Fiscal Policy, Business Cycles and Economic Stabilization:

Evidence from Industrial and Developing Countries

Young Lee*

Hanyang University

Taeyoon Sung**

KAIST Graduate School of Management

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Abstract

The paper empirically investigates the responsiveness of fiscal policy to business cycles, and the effectiveness of fiscal policy in stabilizing economic fluctuations. Using economic fluctuations in neighboring countries as an instrumental variable, we show that the response of fiscal policy is more significantly counter-cyclical in OECD countries than in non-OECD countries. Among the various components of expenditures and taxes, subsidies and transfers in OECD countries show the strongest counter-cyclical response, suggesting that the social welfare system works as an automatic stabilizer. We also observe fiscal policy move asymmetrically over the business cycle, implying that budget deficits can grow over the business cycle. In investigating the effectiveness of fiscal policy in stabilizing economic fluctuations, we mitigate the omitted variable bias of previous studies by adding four important factors: oil production, military expenditures, economic fluctuations in neighboring countries, and fiscal policy responsiveness to the business cycle. The effectiveness regression results are very consistent with the responsiveness regression results, thus highlighting the importance of expenditures, especially subsidies and transfers, in responding to business cycles and stabilizing economies.

JEL classification: E6, H6

Key words: cyclicality, fiscal policy, stabilization, government expenditure, taxes

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* Corresponding Author: Professor Young Lee. Department of Economics, Hanyang University, 17 Haengdang-dong, Seongdong-gu, Seoul, 133-791, Korea. E-mail: younglee@hanyang.ac.kr; Tel: +82-2-2290-1023.

** Professor Taeyoon Sung. KAIST Graduate School of Management, 207-43 Cheongryangri-dong, Seoul, 130-722, Korea. E-mail: econsung@kgsm.kaist.ac.kr; Tel: +82-2-958-3535.

1. Introduction

Using a comprehensive dataset on 94 countries, this paper empirically examines whether or not fiscal policy responds counter-cyclically to the business cycle, and how effective fiscal policy has been in stabilizing economic fluctuations. The main contributions of this paper are twofold: First, in investigating the responsiveness of fiscal policy to the business cycle, we conduct an instrumental variable estimation to correct the downward bias of OLS regressions, which is associated with the reverse causality effect of fiscal policy on economic fluctuations.[1] As an instrumental variable, we use the economic fluctuations in each country's neighboring economies, as they are highly related to the economic fluctuations within each country, and are exogenous to each country's fiscal policy. Second, in investigating the effectiveness of fiscal policy in stabilizing economic fluctuations, we mitigate the omitted variable bias of previous studies by adding four important factors affecting the degree of a country's economic fluctuations: oil production, military expenditures, economic fluctuations of neighboring countries, and the responsiveness of fiscal policy to the business cycle. The first two factors, oil production and military expenditures, are found to possess very strong explanatory power for economic fluctuations in non-OECD countries. We also find that, the responsiveness of fiscal policy in OECD countries is more important than the sheer size of the government in explaining economic fluctuations.

There exists a large body of empirical work on the relationship between fiscal policy and business cycles.[2] Our regression results on the responsiveness of fiscal policy in OECD countries qualitatively confirms the counter-cyclical responsiveness of fiscal policy theory reported in previous studies (Fiorito, 1997; Sorensen, Wu, and Yosha, 2001; Lane, 2003).[3,4] However, in terms

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[1] An expansionary fiscal policy response to a recession, for example, would lead to an increase in output, thus implying that the reverse causality effect of fiscal policy to the economic fluctuations would bias the true responsiveness of fiscal policy downward.

[2] See, among many others, Fiorito and Kollintzas (1994), Gavin, Hausmann, Perotti, and Talvi (1996), Fiorito (1997), Stein, Talvi, and Grisanti (1998), Agenor, Dermott, and Prasad (1999), Van den Noord (2000), Talvi and Vegh (2000), Sorensen, Wu, and Yosha, (2001), Fatas and Mihov (2001), and Lane (2003).

[3] By examining the stylized facts of government finance in the G-7, Fiorito (1997) suggests that government deficits are counter-cyclical, though there is little evidence that stabilization is equally successful in stimulating the economy. Sorenson, Wu, and Yosha (2001) study the cyclical properties of U.S. state and local government fiscal policy. According to their study, budget surpluses (deficits) of both are pro-cyclical (counter-cyclical) over short- and medium-term horizons. In a sample of OECD countries, Lane (2003) suggests that current government spending tends to be mildly counter-cyclical, while the government consumption component of current spending is pro-cyclical, thus implying that the counter-cyclical behavior of current government spending emanates from the behavior of government transfers and/or debt interest payments.

of magnitude, our instrumental-variable estimators suggest a much stronger responsiveness of fiscal policy than those obtained from OLS regressions, thereby implying that the reverse causality effect of fiscal policy on economic fluctuations could bias OLS results downward. As for non-OECD countries, most previous studies have focused on Latin America, reporting pro-cyclical patterns in fiscal policy (see Gavin, Haumann, Perotti, and Talvi, 1996; Gavin and Perotti, 1997; Stein, Talvi, and Grisanti, 1998). However, when the data of other non-OECD countries are used, we see a diversity of patterns. For example, while Talvi and Vegh (2000) show a pro-cyclical pattern in a wider sample of countries, Agenor, McDermott, and Prasad (1999) report a counter-cyclical pattern in some non-OECD countries.[5]

In this paper, we use a more comprehensive dataset consisting of both 22 OECD countries and 72 non-OECD countries, as well as the instrumental variable estimation, to report that fiscal policy responds much more counter-cyclically in OECD countries than in non-OECD countries. Fiscal policy in OECD countries is found to be much more counter-cyclical, with an estimated coefficient two to three times as large as that for non-OECD countries. Non-OECD countries, however, also show a counter-cyclical pattern.

In examining the responsiveness of fiscal policy to the business cycle, we also try to determine which components of fiscal policy are most responsive.[6] Not surprisingly, our comparison of total government expenditures and total revenue shows that expenditures are much more responsive than taxes, and that taxes respond significantly only in OECD countries, and only with a one-year lag. Among the components of expenditure, subsidies and transfers in OECD countries are the most counter-cyclical. Subsidies and transfers in non-OECD countries are not significantly associated

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[4] As an exception to the fiscal policy pattern, Fiorito and Kollintzas (1994), using the data of G7 countries, report that government consumption does not show a clear pattern in the G7 countries, whereas consumption and investment are pro-cyclical.

[5] In Talvi and Vegh (2000), the total sample consists of six G-7 countries, 14 other industrial economies and 36 developing countries not restricted to Latin America. They suggest that, as measured by correlations, fiscal policy variables have pro-cyclical patterns with output. However, according to Agenor, McDermott, and Prasad (1999), who document the stylized features of macroeconomic fluctuations for 12 developing countries, the fiscal impulse (defined as the ratio of government spending to government revenues) is negatively correlated with the business cycle. They also suggest that government expenditure is counter-cyclical, while government revenues are acyclical in some countries but counter-cyclical in others.

