more sensitively in good situations than in bad situations in both data sets. This is the same pattern as the Middle-Income

group case and is a different result from the Low-Income group case.

Comparing the results by income groups based on the significant coefficients, when the economy is normal, the Low-Income group has more pro cyclical policy than the other groups. When the economy is in the bad or good situations, revenue becomes more counter cyclical or less pro cyclical in all groups. In the case of bad situations, all groups show pro cyclical policies. In the case of good situations, the Low-Income group responds pro cyclically while the Middle-Income and the High-Income groups show counter cyclical policies. In addition, the Middle-Income and the High-Income groups show more sensitive responsiveness in good situations than in bad situations while the Low-Income group responds more sensitively in the bad situation than in the good situation.

(2) Expenses

When the economy is normal, the Low-income group shows pro cyclicality in both data sets. In addition, the responsiveness for 1990-2007 is more pro cyclical than for 1972-2007. However, when the economy is in the bad or good situations, expenses become counter cyclical in both data sets. Moreover the responsiveness is more countercyclical in bad situations than in good situations. In other words, the expenses of the Low-Income group respond more sensitively in bad situations than in good situations in both data sets.

In the case of the Middle-Income group, when the economy is in the normal situation, the Middle-income group shows pro cyclicality in both data sets like the Low-Income case. In addition, the responsiveness for 1990-2007 is more pro cyclical than for 1972-2007 like the Low-Income case. When the economy is in the bad

situation, the two data sets report different results. For 1972-2007, the Middle-Income group show counter cyclical responsiveness while it responds pro cyclically for 1990-2007. When the economy is in the good situation, the Middle-Income group responds pro cyclically in both data sets. In addition, the expense of the Middle-Income group responds more sensitively in bad situations than in good situations in both data sets.

In the case of the High-Income group, when the economy is normal, the High-Income group shows pro cyclical in both data sets. In fact, it is close to acyclical policy for 1972-2007. In addition, the responsiveness for 1990-2007 is more pro cyclical than for 1972-2007 like the other groups. However, when the economy is in bad or good situations, the two data sets report different results. For 1972-2007, expenses become more pro cyclical in the bad situation while they respond more counter cyclical in the good situation like the Low-income group. In fact, it is counter cyclical policy in the good situation. On the other hand, for 1990-2007, the expense becomes more counter cyclical in the bad situation, and it responds less pro cyclically in the good situation. In addition, expenses respond more sensitively in good situations than in bad situations for 1972-2007 while it is more sensitive in bad situations than in goods situations for 1990-2007. This is different from the other groups. However, we note that most coefficients are insignificant. Only the lagged expense variables are significant in the High-Income group case.

Comparing the results by income groups based on the significant coefficients, when the economy is normal, the Low-Income group has more pro cyclical policy than the Middle-Income group. When the economy is in the bad or good situations, expenses become more counter cyclical or less pro cyclical in all groups. In the case of the bad situations, the Low-Income group responds strongly counter cyclically. In the case of the good situations, the Low-Income group responds counter cyclically

while the Middle-Income group shows pro cyclical policies. In addition, the Low-Income and the Middle-Income groups respond more sensitively in bad situations than in good situations.

(3) Cash surplus/deficit

When the economy is normal, the Low-income group shows pro cyclical in both data sets. However, when the economy is in the bad or good situations, the cash surplus/deficit becomes counter cyclical in both data sets. For 1972-2007, the Low-Income group responds more sensitively in the good situation than in the bad situation. On the other hand, the Low-Income group responds more sensitively in the good situation for 1990-2007. Further, we note that all coefficients for 1972-2007 are significant.

In the case of the Middle-Income group, when the economy is in the normal or good situations, the Middle-income group shows counter cyclical in both data sets. However, when the economy is in the bad situation, the two data sets show different results. The responsiveness is pro cyclical for 1972-2007 while it is counter cyclical for 1990-2007. In addition, the Middle-Income responds more sensitively in the good situation than in the bad situation. However, we note that all coefficients of the Middle-Income group are insignificant in both data sets.

In the case of the High-Income group, when the economy is normal, the High-Income group shows strong pro cyclical in both data sets. However, when the economy is in the bad or the good situations, the High-Income group responds counter cyclically. In addition, the High-Income group responds more sensitively in the good situation than in the bad situation. In other words, the responsiveness is more counter

cyclical in the good situation than in the bad situation.

Comparing the results by income groups based on the significant coefficients, when the economy is normal, the High-Income group has more pro cyclical policy than the other groups. When the economy is in the bad situation, the Middle-Income group has more pro cyclical policy than the other groups. When the economy is in the good situation, the High-Income group shows more counter cyclical policy than the other groups. Generally speaking, the responsiveness of cash surplus/deficit is more sensitive in the good situation than in the bad situation for the Middle-Income and the High Income groups.

To summarize the sensitivity depending on economic situations, the Low-Income and the Middle-Income groups respond more sensitively in the bad situation than in the good situation for the revenue and expense cases. However, the High-Income group responds more sensitively in the good situation. In addition, the High-Income group shows asymmetric behavior in some cases. On the other hand, in case of cash surplus/deficit, the Middle-Income and the High-Income groups respond more sensitively in the good situation than in the bad situation. Generally speaking, as the economy develops the fiscal responsiveness becomes more sensitive in the good situation than in the bad situation.

<Table 5-10> Fiscal responsiveness depending on economic situations

(a) 61 countries (1972-2007)

