Institutions of Fiscal Discipline and Their Effects on Sovereign Bond Spreads

by Imtiaz Bhatti

MA in International Relations, May 1994, University of Sindh
M.Sc. in Development and Planning, November 2004, University College London

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Joseph J. Cordes
Professor of Economics, Public Policy and Public
Administration, and International Relations

The Columbian College of Arts and Sciences of The George Washington University certifies that Imtiaz Bhatti has passed the Final Examination for the degree of Doctor of Philosophy as of July 21, 2016. This is the final and approved form of the dissertation.

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Imtiaz Bhatti

Dissertation Research Committee:

Joseph J. Cordes, Professor of Economics, Public Policy and Public Administration, & International Affairs, Dissertation Director

Marvin Phaup, Professorial Lecturer and Research Scholar, Committee Member

Xavier Debrun, Chief, Systemic Issues Division, Research Department, International Monetary Fund, Committee Member

Dedication

To my lovely daughter, Aphra Bhatti, and my dear parents, Gul Muhammad Bhatti and Munawar Sultana Bhatti.

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Imtiaz Bhatti

Abstract

Institutions of Fiscal Discipline and Their Effects on Sovereign Bond Spreads

A number of countries have adopted institutions of fiscal discipline (IFDs), such as balanced budget rules and fiscal responsibility laws. Empirical studies have looked into the effects of IFDs on economic fundamentals like GDP growth, fiscal balance, debt-GDP ratio and interest rates. A subset of these studies has focused on the effects of fiscal discipline on sovereign bond spreads (SBS). However, most of this latter research has been limited to high-income countries. This study builds on the existing body of literature to study the effects of IFDs on SBS for a larger set of developing and emerging countries.

The paper employs the IMF's fiscal rules data set and its fiscal responsibility Index (FRI) to study the effects of fiscal discipline on a set of 64 countries. The data on sovereign bond spreads was obtained from the J.P. Morgan's Emerging Market Bond Index Global (EMBIG). The countries that are featured on the EMBIG but are not included in the fiscal rules data set serve in our study as a comparison group. The paper uses the fixed effects and the System GMM estimation methods. The key finding of this study is that IFDs have a beneficial effect on the borrowing costs of developing countries.

Keywords: Fiscal discipline, fiscal institutions, fiscal rules, sovereign bond spreads, sovereign risk premia.

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List of Abbreviations

CPI	Consumer Price Index
CPR	Common Pool Resource
DGMM	Difference Generalized Method of Moments
EMBIG	Emerging Markets Bond Index Global
FRI	Fiscal Rules Index
FRL	Fiscal Responsibility Law
IFD	Institutions of Fiscal Discipline
IFDer	Country that has implemented an IFD
LDV	Lagged Dummy Variable
LSDV	Least Square Dummy Variables
MTEF	Medium-Term Expenditure Framework
Non-IFDer	Country without any type of IFD in place
OECD	Organization for Economic Cooperation and Development
OVB	Omitted Variable Bias
PCT	Public Choice Theory
PFM	Public Financial Management
PSM	Propensity Score Matching
SBS	Sovereign Bond Spreads
SGMM	System Generalized Method of Moments

Chapter 1: Introduction

Fiscal discipline matters to a country's economic health. Research shows that responsible fiscal policies have salutary effects on key economic indicators such as national debt, GDP growth rate, and interest rates. Because of these favorable outcomes, many countries have adopted measures of fiscal discipline, which include various types of fiscal rules and more elaborate arrangements such as fiscal responsibility laws (FRLs).

A number of studies have looked at the impact of fiscal discipline on sovereign bond spreads (SBS) and found that fiscal discipline has a beneficial effect on the price of debt for high-income countries. Gruber and Kamin (2010) indicate that fiscal performance has a robust effect on long-term sovereign bond yields of OECD countries. Similarly, Baldacci and Kumar (2010) find that higher deficits and public debt lead to a significant increase in the borrowing costs for governments of advanced economies. In addition, a fairly large amount of empirical evidence from developed countries is available that indicates that more stringent fiscal rules have stronger positive impact on the bond yields and, when countries upgrade their numerical fiscal rules, they observe substantial drop in their bond spreads (see, for example, Iara & Wolff, 2010; Afonso & Guimarães, 2014).

These studies found convincing links between institutions of fiscal discipline (IFDs) and sovereign bond spreads (SBS), but they only looked at the correlations for advanced economies. A limited amount of research has focused on the correlation between IFDs and SBS for emerging economies, but the results are highly ambiguous.

To the best of our knowledge, there has been no serious attempt to study the effects of IFDs on SBS of a broader set of developing countries. However, the theoretical bases of a strong relationship between fiscal policy and economic indicators make it highly likely that the relationship between fiscal discipline and SBS observed for advanced economies would also hold for developing countries. The absence of such research for developing countries is a significant deficiency in the existing empirical literature and offers an opportunity and direction for further research.

This dissertation attempts to fill the gap in the current literature and studies the effects of institutions of fiscal discipline on sovereign bond spreads for a larger set of developing countries. We use the International Monetary Fund's fiscal rules data set for IFDs. This data set is regularly updated and it covered 84 countries at the end of 2013, representing all income groups and major regions of the world. Out of these 84 countries, we look at a subset that has also borrowed on the international capital markets and whose sovereign bonds have been included in the J.P. Morgan's Emerging Market Bond Index (EMBI) Global. The EMBI Global is considered one of the leading sovereign bond indices (Cunningham, Dixon & Hayes, 2001), and it includes bonds of 64 countries[1] ranging in income levels from low to upper-middle.[2]

The dissertation starts with a survey of extant literature on the effects of fiscal discipline on economic fundamentals. The literature review attempts to identify connections between fiscal institutions and political behavior in fiscal policymaking from

[1] As of end 2013

[2] These countries, along with their income levels, are listed in Appendices AI and AII.

the perspective of public choice theory (PCT) and behavioral aspects of public finance. The study uses several estimation techniques such as OLS multivariate regressions and the fixed effects methods. It also makes use of the Blundell-Bond System GMM technique (Blundell & Bond, 1998), which is an advanced instruments-based method to deal with the problem of endogeneity.

The empirical section of the study draws insights from the papers by Iara and Wolff (2010), Chang (2013), and Heinemann, Osterloh and Kalb (2014). Iara and Wolff (2010), using the European Commission's data set of numerical fiscal rules, find that stronger fiscal rules result in lower government bond yields for EU countries. Chang (2013) looks at a limited number of emerging economies and finds that better fiscal institutions tend to mitigate the negative effects of increasing debt on credit spreads. Heinemann et al. (2014) analyzing a broader sample of rich, OECD countries, find strong evidence that restraint in fiscal policies lowers sovereign risk premia.

This study addresses the question:

Does increased fiscal discipline reduce sovereign borrowing costs for developing countries?

The topic is relevant to the contemporary policy environment. A number of countries in Europe, Latin America, and other parts of the world defaulted on their debt in the aftermath of fiscal and financial crises over the last few decades. Currently, many countries, both advanced and developing, are in the process of consolidating and reforming their fiscal and financial institutions.

Our estimates show that developing countries that implemented IFDs (or IFDers)[3] experienced an average reduction of up to 33 percent in their sovereign bond spreads. The results we have obtained are statistically significant at the usual levels, and are quite substantial in effect size. These results have profound implications, given the absence in most developing countries of institutional framework needed for successful implementation of IFDs. The effect appears to be larger because, with complementary institutions weak or missing, even marginal improvements in the fiscal institutions have disproportionately bigger impact for these countries (Hallerberg & Wolff, 2008).

This study contributes to the current body of research in several ways. To start, it improves our understanding of the effects of IFDs on the price of debt for a broader set of developing countries. The finding that IFDs have far-reaching effects, beyond macroeconomic variables per se, will encourage policymakers of developing countries to get serious about fiscal discipline and develop more effective strategies to keep their sovereign debt within reasonable limits. Another contribution of this paper is that it enhances our understanding of what works and in what context in regard to fiscal discipline when other supporting institutions are either weak or nonexistent. This will enable policymakers, both national and international, to tailor fiscal institutions to each country's unique situation.

The rest of the study is organized as follows. Chapter 2 discusses correlation between key macroeconomic variables and the government's fiscal and monetary

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[3] Hereafter, we shall refer to the countries that have implemented IFDs as IFDers and those without IFDs as non-IFDers.

policies. It attempts to look at suboptimal fiscal policies in the light of the public choice theory and behavioral public finance. The chapter introduces institutions of fiscal discipline as measures countries can put in place to improve their fiscal governance.

Chapter 3 offers empirical evidence on the impact of IFDs on borrowing costs for high income countries. It also discusses the possible causes of the ambiguous results on these effects obtained for emerging economies. The chapter builds the case for doing further research to look at the impact of IFDs on sovereign bond spreads of a larger sample of developing countries.

Chapter 4 sets out the research methodology. It introduces the sources and parameters of our panel data and provides both economic and econometric models. It provides the rationale for various estimation techniques used in this study.

Chapter 5 shows our estimation results and discusses the findings. It deals with the results pertaining to each of our three hypotheses in separate sections and provides a summary of the results in the end.

Chapter 6 offers conclusions. It begins by summarizing the results and then provides the policy implications of our findings. It also discusses the limitations of our study and the areas of further research to build on our work.

Chapter 2: Theoretical Perspectives

I. Economic Fundamentals and Fiscal Discipline

Research shows that macroeconomic variables, such as national debt, GDP growth and interest rates, are strongly affected by the government's fiscal and monetary policies (Alt & Lowry, 1994; Baldacci & Kumar, 2012; Hallerberg & Scartascni, 2011; Codogno, Favero & Missale, 2003). The government's budget policy affects public and private saving and investment (Abel, Bernanke, & Croushore, 2008; Bakija & Slemrod, 2008). Governments that are able to balance their budgets can lower taxes, which in turn may also increase private saving, and, thus, cause more investment – an important leading indicator of economic growth.

Many studies confirm a positive correlation between public debt and interest rates (see, e.g. Kopits & Symanski, 1998; Lemmen & Goodhart, 1999; Lønning, 2000; Codogno et al., 2003). Kopits and Symanski (1998) list a number of studies that model the effects of changes in public debt ratio on interest rates. According to them a 25 percent increase in debt-GDP ratio results in an increase of 125 to 500 basis points in long-term interest rates. Evidence abounds regarding the negative effects of budget deficit on long-term growth (Ball & Mankiw, 1995; Gale & Orszag, 2003), and that bringing deficits under control reduces the cost of borrowing (Gale & Orszag, 2003; Baldacci & Kumar, 2010).

Studies indicate a similar positive correlation between debts of subgovernments and the interest rate they are charged (Bayoumi, Goldstein & Woglom, 1995; Johnson & Kriz, 2005; Poterba & Rueben, 1997). Bayoumi and others (1995) showed that on

average interest rates for US states increased between 23 and 35 basis points for every 1 percent rise in the ratio of government debt to gross state product.

A vast amount of literature looks at the effects of fiscal policy on government debt and of government debt in turn on various other macroeconomic variables.[4] Generally, studies indicate a positive correlation between government expenditures and debt. As governments increase their expenditures, their debt-GDP ratios too experience a proportionate rise. A simulated model in the IMF's 1996 World Economic Outlook report (IMF, 1996) showed that the US Government debt rose by 5 percent in the short-run as the government expenditure swelled by 1.1 percent.

II. Factors behind Lax Fiscal Policies by Governments

Despite strong evidence on beneficial effects of sound fiscal policies, both experience and research show that governments have been negligent regarding fiscal discipline. To better understand the government's slackness toward fiscal discipline, we draw on the perspectives of Public choice theory and behavioral public finance.

A. Public choice theory and fiscal discipline. PCT in essence is a critical assessment of the inefficiencies that afflict the government. It brings together perspectives from various economic and political theories to discuss the concept of government failure. In many situations, governments opt for policies that in effect impose costs much higher than their purported social benefits (Vining & Weimer, 2011).

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[4] Elmendorf and Mankiw (1998) survey the literature on the macroeconomic effects of government debt. They discuss in detail the effects of debt on saving and the differential impacts of generating funds through debt vis-à-vis additional taxes.

Principal-agent problems, the influence of special interest lobbies on politicians, and excessive government regulations are some of the key factors that contribute to government failure.

In their seminal work, *The Calculus of Consent*, James Buchanan and Gordon Tullock (1965) argue that politicians, as rational humans, are prone to pursuing their personal or group interests rather than those of the electorate at large. They look at political and policy problems through the microeconomic perspectives of market exchange. In the exchange of political markets, divergent interest groups compete to secure their preferred policies. In the process, politicians, keen to win elections or retain the public office, allow themselves to be manipulated by lobbies that disproportionately benefit while shifting the costs to wider sections of society (Debrun & Kumar, 2007a). Legislators usually succumb to pressures for overspending in good years – triggering off a vicious circle of procyclical policies (Hou & Duncombe, 2008). Brennan and Buchanan (1979) explain such political behavior through their "Leviathan" model of government in which politicians, keen to be reelected, cause the government to constantly expand in size (p. 2).

Interest group behavior and pressure from important constituencies may also feature in local politics and competition over resources among subgovernments in a federal or decentralized system as "common pool resources" problem (see e.g. Hallerberg & Wolff, 2008; Hallerberg & Scartascini, 2011). Common pool resources (CPR) tend to be overused and depleted, as their "costs are defused," while their benefits are "concentrated on specific groups" or localities (Hallerberg & Wolff, 2008; Tanzi, 2011, p. 306). In other words, individually rational strategies cause actors to demand for more

spending in their constituencies without considering their full tax implications. In the United States, the culture of "earmarks" and "pork-barrel" among the Congress members (see e.g. Patashnik, 2000; Savage, 2009), provide a pertinent example of the CPR problem.

The policy of continual deficit budgeting, and the resultant accumulation of high national debts, in a large number of countries, does not auger well for both their present and future generations. To the extent a subsidy from the future has the potential to cause "misallocation between public and private resource uses in the current budget," they are inequitable to the current generation (Bohn & Inman, 1996, p. 14). To the extent these debts will increase "the share of current costs to be financed by the future taxpayers" (Phaup & Kirschner, 2010, p. 24), they appear to be inequitable to the coming generations.

B. Behavioral aspects of public finance and fiscal discipline. Behavioral public finance is an emerging discipline drawing on the theories of behavioral economics. Behavioral economics, and its turn, brings in perspectives from psychology and political science to posit some unique traits of the *rational utility maximizing* individual. Behavioral economics acknowledge is that individuals are "boundedly rational" (Simon, 1982) and susceptible to the pitfalls of "imperfect optimization" (Congdon, Kling & Mullainathan, 2011, p. 7). Behavioral public finance looks at the behavior of politicians or policymakers (agents) and how it alters the choices of the public or voters (principals) and vice versa. At the middle in the game are the bureaucrats who play the role of agents of the agents. Individuals are not able to optimally process all available information and can at best make contextually relevant and selectively informed decisions. This problem

gets further complicated in the face of information asymmetries arising from agency problems (Miller & Moe, 1983; Miller, 2005).