[6] As for OECD countries, this result is consistent with Lane (2003). Using data for OECD countries, he suggests that the counter-cyclical behavior of current government spending emanates from the behavior of government transfers ('automatic stabilizers') and/or debt interest payments. In G-7 countries, Fiorito (1997) also reports that government transfers, in particular, behave as lagging countercyclical stabilizers. As for Latin America, Gavin, Hausmann, Perotti, and Talvi (1996) suggest that transfer payments comprise a much lower share of government expenditures than is the case in OECD countries. This is suggested as a reflection of their underdeveloped social welfare systems.

with the business cycle, while expenditures other than subsidies and transfers in non-OECD countries move counter-cyclically. This finding suggests that social welfare systems in OECD countries work as automatic stabilizers, and that non-OECD countries tend to rely on discretionary expenditures as their economic stabilization policy measure.

We also observe that fiscal policy responds asymmetrically over economic fluctuations, thus implying that a budget deficit can grow over the business cycle.[7,8] Regarding fiscal policy asymmetry over economic fluctuations, we examine whether budget surpluses respond differently to negative, as opposed to positive, GDP growth rates. The results indicate that the responsiveness of fiscal policy to negative GDP growth rates is much larger than that for positive GDP growth rates, thereby implying that fiscal policy responds more strongly in recessions than in booms.[9]

In addition to the responsiveness of fiscal policy to economic fluctuations, this paper also investigates the effectiveness of fiscal policy in stabilizing economies. When fiscal policy responds correctly to the business cycle and the fiscal policy was effective, the government can work as a stabilizer of economic fluctuations. Several papers have already examined the relationship between government size and output volatility. Notwithstanding the theoretical ambiguity in Gali's (1994) study on the effect of larger government on output volatility, many studies do provide empirical evidence that government size has a negative relationship with output volatility (Gail, 1994; van den Noord, 2000; Fatas and Mihov, 2001a and 2001b).[10] Rodrik (1998) takes this stabilization role of the government sector as given, and suggests that more open economies also tend to have larger

[7] In this paper, a counter-cyclical response indicates that fiscal deficits grow during recessions, but shrink during times of economic growth. Thus, if the asymmetry of fiscal responses is characterized by major expansionary fiscal policy during a recession but only minor fiscal deficit reductions during a boom, the fiscal deficit can grow over the business cycle.

[8] Sorensen and Yosha (2002) report on the asymmetry of state fiscal policy using the data of U.S. states,

[9] Whereas we focus on the magnitude of asymmetry in fiscal policy responses, Alesina and Perotti (1995) report asymmetries between loose and tight fiscal policies in terms of disaggregated components. According to their study, on average, loose fiscal policies are the result of sharp increases in government expenditures, but tight policies are carried out through increases in taxes rather than through reductions in expenditure. Alesina and Perotti (1996) also suggest that fiscal adjustments that rely primarily on spending cuts on transfers and the government wage bill have a better chance of being successful.

[10] Using data for 22 OECD countries, Gali (1994) provides empirical evidence indicating the presence of a negative relationship between output variability and the tax/GDP ratio. Van den Noord (2000) shows that, in OECD countries, the larger the share of government expenditure in domestic output, the greater the sensitivity of the fiscal position to fluctuations in economic activity, thereby dampening cyclical fluctuations. Fatas and Mihov (2001a) report a strong negative correlation between government size and output volatility both for the OECD countries and for U.S. states. Fatas and Mihov (2001b) also present evidence that large governments reduce the volatility of output. They show that this result is robust to the introduction of controls such as openness, GDP, GDP per capita, and average growth.

governments.[11]

This paper also expands upon the previous literature on the effects of government size on output volatility by using a larger set of countries, including both developing countries and industrial economies, and by adding four omitted variables: oil production, military expenditures, economic fluctuations in neighboring countries, and the responsiveness of fiscal policy to the business cycle. Specifically, oil production and military expenditures turn out to have very strong explanatory power for the economic fluctuations in non-OECD countries. Of the included factors, we find that the responsiveness of fiscal policy is statistically significant in OECD countries. In particular, when the responsiveness variable of fiscal policy to the business cycle is included in the empirical specification, the estimated coefficient of government size is reduced to one half of the original estimator without the responsiveness variable, thus indicating that the responsiveness of fiscal policy is a more important factor than the sheer size of the government in explaining economic fluctuations in OECD countries.

The rest of this paper is organized as follows. Section 2 describes empirical specifications, Section 3 explains the data. Using the instrumental variable estimation, Section 4 reports regression results for the responsiveness of fiscal policy to the business cycle. Section 5 reports regression results for the effectiveness of fiscal policy in stabilizing the economy. Section 6 concludes the paper with a summary and discussion of policy implications.

2. Specification

We need two specifications – one for testing the responsiveness of fiscal policy to the business cycle, and the other for testing the effectiveness of fiscal policy in stabilizing the economy. In measuring the responsiveness of fiscal policy to the business cycle, it is important to note that fiscal policy and GDP can trend. As suggested in Solon, Barsky, and Parker (1994), and Shin (2000), we assume the trend in fiscal positions and GDPs are, respectively, a second-order polynomial function of time *t*. Assuming further that the relationship between the *de-trended* fiscal position and the *de-trended* (log of) GDP, i.e. the business cycle, is linear, we can derive equation (1):

[11] Alesina and Wacziarg (1998) provide some evidence of a positive relationship between openness and the size of government transfers, which is consistent with Rodrik's argument concerning the stabilizing role of governments in open economies. However, they cast some doubt on the direct link between openness and the share of government consumption.

$$[Z_{it} - (a_2 t^2 + a_1 t + a_0)] = \alpha_1 [\ln(GDP_{it}) - (b_2 t^2 + b_1 t + b_0)], \quad (1)$$

where Z_{it} is fiscal position of country *i* at time *t*. Taking the first difference and adding country fixed effects and year effects, we can derive equation (2):

$$\Delta Z_{it} = \alpha_1 \Delta \ln(GDP_{it}) + \beta t + \sum_i \gamma_i D_i + \sum_t \delta_t T_t + \varepsilon_{tt}, \quad (2)$$

where D_i is the country dummy of country *i*, and T_t is the year dummy of year *t*.

If there is a time lag in fiscal response, the de-trended fiscal position can be also a function of lagged values of GDP. In this case, equation (2) can be modified to equation (3):

$$\Delta Z_{it} = \alpha_1 \Delta \ln(GDP_{it}) + \alpha_2 \Delta \ln(GDP_{i(t-1)}) + \alpha_3 \Delta \ln(GDP_{i(t-2)}) + \beta t + \sum_i \gamma_i D_i + \sum_t \delta_t T_t + \varepsilon_{tt}, \quad (3)$$

In this specification, the pro-cyclical and counter-cyclical responses of fiscal policy depend on whether α is positive or negative, since we use the ratio of budget surplus, expenditure, or tax revenue to GDP as a fiscal position variable. To stabilize the economy, government expenditures needs to move counter-cyclically, indicated by a negative α, while taxes and budget surplus need to move pro-cyclically, indicated by a positive α.