		1972-2007 (61 countries)		
		rev	exp	csd
Low-Income	L1	0.4240 (0.0487)***	-0.0307 (0.0531)	0.0574 (0.0371)
	L2	-0.0740 (0.0484)	-0.1403 (0.0526)***	0.1652 (0.0366)***
	bad	0.1632 (0.0568)***	-1.7224 (0.6173)***	0.0101 (0.0047)**
	good	0.0101 (0.0634)	0.2164 (0.3967)	0.0246 (0.0083)***
	gdp	0.3315 (0.2958)	1.0760 (0.7358)*	0.1254 (0.0554)**
	bad*gdp	0.4983 (0.3292)	-8.6032 (3.3501)***	-0.1547 (0.0660)**
	good*gdp	0.0633 (0.3348)	-1.5806 (1.8402)	-0.1591 (0.0662)**
	C	-0.0114 (0.0164)	-0.0117 (0.0475)	-0.0108 (0.0026)***
	$\chi^2 < \text{prob}$	0.0000	0.0122	0.0000
	Middle-Income	L1	0.6268 (0.0485)***	0.4360 (0.0502)***
L2		-0.2188 (0.0342)***	-0.1924 (0.0481)***	-0.4803 (0.0474)***
bad		-0.0064 (0.0196)	-0.0918 (0.0655)	0.3989 (3.0057)
good		-0.0540 (0.0282)*	-0.0132 (0.0601)	7.6841 (4.9919)
gdp		-0.0343 (0.1712)	0.1889 (0.0818)**	-3.7229 (41.0397)
bad*gdp		0.1268 (0.2135)	-0.4564 (0.2890)*	5.1147 (46.7982)
good*gdp		0.4374 (0.2447)*	-0.0798 (0.2984)	-33.8280 (51.0335)
C		0.0066 (0.0063)	0.0047 (0.0052)	-0.1385 (1.3664)
$\chi^2 < \text{prob}$		0.0000	0.0000	0.0000
High-Income		L1	0.5090 (0.0347)***	0.5109 (0.0340)***
	L2	-0.1202 (0.0310)***	-0.0904 (0.0326)***	-0.2538 (0.0361)***
	bad	0.0084 (0.0116)	0.0260 (0.0220)	-0.3837 (1.3885)
	good	0.0095 (0.0131)	0.0265 (0.0312)	0.7901 (1.4807)
	gdp	0.1164 (0.0760)**	0.0087 (0.0435)	20.2726 (8.8742)**
	bad*gdp	0.0592 (0.0606)	0.0832 (0.0983)	-21.8678 (11.8022)*
	good*gdp	-0.2315 (0.0762)***	-0.1701 (0.1498)	-22.1707 (14.1874)*
	C	0.0041 (0.0022)*	0.0011 (0.0020)	0.0570 (0.3328)
	$\chi^2 < \text{prob}$	0.0000	0.0000	0.0000

(b) 79 countries (1990-2007)

		1990-2007 (79 countries)		
		rev	exp	csd
Low-Income	L1	0.1163 (0.1876)	-0.1433 (0.0084)***	0.2313 (0.0501)***
	L2	0.0747 (0.0607)	-0.0613 (0.0050)***	0.1168 (0.0422)***
	bad	-0.0771 (0.1164)	-0.4046 (0.1416)***	-0.0369 (0.0196)*
	good	0.1778 (0.0550)***	0.1433 (0.1089)	0.0032 (0.0141)
	gdp	1.3123 (0.3366)***	1.3402 (0.5452)**	0.0848 (0.0605)
	bad*gdp	-1.5637 (0.8078)	-4.5853 (1.4083)***	-0.3911 (0.1722)**
	good*gdp	-1.5017 (0.5392)***	-1.6541 (0.8417)**	-0.1046 (0.1167)
	C	-0.0111 (0.0078)	-0.0223 (0.0135)*	0.0023 (0.0019)
	$\chi^2 < \text{prob}$	0.0000	0.0000	0.0000
	Middle-Income	L1	0.4493 (0.0872)***	0.4034 (0.0582)***
L2		-0.2438 (0.0471)***	-0.1231 (0.0432)***	0.0326 (0.0605)
bad		-0.0568 (0.0332)*	-0.0501 (0.0333)	-0.0015 (0.0081)
good		0.0510 (0.0727)	0.0389 (0.0554)	0.0055 (0.0220)
gdp		0.6846 (0.2024)***	0.6043 (0.1568)***	-0.0075 (0.0485)
bad*gdp		-0.7186 (0.2188)***	-0.5569 (0.2221)**	-0.0031 (0.0665)
good*gdp		-0.6210 (0.5602)	0.1815 (0.6192)	-0.0754 (0.1793)
C		-0.0001 (0.0039)	0.0006 (0.0047)	-0.0012 (0.0016)
$\chi^2 < \text{prob}$		0.0000	0.0000	0.0000
High-Income		L1	0.5109 (0.0777)***	0.4717 (0.0857)***
	L2	-0.1465 (0.0368)***	-0.1540 (0.0654)**	-0.9102 (0.0233)***
	bad	-0.0491 (0.0541)	-0.0342 (0.0214)	-0.1413 (0.4870)
	good	0.0639 (0.0355)*	-0.0276 (0.0097)***	0.3733 (0.3175)
	Gdp	0.3751 (0.1023)***	0.0381 (0.0922)	4.2255 (1.1670)***
	bad*gdp	-0.4567 (0.2059)**	-0.1336 (0.1070)	-4.5419 (2.5155)*
	good*gdp	-0.5701 (0.1586)***	0.1340 (0.1034)	-5.2985 (2.1388)**
	C	0.0031 (0.0011)**	0.0010 (0.0010)	-0.0944 (0.0346)***
	$\chi^2 < \text{prob}$	0.0000	0.0000	0.0000

Note: Arellano-Bond dynamic panel estimates. L1 (L2) is one (two) year lagged variable for each dependent variable, and c is a constant term. bad (good) is the difference in intercept of gdp gap between the contraction (the expansion) and the normal economic situation. bad*gdp (good*gdp) is the difference in slope of gdp gap between the contraction (the expansion) and the normal economic situation. rev=revenue, exp=expenses, csd=cash surplus/deficit.

5.4 Determinants of fiscal responsiveness

Table 5-11 reports the results of cross-sectional regressions which explain the variation in fiscal responsiveness by using country specific variables. For the broad categories such as revenue, expenses and cash surplus/deficit, the control variables include the volatility of GDP, the amount of GDP, public size, government effectiveness, and political stability. Most correlations among the control variables for the broad categories are less than 0.5 except the correlation between government effectiveness and the political stability in both data sets (see Appendix 6). In addition, the *vif* command in STATA is commonly used in order to check multicollinearity of the model. The test reports “Mean *vif*” as a condition number, which represents the degree of multicollinearity. If “Mean *vif*” is 10 or more it implies that the model is suffering from potentially harmful multicollinearity. The “Mean *vif*” of determinants’ regression model report 2.10 for 1990-2007, and 2.28 for 1990-2007. It can be concluded that there is no severe multicollinearity problem in the model.

For the expense components, the control variables include the amount of GDP, public size, each component’s share of total expenses, government effectiveness, and the level of democracy. In this case, each component’s share of total expenses and the level of democracy are used as control variables instead of the volatility of GDP and the political stability. The reason is that the share and democracy can explain the components’ characteristics more significantly than the volatility and political variables. In this case, most correlations among the control variables are less than 0.5 (see Appendix 6). In addition, the “Mean *vif*” is 1.38 for 1972-2007 and 1.34 for 1990-2007. It can be concluded that there is no severe multicollinearity problem in the model.

