
Impact of the Crisis and Policy Response at the Sub-national Level

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15.1 Introduction

The global crisis had an adverse effect on public finances at all levels of government. The impact of the crisis on *general government* finances has been documented widely (e.g., see International Monetary Fund 2010a; International Monetary Fund 2010b; OECD 2009; European Commission 2009), while evidence on *sub-national government* (SNG) finances is scarce. The existing small literature has largely focused on the impact of the crisis on aggregate SNG indicators (OECD 2011; Blöchliger et al. 2010; Dexia 2011; Ter-Minassian and Fedelino 2010), but aggregate data mask substantial regional variation and do not allow disentangling the impact of common and idiosyncratic shocks (Rodden and Wibbels 2010; International Monetary Fund 2012). Systematic analysis of the impact of the crisis on SNG finances is warranted in light of their growing role in public policy-making, driven by rapid decentralization efforts over the last several decades.

The important role played by the central government in stabilizing regional macroeconomic shocks has been documented widely. Sachs and Sala-i-Martin (1992), Von Hagen (1992), and Bayoumi and Masson (1995) showed that the central government cushions the impact of permanent (redistribution) and idiosyncratic (risk-sharing) shocks hitting individual regions in the United States and Canada through a system of intergovernmental transfers. Later studies provided similar evidence for the United Kingdom (Goodhart and Smith 1993), France (Melitz and Zumer 2002), Italy (Decressin 2002), and Sweden (Andersson 2004). However, little empirical evidence is available on the role of SNG finances in coping with macroeconomic shocks.

This chapter provides an empirical assessment of the impact of the crisis on SNG finances using a novel disaggregated dataset for eight large federations—Australia, Brazil, Canada, China, Germany, Mexico, Spain, and the United States. It takes into consideration the regional variation overlooked in most previous studies. We address the following issues: (1) the impact of the crisis on SNG finances, (2) the short-run

response of SNGs to the crisis, and (3) the long-run challenges facing SNGs in the aftermath of the crisis.

Our analysis leads to the following conclusions. First, the global crisis had an adverse effect on SNG finances in most countries under consideration, largely through falling revenues. Overall, an average SNG in an emerging economy was less affected than an SNG in an advanced economy. In both advanced and emerging economies, the impact of the crisis was uneven across regions within the same country. Second, the short-run response of SNGs to the crisis was predominantly countercyclical, avoiding a sharp reduction of expenditures in the aftermath of the crisis. This result seems to contradict the theoretical prediction of limited stabilization room at the disposal of SNGs. However, there was a strong policy response by the central government in the form of stimulus packages. Part of this response was channeled through SNGs, allowing them to abstain from expenditure cuts. Finally, given that a considerable part of revenue declines was structural (or permanent) and taking into account current plans of central governments to withdraw the stimulus packages, going forward SNGs should put in place reforms to tackle the long-run structural gap between the high level of expenditures and permanently lower revenues.

15.2 The Institutional Framework Governing SNG Finances

Differences in the institutional frameworks governing SNG and central government finances have important implications for their vulnerability to macroeconomic shocks. Given the highly elastic nature of most taxes, a cyclical downturn automatically results in a decline in government revenues. In order to smooth expenditures over the business cycle, the central government can either use part of its savings accumulated during good times or borrow from credit markets. By increasing (decreasing) spending during cyclical downturns (upturns) the central government performs its macroeconomic stabilization function.

In principle, SNGs should also be able to smooth their expenditure over the regional cycle, contributing to the stabilization of the local economy. However, in practice, differences in the institutional frameworks of SNG and central government finances limit such stabilization.

- *Disproportional expenditure and revenue decentralization.* As expenditures have been decentralized at a faster pace than revenues, most SNGs rely heavily on intergovernmental transfers to finance their activities (Eyraud and Lusinyan 2011).
- *Revenue sharing.* SNGs share tax revenues with the central government, often through complicated revenue-sharing formulas. Typically the terms of these for-

mulas are dictated by the central government, limiting the autonomous ability of SNGs to react to short-term cyclical fluctuations.

- *Expenditure structure.* SNG expenditures are mostly targeted at non-income-related items and investment projects, whereas unemployment insurance and social welfare spending are usually performed by the central government (Buettner 2009). This makes SNG spending relatively less responsive to the cycle compared to that of the central government. At the same time, SNGs are responsible for a large part of public investment, which is easier to adjust during a crisis.
- *Fiscal rules and limitations on borrowing.* SNGs are subject to various fiscal rules, such as balanced budget rules and limitations on borrowing, which are often designed and monitored by the central government. Indeed, if the rules were strictly applied, fiscal policy in SNGs would be procyclical in the absence of increased transfer payments from the central government or “rainy day funds,” with spending cuts triggered during downturns owing to falling revenues.

The most common form of SNG fiscal rule is a balanced budget requirement (Sutherland et al. 2006).¹ Virtually all US states except Vermont have statutory limitations on their ability to run budget deficits (Bohn and Inman 1996; Liu 2010). During the 1990s many Australian state governments adopted explicit rules requiring balanced cash budgets (Robinson 2002). In Spain, the Fiscal Stability Law came into force in 2003, requiring SNG budgets to be in balance (Sutherland et al. 2006). In Germany, the 2009 amendment to the constitution introduced a (structural) balanced budget provision for SNGs (not binding until 2016), and before that, they were obliged to operate on a “golden rule” limiting borrowing to gross investment (Seitz 1999; Koske 2010). Balanced budget restrictions are common among Canadian provinces, although in some cases surpluses can be carried over to finance a deficit in a subsequent year (Tapp 2010). There is a similar deficit carryover provision in many Australian states (Robinson 2002). In Brazil, the Fiscal Responsibility Law and the Fiscal Crimes Law require balanced budgets for SNGs (Santos de Souza 2008).