A key issue that has not been addressed sufficiently in the previous empirical literature is that the estimated elasticity of fiscal policy position to the business cycle does not correctly reflect the true responsiveness of fiscal policy to economic fluctuations. As we empirically examine whether and how well fiscal policy responds to the business cycle, we should note that fiscal policy also affects economic fluctuations. Indeed, this is why governments use fiscal instruments to stabilize their economies. Thus, if we estimate the elasticity of fiscal policy to the business cycle without controlling for the reverse causality relationship of fiscal policy to economic fluctuations, the responsiveness of fiscal policy could be under-estimated, since the estimated result also reflects the impact of fiscal policy on the business cycle.

To consider the possible impact of fiscal policy on the business cycle, we adopt an instrumental variable estimation by using the average GDP growth rates in neighboring countries, weighted by the inverse of the distance between the two countries. While GDP growth rates in the neighboring economies of a country are not much influenced by the country's fiscal policy, the correlation in GDP growth rates in neighboring countries is remarkably high in the data. Thus, in examining the responsiveness of fiscal policy to the business cycle, the weighted average GDP growth rates in

neighboring countries are a good instrument for estimating a particular country's economic fluctuations.

To test the effectiveness of fiscal policy in stabilizing an economy, we use the standard specification used in the existing literature and simply add four additional factors. Existing studies regress the standard deviation of growth rates of GDP per capita against the log of GDP, GDP growth rates, the log of GDP per capita, and trade. The four factors we add are oil production, military expenditures, economic fluctuations in neighboring countries, and the responsiveness of fiscal policy to the business cycle.

3. Data and Sample

Our data come from World Bank's World Development Indicator. The only exception is the ratio of oil production to GDP, which comes from OPEC's *Annual Statistical Bulletin 2001*.[12] Our main sample for responsive regressions consists of 1994 observations of 94 countries. We use a set of countries each of which has more than five observations and complete data regarding total tax revenue, total government expenditures, and real GDP per capita.

Table 1 reports summary statistics for responsiveness regressions. The average first difference in the log of real GDP per capita, which can be also interpreted as the GDP growth rate, is 3.53%. The weighted average of GDP growth rates in other countries, weighted by the reciprocal of bilateral distance, is 3.20%. Compared to non-OECD countries, OECD countries have smaller growth rates, not only in terms of their own GDP growth rates, but also in terms of the GDP growth rates of neighboring countries. This pattern is due to the fact that OECD countries tend to be located close to other OECD countries. The average first difference in the ratio of budget surplus to GDP is –0.07, an indication that the fiscal position has deteriorated. Deteriorating fiscal positions were more salient in OECD countries than in non-OECD countries.

Summary statistics for the effectiveness regressions are reported in Table 2. Note that we utilize only cross-section variations of 94 countries in the analysis of the effectiveness of fiscal policy in stabilizing an economy. The standard deviation of the GDP growth rate within a country over

[12] Fiscal data from other data sources, including the OECD Economic Outlook, OTPR's World Tax Base, and IMF's GFS, are also used for a robustness check. The regression results are very similar when these fiscal data from other sources are used. The results of using other data sources are also available from the authors. We use WDI data mainly because of their broader country coverage.

several years is on average 4.50, with a much lower figure for OECD countries than for non-OECD countries. The average tax ratio is slightly smaller than 20%, and the average ratio of total expenditures to GDP is 28%. Not surprisingly, OECD countries' budget surpluses are much more responsive to business cycles, with average estimated responsiveness figures 2.5 times larger than those for non-OECD countries. The ratio of oil production to GDP is, on average, 5%, with a very large standard deviation.

4. Responsiveness Regression Results

In this section, we report regression results on the responsiveness of fiscal policy to economic fluctuations. Table 3 reports the regressions results of equations (2) and (3) for a budget surplus. A simple OLS results with only the first difference term of GDP in Column (1) shows that the ratio of budget surplus increases in an economic boom. When we use growth rates in other countries, $DlGDP_{-it}$, as instruments, the estimated coefficient of $DlGDP_{it}$ becomes 0.16, more than two times larger than the OLS estimates. This finding is consistent with the conjecture that OLS estimates under-estimate the true value because they also include the effect of a budget surplus on business cycle. To test the possibility that fiscal policy responds to the business cycle with time lags, we added one-year and two-year lagged values of the first difference in (log of) GDP in columns (3) through (8) in Table 3.

We added time dummies and country dummies to control for country fixed effects and worldwide year effects in columns (5) through (8) in Table 3. Our main result in column (6), the IV estimation result for the whole sample, implies that the ratio of budget surplus to GDP increases by 0.85%p with a one-standard deviation increase in GDP growth rates. The last two columns report the IV estimation results separately for OECD and non-OECD countries. We found that budget surpluses in OECD countries respond much more pro-cyclically than in non-OECD countries, implying that the governments of OECD countries are much more active in responding to the business cycle. It is also interesting to note that budget surpluses in OECD countries also respond to a one-year lagged value of the first difference in GDP, which results from the response of taxes to the business cycle with a one-year lag, as shown in column (7) of Table 4.

Table 4 separately examines the response of expenditures and taxes to economic fluctuations. The key finding in Table 4 is that expenditures respond much more than taxes do. Table 4 also compares the responsiveness between OECD and non-OECD countries. As for each component of a

budget surplus, expenditures in OECD countries respond much more strongly with an estimated coefficient three times as large as the estimated coefficient for non-OECD countries. Taxes are found to respond significantly only in OECD countries and at a one-year lag. The time lag in the response of taxes can be interpreted to reflect the fact that income taxes are based on the previous year's earnings.

To investigate further the factors affecting the responsiveness of fiscal policy to the business cycle, Table 5 disaggregates expenditure and taxes into their main components. Specifically, the counter-cyclical response of government expenditures in OECD countries comes primarily from subsidies and transfers, while those in non-OECD come mainly from expenditures other than subsidies and transfers. This result appears to suggest that subsidies and transfers work strongly and efficiently as an automatic stabilizer in developed countries with advanced welfare systems, and that the counter-cyclical expenditure response in developing countries without well-developed welfare systems is mainly associated with discretionary expenditures. Of the three main components of taxes, income tax revenue in OECD countries is estimated to respond most pro-cyclically, with a one-year lag. In OECD countries, commodity tax revenue is also estimated to move pro-cyclically, but the estimated coefficient is less than half the estimated coefficient for income tax revenue.