The extension of the behavioral theories applicable to individuals to groups and higher-level categories, such as governments, does not appear to be unreasonable at all. As discussed above, politicians are susceptible to interest group pressures and are usually driven by the motivation to get reelected. At the policymaking levels, the interaction between the phenomena of "bounded rationality" and "bounded self-control" (Congdon et al., 2011), on one hand, and the desire of continuing in office, on the other, give rise to an expanding state (Brennan & Buchanan, 1979) with ever greedier agencies and bureaucrats on the lookout to maximize their power and budgets (Niskanen, 1975). In a study of the behavior of the United States Congress, Talbert and Potosky (2002) apply the concept of bounded rationality to the members of Congress and argue that, like ordinary rational beings, Congress members have a limited capacity to process information and ideas. Motivated by self-interest, while bounded by usual cognitive limitations, politicians therefore cannot but have just a limited amount of space on their issue agendas.

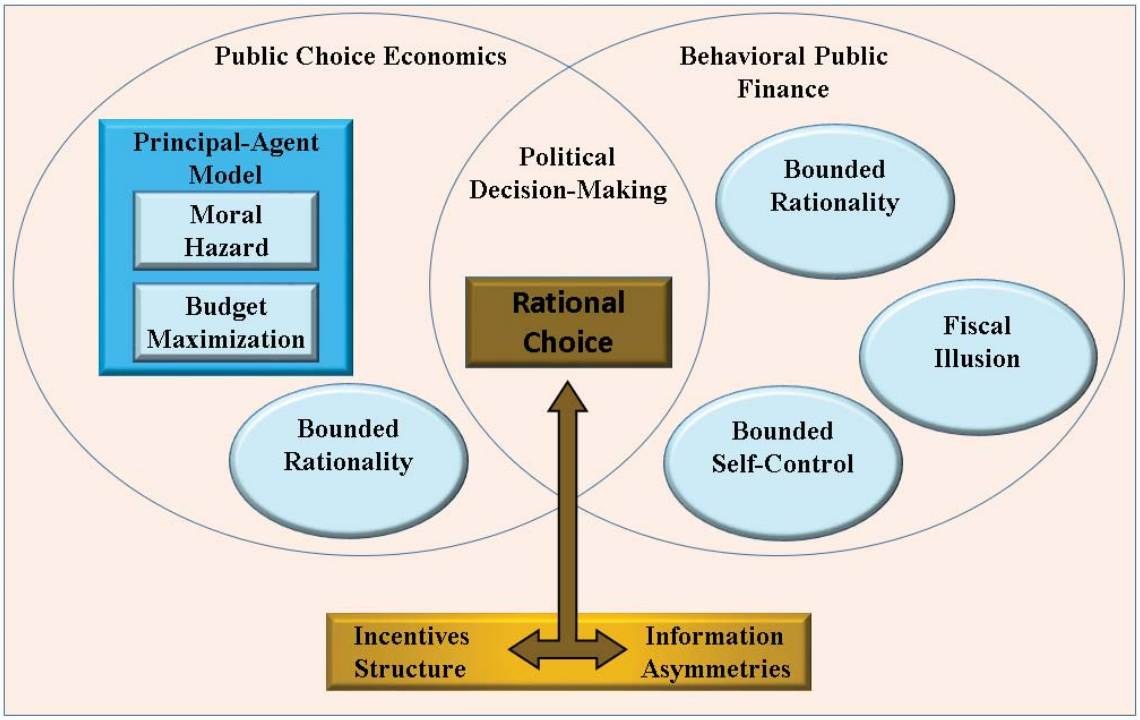

Figure 2.1: **Why policymakers fail to pursue their announced objectives**

To veil their acts of "fiscal populism" (Webb, 2004, p.2) and to give the appearance to the public of an efficient manager, politicians resort to balancing the books through "creative accounting"[5] and "fiscal illusion."[6] In such a backdrop, the policy choices politicians make need to be continually scrutinized and analyzed.

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[5] Creative accounting can take many forms. One way is to transfer certain deficit-inducing, spending programs to off-budget accounts, so that the government's overall budgetary outlook should not portray too dismal a picture. See IMF (2011), Von Hagen and Wolff (2006) and Weber (2012) for more on creative accounting.

[6] The theory of "Fiscal illusion" suggests that the government tends to be less transparent and obfuscate its fiscal inefficiencies and mismanagement so that the taxpayers can only see its operations as more reasonably priced than they actually are. Many hidden government expenditures benefit some

Figure 2.1 depicts an objective picture of forces at play when a world driven by incentives interacts with the system marred by information asymmetries. It creates serious implications for economic theory when boundedly rational, utility maximizing, individuals double in the role of budget maximizing, vote seeking policymakers with powers to manipulate the asymmetries of information to suit their political agenda and personal priorities. The figure reminds that, as multiple forces weigh in on human decision making, political decision-making becomes highly susceptible to departures from maximizing social welfare.

C. Politics of fiscal indiscipline. Over the last few decades a number of countries have seen their budget deficits rise to unmanageable levels. In addition to the institutional and behavioral aspects of disappointing fiscal policies discussed above, social polarization too creates a context for loose fiscal management (Alesina & Tabellini, 1990). Because of polarization of social preferences, policymakers find it ever more difficult to agree on what could be construed as *right* government policies. This usually leads to the adoption of "individually rational but socially inferior policies" (Woo, 2006, p.

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particular sections of society and whet the general appetite for government largesse – incentivizing politicians to continue expanding the size of government (Congdon et al., 2011; Tanzi, 2011; Kopits & Symanski, 1998; Brunori, Bell, Cordes, & Yuan, 2007). Since taxes are more visible to those who pay them, while the benefit of expenditures is usually widely dispersed (or the outcome of expenditures sometimes becomes visible only in the future), it is difficult for taxpayers to make "connection between taxes imposed and services received" (Congdon et al, 2011, p. 4), and, thus, people may not appreciate the true burden of taxes that are less salient. This "asymmetrical visibility" (Brunori et al., 2007, p. 122) provides incentives to policymakers to expand the size of government.

8). The partisan and opportunistic deficit bias in the US federal government, generally, and the recent frequent spats on raising the debt limit in the US legislature, particularly, can be viewed as a case in point. In the absence of institutional restraints on policymakers, such type of political behavior tends to be commonplace in both advanced and developing countries alike.

III. Measures to Ensure Fiscal Discipline

The previous section attempted to explore the causes of the government's predilection for suboptimal economic policies. Both PCT and behavioral public finance help us view this in the light of the concept of *government failure*. Government failure is a problem not just for developing countries but also for rich, developed nations; not just for autocratic regimes, but also for established democracies. Although governments in most countries function within the frameworks of elaborate constitutions that provide boundaries for legislation and policymaking, democratic governments that are formed through weak coalition arrangements usually wind up as more susceptible to populist (Webb, 2004) or substandard fiscal and economic policies. Members of weak coalition governments, when they want, often find out ways to overstep their remit.

In the light of the theoretical perspectives discussed above, one may ask the obvious question: How to constrain the behavior of policymakers – how to regulate the regulator! Kopits and Symanski (1998) emphasize the need for "high order" supervision (p. 17) over the government. Such supervision can only be put in place through strong institutional mechanisms.

IV. The role of institutions.

Recently, economists have flashed a bright light on the impact of institutions on governance and economic growth (e.g., North, 1990; North, 2005; Ostrom, 2007; Acemoglu & Robinson, 2012). Douglas North (2005, p. 3) defines institutions as humanly devised formal or informal "constraints" that help reduce uncertainty. Elinor Ostrom (2007) expands the scope to devices that bring predictability to social and political behavior, such as norms and strategies. At the level of government, institutions can be grouped in various categories such as political, fiscal, financial, and so on. In the fiscal sphere, examples of institutions include well-defined budget processes, measures related to accountability and transparency, and codes of good behavior (Wyplosz, 2012).

V. Fiscal Institutions and Governance

In the realm of public finance, fiscal institutions can act as a damper against the worst budgetary errors. Fiscal institutions can help restrain the impulse toward shortsighted political decisions; provide nudges for better policies; and engender a *choice architecture* (Thaler & Sunstein, 2008) to improve workings of government machinery.

Robert Inman (2003) invokes the prisoners' dilemma[7] model to discuss possible sets of response from a central government to a financially less-prudent subgovernment. While the central government expects subgovernments to balance their budgets, the latter avoid cutting back on their favorite yet costly programs. In the absence of the regulatory

[7] In game theory, Prisoners' Dilemma games are used to model strategic behavior of two completely rational players when they can choose between cooperation and noncooperation. For more on Prisoners' Dilemma and other strategy games, see Morrow (1994).

framework of fiscal institutions, well-meaning politicians face uncertainty before elections if their successor too will continue with the policy of fiscal restraint. Inman (2003) describes a situation in which a central government, facing a close election, can condone an irresponsible fiscal behavior of a subgovernment of the same political party and chooses to bail it out. Although the Mancur Olson's "zero contribution thesis"[8] regarding "rational, self-interested, individuals" has been challenged by proponents of "collective action" (e.g. Ostrom, 2000), it bears a great relevance to the actions of politicians that need oversight to ensure that they act in the long-term *collective* interests of their people and country. Fiscal institutions can encourage policy makers break out of the binds like zero contribution or business dilemma in which they often find themselves mired in.

Behavioral public finance, thus, would emphasize the importance of decision context (*nudges* and *default options*) in the choices made. As "commitment devices" (Debrun & Kumar, 2007a), fiscal institutions extend the concept of nudges and default options to the arenas of public policy and public finance. Fiscal institutions encourage the policymaker to avoid procyclical, more generally irresponsible, budgetary policies that rob (a future) Peter to pay Paul. Thus, by encouraging better budgetary decisions, fiscal

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[8] Mancur Olson (1965) put forward the "zero contribution thesis," which states that rational, self-interested individuals when in large groups, in many situations, are not likely to cooperate to pursue their common interests unless subjected to "coercion or any positive inducement" (p. 33). Such disinclination toward collective action to achieve mutual benefits also features in Hardin's (1968) prisoner's dilemma games.

institutions, in effect promote inter-and intra-generational equitable policies[9] (IMF, 2009; Schaechter, Kinda, Budina, & Weber, 2012). Fiscal institutions can also reduce the incentives of policymakers to indulge in creative accounting or indulge in practices that create fiscal illusions. In short, strong and well-designed fiscal institutions can nurture an environment in which "good politics" will mesh with "good economics" (Acemoglu & Robinson, 2012, p. 66). Technically, partisan deficit bias is a reflection of opportunistic deficit bias. But institutions can minimize the partisan one too.

VI. Institutions of Fiscal Discipline.

Many countries have implemented one or another measure of fiscal discipline and the number and variety of such devices has rapidly increased in the last two decades. These measures range from ordinary fiscal rules to comprehensive laws governing fiscal discipline. They include both hard constitutional restrictions and soft statutory or regulatory mechanisms. Here, we put them all under the broad category of institutions of fiscal discipline (IFDs).

We adapt the definition of fiscal rules by Kopits and Symanski (1998) to define an IFD as *an unambiguous constraint on fiscal policy with clearly defined enforceable steps*. Figure 2.3 shows that various types of fiscal measures can be included under the broad category of institutions of fiscal discipline. These measures are discussed below.

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[9] In recent times, economists have become increasingly concerned about intergenerational or inter-temporal externalities of fiscal policies, especially those related to national debt and environmental sustainability (see, for example, Wyplosz, 2012; Patashnik, 1996; Phaup & Kirschner, 2010).

A. Fiscal rules. At the core of IFDs are fiscal rules, defined as "permanent constraint[s] on fiscal policy" specified to improve fiscal performance (Kopits & Symanski, 1998, p. 2). Fiscal rules can be divided into three categories: 1. Numerical rules, 2. Procedural rules, and 3. Transparency rules.

Numerical rules. A numerical rule involves a specified numerical constraint or limit. Numerical rules can be subdivided into four types.[10] The *balanced budget rule* requires the government to eliminate its fiscal deficits.[11] A *debt rule* stipulates maintaining a certain debt-GDP ratio. An *expenditure rule* puts limits on government expenditures and, sometimes, on the type and nature of expenditures. *Revenue rules*[12] impose an upper limit on the amount of revenue government can collect through taxes.

Procedural rules. Procedural rules generally refer to explicitly delineated parameters for various stages of budget making, from preparation to ex post auditing (Debrun, Joshi & Mitra, 2008a). They are concerned with good practices of budget making. They set "norms" for budget making and define "prerogatives" of fiscal policymakers (Hallerberg & Scartascini, 2011, p. 5). Procedures involved in budgeting are usually incorporated into public financial management (PFM) systems, which provide a baseline framework for putting checks and balances at the various levels of public

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[10] Kopits and Symanski (1998) give a detailed description of numerical rules.

[11] Because of its straightforward requirements, the balanced budget rule is considered the simplest of all fiscal rules (Alesina & Giavazzi, 2013). Perhaps because of its simplicity, a well-implemented balanced budget rule has a better chance of success.

[12] Revenue rules may also involve norms on how to utilize unanticipated revenue windfall (Debrun et al., 2008a, p. 6).

budgeting (Andrews, Cangiano, Cole, de Renzio, Krause, & Seligmann, 2014). A more detailed description of PFM is given in the next section.

Transparency rule. A transparency rule involves "public fiscal reporting and the openness to the public of the government's fiscal policymaking process" (IMF, 2012a). It makes harder for politicians to indulge in creative accounting to show themselves in a good light. In addition, enhanced transparency in developing countries can reduce uncertainty about past and future fiscal policies (Arbatli & Escolano, 2012).

Among developed countries, Japan, Germany, the Netherlands and Australia were the earliest adopters of fiscal rules (Kopits & Symanski, 1998; Liu & Webb, 2011). Many European countries adopted fiscal rules and other IFDs after they signed the Maastricht Treaty in 1992 and had to gradually incorporate the provisions of the Treaty in their constitutions and statutes. Among some important non-EU nations, the United States adopted a fiscal rule[13] in 1990 and Switzerland in 1998. A number of countries from Latin America adopted IFDs in the early 2000s. By the end of that decade, many countries from the world's major regions had in place an IFD in one or another form.

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[13] The US government has been experimenting with the idea of balanced budget since 1985 when the Congress passed the *Balanced Budget and Emergency Deficit Control Act* (commonly known as the Gramm-Rudman-Howling Act or GRH), which required the federal budget to be balanced by 1993. But the key provisions of GRH were toned down through an amendment in 1987 and then it was completely replaced by a less ambitious *Budget Enforcement Act* of 1990. In 1997, the Congress passed the *Balanced Budget Act* requiring the budget to be balanced by 2002. The latest in the series of such laws is the *Budget Control Act* of 2011, which requires gradual cuts in the deficit over the next 10 years. For more on budget reform in the United States, see Schick (2007) and Lee, Johnson, and Joyce (2013).

B. Fiscal responsibility law. Among the recently popular IFDs is the *fiscal responsibility law* (FRL), which is an elaborate fiscal institution that combines several types of qualitative and quantitative fiscal targets and procedural measures applicable to the various levels of governments (Liu & Webb, 2011). FRLs are usually characterized by the "escape clauses" and other provisions of flexibility. It is expected that because of their flexible nature, FRLs can make it easier for the government to adopt countercyclical fiscal policies. In addition, FRLs may also involve enforcement clauses, and mechanisms related to transparency and accountability (Oliva, 2001; Webb, 2004; Cáceres, Corbacho, & Medina, 2010). Because of such multiple provisions built in them, FRLs come in various hues and colors, and their nature and extent varies from country to country.