There are also widespread constraints on SNG borrowing. According to the 1994 Budget Law, Chinese provinces need State Council approval to borrow, although it is possible for provinces to establish special purpose vehicles to finance capital projects through borrowing (Ahmad et al. 2004). In Mexico, states require the permission of the central government to borrow in foreign currency. The central government also obliges Mexican states to obtain at least two credit ratings before borrowing (Liu and Webb 2011; Sutherland et al. 2006). Australia has a unique cooperative arrangement, where a national loan council coordinates borrowing by the Commonwealth and the SNGs (Grewal 2000). In the United States, many states limit borrowing to short-term financing needs. Moreover in most countries SNG borrowing is not

explicitly guaranteed by the central government. A notable exception is Germany where a constitutional court ruling in 1992 established a requirement for the central government to provide support to highly indebted SNGs in times of economic distress (Seitz 1999).

The SNG institutional framework in most countries is characterized by weak enforcement mechanisms. In the United States, there is generally no explicit legal enforcement mechanism, although in many states fiscal rules are embodied in the state constitutions (Mullins and Wallin 2004). Australia, China, and Mexico do not have any formal sanctions for SNGs that break debt rules. Even though Spain requires offending SNGs to develop a fiscal consolidation plan and make up the difference in the following year, it lacks a credible enforcement procedure. A notable exception is Brazil, where violating public officials in noncomplying governments are potentially liable to criminal sanctions (Santos de Souza 2008). Brazil also has a comprehensive requirement for SNGs to have fiscal responsibility legislation. In other countries, medium-term fiscal frameworks and fiscal responsibility laws are relatively rare and in some cases (e.g., Australia and Canada) were introduced only recently (Liu and Webb 2011).

15.3 Data and Empirical Analysis

In this section we provide an empirical assessment of the impact of the crisis on SNG finances in Australia, Brazil, Canada, China, Germany, Mexico, Spain, and the United States.

15.3.1 Data

Appendix A gives a description of the variables used in our analysis and their sources. Given some small definitional differences, adjustments were made to homogenize variables across countries, giving broadly comparable indicators for own-revenues (disaggregated by tax and other revenues),² total expenditures, overall balances, and transfers from central government. The dataset also includes macroeconomic indicators (GDP, population, and, whenever possible, also CPI) at the state level. The sample period starts in the mid-1990s and extends through 2010 for most countries (with the exception of China and Spain, where it ends in 2009).

Using these variables, we arrived at the following SNG-level balance sheet identity:

$$E_{i,t} - OR_{i,t} - T_{i,t} = OB_{i,t}, \quad (15.1)$$

where i and t denote SNG and time, respectively, E_t represents SNG total expenditures, OR_t denotes SNG own-revenues, T_t is central government transfers to SNG budgets, and OB_t is the SNG overall balance.

15.3.2 Impact of the Crisis

We use two complementary approaches to gauge the impact of the crisis. First, we estimate annual percentage changes of SNG-level real per capita total expenditures, own-revenues, and transfers from the central government (variables entering the left-hand side of equation 15.1). We compare the dynamics of these percentage changes with state-level real per capita GDP growth rates during three years before (2005–2007) and after (2008–2010) the crisis. In order to smooth out annual fluctuations, we examine three-year medians for each of these periods. Second, we take the ratios of all four variables entering specification (15.1) in nominal terms with respect to nominal state GDP. Similar to the first approach, we smooth out annual fluctuations by examining three-year medians for the periods before and after the crisis.

Figure 15.1 shows that the global crisis led to a sharp deceleration in median SNG real per capita growth rates across all countries in our sample. This slowdown was more pronounced for advanced economies (e.g., Germany, Spain, and the United States have recorded a decline in median GDP growth) compared to emerging economies, where median growth remained positive albeit at a considerably lower level than in the pre-crisis period. The distribution of growth rates indicates notable heterogeneity across states within a country, with some states continuing to grow rapidly even in countries with a negative median growth rate. In fact heterogeneity increased substantially during the crisis shown in figure 15.1 by a large widening of the distributions.

- *Own-revenues.* In some advanced economies (e.g., Spain), the own-revenue decline in the aftermath of the crisis for the median state outpaced that of output, pushing own-revenues to GDP ratios marginally lower. By contrast, in some emerging economies (notably, China) the deceleration in own-revenues growth was not as pronounced as that of output growth, leading to a modest increase in own-revenues to GDP ratios.
- *Total expenditures.* Unlike own-revenues, real per capita total expenditure was either unaffected or increased despite the output growth slowdown in the aftermath of the crisis. The diverging dynamics of own-revenue and total expenditure growth rates suggests a countercyclical response by SNGs, which seem to go against the popular view that SNGs have a limited ability to conduct stabilization policy in light of institutional and borrowing constraints. As discussed in the next paragraph, this short-term countercyclical response was largely supported by transfers from the central government.
- *Transfers from the central government.* Similar to total expenditures, growth of transfers from the central government has stayed unchanged or increased in response to the output growth slowdown. Not surprisingly, the increase was particularly pronounced in countries where central governments put in place