In the literature on the relationship between fiscal policy and the business cycle, an important issue has been whether fiscal policy responds symmetrically over the business cycle, because of its attendant implications on fiscal soundness. If fiscal policy were to take a strong expansionary position during recessions while taking a weak contractionary position during booms, budget deficits would grow over the business cycle, and government debts would become a serious problem in the long run.[13] Table 6 reports whether budget surpluses respond differently, depending on whether GDP growth rates are positive or negative.[14]

We find that the responsiveness of budget surplus to the business cycle is significantly larger when there is a negative shock on the economy. The OLS results for OECD countries in Column (1) of Table 6 show that the responsiveness to a negative shock is more than two times as large as that

[13] In particular, if there is political pressure to decrease government expenditures or increase taxes, there is a tendency for fiscal policy to take a strong expansionary position during recessions, but a relatively weak contractionary position during booms

[14] It is not clear where asymmetric responses can occur, so we simply assume that asymmetric responses occur depending on the sign of GDP growth rates. Negative GDP growth rates occur in 311(61%) of the 1994 observations in the main sample.

to a positive shock. This difference is significant at the 15% significance level, as indicated in the bottom two rows where we report the test results of equal coefficient of negative and positive *DlGDP*. The IV results in column (2) indicate even greater asymmetry. Here, we use again the GDP growth rates in neighboring countries as an instrumental variable.[15] In non-OECD countries, budget surpluses show a significant pro-cyclical response to negative GDP growth rates. However, in the case of positive GDP growth rates, budget surpluses shows an insignificant (in OLS) or counter-cyclical (in IV) response. This finding suggests that governments in developing countries tend to increase their expenditures considerably during booms, thus implying that they are not helpful in stabilizing the economy.[16] Consistent with this result, we find in the next section on the effectiveness of government in stabilizing the economy that larger governments in advanced countries are associated with lower economic fluctuations, while larger governments in developing countries are not. Columns (5) through (6) report the same set of regressions with one-year and two-year lagged values of $DlGDP_i$, where we observe a similar pattern.

5. Effectiveness Regression Results

In this section, we analyze the effectiveness of fiscal policy in stabilizing the economy. We begin by regressing the standard deviation of GDP growth rates on a set of independent variables used in the previous literature, then add four variables that were never used in previous studies: oil production, military expenditures, economic fluctuations in neighboring countries, and the responsiveness of fiscal policy to the business cycle. Unlike existing studies, most of which examine only the tax ratio, our paper focuses both on expenditures and revenues. Since we find that expenditures responds much more strongly to the business cycle than revenue, and that revenue responds with a time lag (Section 4), we begin our analysis with expenditures.

Without controlling for our four new variables, column (1) shows that the ratio of total expenditures to GDP is not associated with economic fluctuations. This could happen when certain components of expenditures, such as military expenditures, destabilize rather than stabilize the economy, and we did not separate this type of expenditure from expenditures conducive to stabilizing economy, such as social security expenditures. When we add military expenditures, expenditures become significantly negatively associated with the standard deviation in the GDP

[15] We generate two instruments depending on the sign of $DlGDP_i$, not the sign of $DlGDP_{-i}$, because we need separate instruments for negative and positive GDP shocks.

[16] In the IV regression results for expenditure in non-OECD countries, the estimated coefficient of negative *DlGDP* is -0.930 (t=-2.94), and that of positive *DlGDP* is 0.321(t=2.18).

growth rate, with an estimated coefficient of -0.055 (standard errors 0.020). When military expenditures, oil production, and the standard deviation of GDP growth rates in other countries are added, expenditure still takes a similar value (column 2).

When the estimated responsiveness of a budget surplus to the business cycle is added, government expenditures become smaller and less significant. The responsiveness of a budget surplus to the business cycle is estimated for each country by running IV regressions using the specifications in column (2) of Table 3. For the whole sample of 94 countries, as shown in the column (3) of Table 7, the responsiveness takes the expected sign, but is not significant. In separate regressions for OECD and non-OECD countries, shown in columns (4) and (5) of Table 7, the responsiveness of fiscal policy becomes statistically significant in OECD countries. This is not surprising, since the estimates of the responsiveness for OECD countries themselves are mostly significant, while those for non-OECD countries are not (see Table A1 in appendix). With this significance in the responsiveness of fiscal policy, the estimated coefficient of government expenditures becomes smaller and less significant, thus indicating that the responsiveness of fiscal policy is a more important factor than the sheer size of the government in explaining economic fluctuations in OECD countries.[17]

The last three columns use the tax ratio instead of the ratio of expenditure to GDP. Unlike expenditures, the tax ratio is significant even when military expenditures are not controlled for. This is not surprising once we recognize that military expenditures are typically financed by non-tax methods, such as government bonds or seigniorage. When military expenditures, oil production, economic fluctuations in other countries, and the responsiveness of the fiscal position to business cycle are added, the estimated coefficient of the tax ratio takes on a value very similar to that of expenditures. The resulting significant tax effect does not necessarily imply that taxes are very responsive to business cycle. Rather, it means that the tax ratio proxies the degree to which government can respond to the business cycle, such as the development of flexible social welfare system. Note again our finding in Section 4 that expenditures are much more responsive to business cycles than are taxes.

Among other determinants of economic fluctuations, we find that larger economies have smaller economic fluctuations. We also find that economic fluctuations in other countries take a

[17] One should note that the number of observations in regressions for OECD countries is only 22, implying a degree of freedom in column (4) of only 12. In the most parsimonious specification, with only the responsiveness and expenditures, the responsiveness remains significant, with an estimated coefficient of –0.84 (t=-3.42), while expenditures remains insignificant, with an estimated coefficient of –0.001 (t=-0.81).

positive sign, as predicted, though at a marginal level of significance. Countries with larger oil production and military expenditures are found to have larger economic fluctuations. Separate regressions for OECD and non-OECD countries in columns (4) and (5) indicate that oil production and military expenditures significantly increase economic fluctuations only in non-OECD countries.

Table 8 reports regression results for each component of taxes and expenditures. Row (1) confirms the tendency that OECD countries with larger government expenditures experience a lower variation in GDP growth rates. Rows (2) and (4) show that countries with larger current expenditures and subsidies and transfers tend to have smaller variation in their GDP growth rate, which is consistent with the finding in Section 4 that current expenditures and subsidies and transfers move much more counter-cyclically than capital expenditures and other expenditures. Rows (6) through (10) report the results for the revenue side. We find that income taxes are not significantly negatively correlated with economic fluctuations but that commodity taxes are, perhaps reflecting that commodity taxes respond to the business cycle promptly while income taxes respond with a lag. Social security taxes in OECD countries are also significantly negatively associated with economic fluctuations, suggesting again that social welfare systems may work as stabilizers. In sum, the effectiveness regressions results in Table 8 are consistent with the responsiveness regression results in Tables 5A and 5B. This indicates the importance of expenditures, especially social security and current expenditures, in responding to business cycles and stabilizing the economy.

6. Conclusion

Using a comprehensive dataset of both 22 OECD countries and 72 non-OECD countries, and the instrumental variable estimation, we find that fiscal policy responds much more counter-cyclically in OECD countries than in non-OECD countries. We also find that expenditures respond much more strongly than taxes do, and that taxes respond significantly only in OECD countries and at a one-year lag. Among the components of expenditures, subsidies and transfers in OECD countries move most strongly counter-cyclically. This result suggests that the social welfare system in developed countries works as an automatic stabilizer. We also observe that fiscal policy responds asymmetrically over economic fluctuations, thus implying that budget deficits can grow over the business cycle.