New Zealand is considered the pioneer of FRLs. It introduced its *Fiscal Responsibility Act* in 1994. Australia followed up in 1998 with *The Charter of Budget Honesty* (Oliva, 2001; Webb, 2004). However, the broad title *fiscal responsibility law* acquired currency after several Latin American countries adopted their more elaborate versions of the law in the late 1990s and early 2000s (Hallerberg & Scartascini, 2011).

Recently, some countries have extended the scope of their FRLs to their lower tier governments. For example, in 2003 Peru revised its *Fiscal Prudence and Transparency law* of 2000 to bring subnational governments under its scope (Webb, 2004). There are, however, some subgovernments that on their own initiative put in place FRLs. The Canadian province of Manitoba introduced a fiscal law which also involves sanctions for the officials found remiss in implementing the law (Kopits & Symanski, 1998).

C. Miscellaneous Measures. In addition to fiscal rules and FRLs, many countries have various arrangements to ensure fiscal discipline. These include "coalition

agreements," such as the *1998 Coalition Agreement* in the Netherlands (Oliva, 2001; also see Schaechter at al., 2012). Countries have also adopted special fiscal programs keeping in view their own unique situations. For example, the Great Britain's *golden rule*[14] is in effect a different version of the balanced budget rule that allows "deficit financing for investment" rather than for current spending (Alesina & Giavazzi, 2013). Kopits and Symanski (1998) mention specialized rules that alter the level of allocation of certain categories of government expenditure or revenue, and "implicit rules" that are based on monetary or exchange rate rules (p. 27). Hallerberg and Wolff (2008) consider the office of finance minister a fiscal institution, for markets recognize the finance minister as the "most visible" actor in the government. The authors find a correlation between the index measuring the institutional strength of the finance minister and the sovereign bond spreads in the euro area countries.

Another category of special fiscal measures is trust funds, which are usually created to ensure that the revenue stream from a particular project is used for the purpose that project is created. The United States Social Security Trust Fund, Medicare Trust Fund, and Highway Trust Fund are some of the examples of such IFDs (Patashnik, 2000). Special powers for the government chief executive to exercise a *line-item veto*[15] is a disciplinary institution that allows the chief executive to selectively reject the provisions of an enacted law, especially annual budgets, without vetoing the entire bill (Hallerberg

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[14] The golden rule was made part of the *Code for Fiscal Stability* of 1998. For more on Great Britain's golden rule, see Kell (2001).

[15] The US president (like state governors) received the *item-veto power* in 1997 (mainly to control pork-barrel spending) but the provision was invalidated by the Supreme Court.

and Wolff, 2008). Another category of fiscal institutions is *automatic stabilizers* built into the taxation and benefits system of the budget whereby during economic downturns spending on social programs, such as unemployment benefits, is not allowed to decline as a result of the fall in the revenue receipts (GAO, 1993).

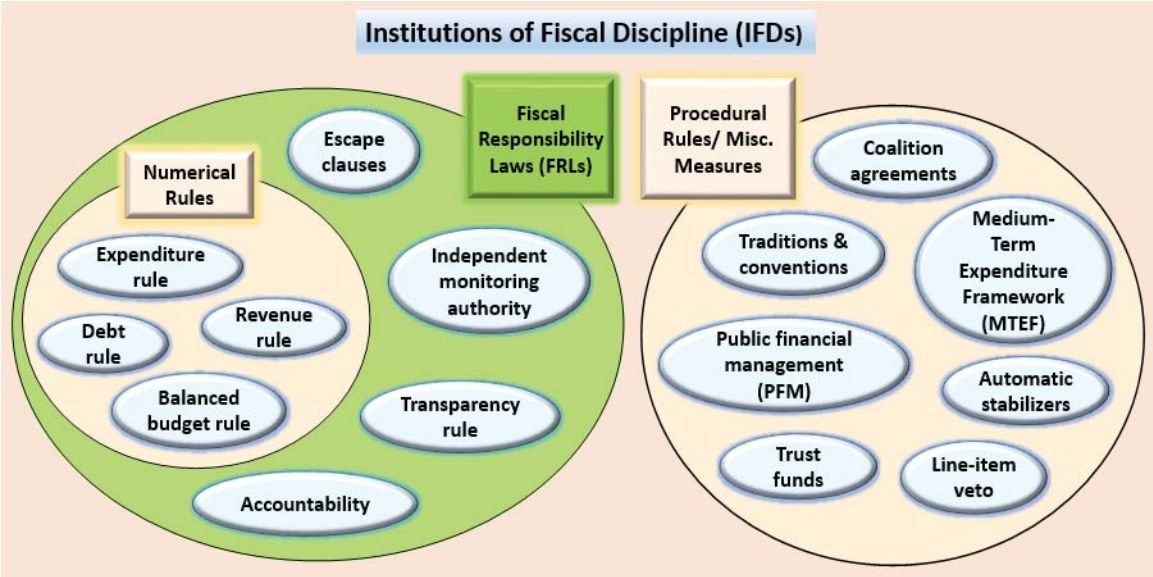

***Figure 2.2*: Institutions of Fiscal Discipline (IFDs)**

VII. Public financial management (PFM)

PFM involves a set of processes, systems and institutions within which governments manage public resources and their socioeconomic impact (Andrews, et al., 2014). It operates like a stage-setter at the micro level for a successful implementation of other IFDs at the macro level. Another key feature of PFM is that it is contextual and can exist with some adaptations to fit into a country's broader institutional framework.

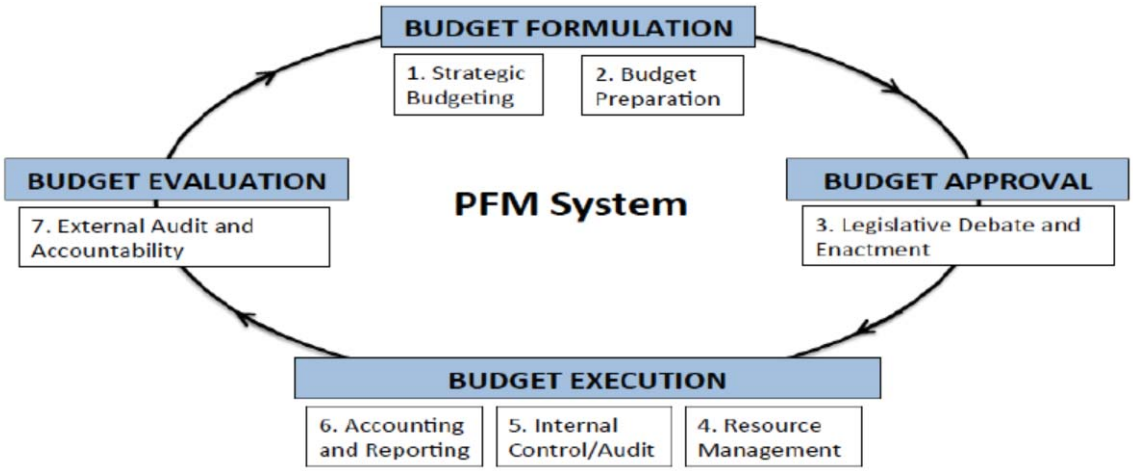

Figure 2.3: **Public Financial Management**[16]

As Figure 2.2 shows, PFM usually has four stages viz. budget formulation, budget approval, budget execution, and budget evaluation. A key aspect of PFM systems is that they afford policymakers a big picture on government finances, which can enhance accountability in public resource management. Although PFM creates reasonable parameters within which policymakers anchor their budgetary decisions, in itself PFM is not sufficient to ensure fiscal prudence. PFM systems (and thus procedural rules), however, can create basic preconditions for effective implementation of numerical fiscal targets (Debrun et al. 2008a). Basic standards of PFM system, such as mechanisms of fiscal forecasting and appropriate cash management and expenditure controls, not only create right conditions for effective implementation of IFDs, but they also bring credibility to government budgeting (Andrews et al., 2014).

[16] *Note:* The figure is adopted from Andrews et al. (2014, p. 2).

Chapter 3: Empirical Evidence on the Impact of IFDs

In Chapter 2, we discussed how fiscal discipline can improve a country's economic outlook and introduced fiscal institutions as devices countries put in place to improve their fiscal governance. In this chapter, we shall look at the empirical evidence regarding the effects of IFDs on macroeconomic variables, generally, and on sovereign bond spreads, particularly. We shall examine these effects from the advanced and developing country contexts. But before that a brief introduction on sovereign bond spreads is in order.

I. Sovereign bond spreads

Sovereign bonds are securities issued by national governments in their own or in a foreign currency. There is a lot of variation in the types of these financial instruments based on their maturity and options pasted on them (Brown, 2006). The price of a sovereign bond is generally determined in comparison to the price of a benchmark (or risk-free) asset – mostly a United States or German security with equivalent features. A sovereign bond spread (SBS), thus, largely comprises the difference between the yields of a national government security and a risk-free asset (Brown, 2006) and indicates a country's creditworthiness and the investors' required financial compensation for bearing the risk (Remolona, Scatigna, & Wu, 2008). SBS incorporates the interest rate, term premium, and various types of risk premia – such as premia for credit risk, currency risk, inflation risk, and so on (Welch, 2011).

Because of the differences in types of risks involved, SBS vary considerably from country to country. The most important difference among them relates to credit risks, which involve differences, on the part of creditors, in their perceived likelihood of debt

service and repayment in full on time. The risk of default depends on characteristics of the issuer, which in the case of sovereign debt include both the ability and the willingness to repay.

Exchange risk is a component of credit risk and denotes risk of a devaluation of the currency of the borrower, causing them to need more local currency to convert it into an international currency for debt servicing or debt retirement (Cunningham et al., 2001). Another type of risk is liquidity risk[17], which implies that the security may be difficult to sell quickly without a significant decline in price, due to the limited nature of the market for such debt. There are also market risks[18] as the price of the securities may fluctuate with the value of all assets traded in the markets – a risk that cannot be eliminated by diversification across many borrowers. Finally, there are other political risks, such as those involving a change of regime in the borrower country and the new rulers' unwillingness to fulfill the commitments made by the previous government.

In sum, yield spreads depend on the determinants of the credibility of the promise of the debtor to repay. Developing countries are often perceived to be more likely to

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[17] Liquidity risk relates to likelihood that the demand, and thus price, of the security will decline more than the market trend owing to possible disturbances in the internal political and economic situation in the borrower country.

[18] To the extent changes in perceived credit risk will be one of the factors affecting secondary market prices, liquidity and market risks are related. But other factors such as changes in the willingness of investors to hold risky assets, and changes in other asset prices affect the opportunity cost of holding that particular security, may also give rise to market risk (Cunningham et al., 2001).

default on their debt than developed countries, and so investors typically require additional compensation to hold developing country bonds (Cunningham et al., 2001). For all countries, factors that increase the capacity and willingness to repay help. These include past, current and projected budget deficits and government debt, income growth relative to growth in debt, and various country-specific cultural and institutional factors.

II. Empirical evidence from high income countries

A considerable amount of research shows that IFDs directly affect macroeconomic performance in high income countries, which in turn influences their sovereign bond spreads. Various types of IFDs have been found to have a joint positive effect on interest rates, budget deficit and public debt. For example, Denmark, New Zealand and Switzerland have consistently enjoyed a robust fiscal health because each of them has had in place for quite long a set of multiple IFDs (Sutherland, Hoeller, & Merola, 2012). In addition to numerical rules, transparency rules leave quite a discernible effect on the country's macroeconomic variables. Alt and Lassen (2006) find that improved fiscal transparency resulted in lower deficits and public debt for OECD countries. Similarly, Irwin (2012), looking at accounting practices in some key advanced and emerging economies, argues that transparency in accounting helps when countries implement a suite of fiscal measures, as different fiscal institutions interact with each other in a number of ways and can afford better financial sustainability, which results in positive perceptions of sovereign credit risks.

Institutions of fiscal discipline have been found to have a positive effect on macroeconomic performance of subgovernments as well. Experience of US states with balanced budget rules provides extensive empirical evidence in this relationship.

According to Bohn and Inman (1996), US states with an ex-ante balanced budget requirement[19] experienced an average reduction in their general fund deficit by up to $100 per person. The distinguishing thing about this finding is that, as the authors assert, these states do not show any hint of creative accounting.

Researchers have found strong evidence from the countries of Euro Area and the OECD that IFDs improve macroeconomic fundamentals leading to a reduction in sovereign bond spreads. Codogno et al. (2003), in their comparison of the impact of international risk factors in Euro Area countries, show that public debt as a percentage of GDP affects risk premia. Looking at bond market of Euro Area for the 1991-2002. Bernoth, von Hagen and Schuknecht (2004) find that debt, deficits and debt service ratios had a positive impact on sovereign bond spreads of the member states. Baldacci and Kumar (2010) look at a panel of 31 emerging and advanced economies over the period 1980-2008 to estimate the impact of fiscal deficits and public debt on sovereign bond yields. According to them higher deficits and public debt lead to a significant increase in long-term interest rates, but this effect further depends on initial fiscal, institutional and structural conditions, as well as current financial market sentiments.

Utilizing forward projections of fiscal positions from the OECD's Economic Outlooks for 1988 to 2007, Gruber and Kamin (2010) find a positive and significant effect of fiscal performance on long-term sovereign bond yields. Iara and Wolff (2010) use the European Commission's Fiscal Rules data set to assess the importance of national numerical fiscal rules for sovereign risk in 11 Euro Area countries over a period of 1999-

[19] An ex-ante balanced budget requirement prohibits the carryover of end-of-year deficits.

2009. They find that yield spreads against Germany of countries with relatively weak fiscal rules could shrink by up to 100 basis points if they upgraded their numerical fiscal rules. For these countries, the legal base turns out to be the most important dimension for the perceived effectiveness of the rules, while the effectiveness of the correction and enforcement mechanisms is important as well.

Heinemann and others (2014) complement the approach of Iara and Wolff (2010) by adding a number of non-Euro members to the sample and by extending the period under study to the pre-monetary union years. They adopt several types of proxies, such as the countries' past stability performance, government characteristics and general trust in government, to analyze the bond spreads in their sample. The authors find evidence that these preference indicators have a positive impact on risk premia.

Researchers have found similar evidence regarding the effectiveness of IFDs of subgovernments in rich countries against their municipal bond spreads. Poterba and Rueben (1997) and Johnson and Kriz (2005) find that expenditure, deficit and debt rules, and tax limitations have positive impact on US state bond yields. Johnson and Kriz (2005) find that all these variables have an indirect impact on state government borrowing via improved credit ratings; while revenue limits have a direct impact. Similarly, Schuknecht, von Hagen and Wolswijk (2008) analyze regional government debt for countries in Europe and North America and offer evidence that regions pay higher risk premia when their fiscal fundamentals are weak.

Evidence from advanced economies indicates that, in addition to affecting current macroeconomic indicators, IFDs shape future policy outcomes as well. They act as, to

invoke Debrun and Kumar (2007a), "signaling tools" for the electorate and markets about seriousness of the government about fiscal discipline.