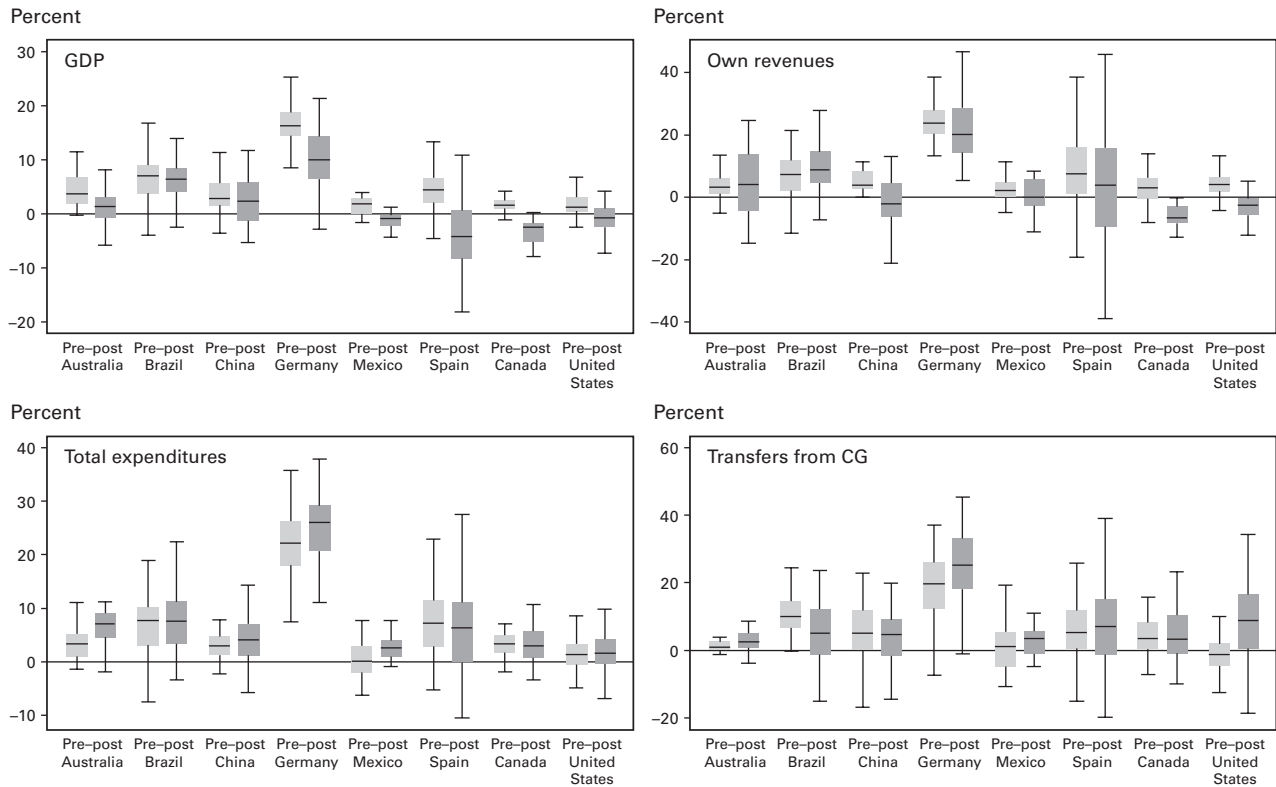


Figure 15.1

Real per capita growth rates of state GDP and other SNG fiscal variables. Each graph shows the distribution for the pre-crisis period (2005–2007) and post-crisis (2008–2010) for the relevant variable. Each vertical line represents the distribution around the median, with the box representing the out-turns between the 25th and 75th quartiles. The central horizontal line represents the median.

Source: IMF staff calculations

sizable stimulus packages following the crisis (e.g., China and the United States). Given that the global crisis represents a common shock hitting all states simultaneously (although some more than others), a coordinated response from the central government helped SNGs to limit procyclical expenditure cuts.

Own-revenue to GDP ratio remained unchanged in most countries following the output slowdown (figure 15.2), implying that the own-revenue elasticity with respect to output was close to one. By contrast, the total expenditure to GDP ratio increased in almost all countries in the aftermath of the crisis. As a consequence a sizable gap between own-revenue and expenditure emerged; this gap was largest in advanced countries. Moreover the increase in the transfers to GDP ratio was not sufficient to

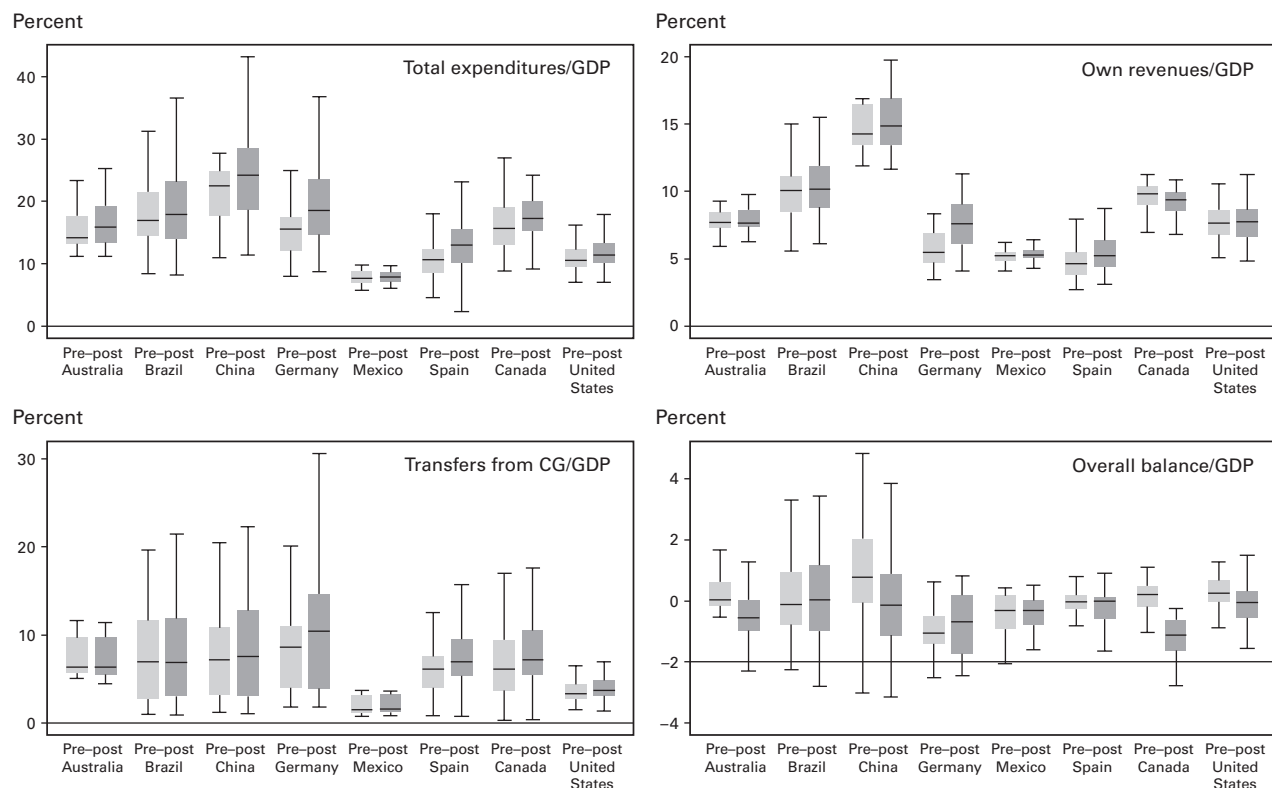


Figure 15.2

SNG fiscal variables as a share of GDP. Each graph shows the distribution for the pre-crisis period (2005–2007) and post-crisis period (2008–2010) for the relevant variable. Each vertical line represents the distribution around the median, with the box representing the out-turns between the 25th and 75th quartiles. The horizontal line represents the median.