In the investigation of the effectiveness of fiscal policy in stabilizing economy, we find that the

government works as a stabilizer of economic fluctuations. This paper extends the previous literature on the effects of government size on output volatility by using a larger set of countries and by adding four previously omitted variables. We find that oil production and military expenditures turn out to have very strong explanatory power for economic fluctuations in non-OECD countries. We also find the importance of expenditures, especially social security and current expenditures, in the stabilizing of economies.

We can draw three main policy implications from our empirical analysis. First, the key aspect of fiscal policy for the stabilization of an economy is not the revenue side but the expenditure side. This very intuitive argument is not shown clearly in previous empirical studies because they focus on the tax ratio and find a negative correlation between the tax ratio and economic fluctuations. We show, however, that expenditure is also significantly negatively correlated with economic fluctuations once we control for military expenditures. We also find that the responsiveness of expenditures to business cycles is strongly present, while that of taxes is not.

Second, current expenditures and social security expenditures are the key components of fiscal policy in stabilizing economic fluctuations. These expenditure components are found to respond most counter-cyclically to the business cycle and be negatively associated with economic fluctuations. From these findings, we can conclude that economic fluctuations tend to decrease as the social security system becomes more developed.

Third, we find that fiscal policy moves asymmetrically over the business cycle, thereby implying that budget deficits can grow over the business cycle. The policy implication of this finding is that it is necessary to overcome the temptation to overspend during an economic boom.

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Table 1. Summary Statistics for Elasticity Regressions

Variables Unit, [*Notation*]	n	All Mean (st. dev)	Min	Max.	OECD Mean (st. dev)	Non-OECD Mean (st. dev)
first-difference in GDP per capita	1994	3.53	-31.02	33.21	2.76	3.83
%, [*DlGDP*]		(5.00)			(2.52)	(5.64)
GDP growth rates of other countries	1994	3.20	-10.15	17.51	2.77	3.36
%, [$DlGDP_{-i}$]		(2.26)			(1.82)	(2.39)
1st dif. in budget surplus / GDP	1994	-0.07	-48.65	50.07	-0.13	-0.05
%, [*DBudSpR*]		(3.83)			(1.94)	(4.34)
1st dif. in tax revenue / GDP	1994	0.17	-12.42	19.07	0.27	0.14
%, [*DTaxTtR*]		(1.97)			(1.30)	(2.17)
1st dif. in income tax rev./ GDP	1976	0.07	-11.85	11.11	0.12	0.05
%, [*DTaxIcR*]		(1.19)			(0.83)	(1.31)
1st dif. in commodity tax rev. / GDP	1973	0.10	-6.98	11.24	0.08	0.11
%, [*DTaxCmR*]		(0.80)			(0.56)	(0.88)
1st dif. in social sec. tax rev. / GDP	1976	0.05	-8.05	5.41	0.11	0.03
%, [*DTaxSsR*]		(0.53)			(0.69)	(0.45)
1st dif. in total expenditures / GDP	1994	0.25	-44.60	40.19	0.40	0.19
%, [*DExpTtR*]		(3.66)			(2.00)	(4.13)
1st dif. in subsidy & transfer / GDP	1832	0.11	-11.50	9.63	0.26	0.05
%, [*DExpStR*]		(1.52)			(1.56)	(1.50)
1st dif. in current exp. / GDP	1897	0.23	-44.06	40.19	0.41	0.17
%, [*DExpCrR*]		(2.95)			(1.87)	(3.29)
1st dif. in capital expenditures / GDP	1893	-0.03	-11.28	14.20	-0.03	-0.03
%, [*DExpCpR*]		(1.65)			(0.43)	(1.93)
Year – 1970	1994	14.73	1	28	14.40	14.85
[*T_Year*]		(7.32)			(7.59)	(7.21)

Note: All variables come from World Bank's World Development Indicator.

Table 2. Summary Statistics for Stability of Economy Regressions

Sample		All (n=94)		OECD (n=22)	non-OECD (n=72)
Variables Unit	Mean (st. dev)	Min	Max.	Mean (st. dev)	Mean (st. dev)
Standard deviation of GDP growth rates	4.50 (2.26)	1.47	12.57	2.40 (0.63)	5.14 (2.19)
Standard deviation of average GDP growth rates in other countries	2.06 (0.83)	0.89	5.32	1.83 (0.40)	2.13 (0.91)
Tax revenue / GDP %	19.17 (9.24)	0.31	43.54	27.86 (8.68)	16.51 (7.68)
Total expenditures / GDP %	28.03 (11.33)	8.37	61.08	33.98 (9.52)	26.22 (11.27)
Estimated responsiveness of budget surplus to business cycle	0.29 (0.90)	-2.58	5.63	0.55 (0.46)	0.21 (0.99)
Trade / GDP, %	70.70 (46.89)	15.32	334.27	64.48 (41.01)	72.60 (48.66)
GDP growth rates, %	3.59 (2.11)	-1.17	10.13	2.81 (0.86)	3.82 (2.32)
GDP, 1995 US $	1.9E+11 (7.0E+11)	2.3E+08	5.7E+12	7.0E+11 (1.4E+12)	3.8E+10 (7.9E+10)
GDP per capita, 1995 US $	6,891 (9,212)	104	39,939	20,138 (8,534)	2,843 (4,314)
Oil production / GDP, %	4.95 (12.70)	0.00	76.67	0.96 (3.05)	6.17 (14.22)
Military expenditures / GDP, %	3.39 (3.14)	0.29	18.49	2.51 (1.18)	3.66 (3.49)

Note: All variables come from World Bank's World Development Indicator, except for oil production. Oil production comes from *OPEC Annual Statistical Bulletin 2001*.

Table 3. Responsiveness of Budget Surplus to Business Cycle

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
sample	All	All	All	All	All	All	OECD	non-OECD
estimation method	OLS	IV	OLS	IV	OLS	IV	IV	IV
$DlGDP_{it}$	0.071	0.159	0.088	0.168	0.084	0.167	0.295	0.150
	(0.017)**	(0.028)**	(0.018)**	(0.030)**	(0.020)**	(0.030)**	(0.077)**	(0.035)**
$DlGDP_{i(t-1)}$			-0.053	-0.005	-0.054	-0.030	0.200	-0.040
			(0.019)**	(0.031)	(0.020)**	(0.031)	(0.071)**	(0.036)
$DlGDP_{i(t-2)}$			0.010	-0.037	0.030	0.035	-0.005	0.039
			(0.018)	(0.028)	(0.020)	(0.030)	(0.071)	(0.035)
trend	0.036	0.041	0.034	0.038	-0.017	-0.003	0.052	-0.025
	(0.012)**	(0.012)**	(0.012)**	(0.012)**	(0.040)	(0.040)	(0.035)	(0.060)
Constant	-0.850	-1.239	-0.720	-1.068	-2.342	-2.598	-2.785	-2.243
	(0.206)**	(0.230)**	(0.222)**	(0.267)**	(1.770)	(1.783)	(1.049)**	(2.252)
Country and year dummies	No	No	No	No	Yes	Yes	Yes	Yes
Observations	1994	1994	1994	1994	1994	1994	554	1440
R-squared	0.012		0.016		0.063	0.052	0.208	0.057

Standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%

Table 4. Responsiveness of Government Expenditures and Taxes to the Business Cycle, IV

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	Expenditure				Taxes			
Sample	All	All	OECD	non-OECD	All	All	OECD	non-OECD
DlGDP	-0.155	-0.143	-0.373	-0.126	0.004	0.024	-0.078	0.024
	(0.027)**	(0.029)**	(0.077)**	(0.033)**	(0.014)	(0.016)	(0.053)	(0.018)
L1DlGDP		0.043	-0.037	0.047		0.012	0.163	0.007
		(0.029)	(0.071)	(0.034)		(0.016)	(0.049)**	(0.018)
L2DlGDP		-0.040	-0.051	-0.042		-0.005	-0.057	-0.003
		(0.028)	(0.072)	(0.033)		(0.015)	(0.050)	(0.017)
trend	-0.057	-0.008	-0.081	0.027	-0.016	-0.012	-0.029	0.002
	(0.011)**	(0.038)	(0.035)*	(0.057)	(0.006)**	(0.021)	(0.024)	(0.030)
Constant	1.635	2.349	3.290	1.683	0.397	-0.248	0.505	-0.560
	(0.219)**	(1.683)	(1.054)**	(2.124)	(0.118)**	(0.915)	(0.728)	(1.120)
Country and year dummies	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Observations	1994	1994	554	1440	1994	1994	554	1440
R-squared	0.005	0.077	0.251	0.070	0.004	0.054	0.146	0.066

Standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%

Table 5A. Responsiveness to Business Cycle, by Component, OECD, IV

Dependent variable is…	(1) Current expenditures	(2) Capital expenditures	(3) Subsidies and transfers	(4) Total – subsidies & transfers	(5) Income tax	(6) Commodity tax	(7) Social Security tax
DlGDP	-0.404	0.030	-0.301	-0.081	-0.055	-0.034	-0.007
	(0.072)**	(0.018)	(0.062)**	(0.048)	(0.035)	(0.023)	(0.029)
L1DlGDP	-0.050	0.005	-0.018	-0.017	0.097	0.042	0.011
	(0.067)	(0.017)	(0.058)	(0.044)	(0.032)**	(0.021)*	(0.027)
L2DlGDP	-0.029	-0.026	0.044	-0.097	-0.035	-0.040	-0.007
	(0.068)	(0.017)	(0.059)	(0.045)*	(0.032)	(0.021)	(0.027)
trend	-0.063	-0.017	-0.042	-0.039	-0.011	0.006	-0.034
	(0.033)	(0.008)*	(0.029)	(0.022)	(0.016)	(0.010)	(0.013)*
Constant	2.792	0.345	1.304	1.824	0.398	0.156	0.347
	(0.997)**	(0.250)	(0.862)	(0.661)**	(0.474)	(0.308)	(0.399)
Obs	543	543	543	543	554	554	554
R-squared	0.241	0.104	0.192	0.104	0.119	0.175	0.101

Standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%
In all regressions, the country and year dummies are included, but not reported in the table.

Table 5B. Responsiveness to the Business Cycle, by Component, non-OECD, IV

Dependent variable is…	(1) Current expenditures	(2) Capital expenditures	(3) Subsidies and transfers	(4) Total – subsidies & transfers	(5) Income tax	(6) Commodity tax	(7) Social Security tax
DlGDP	-0.136	0.012	-0.030	-0.102	-0.000	0.006	0.001
	(0.028)**	(0.017)	(0.013)*	(0.033)**	(0.011)	(0.007)	(0.004)
L1DlGDP	0.070	-0.039	0.012	0.032	0.020	-0.001	-0.002
	(0.028)*	(0.017)*	(0.013)	(0.032)	(0.011)	(0.007)	(0.004)
L2DlGDP	-0.044	0.004	0.006	-0.048	0.001	-0.004	0.009
	(0.027)	(0.016)	(0.013)	(0.032)	(0.011)	(0.007)	(0.004)*
trend	0.025	-0.010	-0.007	0.019	-0.010	-0.000	0.005
	(0.047)	(0.028)	(0.023)	(0.056)	(0.019)	(0.013)	(0.007)
Constant	2.642	0.078	0.414	4.593	-0.645	0.909	-0.108
	(3.487)	(2.077)	(0.895)	(2.189)*	(0.699)	(0.470)	(0.240)
Obs	1354	1350	1289	1289	1422	1419	1422
R-squared	0.075	0.054	0.085	0.071	0.065	0.059	0.054

Standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%
In all regressions, the country and year dummies are included, but not reported in the table.

Table 6. Responsiveness of Budget Surplus, Test of Asymmetry

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample	OECD		non-OECD		OECD		non-OECD	
Estimation method	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Negative $DlGDP_{it}$	0.331	2.042	0.122	1.053	0.333	2.758	0.131	1.016
	(0.109)**	(0.745)**	(0.050)*	(0.338)**	(0.109)**	(1.884)	(0.050)**	(0.364)**
Positive $DlGDP_{it}$	0.142	-0.411	0.028	-0.348	0.132	-0.672	0.054	-0.310
	(0.046)**	(0.256)	(0.034)	(0.158)*	(0.047)**	(0.631)	(0.035)	(0.165)
Negative $DlGDP_{i(t-1)}$					0.215	-0.836	-0.075	0.101
					(0.108)*	(2.361)	(0.053)	(0.329)
Positive $DlGDP_{i(t-1)}$					0.050	0.375	-0.058	-0.122
					(0.047)	(0.745)	(0.035)	(0.136)
Negative $DlGDP_{i(t-2)}$					0.050	0.441	0.188	0.208
					(0.107)	(1.726)	(0.051)**	(0.289)
Positive $DlGDP_{i(t-2)}$					0.049	-0.223	-0.051	-0.019
					(0.046)	(0.597)	(0.033)	(0.120)
Observations	554	554	1440	1440	554	554	1440	1440
R-squared	0.239		0.062		0.255		0.076	
test of (Negative $DlGDP_{it}$ – Positive $DlGDP_{it}$) = 0								
difference	0.189	2.453	0.094	1.401	0.201	3.43	0.077	1.326
[p-value]	[0.15]	[0.01]	[0.17]	[0.00]	[0.13]	[0.17]	[0.27]	[0.01]

Standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%
In all regressions, the constant, time trend, country dummies, and year dummies are included, but not reported in the table.