III. Empirical evidence from developing countries

Not much research is available on the macroeconomic effects of IFDs for developing countries. The limited literature available shows that fiscal discipline on economic fundamentals – and through them on sovereign bond spreads – of developing countries by and large results in mixed effects. Baldacci and Kumar (2010) look at the impact of fiscal deficits and government debt on long-term sovereign bond yields of a panel of 31 advanced and emerging market economies. Their results indicate that institutions of fiscal discipline affect sovereign bond spreads through fiscal deficits and government debt in the long run.

Studies on the impact of fiscal responsibility laws (FRLs) in emerging economies, however, present weak evidence regarding the effectiveness of these laws. Cáceres et al. (2010) have looked at the experience of eight Latin American countries and concluded that FRLs did not have any significant effect on the fiscal performance of these countries. Similarly, John Thornton (2009) in his evaluation of countries from Latin America and South Asia was not able to directly attribute the improvements in macroeconomic variables of these countries to FRLs as, according to him, an overall upsurge in the economic outlook of emerging economies might have masked the effect of FRLs. But Hallerberg and Scartascini (2011), using a richer and longer time series data set, ascertained that the overall economic outlook of the countries in Latin America improved after they implemented fiscal responsibility laws. These mixed signals, however, indicate the need for further research.

IV. Causes of mixed effects

From the research on high-income countries, we have sufficient empirical evidence that a positive correlation between IFDs and strong macroeconomic fundamentals exists. Quite robust evidence is available from these countries that macroeconomic variables, in turn, have a salubrious effect on SBS too. But the literature from emerging economies does not indicate a similar effect of IFDs on macroeconomic variables or SBS. Theoretically, improved versions of fiscal rules, such as FRLs should have more beneficial and significant effect on macroeconomic variables. But the results from empirical studies do not suggest that.

On the other hand, that is abundance of evidence on positive experience of advanced countries with IFDs. This calls for further research to determine the true cause of the observed mixed effects of IFDs on SBS of developing countries. But before attempting to design a more effective empirical research on the effects of IFDs in developing countries, it is important to identify some potential causes of weak or mixed results in the earlier research on the effects of these institutions in emerging markets. In the light of the discussion in this paper so far, it appears that there are possible institutional, economic and technical factors behind these mixed effects.

A. Institutional factors. The large variations observed in the size and statistical significance of the effects of IFDs may depend on the current institutional setting of the

country and the type of the new fiscal institution adopted.[20] The differences among countries in the design and the mechanism of enforcement of IFDs play a large part in the variations in the impact of IFDs (Primo, 2007). Kopits and Symanski (1998) recommend that, to improve their effectiveness, fiscal institutions should be augmented by other structural reforms and related policy measures. These measures include putting in place a reliable public financial management (PFM) system with inherent mechanisms for fiscal forecasting, cash management and expenditure controls. Castellani and Debrun (2001) show that fiscal institutions deliver better results when they are augmented by other arrangements such monetary policy independence.

The previous studies on the effects of IFDs on SBS of emerging economies may not have sufficiently taken into account contextual factors and the ancillary institutional arrangements necessary for success of IFDs. For example, without a reliable PFM to back them up, IFDs may not give expected results, and empirical analyses of their effects may lead to a general feeling that they tend to be ineffective in emerging economies.

B. Economic factors. A relevant problem with empirical research on economic variables for developing and middle-income countries relates to the initial fiscal and financial position of the country that has implemented fiscal reform. If the initial position in terms of debt-GDP ratios is not very good, the countries will have to run higher

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[20] Some researchers argue that IFDs can be detrimental to a country's economy as well. Followers of the Keynesian School are of the view that rules for balancing budgets may aggravate ongoing recessions. But a large amount of the latest research has debunked this point of view. For more on this, see Debrun et al. (2008b) and Dahan and Strawczynski (2013).

primary surpluses to offset the effects of larger debt servicing obligations (Hameed, 2005). As a result, when countries experience less substantial improvements because of IFDs, those effects fail to appear significant.

The unpredictable fluctuations in global financial market sentiment too affect the size of sovereign bond spreads to a large extent. Remolona and others (2008) show that global financial market sentiment governs the risk appetite of investors, especially those trading in emerging bond markets. This phenomenon is largely attributed to the increasing interdependence of financial markets and the global events that affect economic variables.

Lastly, the bond markets have recently exhibited a counterintuitive trend of the fall in SBS for some countries even though their debt-GDP ratios have registered a marked increase. Gruber and Kamin (2010) specifically note this trend for most G7 countries in the past several decades, where debt-GDP ratios have seen a persistent rise, while sovereign bond yields have been steadily declining. No consensus on the explanation of this downtrend exists. Possible causes could be the consistent decline in the inflation rate and inflation uncertainty, the effect of the global saving glut in increasing the availability of capital, and the demographic changes enhancing the demand for long-term safe assets (Gruber & Kamin, 2010). However, we need to see if this trend holds for developing countries as well.

C. Technical factors. A number of technical problems affecting fiscal policy research are subsumed in the broad category of "endogeneity." The term "endogeneity" implies that fiscal policy research is often susceptible to a feedback mechanism of causality between the independent and dependent variables of a model (e.g., Cellini,

2008; Wooldridge, 2009). Several factors can cause endogeneity, such as history bias, selection problems, unobserved heterogeneity, OVB, and simultaneity. These problems are discussed below in their sequence.

In time series research, history bias in fiscal policy adoption is one of the key issues that affect the efficiency of estimations. *History* implies that "events occurring concurrently with treatment could cause the observed effect" (Shadish, Cook, & Campbell, 2002, p. 61). In other words, it relates to the possibility that factors other than those under investigation may have influenced the dependent variable at the time when policy interventions are made.

A possible cause of endogeneity, particularly in the context of the interaction of IFDs and SBS is *self-selection* – which means countries under study may have made a conscious choice about whether or not to adopt an IFD or acquire credit from international markets. It is also possible that these countries decided to adopt IFDs or float their sovereign bonds because they were different in various respects from the countries that did not take that route – a problem referred to as "unobserved heterogeneity."[21]

Omitted variable bias (OVB) is generally considered the major cause of endogeneity (Cellini, 2008). Since countries are different on a number of counts, policy effects on variables such as bond yields can be highly sensitive to omitted organizational,

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[21] Unobserved heterogeneity relates to variation across individual units of observation, e.g. differences in structural characteristics of countries, that result in an increase in the variance of the error term, which makes detection of relationship among variables more difficult (Shadish et al., P. 45). See Cellini (2008) and Bogard (2013) for more discussion on endogeneity and unobserved heterogeneity.

institutional, historical, and population factors specific to a country. Finally, the problem of simultaneity is another cause of endogeneity. Also referred to as "reverse causality" (Cellini, 2008), simultaneity usually arises in the context of the time series approach. It occurs when "one or more of the explanatory variables is jointly determined with the dependent variable" making the direction of causality unclear (Wooldridge, 2009, p. 546). In the context of adoption of institutions of fiscal discipline, simultaneity may result because "disciplined governments may be more likely to adopt strict institutions" (Debrun & Kumar, 2007b).

Studies that fail to minimize the effects of endogeneity are less likely to isolate the exact effect size of fiscal discipline on the price of sovereign bonds. However, it would require more sophisticated methods to control for, or at least minimize, the extent of spuriousness caused by endogeneity.

V. Way forward

Based on the evidence from advanced countries, it is clear that institutions have quite a strong impact on a country's fiscal health. Research shows that when other institutions of governance are generally weak, minor improvements in fiscal institutions can result in larger impacts on the economy. As shown by Heinemann et al. (2014) and Hallerberg and Wolff (2008), the impact of IFDs is more pronounced among high income countries with less stable political and governance institutions. In this context, in countries where political and governance institutions are generally strong, any further institutional improvements may not leave much impact. But in the case of developing countries, with many institutions missing or at their initial stage, implementation of IFDs

should have a salubrious effect on macroeconomic variables, especially sovereign bond spreads.

Since the available empirical research from the advanced EU and OECD countries shows that fiscal rules have beneficial effects on sovereign bond spreads, one may rightly anticipate to observe at least an equally strong impact for developing countries, where political and governance institutions are much weaker. In this study, we look into the impact of IFDs on SBS of a larger set of developing countries, which include upper-middle, middle and low-income countries.

Chapter 4: Methodology

I. Research question and hypotheses

This paper studies the following research question:

Does increased fiscal discipline reduce sovereign borrowing costs for developing countries?

To explore our research question, we specify the following three hypotheses:

1. Presence of an IFD reduces sovereign borrowing costs for developing countries.
2. Each additional IFD further reduces sovereign bond spreads of developing countries.
3. More stringent IFDs effect larger reductions on sovereign bond spreads of developing countries.

II. Research strategy

This study involves a total of 64 countries whose US dollar-denominated sovereign bonds feature on the J.P. Morgan's Emerging Market Bond Index Global (EMBIG). Out of these 64 countries, 33 have implemented an IFD in some form and have been included in the IMF's fiscal rules data set. The remaining 31 countries listed on the EMBIG did not adopt any measure of fiscal discipline until the end of 2013 and they serve as our comparison group.[22]

The countries included range in income from low to upper-middle categories and represent all important geographical regions. Our data set also comprises a longer period – 1993 to 2013 – compared with similar studies, such as Iara and Wolff (2010) whose data set spans the 1999-2009 period. Our 21-year long time series covers several

[22] List of these countries is available in *Appendix A-II*.

business-cycle peaks and troughs including the recent great recession. In addition, we average monthly and quarterly financial data to annual frequencies to synchronize them with our fiscal and institutional data.

We use 1993 as the start year of our panels, as it is the base year of the EMBI Global (EMBI Global, 1999). In addition, the early 1990s is approximately when many countries around the world began working on their versions of IFDs. It is also when many more developing countries, especially those from Eastern Europe, began floating their sovereign bonds on international markets.

In our models, we examine the impact of the presence of any type of institution of fiscal discipline[23] and use a dummy equal to 1 if a country has implemented an IFD; otherwise, equal to 0. We know all IFDs are not created equal, and some, such as balanced budget rules, have been empirically found to be more effective in a number of settings (e.g. see Kopits & Symanski, 1998). Our strategy, therefore, will result in a diluted average effect size; but given the vast difference in the nature and the scope of IFDs implemented around the world, we needed to create as generic a variable as we could manage. This also makes sense because most numerical rules have overlapping components built in them. For example, expenditure and revenue rules complement in achieving targets set out in balanced budget and debt rules (Debrun et al., 2008a).

[23] In addition to the four numerical rules implemented at national or supra-national level, the fiscal measures we add to our collective set of IFDs include fiscal responsibility laws, which include procedures related to transparency.

Moreover, debt rules are usually incorporated in medium-term expenditure frameworks (MTEFs), which here in this study are part of procedural rules.

We deal with our hypotheses in three separate sections. In each section, we depend on three different estimation techniques. First, we use a naïve OLS estimator to analyze our model. Next, we look into a baseline fixed effects model and its extended forms. Finally, in each section, we subject our extended models to the System GMM estimator. We are aware that naïve estimates usually tend to be biased as they do not account for factors other than treatment effects. In addition, for OLS to be consistent, the regressors have to be exogenous, otherwise the estimates are likely to exaggerate the effects. But in any type of policy research, it is very difficult to find truly exogenous regressors. Our pooled OLS estimations will just serve as a reference point and for clarifying our thinking about preliminary criteria for strengthening our models and estimation methodology.

Next, we test our baseline model with the fixed effects[24] estimation techniques. By comparing a unit of analysis to itself and by identifying changes or differences within units, the fixed effects estimator attempts to minimize the bias resulting from any characteristics that are common to units, such as unobserved heterogeneity and omitted variables (Cellini, 2008). Our fixed effects models feature country and time effects. Country fixed effects control for the impact of time-invariant characteristics unique to each country. These are the values that remain constant across time, such as gender, race,

[24] The fixed effects estimator is also known as the "within estimator" and is sometimes also referred to as the "least square dummy variables" (LSDV) estimator (see, e.g. Cellini, 2008).

institutions, socioeconomic conditions and so on. Time fixed effects account for country-invariant (regional or global) time trends. We add time fixed effects to our baseline model to control for fluctuations in international financial markets caused by inexplicable variations in investors' risk appetite and other "market sentiments," which are believed to collectively drive country spreads (Heinemann et al., 2014). The time fixed effects will also account for the recent overall downtrend in the interest rates around the world. With the fixed effects estimator, we will be able to also control for the differing initial fiscal positions[25] of the countries in our sample.

As we proceed with our estimations, we make some modifications to our baseline model. For example, we look at the impact of the total count of IFDs on SBS – we attempt to see the behavior of SBS as countries add each additional IFD to their fiscal discipline repertoire. In one of our fixed effects specifications, we interact IFDs and gross government debt to determine their combined effects – practically designing an advanced form of differences-in-differences approach suitable for multi-time panels.

Ardagna, Caselli, and Lane (2007) show that fiscal variables exert little effect on bond yields when fiscal performance is good, but a greater effect when performance is poor and investors are more concerned about future fiscal outlook. To deal with these nonlinearities, we augment our models by using the logs of the economic controls.[26] In

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[25] It is expected that a country with lower debt-GDP ratio will have more beneficial effects of IFDs than one with weaker fiscal health.

[26] We use the balanced budget variable in levels because it has too many observations in the negative sign and log transformation of negative values is not defined.

addition, following Bertrand, Duflo and Mullainathan (2004), we cluster the standard errors by the country to address the concern with serial correlation.

We are aware that the ordinary fixed effects estimator can minimize the problem of endogeneity arising from OVB. But endogeneity is a complex problem driven by several factors in addition to OVB, such as unobserved heterogeneity and simultaneity (reverse causality), which the fixed effects estimator cannot fix. In addition, often, instead of minimizing the noise, the fixed effects estimators end up removing a lot of important information (or signal) relevant to the analysis – thus substantially reducing the statistical power of the study (Lobell, 2012).

In the final part of our analysis, we needed to use some technique that could tackle the problem of endogeneity in a better way. One favored method of dealing with endogeneity in extant empirical literature on policy outcomes is the propensity score matching (e.g. see Lin & Ye, 2007; Wilde & Hollister, 2007; Guerguil, Mandon & Tapsoba, 2016). The propensity score matching (PSM)[27] involves comparing outcomes between units that have introduced a policy change and those that have not on the basis of selected matching characteristics. In the absence of randomization, which enables unbiased assignment of treatment, in many situations, matching can be the best possible substitute for randomization.

Another increasingly popular estimation procedure in policy research is the Arellano-Bond Difference GMM Estimator, which was popularized by Arellano and Bond (1991), and its improved version, Blundell-Bond System GMM estimator (e.g. see

[27] The PSM approach was popularized by Paul Rosenbaum and Donald Rubin (1983).