Source: IMF staff calculations

fully cover this gap in most countries, including those with sizable stimulus packages, resulting in a deterioration of SNG deficit ratios.

Despite the deterioration in SNG deficits after the crisis, their level was not that large compared to deficits run by the countries as a whole. The main reason for this divergence is a surge in intergovernmental transfers after the crisis, which helped reduce SNG deficits at the cost of increasing central government deficits. On balance, this intervention resulted in much higher general government deficits compared to SNG deficits.

Overall, the analysis above suggests that the global crisis has had an adverse impact on SNG finances, resulting in deteriorating deficits. The slowdown in own-revenues was partially mitigated by the increase in transfers from the central

government triggered by countercyclical stimulus packages. The latter helped SNGs to smooth out expenditure in the short run.

15.3.3 Policy Response

Analysis Based on Fiscal Impulses

In this section we conduct a more formal analysis of SNG policy countercyclicality. Previous studies analyzing SNG fiscal policy countercyclicality in the United States (Sorensen and Yosha 2001), Brazil (Arena and Revilla 2009), and a panel of federations (Rodden and Wibbels 2010; IMF *Fiscal Monitor* 2012) have adopted an approach focused on panel regressions between expenditure and GDP growth rates. Our analysis is based on fiscal impulse methodology outlined in IMF (2008) and Blanchard (1993).

Appendix B describes the methodology employed in our analysis. An expenditure impulse represents the discretionary (or policy induced) component of SNG expenditures as opposed to the cyclical (or automatic stabilization) component. To identify the expenditure impulse, we estimate expenditure movements driven by changes in the economic environment between t and $t - 1$. The part of movements not explained by changes in the economic environment is assumed to be driven by discretionary policies. This latter component is the expenditure impulse, which we estimated for the three-year periods before (2005–2007) and after (2008–2010) the crisis. A positive (negative) value of the impulse indicates expansionary (contractionary) fiscal policies. As in the previous section, we smooth out annual fluctuations by focusing our analysis on three-year medians for both periods.

Figure 15.3 presents comparative analysis of fiscal policy cyclicality in the three-year periods before and after the crisis. For both periods, the scatterplots are divided into four quadrants, two of which represent procyclical policies (a combination of expenditure impulses and output gaps with the same sign), while the other two represent countercyclical policies (a combination of expenditure impulses and output gaps with the opposite signs).

- *Pre-crisis.* As shown in the top scatterplot, in the pre-crisis period SNG expenditure policies were predominantly procyclical. This finding is in line with the evidence from previous empirical studies.
- *After the crisis.* As shown in the bottom scatterplot, during the short period following the crisis, SNG policies in all countries (except Germany) turned countercyclical. This finding differs from the results obtained in previous empirical studies. The main reason is that the previous studies covered only samples that preceded the global crisis. In those samples, states did not experience common shocks of a comparable magnitude and did not benefit from as massive national stimulus packages as they did recently.