Table 7. Stability of Economy and Government Size, OLS, All countries

The dependent variables are standard deviations of the GDP growth rates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample	All	All	All	OECD	non-OECD	All	All	All
Gov't expenditures / GDP	0.000	-0.046	-0.041	-0.023	-0.033			
	(0.023)	(0.017)**	(0.017)*	(0.012)+	(0.022)			
Total tax revenue / GDP						-0.103	-0.054	-0.049
						(0.026)**	(0.020)**	(0.020)*
Responsiveness of budget surplus			-0.242	-0.619	-0.152			-0.248
			(0.182)	(0.226)*	(0.210)			(0.182)
log of GDP	-0.560	-0.415	-0.386	-0.196	-0.355	-0.583	-0.393	-0.365
	(0.176)**	(0.124)**	(0.125)**	(0.103)+	(0.152)*	(0.160)**	(0.123)**	(0.124)**
GDP growth rates	0.079	-0.075	-0.082	0.043	-0.111	0.004	-0.056	-0.065
	(0.113)	(0.079)	(0.079)	(0.127)	(0.092)	(0.103)	(0.078)	(0.078)
log of GDP per capita	0.125	0.048	0.027	-0.005	0.255	0.419	0.076	0.052
	(0.244)	(0.170)	(0.170)	(0.248)	(0.220)	(0.227)+	(0.173)	(0.173)
Trade volume / GDP	-0.006	-0.004	-0.003	0.002	-0.007	-0.001	-0.004	-0.004
	(0.007)	(0.005)	(0.005)	(0.004)	(0.006)	(0.006)	(0.005)	(0.005)
Oil production / GDP		0.068	0.076	-0.035	0.071		0.063	0.072
		(0.013)**	(0.015)**	(0.028)	(0.017)**		(0.014)**	(0.015)**
Military expenditures / GDP		0.277	0.264	0.079	0.237		0.207	0.200
		(0.056)**	(0.057)**	(0.084)	(0.068)**		(0.051)**	(0.051)**
st. dev. of GDP growth rates of other countries		0.428	0.414	0.585	0.435		0.414	0.400
		(0.213)*	(0.212)+	(0.191)**	(0.250)+		(0.214)+	(0.213)+
Constant	16.924	13.624	13.064	7.263	11.068	17.101	12.891	12.393
	(3.174)**	(2.320)**	(2.348)**	(2.343)**	(3.051)**	(2.864)**	(2.282)**	(2.300)**
Observations	94	94	94	22	72	94	94	94
R-squared	0.211	0.648	0.656	0.874	0.568	0.330	0.648	0.656

Standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%

Table 8. Stability of Economy and Government Size, by Component, OLS

The dependent variables are standard deviations of the GDP growth rates

	All	OECD	non-OECD
(1) Total expenditures / GDP	-0.046	-0.044	-0.035
	(0.017)**	(0.012)**	(0.022)
(2) Current expenditures / GDP	-0.062	-0.049	-0.055
	(0.018)**	(0.011)**	(0.024)*
(3) Capital expenditures / GDP	0.020	0.063	0.047
	(0.064)	(0.149)	(0.072)
(4) Subsidies and transfers / GDP	-0.077	-0.067	-0.079
	(0.027)**	(0.011)**	(0.042)+
(5) Total - subsidies & transfers / GDP	-0.040	-0.014	-0.035
	(0.027)	(0.035)	(0.033)
(6) Total tax revenue / GDP	-0.054	-0.056	-0.038
	(0.020)**	(0.013)**	(0.027)
(7) Total tax revenue / GDP	-0.049	-0.032	-0.036
(with responsiveness term)	(0.020)*	(0.016)+	(0.027)
(8) Income tax / GDP	-0.047	-0.010	-0.043
	(0.038)	(0.032)	(0.049)
(9) Commodity tax / GDP	-0.126	-0.083	-0.131
	(0.048)*	(0.032)*	(0.071)+
(10) Social Security tax / GDP	-0.047	-0.066	-0.027
	(0.054)	(0.028)*	(0.111)

Standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%

Note: Each cell represents the estimated coefficient of fiscal component from a regression with the log of GDP, GDP growth rates, the log of GDP per capita, Trade volume/GDP, Oil production/GDP, Military expenditures/GDP, and the standard deviation of the GDP growth rates of other countries.

Appendix

Table A1. Responsiveness of Budget Surplus to Business Cycle, for Each Country

No	Country	Code	OECD	*t* stat > 1.7	IV estimates (t stat)		OLS estimates (t stat)	
1	Sweden	SWE	Yes	Yes	1.76	(3.38)	0.96	(3.32)
2	Norway	NOR	Yes	Yes	1.25	(1.25)	0.60	(3.42)
3	Austria	AUT	Yes	Yes	1.01	(1.32)	0.24	(1.76)
4	France	FRA	Yes	Yes	0.97	(4.10)	0.55	(4.29)
5	Finland	FIN	Yes	Yes	0.85	(4.75)	0.63	(5.09)
6	Nigeria	NGA	No	Yes	0.84	(2.08)	0.41	(1.56)
7	Italy	ITA	Yes	Yes	0.81	(2.24)	0.40	(2.19)
8	Denmark	DNK	Yes	Yes	0.71	(3.35)	0.63	(4.55)
9	United Kingdom	GBR	Yes	Yes	0.67	(2.71)	0.27	(2.07)
10	Malaysia	MYS	No	Yes	0.54	(1.90)	0.44	(1.95)
11	Singapore	SGP	No	Yes	0.53	(2.25)	0.54	(2.32)
12	Hungary	HUN	No	Yes	0.52	(2.49)	0.40	(2.49)
13	Spain	ESP	Yes	Yes	0.49	(2.53)	0.36	(3.23)
14	Kuwait	KWT	No	Yes	0.49	(2.77)	0.54	(3.21)
15	Netherlands	NLD	Yes	Yes	0.45	(2.04)	0.27	(1.72)
16	United States	USA	Yes	Yes	0.43	(2.85)	0.26	(2.81)
17	Japan	JPN	Yes	Yes	0.42	(2.88)	0.35	(3.58)
18	Belgium	BEL	Yes	Yes	0.42	(2.47)	0.32	(2.45)
19	Thailand	THA	No	Yes	0.40	(2.67)	0.28	(3.49)
20	Lesotho	LSO	No	Yes	0.38	(2.12)	0.48	(2.78)
21	New Zealand	NZL	Yes	Yes	0.32	(1.85)	0.22	(1.80)
22	South Africa	ZAF	No	Yes	0.32	(1.73)	0.17	(1.67)
23	Luxembourg	LUX	Yes	Yes	0.29	(1.09)	0.25	(2.54)
24	Korea, Rep.	KOR	No	Yes	0.27	(2.51)	0.27	(2.95)
25	Bahrain	BHR	No	Yes	0.25	(2.16)	0.24	(2.08)
26	Canada	CAN	Yes	Yes	0.22	(1.31)	0.28	(2.51)
27	Switzerland	CHE	Yes	Yes	0.19	(2.19)	0.14	(2.66)
28	Zimbabwe	ZWE	No	Yes	0.17	(0.80)	0.28	(2.41)
29	Jordan	JOR	No	Yes	0.17	(0.99)	0.29	(2.37)
30	Nepal	NPL	No	Yes	0.09	(0.48)	0.26	(2.70)
31	Botswana	BWA	No	Yes	0.02	(0.04)	0.37	(1.87)
32	Tunisia	TUN	No	Yes	-0.03	(0.09)	0.24	(3.51)

t statistics in parentheses. Countries are ordered based on, first, whether the *t* statistic of the IV or OLS estimate is larger than 1.7, then on the size of the IV estimate.