Blundell & Bond, 1998; Judson & Owen, 1999; Mileva, 2007; Roodman, 2009). The Difference GMM (DGMM) estimator relies on external instruments to correct these problems. But it is not easy to find variables that meet all the criteria of a good quality external instrument.[28] The SGMM estimator instruments those of the dependent and explanatory variables that cause endogeneity. Thus, by rendering endogenous variables predetermined, the SGMM estimator reduces their correlation with the error term (Roodman, 2009). This method is especially suitable for data sets that have quite many missing observations, as in DGMM the act of differencing results in the dropping of the missing observations, which reduces the size of the sample in already chronologically limited and observationally narrow data sets. But the SGMM estimator offsets the need to drop the missing values by employing "forward orthogonal deviations" (Arellano & Bover, 1995), which involve differencing the average of all future available observations from the contemporaneous ones. We hope the SGMM procedure will to a great extent cope with the problem of "ambiguous temporal precedence"[29] (Shadish et al., 2002, p. 63), which is usually the bane of nonexperimental designs, especially those in fiscal policy research.

The PSM technique has some drawbacks. Since countries have so many unique characteristics that make them vastly different from each other, it would not be easy to find an adequate number of matching parameters. In addition, PSM can only match units

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[28] An effective instrument will be correlated with the endogenous variable without directly affecting the dependent variable. See Studenmund (2006) for more discussion on instrumentation.

[29] Also known as simultaneity or reverse causality (see Cellini, 2008).

on the basis of observable attributes (Shadish et al., 2002). This results in leaving out the unobserved factors that usually cause heterogeneity in the panel data context. On the other hand, the SGMM approach too tends to create many more instruments than the number of groups available in the panel data set, which renders the specification tests, such as the Sargan test, meaningless. Nevertheless, since the SGMM estimator has the potential to minimize the effects of reverse causality, we decide in favor of the SGMM estimator for our final regression analyses.

For data analysis, the study uses the statistical software package *Stata*, which is quite popular in macroeconomic research. *Stata* offers most of the bells and whistles of other advanced statistical packages such as *SAS* and *R* with the additional benefits of simplicity and flexibility (Nichols, 2007).

III. Data

Our main data set on sovereign bond spreads comes from J.P. Morgan's Emerging Market Bond Index Global (EMBIG).[30] The EMBIG is a market-capitalization-weighted index that includes instruments denominated in the US dollar with a minimum current face outstanding of US $500 million (EMBI Global, 1999). The EMBIG calculates the spreads in comparison to the premium charged by the markets on a country bond over that on a US security with similar maturity. The index's base year is 1993 and it covers 64 countries.

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[30] The EMBI Global expands upon the composition of its predecessor, the Emerging Market Bond Index Plus (EMBI+) and includes some high income countries as well.

Our key independent variable is institutions of fiscal discipline (IFDs) and the data on it are retrieved from the IMF's fiscal rules data set.[31] This data set includes 84 countries[32] representing all regions and income groups. It categorizes fiscal rules on the basis of their scope in terms of the various tiers of government and their legal nature. We also use the IMF's Fiscal Rules Index (FRI), which has been created within the framework of the agency's fiscal rules data set. The FRI ranks the countries on the basis of the qualitative and quantitative features of their IFDs and collates the information in a summary index on the pattern of the European Commission's identical index that ranks the fiscal rules of the European Union countries.[33]

We use *government effectiveness perceptions* as a proxy for the government's ability to implement institutions of fiscal discipline. We have obtained these data from the World Bank's Worldwide Governance Indicators (WGI), which is a research data set summarizing survey responses about six different measures of quality of governance, including government effectiveness perceptions. The effectiveness indicator itself is a composite of perceptions on governance components such as the quality of government policies and their implementation, and the government's credibility that it will remain committed to its announced policies (Kaufmann, Kraay, & Mastruzzi, 2010).

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[31] See Schaechter et al. (2012) for a detailed discussion of this data set.

[32] As of 2013 – our cutoff date for this is study.

[33] For more on the European Commission's fiscal rules index, see European Commission, 2006; Heinemann et al., 2014.

In addition to these institutional variables, the study puts to use a number of economic variables[34] such as gross government debt, budget balance, GDP growth, short-term nominal interest rates, CPI inflation, gross domestic saving, exchange rate, and foreign direct investment. These variables have been obtained from the IMF's World Economic Outlook (WEO), International Financial Statistics (IFS) and Government Financial Statistics (GFS) databases, and the World Bank's Global Economic Monitor (GEM) and World Development Indicators (WDI) databases.

Despite the availability of rich data from various sources, it was not easy to create a completely balanced panel data set, as not all the countries have had IFDs or US dollar-denominated sovereign bonds with a time series dating from 1993 to 2013.[35] In the best case, we have an uninterrupted sequence of observations for the years 1996 through 2013. In the worst case, we have observations for just a single year.

IV. Economic model

As discussed in the previous chapters, a broad category of fiscal institutions individually and collectively appears to have an effect on sovereign bond spreads. These institutions may influence bond yields through various mediating factors or channels of impact (see e.g. Debrun et al. 2008a; Baldacci & Kumar, 2010). In the following conceptual framework, we attempt to show the path of effects of IFDs on SBS. The

[34] These variables, their data sources, and their time series ranges are given in *Appendix A-III.*

[35] See Appendices A-I and A-II for the earliest years when countries adopted their IFDs and/or they featured on the EMBI Global index.

framework describes how governance and economic institutions ultimately influence the variation in sovereign bond spreads.

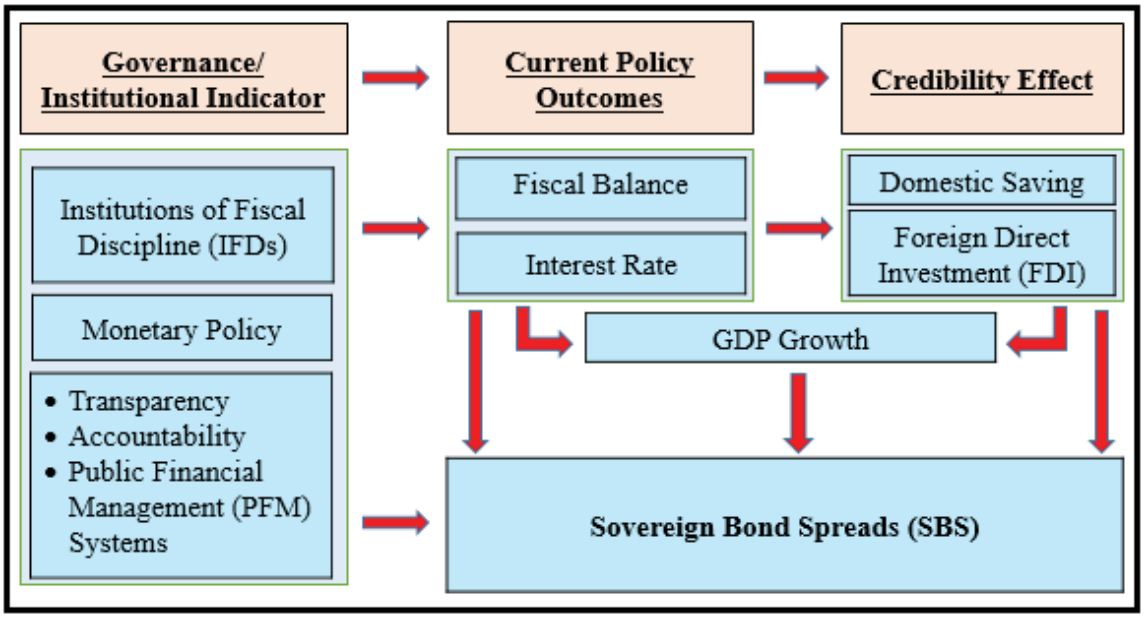

Figure 4.1: **Conceptual Framework**

The figure indicates that institutional variables have current policy outcomes and credibility effects, which in turn drive sovereign bond yields. To cite Debrun et al. (2008a), IFDs reduce bond yields either through "induced improvement in fiscal indicators" or through credibility effect. In addition to IFDs and other institutional variables, macroeconomic variables, such as fiscal balance, domestic saving and foreign direct investment, can effect changes in SBS both directly and through the government credibility channel.[36] In the light of the conceptual framework above, our economic model takes the following form:

[36] Debrun et al. (2008a) argue that IFDs have a direct beneficial effect on SBS by lowering primary balance and public debt and an indirect one through the "credibility" channel.

SBS = f(IFDs, economic variables, institutional variables)

Among macroeconomic controls in our models are government debt and deficit as indicators of overall fiscal balance. Since public debt amounts to a deferred payment through future taxes, it needs to be included in the model as an element of "private wealth" that affects private saving (Debrun et al. 2008a, p. 12). In addition, we add budget balance to the model as an indicator of the current fiscal policies of the government and as a flow variable complementing the stock variable of debt (Debrun et al. 2008a). We expect budget balance to be negatively correlated to the spreads, while government debt positively correlated to it.

Following Baldacci and Kumar (2010), we add GDP growth in our model. We expect that GDP growth will control for the effects of business cycles on long-term interest rates and risk premia, as business cycles can explain changes in the creditors' probability of default. We also add lagged GDP growth to account for the accelerator effect[37] (Mileva, 2007). As in Iara and Wolff (2010), we include most of the economic variables in terms of GDP to portray the relative size of the economy. Reflecting these variables as a share of GDP will afford a cumulative picture of economic health through the size of public debt as economy expands over time (Wyplosz, 2012). It is expected that the effect of each of these variables would vary depending on the size of current budget

[37] The accelerator effect explains the nexus between investment levels and GDP growth. For more on the accelerator effect, see Ćorić (2011).

deficits and accumulated public debts,[38] which would indicate a likelihood of default in both current and future obligations.[39]

In our models, we needed to control for various risk factors that affect a country's credit rating. A nice measure of bond market liquidity risk and, thus, an appropriate proxy for "country risk" would be *bid-ask* spreads of sovereign bonds (Bernoth & Wolff, 2006; Pape & Schlecker, 2007; Maltritz, 2012). However, because of lack of data, we could not include bid-ask spreads in our analyses and, instead, use "foreign direct investment" (FDI) as a proxy for risk investors associate with a country. FDI usually fluctuates in response to changes in both return risk and currency risk (Hayakawa, Kimura, & Lee, 2013). In addition, there is a direct correlation between a country with excessive capital controls and the amount of foreign direct investment it receives (IMF, 2012b). Countries with on-off capital controls raise doubts, as they, in effect, screen the information about their *revealed preferences,*[40] which may alarm the investors and negatively affect FDI. Further, FDI is also linked to "country risk" through government

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[38] A debt-GDP ratio with not much fluctuation over a sustained period would thus signify better fiscal discipline. For example, Japan over the years has run a deficit less frequently than the Netherlands during the same period. But its accumulated debt was 204 percent of GDP in 2011, while that of the Netherlands was only 78 percent of GDP (Wyplosz, 2012).

[39] We chose to not include GDP per capita in our models. Most of our variables are reflected in terms of GDP and, as such, they indirectly portray the changes in the national incomes. Further, in presence of GDP growth rate and with GDP used to standardize economic variables, the inclusion of GDP per capita would more give rise to multicollinearities than provide any new information.

[40] Debrun et al. (2008a) show that enhanced "revealed preferences" in the shape of balanced budget and debt rules lead to lower borrowing costs.

"transparency." Investors tend to be less certain about the ability of governments that are less transparent to meet their financial obligations (Drabek & Payne, 2001; Hameed, 2005). In this way, absent a suitable measure for government transparency, the variable "FDI" in our study doubles as a viable proxy for "transparency."

In addition to observed heterogeneity in their structure and design, IFDs vary on the extent of their implementation. Because of both differing institutional capacity and governments' willingness, even largely similar IFDs can end up being implemented differently. In many cases, lack or incomplete implementations of PFM and other institutional preconditions of success of IFDs make it difficult to isolate the effects of fiscal discipline in an empirical analysis. As we do not have a straightforward indicator to measure the extent of implementation of an IFD, we use the World Bank's "government effectiveness perception" indicator as a proxy for the governments' varying abilities to implement fiscal rules.

The "new growth theory"[41] hypothesizes that better fiscal policies lead to higher growth by encouraging private saving, which in turn leads to more investment (Cortright, 2001). Governments that are able to balance their budgets can lower taxes, which in turn may also increase private saving, and, thus, engender more investment and spending – two of the most important leading indicators of economic growth (Bakija & Slemrod, 2008). As domestic saving affects the availability of loanable funds for investment, we include gross domestic saving in our analysis. The "Saving" variable can also account for

[41] For an original discussion on the "new growth theory," see Romer (1990).

financial repression by fiscally-undisciplined governments that soak up domestic supply of funds to finance their budget deficits and therefore drive up the borrowing costs.

As indicated in our conceptual framework, we also include in our models short-term interest rate to control for impact of monetary policy on the term structure. Although the real interest rate is a better measure of the borrowing costs and, thus, a fair gauge of fluctuations in national saving and investment, following the current trend in research (see, for example, Baldacci & Kumar 2010), we use nominal interest rates as they determine the budgetary costs of debt service.

Finally, we include in our analysis currency exchange rate as a monetary policy variable along with interest rate. Although a large number of countries have allowed flexible exchange rates, those rates are prone to fluctuations due to changes in the monetary policies of other countries. In case of non-uniform fluctuations in interest rates across countries, the rising demand for the currency of the country with higher interest rates leads to a currency arbitrage until the exchange rate for that country to an equilibrium price (Parkin, 2012). Further, central banks often trade in foreign exchange to influence their own exchange rate. But the chief motivating factor to include exchange rate in our models is that only US dollar-denominated sovereign bonds feature on the EMBI Global. The EMBIG index can be therefore susceptible to the currency market fluctuations.

V. Econometric models

Our models take the following form:

$$SBS_{it} = \alpha + \beta IFD_{it} \text{ (or } \beta FRI_{it} \text{ or } \beta IFDCount_{it}) + \gamma' X_{it} + \varepsilon_{it} \quad (1)$$

$$SBS_{it} = \alpha + \beta IFD_{it} \text{ (or } \beta FRI_{it} \text{ or } \beta IFDCount_{it}) + \gamma' X_{it} + \eta_i + \varphi_t + \mu_{it} \quad (2)$$

$$SBS_{it} = \alpha + \beta IFD_{it} + \delta IFD_{it} * Debt_{it} \text{ (or } \beta FRI_{it} * Debt_{it} \text{ or } \beta IFDCount_{it} * Debt_{it})$$

$$+ \gamma' X_{it} + \eta_i + \varphi_t + \mu_{it} \quad (3)$$

$$SBS_{it} = \alpha + \beta IFD_{it} + \delta IFD_{it}^2 \text{ (or } \delta FRI_{it}^2 \text{ or } \delta IFDCount_{it}^2) + \gamma' X_{it} + \eta_i + \varphi_t + \mu_{it} \quad (4)$$

SBS_{it} is sovereign bond spread for country i at time t. IFD_{it} or Institutions of Fiscal Discipline is the key independent variable which is equal to 1 if the country i has implemented any fiscal institution (e.g. a numerical or procedural fiscal rule or fiscal responsibility law, or any other measure of fiscal discipline featured in the IMF's fiscal rules data set) at time t, otherwise it is equal to 0. IFD_{it} is expected to be negatively correlated with sovereign bond spreads. FRI_{it} is the Fiscal Rules Index – a composite measure of the strength or stringency of institutions of fiscal discipline – for the country i at time t. $IFD_{it} * Debt_{it}$ (and $FRI_{it} * Debt_{it}$) is an interaction term meant for isolating the effects of fiscal institutions and debt jointly. IFD_{it}^2 (and FRI_{it}^2 and $IFDCount_{it}^2$) is the squared version of the variable of interest. X_{it} is a matrix of economic and institutional variables that directly or indirectly affect the size of sovereign bond spreads. ε_{it} (and μ_{it}) is a time-and country-specific disturbance. η_i and φ_t are unobserved country and time fixed effects.