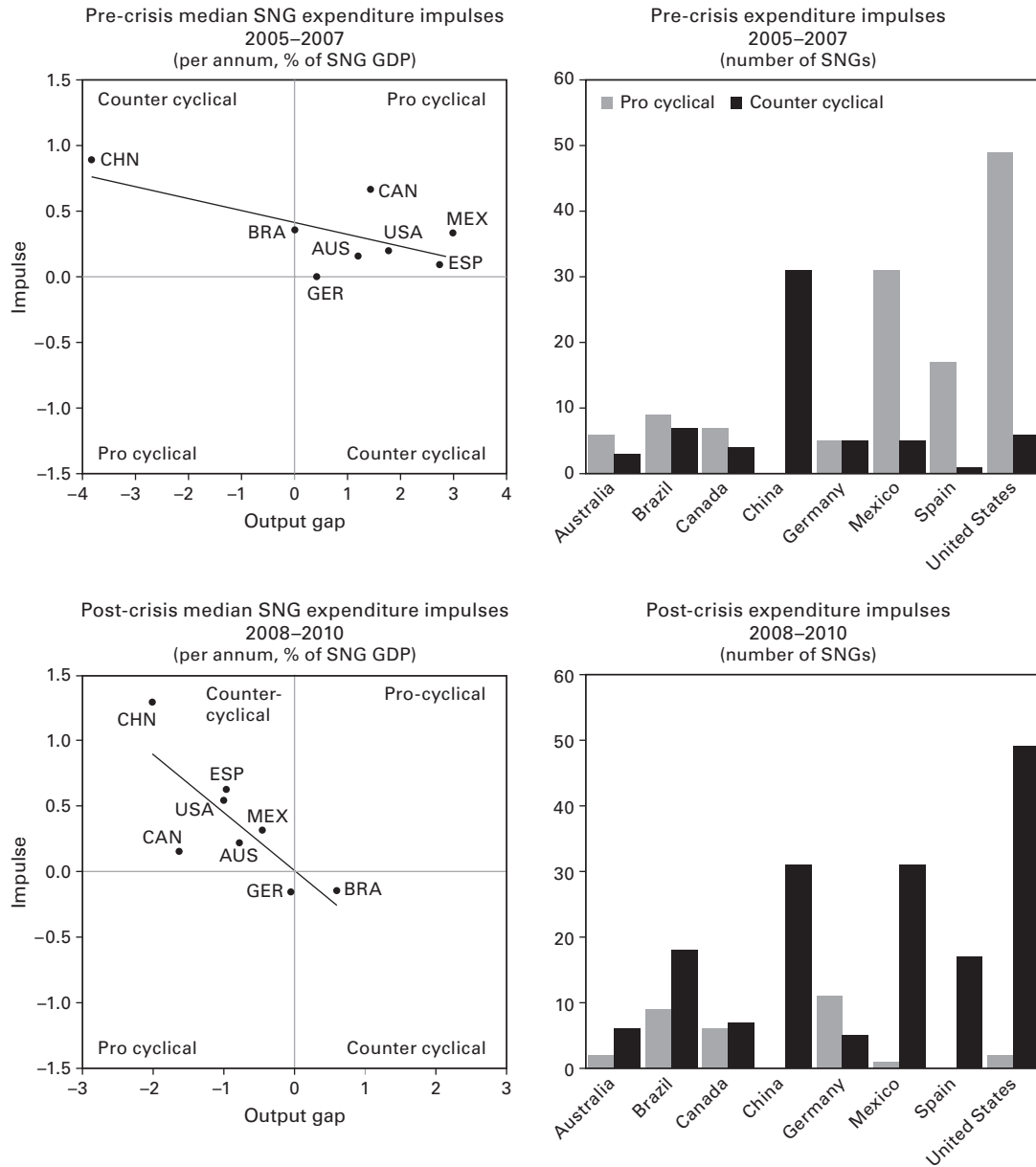


Figure 15.3
Response to the crisis: Comparison of SNG expenditure impulses before (2005–2007) and after (2008–2010) the crisis.

The bar charts in the same figure show the number of SNGs with positive and negative expenditure impulses in both periods. The charts suggest that following the crisis, a predominant number of SNGs were running a countercyclical expenditure policy in all countries (except Germany). This contrasts with the pre-crisis period, when a predominant number of states were running a procyclical fiscal policy. A notable example is the United States where almost all states running procyclical policies before the crisis switched their stance to countercyclical in the aftermath of the crisis.

Factors Contributing to Countercyclical SNG Fiscal Policy after the Crisis

The countercyclical response of SNG expenditures to the crisis documented in the previous section seems to contradict the theoretical prediction that SNGs should have a limited role in economic stabilization. SNG countercyclical response was supported by measures introduced by the central government in response to the common shock hitting all states. These temporary measures can be grouped into two broad categories: (1) national stimulus packages channeled through SNGs and (2) temporary relaxation of fiscal rules/borrowing constraints. Below we describe each of these measures in detail.

Support through Stimulus

As shown in figure 15.1, in the aftermath of the crisis transfers from the central government increased for most countries of our sample. The extent of the increase depended on the specificities of national stimulus packages. In China, Mexico, the United States, and to a lesser extent Canada and Spain, a considerable portion of the stimulus package was directed through SNGs. In the case of Australia, Brazil, and Germany, the direct role of SNGs in national stimulus efforts was more limited.

- *Australia.* SNGs played a central role in managing the stimulus efforts but received little direct budgetary support (Leigh 2009). Out of a total stimulus package of AU\$49 billion, around AU\$2.1 billion were allocated directly to states under the Nation Building and Jobs Plan (Swan 2009). This direct allocation understates the role of Australian states in stimulus efforts. The Council of Australian Governments established a National Partnership Agreement to facilitate the “rapid and cooperative delivery of the plan” (Australian Government 2009). As such, much of the package was implemented by agencies managed by the Australian states rather than by the state governments directly.
- *Canada.* The Economic Action Plan of 2008 envisaged a limited supporting role for provinces. From a total stimulus package of C\$60 billion, around C\$14 billion were directed toward “leveraged provincial and territorial actions,” which

required an element of provincial co-financing. As part of the action plan, an infrastructure stimulus fund was established, providing up to 50 percent in federal funding for provincial investment projects. Canada's stimulus plan also offered SNGs the option of accelerating transfers under the already existing Provincial-Territorial Base Fund.

- *China*. The stimulus package was designed to maximize its impact at a regional level, with a strong emphasis on public investment rather than tax cuts (Cova et al. 2010; Fardoust et al. 2012). A large share of the stimulus was earmarked for investment managed by the provinces, particularly in the transport and energy sectors.
- *Germany*. Two stimulus packages focused on tax cuts and labor market measures to cushion the fall in economic output and employment. There was little direct budgetary support for SNGs. Nevertheless, an agreement was reached whereby struggling SNGs would receive additional support amounting to €800 million, financed jointly by the federal government and other SNGs.³
- *Spain and Brazil*. A key objective of their stimulus packages was to avoid a decrease in SNG infrastructure investment (OECD 2010). In Spain, a State Fund for Local Governments was established and received an allocation of €8 billion to help sustain public investment. In Brazil, the focus of the stimulus was on tax reductions rather than expenditure increases. However, Brazilian federal government utilized the growth acceleration program (Programa de Aceleração do Crescimento) to maintain public investment levels in SNGs and municipalities. With the onset of the crisis, the program was used to accelerate transfers to municipalities and special credit lines for long-term investment by SNGs (Allain-Dupré 2011).
- *The United States*. The stimulus package envisaged a key role for SNGs. A large component of the American Recovery and Reinvestment Act (ARRA) of 2009 provided direct budgetary support for SNGs. The plan earmarked US\$286 billion for state and local administrations through infrastructure expenditure and social spending. The Act also established a State Fiscal Stabilization Fund, which received an allocation of \$53.6 billion to help state and local governments avert budget cuts. The bulk of these funds were targeted toward protecting education expenditures.

Relaxing Fiscal Rules/Borrowing Constraints

At the onset of the crisis, SNG fiscal rules—in particular, borrowing constraints—were eased in a number of countries. This provided some limited opportunities for SNGs to cover part of the rising gap between own-revenues and expenditures by borrowing.

- *Australia and Spain.* In both countries the central government offered explicit guarantees to facilitate sub-national borrowing. Spain also allowed municipalities to borrow and finance their 2008 operational deficit, including payments owed to suppliers (OECD 2010).
- *Brazil.* The federal government established credit lines for SNGs through the national development bank. A degree of forbearance was given to those SNGs that were not in compliance with the requirements of fiscal responsibility legislation (Canuto and Liu 2010).
- *China.* Provincial borrowing restrictions were relaxed. The central government issued bonds on behalf of provinces, although this debt will eventually become the responsibility of provinces. Provincial governments also established off-budget special purpose vehicles to borrow funds and finance public investment.
- *Germany.* Unlike the above-mentioned countries, there has been a move toward tightening sub-national fiscal rules.⁴ In 2009 the Constitution was amended to include a structural balance rule for SNGs. Moreover SNGs will be only permitted to engage in cyclically adjusted net borrowing. These reforms come into force in 2011 and should be fully operational by 2020. Nevertheless, a sizable part of the additional post-crisis SNG expenditures was covered by additional borrowing by the states.
- *The United States.* The central government did not have the power to modify the self-imposed balanced budget requirements of states, which remained in place following the crisis. Nevertheless, the ex post median overall deficit deteriorated by 0.6 percent of state GDP. This broadly matched the increase in current expenditures, indicating that there was some implicit relaxation of ex post policies relative to ex ante balanced budget rules. The US states also mitigated revenue shortfalls by drawing on the reserves accumulated in “rainy day funds” (Bernanke 2010).