5.4.1. Overall

(1) Revenue

Table 5-11 reports the results for the broad categories. First, economic volatility has a negative impact on the fiscal responsiveness of revenue in both data sets. As the economy is more volatile, the responsiveness of revenue becomes less pro cyclical. We note that only the coefficient for 1972-2007 is significant. Second, economic size, such as the amount of GDP, is significant for 1990-2007. However, the coefficient is close to zero, and the signs of the coefficient are opposite in two data sets. Third, the public size (i.e. the ratio of revenue over GDP) affects the fiscal responsiveness significantly in both data sets. For 1972-2007 (61 countries), the coefficient is positive so that a larger share of revenue to GDP makes it more pro cyclical. On the other hand, for 1990-2007 (79 countries), the coefficient is negative and the larger share of revenue to GDP makes it less pro cyclical. However, those coefficients are very small in both data sets, which implies that the effects of public size are not strong. Fourth, the coefficients of government effectiveness are positive in both data sets. This means that when the performance of government is more effective, the revenue becomes more pro cyclical. However, the coefficients are not significant at the 10% level. Finally, political stability has a negative impact on the fiscal responsiveness of revenue so that the revenue is less pro cyclical as politics become more stable. However, the coefficients are not significant at the 10% level.

(2) Expenses

First, political stability has positive signs in both data sets. This means that expenses are more pro cyclical as the politics is more stable. However, we note that the coefficients are insignificant in both data sets. Second, the amount of GDP has a positive impact on the fiscal responsiveness of expenses in both data sets. In addition, the coefficients are significant in both data sets. As the size of the economy grows larger, the marginal effect β of expenses becomes larger, but the coefficients are small and the impacts of GDP size are not strong. Third, the public size (i.e. expense over GDP) has a negative impact on the responsiveness, which means that larger the share of expense to GDP makes it less pro cyclical or more counter cyclical. Therefore, the public size might be considered as the important determinant of fiscal responsiveness. In addition, the coefficients are significant at the 10% level in both data sets. Fourth, the government effectiveness has significant impacts in both data sets and it has a negative sign. We conjecture that the people and Congress support the government and allow the government to use the budget more counter cyclically in governments which are more effective. Fifth, the economical volatility has opposite signs in the two data sets, and returns insignificant coefficients at the 10% level.

(3) Cash surplus/deficit

First, the government effectiveness has significant positive impacts on the responsiveness in both data sets. As the government is more effective, the surplus/deficit responds more pro cyclically to economic fluctuations. Therefore, when the economy is in good times, the more effective government raises surpluses

rather than deficits. Second, the coefficients of public size (i.e. the ratio of expense to GDP) are positive in both data sets. It means that as the public size is larger the surplus becomes more pro cyclical. Third, the political stability has negative impacts, which is the same as the revenue case. This means that the surplus/deficit is less pro cyclical as politics is more stable. Fourth, the volatility has negative impacts on the fiscal responsiveness and also this is the same as the revenue case

<Table 5-11> Determinants of fiscal responsiveness

	1972-2007 (61 countries)			1990-2007 (79 countries)		
	rev	exp	Csd	rev	Exp	csd
C	0.5615 (0.0778)***	0.0746 (0.1170)	0.0330 (0.0631)	0.7605 (0.1692)** *	0.9834 (0.5099)*	0.0410 (0.1227)
Volatility	-1.3677 (0.6278)**	1.0822 (1.2405)	-0.8522 (0.6480)	-1.0571 (1.2053)	-3.8221 (3.5479)	-0.2422 (0.9293)
GDP	-0.00001 (0.00001)	0.00002 (0.00007)***	-0.00001 (0.00001)	0.0001 (0.00001)* **	0.00005 (0.00003)*	0.00001 (0.00001)
Public size	0.0002 (0.00007)*	-0.0002 (0.0001)*	0.0467 (0.0258)*	-0.0006 (0.0002)** *	-0.0014 (0.0004)** *	0.0009 (0.0033)
Effective	0.0538 (0.0934)	-0.2730 (0.0896)***	0.1486 (0.0597)**	0.0006 (0.1382)	-0.9483 (0.4169)**	0.2602 (0.1007)**
Politics	-0.0889 (0.1043)	0.2144 (0.0839)*	-0.0895 (0.0591)	-0.1447 (0.1431)	0.4591 (0.3117)	-0.1743 (0.0864)**
R ²	0.08	0.29	0.39	0.12	0.28	0.27

Note: Volatility is the volatility of GDP, measured as standard deviation of GDP gap for the period 1990-2007. GDP is the amount of GDP, measured as the average of GDP for the 2000s at current U.S dollar. Public size is the average ratio of expense (or revenue)/GDP for 1990-1995. Effectiveness is the quality of public services, the degree of its independence from political pressures (+2.5=excellent governance, -2.5 = worst governance). Politics is the degree of stability and violence (+2.5=stabilized, -2.5=destabilized). ***, ** and * denotes significance at the 1, 5, 10% level. () is a robust standard error

5.4.2. Determinants of the responsiveness of economic expenses

(1) Compensation of employees

Table 5-12 reports the results of the determinants impact on the fiscal responsiveness. Economic size, measured as the amount of GDP, has positive and significant coefficients in both data sets. It means that as an economy is larger expenses for employees becomes more pro cyclical. Public size, measured as the ratio of expenses to GDP, also has positive and significant coefficients in both data sets, which supports Lane (2003) even though he defined public size as the ratio of public sector employment to total employment. He found a positive coefficient for OECD countries. Therefore, as the public size increases, wage consumption responds more pro cyclically. Share is measured as the ratio of compensation of employees to total expenses and shows negative signs in both data sets. It means that as the share of the expense for employee compensation increases, the fiscal responsiveness of this component becomes less pro cyclical or more counter cyclical. Government effectiveness also shows negative signs in both data sets so that the country which has more effective government uses the compensation of employees more counter cyclically or less pro cyclically. The degree of democracy also has negative signs in both data sets. It implies that the country in which democracy develops uses the compensation of employees more counter cyclically or less pro cyclically.

(2) Usage of goods and services

Economic size has positive signs in both data sets, and it is the same as the compensation of employees, which is considered as wage consumption. In the case of public size, the coefficients have different signs in the two data sets. Lane (2003)

found a negative sign for public size. Government effectiveness has negative signs in both data sets, and this implies that the country which has more effective government uses the government consumption more counter cyclically or less pro cyclically. However, the degree of democracy has positive signs in both data sets. It implies that as the country is more democratic non wage consumption responds more pro cyclically or less counter cyclically.

(3) Other components

In the case of interest payments, all control variables show different signs in the two data sets, and the significance levels of the coefficients are opposite in the two data sets.