Chapter 5: Findings and Discussion

This chapter has four sections. In the first three sections, we test and discuss our three hypotheses. In each of the sections, we begin with a naïve OLS estimation of our model and, then, use the fixed effects method to estimate our baseline and its enhanced forms. Finally, we subject our models to the System GMM estimators. In the fourth section, we sum up the key results from our empirical tests.

I. How the presence of an IFD affects sovereign bond spreads

We begin our analysis by putting to test *Hypothesis 1*:

Presence of an IFD reduces sovereign borrowing costs for developing countries.

A. Ordinary least squares estimates. To have an idea on the nature and extent of the impact of IFDs on SBS, we first subject our model in Equation 1 to naïve pooled OLS method. The results reported in Table 5.1 support the predictions of our hypothesis. As shown in our economic model, our key independent variable IFD captures the credibility effect of the government's commitment to fiscal discipline. The results show that when a country implements an IFD, its spread declines between 20 and 35 percent (Columns 1-6), cetaris paribus.[42] These findings are statistically significantly different from zero at 1 and 5 percent levels and are robust to several variations specified in Columns 1-6 of Table 5.1. In the first two models (Columns 1-2), we control for government debt, fiscal balance and GDP growth. The coefficients obtained on all these variables show the theoretically expected signs. As a country's government debt rises by 1 percent, its SBS

[42] Cetaris paribus or "holding other variables constant" is the phrase applicable to all our regression findings, even though we shall omit to state it while reporting results henceforth.

expands by 0.3 to 0.4 percent. Similarly, each 1 percent increase in GDP growth marks down the spreads by about 0.13 percent. These results are statistically significant at the 1 percent level (Columns 1-2).

Table 5.1: ***OLS Regressions on IFDs***

	EMBIGLn					
	(1)	(2)	(3)	(4)	(5)	(6)
IFD	-0.289***	-0.353***	-0.200***	-0.241**	-0.221***	-0.255**
	(0.0755)	(0.0767)	(0.0763)	(0.106)	(0.0772)	(0.114)
DebtLn	0.399***	0.299***	0.297***	0.250**	0.289***	0.242**
	(0.0635)	(0.0662)	(0.0642)	(0.102)	(0.0643)	(0.105)
Balance	-0.0116	-0.0114	-0.00854	-0.00484	-0.00947	-0.00577
	(0.0103)	(0.0108)	(0.0103)	(0.0135)	(0.0103)	(0.0138)
GrowthLn (-1)		-0.126***	-0.121***	-0.169***	-0.117***	-0.167***
		(0.0471)	(0.0448)	(0.0630)	(0.0447)	(0.0634)
Effectiveness			-0.470***	-0.370***	-0.451***	-0.366***
			(0.0686)	(0.0938)	(0.0694)	(0.0947)
InterestLn				0.235***		0.228***
				(0.0694)		(0.0724)
InflationLn					0.0126*	0.00323
					(0.00752)	(0.00952)
Constant	4.300***	4.823***	4.762***	4.529***	4.718***	4.552***
	(0.228)	(0.258)	(0.250)	(0.415)	(0.251)	(0.421)
N	435	389	386	227	386	227
R^2	0.158	0.162	0.250	0.263	0.255	0.264
$\bar{R}^2$	0.153	0.153	0.240	0.243	0.244	0.240
F	27.03	18.56	25.32	13.09	21.67	11.19

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The suffix "Ln" indicates that the variable has been log-transformed

In Column 3, we add "Effectiveness," as a proxy for the government's capability to implement IFDs. With this, the coefficient on IFDs continues to be quite significant and that on "Effectiveness" shows that a 1-unit rise in government effectiveness results in a 47 percent decline in sovereign bond spreads and the finding is significant within the 99 percent confidence interval. In Column 4, we add short-term interest rate and learn that a

1 percent increase in interest rate nudges the spreads up by about 0.24 percent – and the obtained statistic is significantly different from zero at the 1 percent level. In Column 5, we replace interest rate with annual CPI inflation and find that a 1 percent increase in CPI inflation results in about 0.01 percent rise in the spreads. Finally, in column 6, we keep both interest rate and inflation rate to see their combined effect and find that, in presence of interest rate, the effect of inflation on SBS weakens both quantitatively and statistically, which affirms an anticipated high degree of multicollinearity between these two variables.

B. Fixed effects estimates. After getting an idea on the correlations between SBS and IFDs and between SBS and various control variables through our naïve estimations, we proceed in this subsection to estimate our baseline model (as shown in Equation 2) with the fixed effects estimator.[43] Following Bertrand et al. (2004), we use cluster-robust standard errors to correct for possible serial correlation in the group means of our panel data set. Results reported in Table 5.2 show that in all the versions of the model the coefficients on IFDs are consistently negatively correlated with SBS, in line with the theoretical expectations. Even though these results are not statistically significant,[44] they confirm that IFDs leave a substantial credibility effect on SBS. Furthermore, in these estimates, all our control variables show a theoretically justified correlation with sovereign bond spreads. In Part A (Column 1) of the table, the variable "Debt" indicates

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[43] We performed a Hausman Test and found that the fixed effects estimator is better than the random effects estimator for our panels.

[44] Since our hypotheses are one-tailed, we could consider these results somewhat significant as the p-values obtained in these results are meant for a two-tailed analysis.

that a 1 percent increase in government debt results in about 0.60 percent rise in SBS, statistically significant at the 1 percent level. This correlation continues to be positive, while shedding its statistical significance a little bit, when interest rate is added to the model (Column 2). Similarly, the variables for fiscal balance, GDP growth and government effectiveness are found to be both negatively signed and highly significant (Column 1). Like "Debt," both "Balance" and "Effectiveness" lose their statistical significance when we control for interest rate (Column 2).

In all the specifications of our model in Part A of the table, the variable "Interest" is positively correlated with SBS, its effect size ranges between 0.30 and 0.32 percent, and it falls within the 95 percent confidence interval. We decided to drop the variable "Inflation" from all the specifications of our baseline model because it was found to be multicollinear with nominal interest rate in our naïve estimations in the previous subsection. The variable for GDP growth is found to be consistently inversely, and highly significantly, correlated with SBS – with the effect size ranging between 0.09 and 0.13 percent. When we add the variable for gross domestic saving, we find that each 1 percent increase in saving results in a modest decline in SBS (from 0.006 to 0.033 percent), which is not found to be statistically significant (Columns 3-5).

We add nominal exchange rate to our models as a monetary policy variable (along with the interest rate), and learn that as the number of units of a local currency per US dollar increase (the exchange rate[45] depreciates) by 1 percent, its sovereign bond spreads

[45] Here we define nominal "exchange rate" as the number of units of local (home) currency that can be purchased with one unit of the foreign or reference currency (i.e. US dollar).

experience a surge between 0.28 and 0.32 percent (Columns 4-5). These results, too, are not significantly different from zero at any of the usual levels. Finally, we add a variable for foreign direct investment to our model (Column 5) to account for the range and size of risks markets associate to a country. Our results show that FDI drives SBS to contract by 0.03 percent; but these results are not statistically significant.

In Part B of Table 5.2, we add an interaction term to see how IFDs and Debt jointly influence SBS. We were expecting these regressions to show that the size of debt influences the relationship between SBS and IFDs by affecting both the intercept and the slope. Precisely, we were expecting that each 1 percent increase in debt would result in a less distinguishable rise in its SBS for an IFDer than for a non-IFDer. The results obtained, however, are otherwise.

Table 5.2: ***Fixed Effects Regressions on IFDs***

	EMBIGLn									
	A					B				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
IFD	-0.0320	-0.136	-0.170	-0.173	-0.147	-0.489	-0.971	-0.880	-0.950	-0.935
	(0.116)	(0.175)	(0.174)	(0.176)	(0.173)	(0.921)	(1.264)	(1.426)	(1.476)	(1.432)
DebtLn	0.592***	0.416*	0.403*	0.384	0.399*	0.536***	0.304	0.307	0.278	0.292
	(0.146)	(0.208)	(0.214)	(0.236)	(0.234)	(0.103)	(0.204)	(0.217)	(0.245)	(0.226)
IFD*DebtLn						0.123	0.236	0.205	0.224	0.227
						(0.232)	(0.322)	(0.374)	(0.385)	(0.375)
Balance	-0.0349**	-0.0259	-0.0248	-0.0162	-0.0197	-0.0345**	-0.0267	-0.0252	-0.0163	-0.0197
	(0.0136)	(0.0164)	(0.0185)	(0.0188)	(0.0192)	(0.0133)	(0.0162)	(0.0181)	(0.0183)	(0.0186)
GrowthLn (-1)	-0.0897***	-0.110***	-0.114**	-0.128***	-0.128***	-0.0899***	-0.107**	-0.110**	-0.124**	-0.124**
	(0.0249)	(0.0372)	(0.0443)	(0.0459)	(0.0444)	(0.0243)	(0.0393)	(0.0468)	(0.0473)	(0.0456)
Effectiveness	-0.660**	-0.439	-0.386	-0.280	-0.284	-0.648**	-0.434	-0.403	-0.295	-0.298
	(0.280)	(0.396)	(0.405)	(0.392)	(0.382)	(0.281)	(0.397)	(0.400)	(0.388)	(0.379)
InterestLn		0.309**	0.316**	0.303**	0.297**		0.299**	0.307**	0.293**	0.286**
		(0.119)	(0.131)	(0.131)	(0.131)		(0.109)	(0.119)	(0.119)	(0.119)
SavingLn			-0.0215	-0.0329	-0.00607			0.00145	-0.00820	0.0182
			(0.157)	(0.165)	(0.162)			(0.166)	(0.172)	(0.169)
XchangeLn				0.318	0.279				0.328	0.290
				(0.210)	(0.219)				(0.203)	(0.210)
FDILn					-0.0290					-0.0317
					(0.0237)					(0.0235)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	3.309***	2.878***	2.985**	2.482*	2.494*	3.523***	3.354***	3.320***	2.832**	2.858**
	(0.526)	(0.944)	(1.269)	(1.367)	(1.352)	(0.395)	(0.838)	(1.140)	(1.270)	(1.213)
N	386	227	216	216	212	386	227	216	216	212
Number of Groups	46	30	29	29	28	46	30	29	29	28
R^2	0.643	0.659	0.663	0.670	0.675	0.644	0.663	0.665	0.673	0.678
$\bar{R}^2$	0.621	0.621	0.620	0.627	0.629	0.621	0.623	0.621	0.628	0.630
F	79.18	1816	259386	.	.	103.8	3442	.	.	.

Cluster-robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The suffix "Ln" indicates that the variable has been log-transformed

For a non-IFDer, each 1 percent increase in its debt leads to a rise of about 0.54 percent in its SBS, significant at the 1 percent level (Column 6). However, the interacted variable in this model indicates that in presence of an IFD, each 1 percent rise in a country's debt results in an additional increase of about 0.12 percent in its SBS – causing a total change in the spreads of 0.66 percent for an IFDer. In other specifications of the moral in this table too, the combined individual effects of debt and the interacted effects of debt and IFD lead to a rise in SBS in the range of 0.50 to 0.54 percent (Columns 7-10).

These results are counterintuitive, as economic theory indicates that IFDs should depress the effect of debt on SBS. But the inclusion of the interacted variable causes "Debt" in all the remaining specifications (Columns 7-10) to completely lose its statistical significance (as compared with the corresponding results in Table 5.2). It also appears that the high significance observed in Column 6 is due to the parsimoniousness of the models – in Columns 7-10, the successive inclusion of four additional variables results in the loss of the statistical significance. This also renders the counterintuitive effect of Debt and IFD together less important. In all the specifications given in Part B, however, the individual effects of IFDs on SBS substantially increase, though insignificant at any of the conventional levels. For an IFDer (when debt is not factored in), the spread experiences a fall between 49 and 97 percent.[46] As in Part A, in all the columns of Part B, each of the control variables maintains its theoretically plausible direction of correlation with SBS.

Next, to check the robustness of our results, we alter the specifications in Table 5.2 by including a 1-year lagged value of IFDs and re-estimate them (results in *Appendix B-I*). The results show that the 1-year lagged values of IFDs, as expected, maintain an inverse correlation with SBS, though the effect size has now considerably narrowed and the results are not statistically significant (Part A). Not much difference, however, has been observed in the control variables – with regard to the strength and direction of the

[46] Although there is no plausible explanation but it appears that Stata first blew up the effects of IFDs in these columns only to give us a final toned down net effect of IFDs on SBS that we expected to get after differencing the additional effect of the interaction term on SBS.

effect and its statistical significance – in all the three specifications if compared with the results given in Part B of Table 5.2.

In Part B of the table (*Appendix B-I*), we add to our models an interaction term to check the joint effect of IFDs and government debt. Here, the coefficients on the lagged IFD, however, changes to a theoretically unexplained positive correlation with SBS. The results show that, when debt is not factored in, the presence of an IFD results in a rise in the SBS by 3 to 6 percent. Further, the results provide that a 1 percent increase in the size of government debt for a developing country (whether it is an IFDer or a non-IFDer) leads to about 0.4 percent rise in its SBS. But, for IFDers, this effect appears to be smaller by up to 0.05 percent.

C. System GMM estimates. Our fixed effects regressions provide a weak evidence that IFDs have an inverse (beneficial) effect on SBS. In this part, we test our hypothesis with the Blundell-Bond System GMM technique[47] to improve our empirical analysis. We perform the default One-Step SGMM regressions and use 2-2, 3-3, and 4-4 sets of lags for instrumentation. These results are reported in *Appendix B-II*.

When we estimate the conventional SGMM *dynamic* model (with a lag of the dependent variable on the right-hand side), the coefficient on the lagged dependent variable ($EMBIG_{t-1}$) appears to absorb much of the effects of other independent variables, not least of "IFD," which is our variable of interest. Further, results now show that IFDs

[47] We employ the command *xtabond2*, which engages lags of the endogenous variables as instruments and uses forward orthogonal deviations (FOD) to transform each observation by subtracting the average of all future observations (see Roodman, 2009, for a detailed discussion of *xtabond2*).

have a detrimental effect on SBS, which is intriguing. Even more counterintuitive to the theoretical expectations is that all the macroeconomic variables in the model ("Debt," "Balance," "Growth," "Saving," "Xchange" and "FDI") almost completely lose their statistical significance.

This could be due to a possible existence of serial correlations in our model. Research indicates that when an auto-regressive term is added to a serially-correlated equation, it causes the lagged dependent variable (LDV) to acquire a disproportionately large coefficient, almost obliterating the true effect of other variables (Achen, 2000; Keele & Kelly, 2005). So it follows that where the dependent variable is *co-integrated* (or *non-stationary*), an LDV model is not appropriate. To confirm our apprehension about a serial correlation in the model, we perform the Wooldridge test for auto-correlation in panel data[48] (Wooldridge, 2010). The test confirms that our model suffers from a high level of serial correlation[49].