Table A1. Responsiveness of Budget Surplus to the Business Cycle - continued

No	Country	Code	OECD	*t* stat > 1.7	IV estimates		OLS estimates	
33	Trinidad and Tobago	TTO	No	Yes	-1.86	(2.53)	-1.72	(2.45)
34	Congo, Rep.	COG	No	No	5.63	(0.21)	0.00	(0.01)
35	Bolivia	BOL	No	No	4.15	(0.66)	0.64	(1.20)
36	Israel	ISR	No	No	1.74	(1.02)	0.21	(0.31)
37	Iran, Islamic Rep.	IRN	No	No	1.11	(0.57)	0.04	(0.52)
38	Zambia	ZMB	No	No	0.87	(1.37)	0.48	(0.93)
39	Cameroon	CMR	No	No	0.69	(0.26)	-0.05	(0.38)
40	Guyana	GUY	No	No	0.61	(0.47)	0.65	(0.76)
41	Australia	AUS	Yes	No	0.60	(0.96)	-0.06	(0.49)
42	Madagascar	MDG	No	No	0.60	(0.76)	0.02	(0.07)
43	Ireland	IRL	Yes	No	0.52	(1.68)	-0.05	(0.31)
44	Mexico	MEX	No	No	0.47	(1.02)	0.14	(0.90)
45	Mali	MLI	No	No	0.38	(0.91)	0.13	(0.81)
46	Portugal	PRT	Yes	No	0.38	(1.24)	0.28	(1.25)
47	Kenya	KEN	No	No	0.36	(0.94)	0.07	(0.37)
48	Indonesia	IDN	No	No	0.33	(1.15)	0.08	(0.75)
49	Malta	MLT	No	No	0.31	(1.39)	0.33	(1.50)
50	Malawi	MWI	No	No	0.31	(0.70)	0.03	(0.11)
51	Nicaragua	NIC	No	No	0.26	(0.42)	-0.06	(0.14)
52	Chad	TCD	No	No	0.25	(0.92)	0.12	(0.83)
53	Cote d'Ivoire	CIV	No	No	0.22	(0.25)	0.85	(1.60)
54	Sierra Leone	SLE	No	No	0.22	(0.85)	0.04	(0.22)
55	Swaziland	SWZ	No	No	0.18	(0.57)	0.25	(0.83)
56	Papua New Guinea	PNG	No	No	0.16	(0.53)	0.11	(0.65)
57	Chile	CHL	No	No	0.15	(1.34)	0.09	(1.00)
58	Oman	OMN	No	No	0.14	(0.51)	-0.22	(1.28)
59	Peru	PER	No	No	0.12	(1.17)	0.07	(1.10)
60	Colombia	COL	No	No	0.12	(0.54)	0.03	(0.21)
61	Uruguay	URY	No	No	0.11	(0.89)	0.03	(0.30)
62	Paraguay	PRY	No	No	0.09	(1.06)	0.02	(0.35)
63	United Arab Emirates	ARE	No	No	0.07	(1.45)	0.06	(1.38)
64	Fiji	FJI	No	No	0.05	(0.74)	0.05	(0.74)

t statistics in parentheses. Countries are ordered based on, first, whether the *t* statistic of the IV or OLS estimate is larger than 1.7, then on the size of the IV estimate.

Table A1. Responsiveness of Budget Surplus to the Business Cycle - continued

No	Country	Code	OECD	*t* stat > 1.7	IV estimates		OLS estimates	
65	Ghana	GHA	No	No	0.04	(0.38)	0.07	(0.75)
66	Barbados	BRB	No	No	0.04	(0.20)	0.05	(0.22)
67	Philippines	PHL	No	No	0.04	(0.31)	-0.07	(0.79)
68	Gabon	GAB	No	No	0.02	(0.08)	-0.11	(0.54)
69	Syrian Arab Republic	SYR	No	No	0.01	(0.04)	-0.06	(0.38)
70	Venezuela, RB	VEN	No	No	-0.01	(0.02)	-0.25	(1.48)
71	Rwanda	RWA	No	No	-0.01	(0.34)	-0.01	(0.26)
72	Cyprus	CYP	No	No	-0.01	(0.07)	0.18	(1.53)
73	India	IND	No	No	-0.03	(0.05)	0.06	(1.55)
74	Romania	ROM	No	No	-0.05	(0.10)	-0.19	(0.66)
75	Panama	PAN	No	No	-0.10	(0.54)	-0.08	(0.58)
76	Mauritius	MUS	No	No	-0.10	(1.35)	-0.10	(1.37)
77	Ethiopia	ETH	No	No	-0.11	(0.70)	-0.04	(0.42)
78	Sri Lanka	LKA	No	No	-0.11	(0.06)	-0.29	(0.57)
79	Ecuador	ECU	No	No	-0.12	(0.62)	-0.08	(0.59)
80	Bangladesh	BGD	No	No	-0.13	(0.96)	-0.06	(0.53)
81	Costa Rica	CRI	No	No	-0.14	(0.92)	-0.19	(1.50)
82	Turkey	TUR	Yes	No	-0.15	(0.50)	-0.06	(0.52)
83	Argentina	ARG	No	No	-0.15	(0.85)	-0.03	(0.41)
84	Burkina Faso	BFA	No	No	-0.15	(0.89)	-0.13	(1.33)
85	Dominican Republic	DOM	No	No	-0.17	(1.17)	-0.01	(0.13)
86	Pakistan	PAK	No	No	-0.24	(0.47)	-0.09	(0.54)
87	Burundi	BDI	No	No	-0.29	(0.72)	-0.01	(0.06)
88	Brazil	BRA	No	No	-0.40	(0.51)	-0.21	(0.47)
89	Morocco	MAR	No	No	-0.40	(0.87)	-0.03	(0.18)
90	Egypt, Arab Rep.	EGY	No	No	-0.43	(0.38)	-0.14	(0.26)
91	Greece	GRC	Yes	No	-0.47	(0.77)	0.14	(0.51)
92	Gambia, The	GMB	No	No	-0.61	(0.62)	-0.82	(1.36)
93	Congo, Dem. Rep.	ZAR	No	No	-1.59	(0.41)	0.03	(0.18)
94	Suriname	SUR	No	No	-2.58	(0.54)	1.46	(0.89)

t statistics in parentheses. Countries are ordered based on, first, whether the *t* statistic of the IV or OLS estimate is larger than 1.7, then on the size of the IV estimate.