In the case of subsidies, public size has significant and positive coefficients in both data sets. It means that as the share of public sector increases in a society, the expense for subsidies responds more pro cyclically to economic fluctuations. I conjecture that when the economy is in good times a government with a larger public sector would like to spend more budgets for public corporation or private enterprises because the political pressures to use the budget surplus from interest groups increases. Regarding this, Talvi and Végh (2005) insisted that the political pressure increased when an economy was in good times. On the other hand, Lane (2003) insisted that during boom the fiscal competition increased. He called it “the pro cyclical bias”.

In the case of social benefits, the economic size has opposite signs in two data sets. However, government effectiveness has negative and significant coefficients, which implies that a country that has a more effective government uses the budget for social security more counter cyclically.

< Table 5-12 > Determinants of the responsiveness of economic expenses

(a) 61 countries (1972-2007)

	1972-2007 (61 countries)				
	Cem	ugs	int	sub	scb
C	0.5126 (0.1839)***	0.1310 (0.1164)	2.3148 (0.3793)***	-0.5841 (0.8279)	0.2208 (0.3071)
GDP	0.00003 (0.00001)***	0.00004 (0.00002)**	-0.000001 (0.00002)	0.00005 (0.00007)	0.00001 (0.00002)
Public size	0.0004 (0.0001)***	0.0003 (0.0001)***	0.0064 (0.0032)*	0.0020 (0.0007)***	-0.00007 (0.0003)
Share	-0.6387 (0.4553)	-0.3835 (0.5074)	2.9313 (1.9369)	0.2926 (5.9164)	0.1019 (1.1161)
Effectiveness	-0.1376 (0.0724)*	-0.0782 (0.0555)	0.4834 (0.2136)**	0.2096 (0.4666)	-0.3454 (0.1877)*
Democracy	-0.0177 (0.0122)	0.0087 (0.0073)	-0.2331 (0.0639)***	-0.0144 (0.0709)	0.0038 (0.0237)
R ²	0.17	0.12	0.25	0.03	0.15

(b) 79 countries (1990-2007)

	1990-2007 (79 countries)				
	Cem	ugs	int	sub	scb
C	1.0191 (0.3278)***	0.1105 (0.4562)	1.1260 (0.1599)***	0.4162 (0.7550)	0.8442 (0.4118)**
GDP	0.00004 (0.00003)*	0.00004 (0.00003)	0.0001 (0.0001)	0.0001 (0.00008)*	-0.00005 (0.00003)*
Public size	0.0016 (0.0002)***	-0.0023 (0.0003)***	-0.0028 (0.0030)	0.0035 (0.0006)***	-0.0006 (0.0004)
Share	-2.1761 (0.8987)**	2.0251 (2.0709)	-4.0680 (1.1715)***	0.7016 (3.6036)	-1.5516 (1.4873)
Effectiveness	-0.1122 (0.1344)	-0.3916 (0.1834)**	-0.0721 (0.1200)	0.0061 (0.4374)	-0.5792 (0.2019)***
Democracy	-0.0534 (0.0222)**	0.0543 (0.0259)**	0.0285 (0.0153)*	-0.0455 (0.0890)	0.0336 (0.0305)
R ²	0.23	0.18	0.40	0.07	0.27

Note: GDP is the amount of GDP, measured as the average of GDP for the period 2000s at current U.S dollar. Public size is the average ratio of expense/GDP for 1990-1995. Share is the ratio of expense components to total expenses. Effectiveness is the quality of public services, the degree of its independence from political pressures (+2.5=excellent governance, -2.5 = worst governance). Democracy is the "Polity 2" index (+10=strongly democratic;-10=strongly autocratic). ***, **, * denotes significance at the 1, 5, 10% level. Heteroskedasticity robust estimation. () is a robust standard error. cem=compensation of employees, ugs= use of goods and services, int=interest, sub=subsidies, scb=social benefits

5.4.3. Determinants of the responsiveness of functional expenses

(1) Defense

Economic size has positive and significant coefficients in both data sets, and larger economies respond more pro cyclically or less counter cyclically for defense expenses. Government effectiveness also has significant coefficients in both data sets, but the coefficients are negative. It implies that a country with an effective government uses the budget for defense more counter cyclically. The degree of democracy shows a positive impact on the responsiveness in both data sets, which implies that as the country is more democratic the expenses for defense becomes more pro cyclical. I conjecture that many lobbyist and interest groups for the military industry might exist in more democratic societies and the political pressures for the defense budget to increase during booms are stronger.

(2) Economic Affairs

Economic size has positive and significant coefficients in both data sets so that larger economies respond more pro cyclically or less counter cyclically to expenses for industrial policies. The public size has negative signs in both data sets, and a government with a larger share of the whole economy responds more counter cyclically or less pro cyclically. Thus governments with a larger share could use industrial policies for stabilizing the economy rather than governments with a smaller share. The share shows negative signs in both data sets so that the larger the share of economic affairs to total expenses the responsiveness of economic affairs becomes

more counter cyclical or less pro cyclical. It might be evidence that a government with a larger budget share for industrial policies could use industrial policies as a stabilizing tool.

(3) Housing and Community amenities

Government effectiveness has negative and significant coefficients in both data sets so that the country with effective government uses the budget for housing and community more counter cyclically. Housing and community amenities might be considered as small construction. Since the construction is one of economic affairs, I conjecture that housing and community amenities have the same sign as the economic affairs in government effectiveness.

(4) Health Affairs

Public size has significant coefficients in the two data sets, but the signs are opposite in the two data sets. The share has negative signs in both data sets so that as the health share of total expenses increases the responsiveness of health affairs becomes more counter cyclical or less pro cyclical. The degree of democracy also has negative signs in both data sets. Therefore, the country with a larger share of health expenses and democracy uses the budget for health more counter cyclically.

(5) Education

Economic size and public size have opposite signs for the coefficients in the two data sets. On the other hand, the share and government effectiveness have negative signs in both data sets, which implies that governments with a larger share of education expenses and effectiveness tend to use the budget for education more counter cyclically.

(6) Recreation and Religion Affairs

The economic size, public size, and share have opposite signs for the coefficients in the two data sets. However, government effectiveness and the degree of democracy have the same signs in both data sets. The government effectiveness also has negative signs, which implies that an effective government tends to use the budget for recreation and religion more counter cyclically. On the other hand, the degree of democracy has positive signs in both data sets. It means that as a society is more democratic, the responsiveness of recreation and religion becomes more pro cyclical.

(7) Social protection

Economic size has negative signs in both data sets, and this implies that as the size of economy is larger the responsiveness of social protection becomes more counter cyclical. If we assume that a country with large economic size belongs in the High-Income group, the countries in the High-Income group have well developed social security systems. Therefore, those countries might tend to use the budget for social

protection more counter cyclically, which is an auto-stabilizer. Public size has positive signs in both data sets so that as the expense share to GDP increases the responsiveness of social protection becomes more pro cyclical. Government effectiveness shows the same result as the case of social benefit of economic classification. It has negative and significant coefficients at the 1% level in both data sets, which implies that a country which has a more effective government uses the budget for the social security system more counter cyclically.