The impact of the more lax fiscal rules and borrowing constraints was partially offset by a worsening in SNG borrowing conditions, which might have constrained the rise in post-crisis SNG borrowing. Canuto and Liu (2010) reported that between October 2008 and January 2010, Moody's initiated 72 ratings actions on SNG debt, representing about a quarter of the “rated universe outside the United States” of which 96 percent of the actions were in a downward direction. Canuto and Liu also reported that in 2009 Fitch ratings of European SNGs were experiencing a “general shift towards negative outlooks.” Similarly S&P's negative ratings actions for European SNGs largely exceed positive ones in 2009 and 2010. Reflecting this deterioration in borrowing conditions, the Spanish government established a liquidity facility for regional governments.

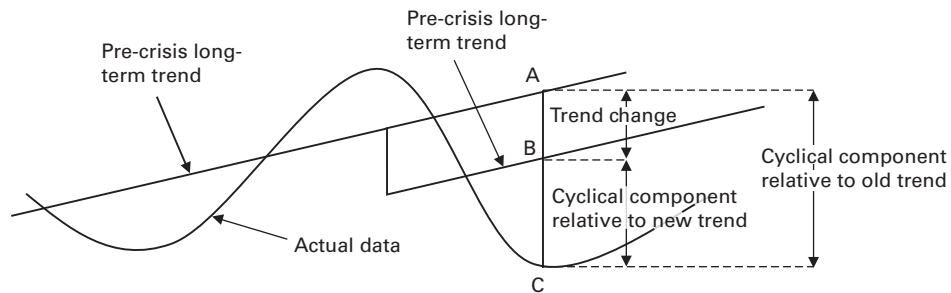


Figure 15.4
Decomposition of the changes into cyclical and structural components

Long-Term Fiscal Implications of the Crisis

Due to their highly elastic nature, SNG own-revenues closely followed the regional growth developments. As a result the adverse output shock experienced by most countries in our sample has pushed down SNG own-revenues. A natural question arising here is whether this output shock was temporary or permanent. Figure 15.4 illustrates this point graphically. If the shock was temporary (or cyclical), then own-revenues should recover to their pre-crisis trend when the output recovers. If the shock was permanent, then own revenues will recover to a new trend level that would fall short of the pre-crisis trend, having long-run implications for the structural adjustment in expenditures to cover the revenue gap.

In order to assess the long-run impact of the crisis, we estimated the pre-and post-crisis trends for real per capita output, own-revenues, and expenditures using the following regression for each state:

$$\log(X_{it}) = a_{0i} + a_{1i}trend_t + a_{2i}trend_t^2 + \beta_i crisis_t + \varepsilon_t, \quad (15.2)$$

where i and t indexes denote state and time, respectively, $\log(X_{it})$ is the logarithm of the variable of interest (real per capita GDP, own-revenue, and total expenditure), $trend$ and $trend^2$ are linear and squared trends, respectively, $crisis$ is the dummy variable that takes the value of 1 for the period 2008 to 2010 and 0 prior to the crisis, and ε is the i.i.d. error term. The coefficients a_{0i} , a_{1i} , and a_{2i} identify the pre-crisis trend. The coefficient β_i is the parameter of interest: it captures the shift in the post-crisis trend variable. Given that the dependent variable is expressed in logarithm, the magnitude of the coefficient β_i indicates the percentage deviation of the post-crisis trend in state i relative to its pre-crisis level.

Table 15.1 shows country-level weighted averages of state-specific estimates β_i for real per capita GDP, own-revenue, and expenditures, where weights represent the share of respective state variable in the national aggregate. In all countries

Table 15.1
Estimated level shift of trend relative to the pre-crisis level

	GDP	Total expenditures	Own-revenues
Australia	-2.5	-0.5	-3.4
Brazil	1.2	4.2	3.6
Canada	-3.7	1.2	-2.8
China	-4.8	3.0	-2.7
Germany	-0.9	0.5	-1.0
Mexico	-5.2	3.0	-8.0
Spain	-4.8	0.1	-5.3
United States	-4.4	0.9	-3.2

Note: Reported data are weighted averages of state-specific estimates of coefficients β_i from specification (15.2).

(except Brazil), trend output was shifted down following the crisis, with the magnitude of the shift ranging from -0.9 percent in Germany to -5.2 percent in Mexico. This permanent shift resulted in a permanent loss of SNG own revenues, ranging from -1 percent in Germany to -8 percent in Mexico, suggesting that the structural loss of own-revenues closely matched the structural decline in trend GDP (see figure 15.5, right panel). In contrast, structural expenditures have increased following the decline in structural GDP; in some cases by a wide margin (see also figure 15.5, left panel).

The bottom panels of figure 15.5 decompose deviations of real per capita own-revenues and total expenditures for the last year of the sample (2010 for most countries). The chart shows that in all countries (except Brazil and China), own-revenues at the end of the sample are lower compared to their pre-crisis trend. A bulk of this difference is explained by the downward structural shift in own-revenues caused by a permanent decline in output (distance between points *A* and *B* in figure 15.4), while the rest of the decline is cyclical. By contrast, total expenditures in all countries exceed their pre-crisis trend. The contribution of the structural shift to this increase is sizable, creating a structural gap between post-crisis total expenditures and own-revenues.