As discussed in the previous chapter, the SGMM estimator has a number of advantages over the fixed effects estimator. First, it can address the deeper causes of endogeneity beyond OVB. Second, unlike fixed effects, which tend to remove important "signal" leaving out much of the "noise" (Lobell, 2012), the SGMM estimator has much

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[48] The ordinary tests for serial correlation, such as the Durbin-Watson test or the Breusch-Godfrey test are not ideal for panel data.

[49] In *Stata* the test is implemented with the command *xtserial*. The results provide that the null hypothesis of "no first-order correlation" can be rejected within 99 percent confidence level. For further discussion on serial correlation in linear panel data models and *xtserial*, see Drukker (2003).

more to offer through a hierarchy of endogenous and exogenous instruments. We therefore decide to give it a shot and estimate a *static*[50] model using the Blundell-Bond SGMM technique.[51]

The results from our *static* SGMM estimations are reported in Table 5.3. The results show that, by and large, our economic variables have acquired their theoretically-plausible correlation with the dependent variable. In Part A of the table, we present the results from the specifications that do not feature the year dummies. The results show that IFDers, on average, have to pay up to 25 percent lower premium on their international debt. These findings are statistically significant at moderate to high levels. The results obtained on the effect of the control variables on SBS in these columns are as follows.

The results further show that as sovereign debt of a developing country increases by 1 percent, its SBS too experiences an expansion of up to 0.24 percent. With each 1-unit rise in a country's GDP growth rate, its SBS shrink by up to 0.17 percent. As a country's performance on the effectiveness perception rises by 1 unit, its SBS contract by 28 to 38 percent. Each 1 percent rise in the short-term interest rate of such country results in a further expansion of its SBS by 0.23 to 0.27 percent. All these results are highly significant.

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[50] The only difference between a *dynamic* and a *static* model is that the former has an LDV on the right-hand side. So we remove the LDV to make the model *static*.

[51] It would be pertinent to state here that Burguete, Gallant and Souza (1982, qtd. in Hall, 2005) were the first to apply the term "methods of moment" to their technique which involved instrumental variables to estimate static parameters of their model. Further, it is not the first time that the SGMM estimator is being used for static models (see e.g. Aguirregabiria, 2009; Alonso-Borrego, 2010).

Table 5.3: ***System GMM Regressions on IFDs***

	EMBIGLn					
	A			B		
	Lags 2-2	Lags 3-3	Lags 4-4	Lags 2-2	Lags 3-3	Lags 4-4
	(1)	(2)	(3)	(4)	(5)	(6)
IFD	-0.190*	-0.246**	-0.213**	-0.208***	-0.281***	-0.276***
	(0.108)	(0.103)	(0.100)	(0.0627)	(0.0597)	(0.0581)
DebtLn	0.228**	0.228**	0.230**	0.527***	0.451***	0.430***
	(0.103)	(0.103)	(0.0939)	(0.0651)	(0.0640)	(0.0565)
Balance	0.00148	-0.00115	0.00342	0.0289***	0.0204**	0.0200***
	(0.0133)	(0.0132)	(0.0127)	(0.00823)	(0.00808)	(0.00766)
GrowthLn (-1)	-0.153***	-0.169***	-0.147***	-0.0764**	-0.125***	-0.102***
	(0.0492)	(0.0490)	(0.0484)	(0.0324)	(0.0321)	(0.0315)
Effectiveness	-0.276***	-0.303***	-0.329***	-0.311***	-0.349***	-0.389***
	(0.0907)	(0.0918)	(0.0910)	(0.0553)	(0.0547)	(0.0549)
InterestLn	0.269***	0.236***	0.250***	0.230***	0.185***	0.166***
	(0.0641)	(0.0622)	(0.0632)	(0.0433)	(0.0411)	(0.0430)
SavingLn	-0.0752	-0.0554	-0.0806	-0.0337	-0.0232	-0.0326
	(0.0793)	(0.0821)	(0.0785)	(0.0468)	(0.0478)	(0.0455)
XchangeLn	-0.0244	-0.0254	-0.0296	-0.0193	-0.0169	-0.0224*
	(0.0226)	(0.0226)	(0.0224)	(0.0132)	(0.0131)	(0.0129)
FDILn	-0.0129	0.00150	-0.00406	-0.0193	-0.0159	-0.0132
	(0.0314)	(0.0319)	(0.0309)	(0.0199)	(0.0198)	(0.0193)
Year Dummies	No	No	No	Yes	Yes	Yes
Constant	4.794***	4.830***	4.852***	2.652***	3.160***	0
	(0.550)	(0.557)	(0.504)	(0.424)	(0.418)	(0)
N	212	212	212	212	212	212
Number of Groups	28	28	28	28	28	28
Instruments	152	152	152	152	152	152
AR-2	-4.102	-3.542	-3.629	-0.269	-0.355	-0.331
AR-2 p-value [a]	4.09e-05	0.000398	0.000284	0.788	0.723	0.741
Sargan	331.2	320.2	339.6	504.1	490.7	574.9
Sargan df	142	142	142	121	121	121
Sargan p-value [b]	0	0	0	0	0	0

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The suffix "Ln" indicates that the variable has been log-transformed

[a] Test for 2nd order serial correlation (null hypothesis of no autocorrelation of residuals)

[b] Test for the null hypothesis that identifying restrictions are valid

Gmmstyle instruments: l.EMBIGLn IFD DebtLn Effectiveness InterestLn

Ivstyle instruments: Balance l.GrowthLn SavingLn XchangeLn FDILn

The gross domestic savings of these countries too influence a reduction in their SBS by 0.05 to 0.08 percent – though not found to be statistically significant. Three of

the control variables, viz. budget balance, exchange rate and FDI, yield either wrong or mixed results – though none of these results is statistically significant.

To further investigate the validity of our results, we control for the year fixed effects in Part B of the table and find that the beneficial effect of IFDs on SBS increases to 28 percent and is significant at the 1 percent level. In these columns, while we find that the variables "Saving" and "FDI" maintain the expected inverse correlation with SBS, both "Balance" and "Xchange"[52] continue to have the wrong signs. Even more, this time, the coefficient on budget balance acquires high statistical significance. Nonetheless, in addition to observing a more potent effect of IFDs on SBS, another good thing achieved by including the year dummies (Columns 4-6) is that the Arellano-Bond statistic of autocorrelation loses its statistical significance, causing us to fail to reject the null that there exists no autocorrelation among residuals, which indicates the robustness of the estimates.[53]

The default System GMM technique performs estimation in a single step. Windmeijer (2005) introduced a correction to control for the downward bias in the standard errors, which is implemented through a two-step version of the technique. In the two-step procedure, first an unweighted GMM estimator is computed and the residuals

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[52] As mentioned earlier, we calculate exchange rate as number of local currency units per US dollar. So, "increase" in exchange rate implies that local currency depreciates against the US dollar.

[53] The AR-2 statistic is structured so that failure to reject the null indicates that there is no autocorrelation and signifies the strength of the results, which is what the researcher should look for. See Roodman (2009) for more discussion on AR-2.

thus obtained are used to get a weight matrix for constructing a weighted GMM estimator in the next step (Xiao, Shao, Xu, & Palta, 2007). To check the robustness of our results, we subject our *static* models in Table 5.3 to the Two-Step SGMM technique. We employ all the sets of lags used in Table 5.3 and re-run these regressions in two parts: with the year dummies, and without them. The results are reported in *Appendix B-III*.

In Part A of the table in the appendix, we show the results from our Two-Step SGMM regressions without the time fixed effects. Many of the coefficients in the two-step analysis have lost much of their statistical significance. However, the results also indicate that our regressions with the time fixed effects fare worse than those without these effects. The coefficients on most of the control variables lose both their quantitative and statistical power when subjected to the two-step analysis. To sum up, we find that our estimates from the One-Step SGMM technique (Table 5.3) return more consistent results than those from the Two-Step SGMM (*Appendix B-III*). A number of studies confirm our finding that the One-Step SGMM estimator is better for finite samples (see, for example, Ferson & Foerster, 1994; Hansen, Heaton, & Yaron, 1996; Judson & Owen, 1999; Ramalho, 2005; Windmeijer, 2005). Judson and Owen (1999), use Monte Carlo simulations to show that "the one-step GMM estimator outperforms the two-step [estimator]" (p. 13). In the light of these studies, we choose to rely more on our One-Step SGMM results and use the one-step estimator to test our remaining hypotheses in the following sections.

II. How the number of IFDs affects sovereign bond spreads

In this section we test *Hypothesis 2*:

Each additional IFD further reduces sovereign bond spreads of developing countries.

We proceed to find out how SBS respond as the number of IFDs implemented increases. In other words, we examine the behavior of SBS as one more IFD at a time (the variable "IFDCount") is added to a country's fiscal institutional framework.

A. Ordinary Least Squares estimates. As in the previous section, we begin by testing our hypothesis first with a naïve OLS model using a pooled cross-section data set (Table 5.4). In Column 1, we add only government debt and budget balance to our model and then, in the following columns, we successively add more control variables. We find that each additional IFD results in an average reduction in SBS between 4 and 10 percent. These results are quite significant except those in Columns 4 and 6, which appear to be affected by the inclusion of interest rate to the model. The variables for government debt, GDP growth and government effectiveness in these estimates are correctly signed and statistically significant.

Table 5.4: ***OLS Regressions on Number of IFDs***

	EMBIGLn					
	(1)	(2)	(3)	(4)	(5)	(6)
IFDCount	-0.0767***	-0.0954***	-0.0505*	-0.0385	-0.0588**	-0.0371
	(0.0268)	(0.0275)	(0.0267)	(0.0352)	(0.0271)	(0.0380)
DebtLn	0.412***	0.320***	0.309***	0.273***	0.303***	0.275***
	(0.0640)	(0.0670)	(0.0644)	(0.102)	(0.0644)	(0.105)
Balance	-0.0122	-0.0119	-0.00858	-0.00330	-0.00945	-0.00301
	(0.0104)	(0.0109)	(0.0103)	(0.0136)	(0.0103)	(0.0139)
GrowthLn (-1)		-0.123**	-0.119***	-0.165**	-0.115**	-0.165**
		(0.0477)	(0.0450)	(0.0638)	(0.0450)	(0.0641)
Effectiveness			-0.494***	-0.408***	-0.476***	-0.409***
			(0.0677)	(0.0933)	(0.0684)	(0.0941)
InterestLn				0.242***		0.244***
				(0.0701)		(0.0733)
InflationLn					0.0122	-0.000988
					(0.00759)	(0.00965)
Constant	4.211***	4.699***	4.685***	4.368***	4.637***	4.361***
	(0.227)	(0.258)	(0.248)	(0.414)	(0.249)	(0.420)
N	435	389	386	227	386	227
R^2	0.146	0.142	0.243	0.250	0.249	0.250
$\bar{R}^2$	0.140	0.134	0.234	0.229	0.237	0.226
F	24.54	15.95	24.46	12.21	20.90	10.42

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The suffix "Ln" indicates that the variable has been log-transformed

B. Fixed effects estimates. In this subsection, we use the fixed effects estimator to test our hypothesis. Our results are given in Table 5.5. When we control for government debt, fiscal balance, GDP growth, government effectiveness, and nominal interest rate, each additional IFD appears to cause SBS to expand by about 1.3 percent (Column 1). When we add gross domestic saving, nominal exchange rate, and foreign direct investment to our model, the coefficient on SBS swells to about 2.3 percent (Column 2). While these effects are not statistically significant, the positive correlation between IFDs and SBS does not conform to the theoretical expectations. Nonetheless, all

the control variables in these models maintain their theoretically plausible signs and, in the case of government debt, GDP growth, and interest rate (Columns 1-2), the effects observed are statistically significant. In Column 2, we find that a 1 percent increase in the number of units of local currency against the US dollar leads to about 0.3 percent increase in SBS. Similarly, a 1 percent increase in FDI results in a 0.03 percent reduction in SBS. These effects are not statistically significant, though.

In Part B of the table, we test the relationship by adding the squared term of the variable "IFDCount" to account for possible nonlinearities in the relationship between the number of IFDs implemented and sovereign bond spreads. The estimated coefficients for IFDCount and $IFDCount^2$ are interpreted in conjunction as both refer to the impact of the number of IFDs implemented on SBS. Here, we find that the relationship between IFDs and SBS changes to the theoretically justified inverse one: with each additional IFD implemented, SBS shrink between 22 and 26 percent (Part B). In addition, the coefficient $IFDCount^2$ shows a positive and significant correlation between IFDs and SBS (Column 4). The effect of both the level and squared variables together indicates that when the number of IFDs is smaller, they result in a decrease in sovereign bond spreads; but as governments pile on more IFDs, their SBS reach a tipping point beyond which each additional IFD results in an increase in the country's SBS. This U-shaped relationship is plotted in Figure 5.1. The SBS curve illustrates that the beneficial change in spreads hits a tipping point when the number of IFDs reaches 1.8, and beyond which the beneficial effect begins to abate and soon reaches a point where it becomes detrimental to have more IFDs.

In Part C of the table, we interact the number of IFDs (the variable IFDCount) with government debt. Again, although insignificant at the conventional levels, the results show that, when government debt is not factored in, each additional IFD leads to a reduction in the SBS between 11 and 17 percent. On the other hand, for both the IFDers and non-IFDers, each 1 percent increase in government debt leads to an expansion in the spreads by about 0.4 percent. For IFDers, each incremental rise in debt leads to a comparatively much smaller increase in their SBS (up to 0.05 percent). In addition, in both the models (Columns 5-6) all our control variables, except "Saving," maintain the direction of their relationship with SBS. Also, when we add the interaction term to the model, the variables for debt, GDP growth and interest rate largely continue to maintain the statistical significance observed in Column 4.

Table 5.5: ***Fixed Effects Regressions on Number of IFDs***

	EMBIGLn							
	A		B		C		D	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IFDCount	0.0128	0.0230	-0.221	-0.259*	-0.173	-0.114	-0.714*	-0.710
	(0.0553)	(0.0662)	(0.157)	(0.151)	(0.411)	(0.472)	(0.419)	(0.481)
$IFDCount^2$			0.0592*	0.0719**			0.0769**	0.0861**
			(0.0317)	(0.0298)			(0.0373)	(0.0368)
DebtLn	0.462**	0.452*	0.458**	0.443**	0.394**	0.400*	0.302*	0.294
	(0.214)	(0.241)	(0.185)	(0.201)	(0.192)	(0.203)	(0.169)	(0.182)
IFDCount*DebtLn					0.0523	0.0390	0.119	0.113
					(0.103)	(0.121)	(0.0811)	(0.0969)
Balance	-0.0273	-0.0211	-0.0260	-0.0162	-0.0284	-0.0217	-0.0281	-0.0170
	(0.0170)	(0.0202)	(0.0169)	(0.0191)	(0.0171)	(0.0203)	(0.0171)	(0.0187)
GrowthLn (-1)	-0.103***	-0.120***	-0.109***	-0.131***	-0.101***	-0.118**	-0.107**	-0.127**
	(0.0349)	(0.0411)	(0.0373)	(0.0434)	(0.0363)	(0.0428)	(0.0398)	(0.0458)
Effectiveness	-0.369	-0.210	-0.431	-0.228	-0.373	-0.227	-0.458	-0.279
	(0.417)	(0.404)	(0.388)	(0.372)	(0.411)	(0.393)	(0.370)	(0.357)
InterestLn	0.300**	0.284**	0.292**	0.267**	0.298**	0.283**	0.286**	0.259**
	(0.120)	(0.134)	(0.114)	(0.124)	(0.118)	(0.132)	(0.108)	(0.117)
SavingLn		0.00889		-0.0666		0.0249		-0.0354
		(0.170)		(0.149)		(0.177)		(0.151)
XchangeLn		0.290		0.381		0.290		0.397*
		(0.227)		(0.232)		(0.221)		(0.211)
FDILn		-0.0307		-0.0211		-0.0314		-0.0212
		(0.0231)		(0.0239)		(0.0232)		(0.0249)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.732**	2.269	2.790***	2.401*	3.005***	2.426*	3.427***	2.882**
	(1.008)	(1.434)	(0.885)	(1.339)	(0.882)	(1.298)	(0.749)	(1.201)
N	227	212	227	212	227	212	227	212
Number of Groups	30	28	30	28	30	28	30	28
R^2	0.657	0.672	0.669	0.689	0.659	0.673	0.676	0.694
$\bar{R}^2$	0.618	0.626	0.629	0.643	0.618	0.625	0.635	0.647
F	14977	.	52256	.	183144	.	18114	.