In conclusion, the interesting finding in the functional components of expenses is that the government effectiveness shows a negative sign in all components and has significant coefficients in most cases. This implies that the government effectiveness is an important determinant of fiscal responsiveness to expenses, and a more effective government tends to use the expenses more counter cyclically.

< Table 5-13 > Determinants of the responsiveness of functional expenses

(a) 61 countries (1972-2007)

	1972-2007 (61 countries)						
	def	eca	hus	hel	edu	rec	spt
C	0.2158 (0.2118)	0.3344 (0.1945)*	0.6539 (0.7390)	0.5863 (0.1940)***	0.5425 (0.2090)**	0.1483 (0.2483)	0.0952 (0.2137)
GDP	0.00007 (0.00002)***	0.00003 (0.00002)*	0.0001 (0.0001)	0.00004 (0.00004)	0.00003 (0.00001)**	-0.00004 (0.00003)	-0.00002 (0.00002)
Public size	0.00005 (0.0002)	-0.0014 (0.0022)	-0.0029 (0.0209)	-0.0019 (0.0002)***	-0.0002 (0.0002)	0.0009 (0.0002)***	0.0005 (0.0003)*
Share	0.4634 (1.2830)	-0.6511 (0.5347)	4.9606 (11.2395)	-4.5654 (1.7349)*	-1.9176 (0.9491)**	3.0680 (8.4733)	0.5995 (0.6440)
Effectiveness	-0.2040 (0.0782)**	-0.1958 (0.1328)	-0.9906 (0.2433)***	-0.0712 (0.1020)	-0.1218 (0.0644)*	-0.1984 (0.1363)	-0.3436 (0.1062)***
Democracy	0.0124 (0.0162)	0.0022 (0.0163)	0.0146 (0.0557)	-0.0057 (0.0111)	-0.0135 (0.0095)	0.0302 (0.0176)*	0.0075 (0.0275)
R ²	0.17	0.08	0.30	0.23	0.21	0.11	0.21

(b) 79 countries (1990-2007)

	1990-2007 (79 countries)						
	def	eca	hus	hel	edu	rec	spt
C	0.4281 (0.2761)	0.8547 (0.4869)*	0.8078 (0.7862)	0.7910 (0.4722)*	0.4973 (0.3668)	0.6899 (0.5334)	-0.0663 (0.5574)
GDP	0.0001 (0.00003)***	0.0004 (0.0002)*	0.00007 (0.00008)	-0.0002 (0.00008)*	-0.00006 (0.00007)	0.0002 (0.0001)**	-0.00007 (0.00003)**
Public size	-0.0052 (0.0037)	-0.0204 (0.0087)**	-0.0021 (0.0095)	0.0016 (0.0009)*	0.0010 (0.0004)***	-0.0027 (0.0005)***	0.0001 (0.0010)
Share	-0.5705 (2.2341)	-2.4996 (1.4776)*	-6.5346 (20.1948)	-1.6233 (5.3093)	-1.3583 (2.1079)	-15.1654 (20.2561)	0.3592 (1.9020)
Effectiveness	-0.4949 (0.1372)***	-0.0357 (0.2143)	-0.8927 (0.3809)**	-0.3161 (0.4245)	-0.1936 (0.1403)	-0.8362 (0.3690)**	-0.6382 (0.2194)***
Democracy	0.0590 (0.0217)***	-0.0249 (0.0401)	-0.0015 (0.0647)	-0.0526 (0.0322)*	-0.0169 (0.0241)	0.0953 (0.0474)**	0.0506 (0.0509)
R ²	0.23	0.11	0.13	0.06	0.08	0.14	0.15

Note: GDP is the amount of GDP, measured as the average of GDP for the period 2000s at current U.S dollar. Public size is the average ratio of expense/GDP for 1990-1995. Share is the ratio of expense components to total expenses. Effectiveness is the quality of public services, the degree of its independence from political pressures (+2.5=excellent governance, -2.5 = worst governance). Democracy is the "Polity 2" index (+10=strongly democratic;-10=strongly autocratic). ***, **, * denotes significance at the 1, 5, 10% level. Heteroskedasticity robust estimation. () is a robust standard error. def=defense, eca=economic affairs, hus=housing and community amenities, hel=health, rec=recreation & culture & religion, edu=education, spt=social protection.

Chapter VI.

Conclusion

The purpose of the paper is to investigate the fiscal responsiveness to economic fluctuations. This paper focuses on examining the pattern of the fiscal responsiveness with economic development and the determinants of fiscal responsiveness. For this study, I use pane data on central government observations obtained from the GFS of the IMF. In addition, I use two data sets: 61 countries for 1972-2007 and 79 countries for 1990-2007. For the empirical analysis, the fiscal outcomes and GDPs are the key variables, and they are expressed as the gap between the actual values and de-trended values.

I start the argument with the volatility of key variables. As the economy develops, the volatility of the output gap as well as fiscal outcomes decrease. Even though I do not examine the effectiveness, the less volatility with economic developments implies that the fiscal stabilization policy contributes this along with monetary policy, provided that the fiscal responsiveness in expenses becomes more counter cyclical or less pro cyclical with economic development.

In order to analyze this pattern of the fiscal responsiveness, I estimate both the dynamic panel regression model and the country-by-country regression model. For the dynamic panel empirical analysis, I use the Arellano-Bond IV estimator which is a type of GMM method and dynamic panel IV estimation. For the country-by-country regression, I use OLS with AR(1) errors which Lane(2003) used. In addition, I use

cross sectional regressions to analyze which determinants affect fiscal responsiveness.

From the empirical analysis, the findings are as follows: first, the fiscal responsiveness of revenue becomes less pro cyclical as the economy develops. To stabilize the economy, it should be pro cyclical. The fact that revenue is more pro cyclical in the developing countries than in the developed countries is the “puzzling behavior” that Talvi and Végh (2005) mentioned. They explained the reason from the tax base volatility. In my paper, their argument is more meaningful for taxes on goods and services from the “disaggregate approach” which Lane (2003) emphasized. The results from the country-by-country regression show this pattern clearly. The responsiveness of taxes on goods and services becomes less pro cyclical while the income taxes becomes more pro cyclical as the economy develops. The responsiveness of total taxes and revenue become less pro cyclical. In addition, the responsiveness of taxes and revenue for 1990-2007 is more pro cyclical than for 1972-2007. Probably it is because of the different composition of the countries. In the case of expenses, the responsiveness becomes less pro cyclical as the economy develops. In many cases, the responsiveness shows that it is counter cyclical in the High-Income group. In other words, the change of the pattern of the fiscal responsiveness is more obvious in the expense case than in the revenue case. Taking this into considerations, we conjecture that the government would like to prefer the expense policy to the revenue policy for stabilization. For example, when the economy is bad, the government prefers increasing government spending to tax rebates. The fact that the multiplier of the government spending is larger than the multiplier of taxes also supports the argument. In the case of cash surplus/deficit, the responsiveness becomes more pro cyclical as the economy develops.