15.4 Conclusions

Motivated by the ongoing decentralization efforts and growing role of SNGs in public policy-making, this chapter analyzes the impact of the global crisis on SNG finances. Using disaggregated data on eight large federations over the most recent period starting from the mid-1990s, we find that:

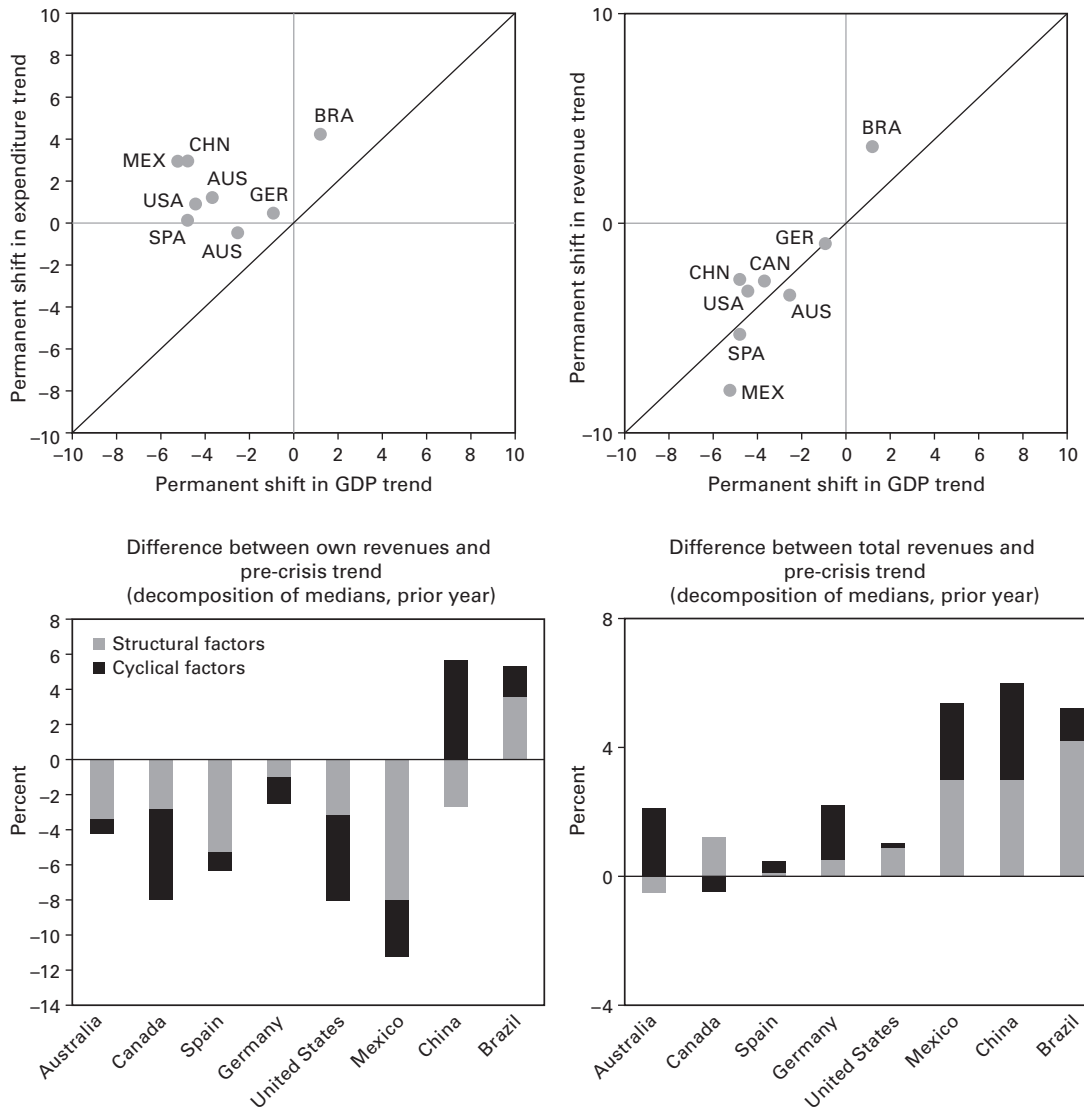


Figure 15.5 Permanent and transitory impact of the crisis on SNG finances

- The global crisis has had an adverse effect on SNG finances in most countries under consideration. The impact of the crisis was largely transmitted through lower own-revenues in response to a permanent and cyclical decline in state outputs. In general, SNGs in advanced economies, where the crisis originated, were more affected than those in emerging economies. The strength of the adverse impact was uneven across individual SNGs within a country.
- The short-run response of SNGs to the crisis was predominantly countercyclical. In most SNGs, total expenditures held ground or even increased following the crisis, helped by the support from the central government. This support was provided through two main channels: (1) by an increase in transfers from the central government through national stimulus packages and (2) by relaxation of SNG budget rules and borrowing constraints.
- The crisis unveiled long-run sustainability challenges facing SNGs due to a permanent loss of own-revenues triggered by a downward shift in the level of trend output. Given that the temporary stimulus measures put in place by central governments were withdrawn in many countries and will be withdrawn over the next few years in the remaining countries, SNGs have to implement structural reforms to fill out the structural gap between permanently lower own-revenues and persistently high expenditures.

Overall, moving from stimulus to consolidation will require close coordination between SNGs and central governments. In order to be successful, consolidation efforts will require a coherent medium-term framework that encompasses both central and sub-national levels of government. This will provide SNGs with sufficient time to incorporate stimulus withdrawal plans into their medium-term budgetary frameworks in order to minimize the possible disruption caused by the eventual decline in transfer flows from the central government.

Appendix A: Database

The database covers revenues, expenditures, debt and GDP at the state government level. Municipal data is not included. The database includes eight countries (Australia, Brazil, Canada, China, Germany, Mexico, Spain, and the United States). Our sample countries have broadly similar expenditure responsibilities, covering law and order, education, transportation, and infrastructure development. Revenue assignments are more heterogeneous. In some countries, for example, SNGs have the authority to raise income tax. In other countries, revenues from headline taxes are shared between federal and state level entities, as in the case of general sales tax in Australia.

The data for Australia were taken from the *Australian Bureau of Statistics*. Revenue, expenditure and public debt data range from 1999 to 2010, while GDP data range from 1990 to 2010. Revenue data are broken down into 12 variables including total revenue, tax revenue, sales of goods and services, and interest income and current grants and subsidies. Expenditure data are broken down into 11 variables and includes subsidies and transfers, personal services, goods and services, financial investment, public works, and other services.