Second, the responsiveness shows different cyclicity depending on economic

situations. For example, the High-Income group shows asymmetric behavior. For the Low-Income group, the responsiveness becomes more pro cyclical in the bad or the good situations than the normal situations. In addition, the Low-Income and the Middle-Income groups respond more sensitively in the bad situation than in the good situation while the High-income group responds more sensitively in the good situation than in the bad situation. In the case of expenses, when the economy is in the bad situation, the responsiveness of the Low-Income group becomes more counter cyclical than the other groups. Like the revenue case, the Low-Income and the Middle-Income groups respond more sensitively in the bad situation than in the good situation while the High-income group responds more sensitively in the good situation than in the bad situation. On the other hand, in the case of cash surplus/deficit, the Middle-Income and the High-Income groups respond more sensitively in the good situation than in the bad situation. Therefore, as the economy develops, the responsiveness becomes more sensitive in the good situation.

Third, the determinants regression reports that more effective governments show more counter cyclicity in total expenses and most expense components while they show more pro cyclicity in revenue and surplus/deficit. In addition, the impacts of the political stability on the fiscal responsiveness are opposite to the government effectiveness.

There are some limitations in my study. One concern is the classification of income groups used for the empirical analysis. I follow the World Bank's criterion according to GNI per capita in 2008. The periods during 1972-2007 considered in this paper are relatively long. So, some countries experienced structural changes in the economy including GNI per capita. For example, some richer countries in 1970-1980s might now be categorized in the Low-Income group. A second concern is the selection

of the countries. The countries are selected based on data availability. So, Japan and China are not included in the data sets due to insufficient data even though they are leading countries in the world. Third, the government capital investment is not included even though it is an important component of the government spending. It is excluded because of insufficient data. The GFS do not contain capital investment data for many countries. Many preceding researchers found that the government capital investment is the most pro cyclical policy among the components of the government spending.

Future research could address the following issues. The positive multiplier of government spending is the precondition of the counter cyclical policy in expenses. The study on the relationship between the fiscal responsiveness and the government spending multiplier would be useful in identifying the government behavior related to the effectiveness of the fiscal policy. Also, studies comparing the fiscal responsiveness by regions, such as Eastern Europe, Western Europe Asia, Latin America and North America would be interesting. Another possible topic is to investigate the fiscal responsiveness related to monetary policy. Monetary policy and fiscal policy might affect each other.

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Appendix 1 Changes from the GFSM 1986 to the GFSM 2001.

The GFSM 2001 improves on the GFSM 1986 in many ways. It is also more harmonized with other macroeconomic statistical systems, such as the 1993 SNA, than the GFSM 1986. Major changes are as follows:

1.1 Coverage of units

The focus of the coverage of units in the GFSM 2001 is the general government sector as defined in the 1993 SNA while the coverage of the GFSM 1986 is defined on a functional basis.

1.2 Time of recording economic events

In the GFSM 2001, the time of recording economic events is determined by the principles of accrual accounting. In the GFSM 1986, the recording of transactions is based when cash is received or paid.

1.3 Coverage of events

The coverage of events in the GFSM 2001 is broader than in the GFSM 1986. For example, the GFSM 2001 includes barter and grants of goods and services while the GFSM 1986 includes only cash transactions.

1.4 Valuation

Assets and liabilities are valued at current market prices in the GFSM 2001. In the GFSM 1986, debt securities are valued at the amount the government is obligated to pay when the debt matured.

1.5 Integration of flows and stocks

In the GFSM 2001, the stock data is fully integrated. All events which affect the financial performance, financial position, or liquidity situation of the general government are included. In the GFSM 1986, the stock data included are limited to debt liabilities.

1.6 Definition and classification

The definitions of revenue and expense are different between the two systems. In the GFSM 2001, revenue is an increase in net worth resulting from a transaction while in the GFSM 1986 it is defined as the set of all non repayable receipts other than grants. Thus, in the GFSM 2001, revenue includes grants but excludes proceeds from disposals of nonfinancial assets. In addition, the classifications of revenue are substantially different between the two systems. In the GFSM 1986, revenue is divided into tax, nontax, or capital revenue. In the GFSM 2001, revenue is divided into taxes, social contributions, grants, and other revenues.

In the GFSM 2001, “expense” replaces “expenditure” in the GFSM 1986 because it is more closely associated with the accrual basis. Expense is a decrease in net worth resulting from a transaction. Thus, expense excludes purchases of nonfinancial assets. In the GFSM 1986, expenditure is defined as the set of all non repayable payments and includes purchase of nonfinancial assets.

1.7 Balancing items

Several new balancing items, such as net operating balance, net lending/borrowing, net worth, and net financial worth, are introduced in the GFSM 2001 while the GFSM 1986 focused on a single balancing item, the overall deficit/surplus.

Appendix 2 The World Bank's classification of income groups

Low-income economies (43)

Afghanistan	Guinea-Bissau	Rwanda
Bangladesh	Haiti	Senegal
Benin	Kenya	Sierra Leone
Burkina Faso	Korea, Dem Rep.	Somalia
Burundi	Kyrgyz Republic	Tajikistan
Cambodia	Lao PDR	Tanzania
Central African Republic	Liberia	Togo
Chad	Madagascar	Uganda
Comoros	Malawi	Uzbekistan
Congo, Dem. Rep	Mali	Vietnam
Eritrea	Mauritania	Yemen, Rep.
Ethiopia	Mozambique	Zambia
Gambia, The	Myanmar	Zimbabwe
Ghana	Nepal	
Guinea	Niger	

Lower-middle-income economies (55)

Albania	Honduras	Paraguay
Angola	India	Philippines
Armenia	Indonesia	Samoa
Azerbaijan	Iran, Islamic Rep.	São Tomé and Príncipe
Belize	Iraq	Solomon Islands
Bhutan	Jordan	Sri Lanka
Bolivia	Kiribati	Sudan
Cameroon	Kosovo	Swaziland
Cape Verde	Lesotho	Syrian Arab Republic
China	Maldives	Thailand
Congo, Rep.	Marshall Islands	Timor-Leste
Côte d'Ivoire	Micronesia, Fed. Sts.	Tonga
Djibouti	Moldova	Tunisia
Ecuador	Mongolia	Turkmenistan
Egypt, Arab Rep.	Morocco	Ukraine
El Salvador	Nicaragua	Vanuatu
Georgia	Nigeria	West Bank and Gaza
Guatemala	Pakistan	
Guyana	Papua New Guinea	

Upper-middle-income economies (46)

Algeria	Grenada	Peru
American Samoa	Jamaica	Poland
Argentina	Kazakhstan	Romania
Belarus	Latvia	Russian Federation
Bosnia and Herzegovina	Lebanon	Serbia
Botswana	Libya	Seychelles
Brazil	Lithuania	South Africa
Bulgaria	Macedonia, FYR	St. Kitts and Nevis
Chile	Malaysia	St. Lucia
Colombia	Mauritius	St. Vincent and the Grenadines
Costa Rica	Mayotte	Suriname
Cuba	Mexico	Turkey
Dominica	Montenegro	Uruguay
Dominican Republic	Namibia	Venezuela, RB
Fiji	Palau	
Gabon	Panama	

High-income economies (66)

Andorra	France	Netherlands Antilles
Antigua and Barbuda	French Polynesia	New Caledonia
Aruba	Germany	New Zealand
Australia	Greece	Northern Mariana Islands
Austria	Greenland	Norway
Bahamas, The	Guam	Oman
Bahrain	Hong Kong, China	Portugal
Barbados	Hungary	Puerto Rico
Belgium	Iceland	Qatar
Bermuda	Ireland	San Marino
Brunei Darussalam	Isle of Man	Saudi Arabia
Canada	Israel	Singapore
Cayman Islands	Italy	Slovak Republic
Channel Islands	Japan	Slovenia
Croatia	Korea, Rep.	Spain
Cyprus	Kuwait	Sweden
Czech Republic	Liechtenstein	Switzerland
Denmark	Luxembourg	Trinidad and Tobago
Estonia	Macao, China	United Arab Emirates
Equatorial Guinea	Malta	United Kingdom
Faeroe Islands	Monaco	United States
Finland	Netherlands	Virgin Islands (U.S.)

Appendix 3 Main Classifications of the IMF

A3-1 Classification of Revenue

Code	Contents
1	Revenue
11	Tax
111	Taxes on income, profits, and capital gains
112	Taxes on payroll and workforce
113	Taxes on property
114	Taxes on goods and services
115	Taxes on international trade and transactions
116	Other taxes
12	Social contributions
13	Grants
14	Other revenue

A3-2 Economic Classification of Expense

Code	Contents
2	Expense
21	Compensation of employees
22	Use of goods and services
23	Consumption of fixed capital
24	Interest
25	Subsidies
26	Grants
27	Social benefits
28	Other expense

A3-3 Functional Classification of Expense

Code	Contents
7	Total outlays
701	General public services
702	Defense
703	Public order and safety
704	Economic affairs
705	Environmental protection
706	Housing and community amenities
707	Health
708	Recreation, culture, and religion
709	Education
710	Social protection

Appendix 4 Conversion of 1986 GFS data into the 2001 GFS data

2001 GFS Classification	1986 Category
1.Revenue	81.zg(Total revue & Grants)- 81ma.zg(Sales of fixed capital asset)- 81mb.zg(Sales of stocks)- 81mc.zg(Sales of land & intangible asset)
11 Taxes	81ya.zg(Tax revenue)- 81b.zg(Social security contribution)
111 Taxes on income, profits, and capital gains	81a.zg(Taxes on income, profits, and capital gains)
113 Taxes on property	81d.zg(Taxes on property)
114 Taxes on goods and services	81e.zg(Domestic taxes on goods and services)
12 Social contributions	81b.zg(Social security contribution) + 81mm.zg(Contributions to government employee pension and welfare funds within government)
2 Expense	82r.zg(Total current expenditure) + 82u.zg(Capital transfers)
21 Compensation of employees	82na.zg(Wages and salaries) + 82nx.zg(Employer contributions)
22 Use of goods and services	82np.zg(Other purchases of goods and services)
24 Interest	82pa.zg(Interest payments)
25 Subsidies	82pk.zg(Subsidies)
27 Social benefits	82pt.zg(Current transfers to households)
702 Defense	82b.zg(Defense affairs and services)
704 Economic affairs	82h.zg(Economic affairs)
706 Housing and community amenities	82f.zg(Housing and community amenity affairs and services)
707 Health	82d.zg(Health affairs and services)
708 Recreation, culture, and religion	82g.zg(Recreational, cultural, and religious affairs and services)
709 Education	82c.zg(Education affairs and services)
710 Social protection	82e.zg(Social security and welfare affairs and services)
CSD Cash surplus/deficit	80.zg(Overall deficit/surplus)

Appendix 5 Country-by-country Regression: OLS with AR (1) correction

A5-1 1972-2007 (61 countries)

1972-2007 (61 countries)												
Low Income				Middle Income				High Income				
Country	rev	exp	csd	Country	rev	exp	csd	Country	rev	exp	csd	
Bolivia	0.123	-0.490	0.456	Argentina	0.638	0.488	-0.019	Australia	0.135	-0.235	0.105	
Bhutan	-0.061	0.357	-0.048	Chile	0.015	0.095	-0.013	Austria	0.043	-0.208	0.681	
Egypt	0.099	-0.065	-0.018	Costa Rica	-0.023	0.014	0.000	Belgium	0.021	-0.338	10.550	
Indonesia	0.047	-0.158	0.032	Dominican Rep	-0.423	-0.463	-0.005	Bahrain	0.041	-0.063	0.042	
India	0.093	0.203	-0.006	Jamaica	-0.072	-0.041	0.042	Canada	0.767	0.298	0.084	
Iran	0.900	0.487	0.035	Mexico	0.792	0.138	-0.041	Switzerland	-0.040	-0.663	0.084	
Lesotho	-0.020	-0.037	0.015	Mauritius	0.245	-0.103	0.018	Cyprus	-0.143	0.024	-0.026	
Morocco	0.140	0.148	-0.130	Malaysia	1.171	-0.186	0.427	Germany	0.153	0.058	0.100	
Maldives	0.045	1.146	-0.014	Panama	0.121	0.164	-0.009	Denmark	1.380	-0.119	0.624	
Myanmar	0.247	0.345	-0.033	Poland	0.029	0.012	0.031	Spain	0.349	0.091	10.158	
Nicaragua	0.535	0.414	-0.090	Romania	0.089	0.090	4.718	Finland	0.380	-0.353	0.650	
Nepal	-0.002	0.000	-0.024	Seychelles	0.192	0.581	-0.524	France	0.366	-0.361	1.076	
Pakistan	1.001	1.641	-0.048	Uruguay	0.800	0.761	-0.021	U.K	0.059	-0.500	0.194	
Syrian Arab	-0.135	-0.253	-0.010	Venezuela	-0.598	0.229	-0.105	Greece	0.068	0.082	2.277	
Thailand	0.125	0.042	0.005	South Africa	0.264	0.018	0.076	Hungary	0.080	0.025	0.037	
Tunisia	-0.023	0.020	0.010					Ireland	0.008	-0.031	0.019	
Zimbabwe	0.115	0.055	0.012					Iceland	0.454	0.127	0.052	
								Israel	-0.390	-0.369	0.088	
								Italy	0.474	-0.172	516.445	
								Korea	-0.002	-0.004	0.000	
								Kuwait	-0.052	0.136	-0.054	
								Luxembourg	-0.021	-0.045	0.446	
								Malta	0.005	0.000	0.006	
								Netherlands	0.144	-0.229	0.274	
								Norway	0.405	0.039	0.071	
								Portugal	0.573	0.330	21.879	
								Singapore	-0.008	-0.043	0.001	
								Sweden	0.540	-0.873	0.291	
								United States	0.222	0.040	0.053	