The data for Brazil were taken from the *Institute of Applied Economic Research* (IPEA Data) and the *Ministry of Finance*. Data from IPEA range from 1985 to 2005, while the data from the Ministry of Finance span from 1995 to 2010. The Brazil data set includes revenues, expenditure and GDP data. Revenue data are broken down into 17 variables including total revenue, tax revenue, current and capital revenue, while expenditure is broken up into 30 variables including expenditure by function and capital and current expenditure.

State level data for Canada were taken from the *Department of Finance*. Revenue, expenditure and net public debt data are available from 1988 to 2010, while GDP data are available from 1980 to 2010; however, the breakdown available for revenues and expenditure data is limited including just total revenues and federal cash transfers, and debt charges and other expenditures, respectively.

Data for China were collected from the *CEIC China database*. The CEIC database includes macroeconomic, industry and financial time series for global emerging and developed markets. Revenue and expenditure data are available from 1999 to 2009, while GDP data are available from 2004 to 2011. Revenue data include a breakdown of 29 variables (mainly tax revenue variables), while expenditure data are broken up into expenditure by function (40 variables).

Revenue, expenditure, public debt, and GDP for Germany have been taken from the *Federal Statistics Office*. Data are available from 1995 to 2010. Revenues and expenditure data are broken down by broad capital budget and administrative budget categories.

Revenues, expenditure and GDP data for Mexico have been collected from the *CEIC Non-Asia Database* and from the *National Institute of Statistics and Geography* (INEGI). Revenues and expenditure data taken from INEGI range from 1989 to 2010, and are broken down in to 12 and 13 categories, respectively. GDP data from the CEIC Non Asia Database are from 2003 to 2009.

State-level data for Spain have been collected from the *Ministry of Finance*. Revenue, expenditure, and public data range from 1984 to 2009, while GDP data range from 1980 to 2009. Revenue and expenditure data are broken down into 14 variables each, including totals, different taxes, capital and current spending, and expenditure by function.

The data for the United States have been collected from the *US Census Bureau*. Revenue, expenditure and debt data range from 1958 to 2009, while GDP data have been collected from 1995 to 2009. Data for 2010 are expected to be available by December. The database includes a breakdown for revenues (140 variables), expenditures (350 variables), including different type of tax revenues, and expenditure by function.

Appendix B: Estimation of Regression-Based Fiscal Impulses

We adopt the IMF (2008) methodology for assessing fiscal impulses at the state level. The SNGs fiscal balance (excluding CG transfers) in period t can be expressed as $B(P_t, E_t) = Rev(P_t, E_t) - Exp(P_t, E_t)$, where P_t and E_t stand for the discretionary fiscal policy and economic environment, respectively, and Exp_t and Rev_t for total expenditures and own-revenues, respectively (both measured in real per capita terms).

The change in the fiscal balance can be decomposed as follows:

$$\begin{aligned}\Delta B_t &= B(P_t, E_t) - B(P_{t-1}, E_{t-1}) \\ &= [B(P_t, E_t) - B(P_t, E_{t-1})] + [B(P_t, E_{t-1}) - B(P_{t-1}, E_{t-1})] = \Delta B_t^E + \Delta B_t^P.\end{aligned}$$

The first element, ΔB_t^E , represents the *automatic stabilizers* or the fiscal effects of changes in the economic environment between t and $t-1$. The second element, ΔB_t^P , represents the *fiscal impulse* or changes in the fiscal balance due to discretionary policies.

Following IMF (2008), we assume that real per capita GDP growth is a good proxy for the economic environment and start by estimating the following equations:

$$Rev_t = a_0^R + a_1^R growth_t + a_2^R trend_t + u_t,$$

$$Exp_t = a_0^E + a_1^E growth_t + a_2^E trend_t + e_t,$$

where *trend* is a time trend and u and e are the i.i.d. residuals. The growth-adjusted revenue, indicating what the revenue would have been in period t if the growth rate remained unchanged from the previous period, is computed as

$$Rev_t(growth_{t-1}) = \hat{a}_0^R + \hat{a}_1^R growth_{t-1} + \hat{a}_2^R trend_t + \hat{u}_t.$$

Similarly the growth-adjusted expenditure is computed as

$$Exp_t(growth_{t-1}) = \hat{a}_0^E + \hat{a}_1^E growth_{t-1} + \hat{a}_2^E trend_t + \hat{e}_t.$$

The measure of the balance that would have prevailed in period t if the growth rate remained at the $t-1$ level $B(P_t, E_{t-1})$ can be calculated as

$$Rev_t(growth_{t-1}) - Exp_t(growth_{t-1}).$$

The fiscal impulse measure then can be derived as

$$FI_t = [Rev_t (growth_{t-1}) - Exp_t (growth_{t-1})] - [Rev_{t-1} - Exp_{t-1}].$$

FI_t captures changes in the fiscal balance that are attributed solely to discretionary policies in period t .

Impulses can be procyclical, neutral or countercyclical, depending on the change of output gap. If the output gap is negative and the own-revenues are also negative then this signifies a countercyclical response. Discretionary taxes being reduced as output has fallen below trend. For transfers and expenditures, a positive impulse is countercyclical when the output gap is negative. Expenditures are increasing and the central government is transferring more resources to the sub-national entities, while the economy is operating below trend.

Notes

1. Revenue rules are rare and include some US and Canadian states that require voter approval for new taxes (Lutz and Follette 2012; Tapp 2010). Expenditure rules exist in Brazil in the form of a cap on salary costs (Liu and Webb 2011), the United States (and more recently Spain) in the form of limits on SNG total expenditure (Waisanen 2008).
2. We consider shared revenues with the central government as part of SNG own revenues.
3. Berlin, Sachsen-Anhalt and Schleswig-Holstein will each receive €80 million per year, Saarland will receive €260 million per year, and Bremen will receive €300 million per year (Koske 2010).
4. Incidentally, Germany is the only country in our sample that did not exhibit countercyclical policy response following the crisis (see figure 15.3) as tighter borrowing constraints may have limited the ability of SNGs to increase expenditures.

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