*Yule-Walker estimates

** csd=cash surplus/deficit. rev=revenue. exp=expense.

A5-2 1990-2007 (79 countries)

1990-2007 (79 countries)												
Low Income				Middle Income				High Income				
Country	rev	exp	csd	Country	rev	exp	csd	Country	rev	exp	csd	
Bolivia	0.315	-1.162	0.867	Argentina	0.809	0.518	-0.036	Australia	0.968	-0.283	0.430	
Bhutan	-0.143	0.424	-0.148	Bulgaria	1.765	1.557	0.047	Austria	0.117	-0.596	3.348	
Cote d'Ivoire	0.702	0.203	0.136	Belarus	0.601	0.668	-0.009	Belgium	0.254	-0.121	1.034	
Egypt	-0.443	0.930	-0.322	Chile	0.521	-0.634	0.288	Bahrain	2.235	0.972	0.285	
Georgia	6.604	4.522	-0.012	Costa Rica	0.141	-0.235	0.107	Canada	0.891	0.540	0.095	
Indonesia	0.638	-0.404	0.113	Dominican Rep	0.566	1.601	0.028	Switzerland	-0.603	-2.009	0.348	
India	0.455	0.775	-0.050	Jamaica	-0.748	-0.146	0.239	Cyprus	0.589	-0.154	0.116	
Iran	2.762	1.738	0.273	Kazakhstan	0.005	0.122	0.006	Czech Rep	1.167	0.634	0.117	
Lesotho	1.753	1.518	0.231	Lithuania	0.305	0.216	0.109	Germany	0.822	0.882	-0.121	
Morocco	0.027	-0.002	0.034	Mexico	0.326	-0.045	0.011	Denmark	0.447	-0.520	0.334	
Moldova	0.798	0.484	-0.028	Mauritius	1.330	0.357	0.223	Spain	0.176	-0.142	6.360	
Madagascar	1.476	1.085	0.040	Malaysia	1.171	-0.186	0.427	Estonia	0.275	0.078	-0.001	
Maldives	14.826	-28.444	-0.117	Panama	0.519	0.402	0.092	Finland	0.392	-0.781	0.365	
Myanmar	1.146	0.027	-0.032	Peru	1.543	1.006	0.170	France	0.308	-0.340	0.878	
Mongolia	-0.663	0.483	-0.128	Poland	0.383	-0.009	0.294	U.K	1.012	-0.931	0.685	
Nicaragua	3.232	7.322	-1.208	Romania	0.285	0.193	0.067	Greece	0.064	0.089	0.000	
Nepal	0.318	0.000	0.000	Russia	1.249	0.384	0.080	Croatia	0.786	1.024	-0.074	
Pakistan	0.545	0.800	-0.126	Seychelles	0.082	0.844	-0.822	Hungary	0.424	0.072	0.091	
El Salvador	3.470	3.010	0.444	Uruguay	1.236	1.097	0.027	Ireland	0.088	-0.033	0.002	
Syrian Arab	0.467		-0.181	Venezuela	0.641	0.663	0.000	Iceland	0.456	0.012	0.033	
Thailand	1.301	-0.677	0.205	South Africa	0.879	-0.053	0.247	Israel	1.025	0.197	0.326	
Tunisia	0.391	0.402	-0.046					Italy	0.470	-0.764	-58.506	
Ukraine	-0.046	-0.077	-0.004					Korea	1.467	0.790	0.114	
Zimbabwe	0.133	0.128	-0.022					Kuwait	1.933	-0.348	0.474	
								Luxembourg	0.146	-0.090	-3.336	
								Malta	-0.032	0.027	-0.012	
								Netherlands	0.415	-0.141	-0.013	
								Norway	1.746	-1.388	0.733	
								New Zealand	0.677	-0.067	0.244	
								Portugal	0.486	0.250	21.708	
								Singapore	0.865	-0.408	0.605	
								Slovak Rep	0.008	-0.076	7.569	
								Sweden	1.390	-0.635	0.114	
								United States	2.253	-0.019	0.379	

*Yule-Walker estimates

** csd=cash surplus/deficit. rev=revenue. exp=expense.

Appendix 6 Correlation among control variables in cross-sectional regression

A6-1 For broad categories

	Volatility	GDP	Public size	Effectiveness	Politics
Volatility	1.0000 (1.0000)				
GDP	-0.1866 (-0.2116)	1.0000 (1.0000)			
Public size	-0.1123 (-0.2053)	-0.0686 (-0.0864)	1.0000 (1.0000)		
Effectiveness	-0.3917 (-0.2727)	0.2543 (0.2468)	0.4150 (0.4196)	1.0000 (1.0000)	
Politics	-0.0818 (-0.0436)	0.0780 (0.0708)	0.4507 (0.4272)	0.7791 (0.7963)	1.0000 (1.0000)

A6-2 For expense components

	GDP	Public size	Effectiveness	Democracy
GDP	1.0000 (1.0000)			
Public size	-0.0655 (-0.0750)	1.0000 (1.0000)		
Effectiveness	0.2751 (0.2676)	0.4299 (0.4662)	1.0000 (1.0000)	
Democracy	0.1777 (0.1912)	0.1581 (0.1453)	0.4625 (0.4958)	1.0000 (1.0000)

Note: The values in parentheses are the correlations for 1972-2007.

VITA

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