Cluster-robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The suffix "Ln" indicates that the variable has been log-transformed

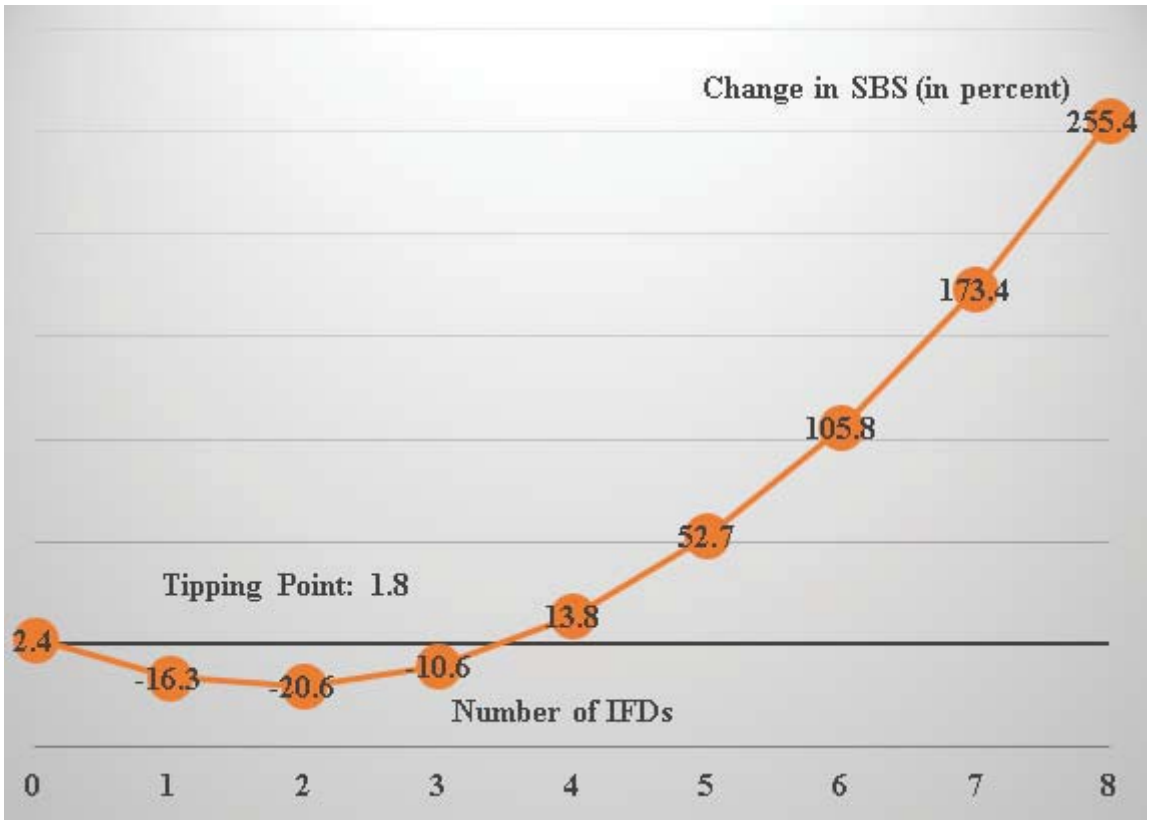

Figure 5.1: **Sovereign Bond Spreads and Number of IFDs**

Finally, in Part D of Table 5.5, we add both an interaction term for the number of IFDs and government debt and a squared term for the total number of IFDs ($IFDCount^2$). In other words, we merge the specifications in Parts B and C to create our new specifications in Part D in order to observe the concomitant effect of the *interaction* and the *squared* terms. Our results convey that introduction of each additional IFD drives the spreads down by about 71 percent. This is a huge change and it is also significant at the 10 percent level (Column 7). We plot the effect of the squared term "$IFDCount^2$" to find the tipping point after which adding more IFDs would be counterproductive for a country's spreads (Figure 5.2). The graph indicates that each additional IFD has a beneficial effect on SBS until their number crosses the tipping point of 4.1 IFDs.

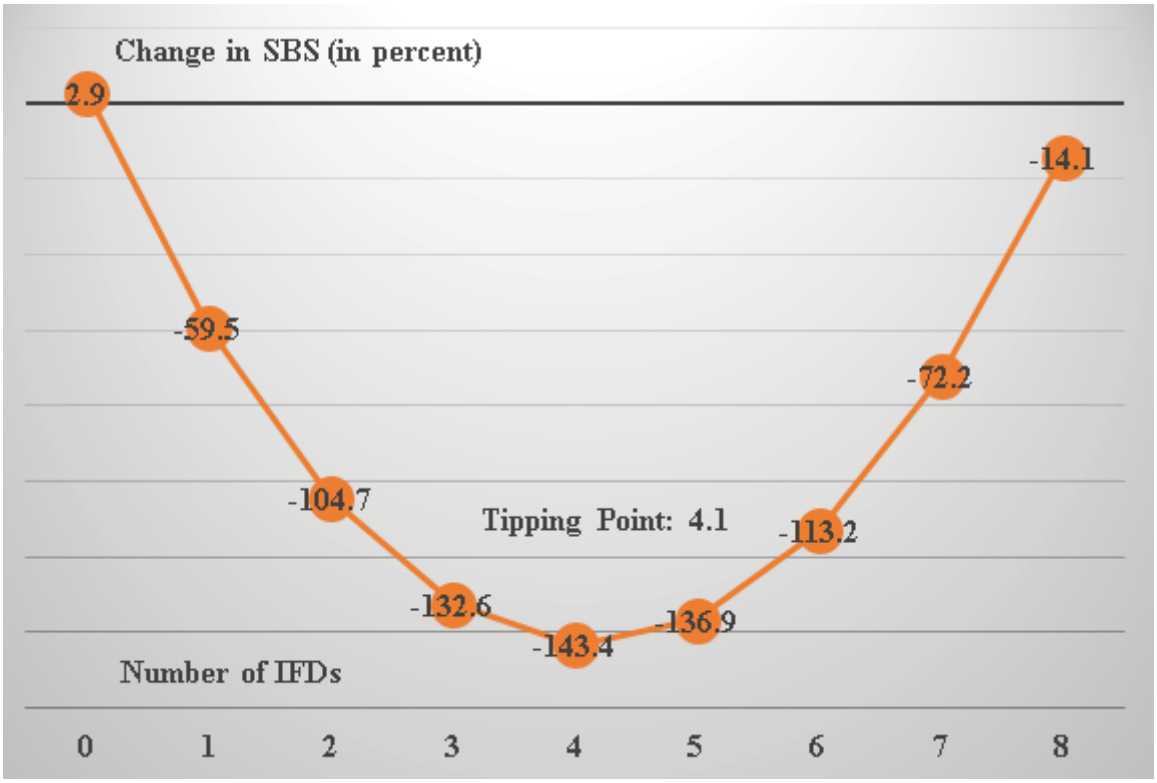

Figure 5.2: **Sovereign Bond Spreads and Number of IFDs (with Interaction Term)**

Our interaction term for IFDs and debt in Part D of the table portrays the similar effects as in Part C. The results show that the combined effect of IFDs and debt on SBS remains positive, though not statistically significant. These results indicate that, in developing countries, effects of fiscal indiscipline linger long, even after they choose to implement IFDs.

We undertake a sensitivity analysis of our results discussed in Table 5.5 by running the same regressions this time with minimum 5 years since a country implemented the first of its IFDs (i.e. with $T \geq 5$). The results are given in *Appendix B-IV*. These results are not much different from those given in Table 5.5. All the variables used in the analysis maintain their direction of correlation with SBS, and with the statistical

significance not varying much. These results indicate that countries that recently adopted IFDs (with $T \leq 5$) do not much skew the results obtained for the total sample.

Although all our coefficients from the fixed effects estimates in this part are correctly signed, they are not found to be statistically significant. We suspect that the underlying processes in our data may involve idiosyncratic patterns of autocorrelation and heteroskedasticity, which call for the use of a more advanced estimator. In the next part, we use the System GMM estimator to try to deal with some of these problems.

C. System GMM estimates. In Table 5.6 we run more regressions to see how our hypothesis performs when tested with the System GMM estimator. As with our previous *static* regressions with SGMM, we limit our estimations to the one-step technique and use the 2-2, 3-3, and 4-4 GMM lags. We also run these regressions with and without the time dummies. However, without the year dummies in our model, we get both quantitatively and statistically insignificant results. Our regressions with the time fixed effects are reported in Part B of the table. Mostly, we get statistically significant coefficients on IFDs and find that each additional IFD leads SBS to shrink between 2.2 and 5.3 percent.

Adding the year dummies, however, causes the variable for budget balance to be positively, and significantly, correlated with SBS, which does not conform to the theoretical expectations. In both situations (with and without the year dummies), many control variables, such as government debt, GDP growth, government effectiveness and interest rate have correct signs and are statistically significant. The only theoretically conflicting result obtained (in addition to the budget balance variable) is regarding exchange rate, which has taken a negative sign, indicating that SBS shrink as exchange rate depreciates. However, the result is not statistically significant.

Table 5.6: ***System GMM Regressions on Number of IFDs***

	EMBIGLn					
	A			B		
	Lags 2-2	Lags 3-3	Lags 4-4	Lags 2-2	Lags 3-3	Lags 4-4
	(1)	(2)	(3)	(4)	(5)	(6)
IFDCount	-0.0167	0.00237	-0.0148	-0.0433**	-0.0220	-0.0416**
	(0.0310)	(0.0325)	(0.0320)	(0.0188)	(0.0197)	(0.0194)
DebtLn	0.298***	0.330***	0.302***	0.579***	0.555***	0.501***
	(0.100)	(0.0990)	(0.0917)	(0.0635)	(0.0619)	(0.0553)
Balance	0.00780	0.0108	0.0109	0.0317***	0.0316***	0.0269***
	(0.0129)	(0.0128)	(0.0126)	(0.00802)	(0.00791)	(0.00758)
GrowthLn (-1)	-0.152***	-0.154***	-0.139***	-0.0896***	-0.103***	-0.0937***
	(0.0492)	(0.0487)	(0.0485)	(0.0327)	(0.0325)	(0.0319)
Effectiveness	-0.335***	-0.385***	-0.416***	-0.375***	-0.427***	-0.476***
	(0.0904)	(0.0882)	(0.0903)	(0.0559)	(0.0535)	(0.0554)
InterestLn	0.298***	0.287***	0.272***	0.245***	0.240***	0.183***
	(0.0617)	(0.0606)	(0.0621)	(0.0417)	(0.0406)	(0.0421)
SavingLn	-0.0723	-0.0566	-0.0802	-0.0257	-0.0197	-0.0350
	(0.0784)	(0.0807)	(0.0774)	(0.0467)	(0.0477)	(0.0451)
XchangeLn	-0.0260	-0.0258	-0.0334	-0.0234*	-0.0202	-0.0271**
	(0.0226)	(0.0225)	(0.0224)	(0.0133)	(0.0132)	(0.0130)
FDILn	-0.0163	-0.00588	-0.00680	-0.0259	-0.0196	-0.0170
	(0.0307)	(0.0315)	(0.0307)	(0.0197)	(0.0199)	(0.0193)
Year Dummies	No	No	No	Yes	Yes	Yes
Constant	4.424***	4.260***	4.480***	0	2.542***	2.967***
	(0.539)	(0.536)	(0.496)	(0)	(0.410)	(0.380)
N	212	212	212	212	212	212
Number of Groups	28	28	28	28	28	28
Instruments	155	155	153	155	155	153
AR-2	-3.921	-3.495	-3.538	-0.379	-0.484	-0.473
AR-2 p-value [a]	8.81e-05	0.000474	0.000403	0.705	0.628	0.636
Sargan	345.9	329.3	350.5	542.8	499.4	591.6
Sargan df	145	145	143	124	124	122
Sargan p-value [b]	0	0	0	0	0	0

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The suffix "Ln" indicates that the variable has been log-transformed

[a] Test for 2nd order serial correlation (null hypothesis of no autocorrelation of residuals)

[b] Test for the null hypothesis that identifying restrictions are valid

Gmmstyle instruments: l.EMBIGLn IFD DebtLn Effectiveness InterestLn

Ivstyle instruments: Balance l.GrowthLn SavingLn XchangeLn FDILn

III. How the stringency of IFDs affects sovereign bond spreads

In this section, we turn to *Hypothesis 3*:

More stringent IFDs effect larger reductions on sovereign bond spreads of developing countries.

A. Ordinary Least Squares estimates. We begin to test this hypothesis with the ordinary least squares estimator. The results reported in Table 5.7 show theoretically explained signs on the coefficients on the variable FRI (Columns 1-6), which measures the stringency of IFDs. As IFDs become more stringent, the sovereign bond spreads experience a reduction of 6 to 14 percent and the results are mostly significant. The variable "Debt" shows a predicted positive correlation with SBS, which is highly significant too. When a developing country's GDP grows by 1 percent, its SBS shrinks by 0.12 to 0.17 percent, significant at the 1 percent level. The variable for budget balance in these columns shows an expected negative, albeit statistically insignificant, correlation with SBS. When we control for interest rate, we find that the coefficient on FRI loses its statistical significance (Columns 4 and 6), but the coefficient on "Interest" acquires a correctly signed and highly significant correlation with SBS.

Table 5.7: ***OLS Regressions on Strength of IFDs***

	EMBIGLn					
	(1)	(2)	(3)	(4)	(5)	(6)
FRI	-0.0983***	-0.136***	-0.0586*	-0.0550	-0.0723**	-0.0551
	(0.0324)	(0.0336)	(0.0338)	(0.0431)	(0.0347)	(0.0472)
DebtLn	0.412***	0.317***	0.308***	0.270***	0.300***	0.270**
	(0.0639)	(0.0666)	(0.0645)	(0.102)	(0.0645)	(0.105)
Balance	-0.0120	-0.0114	-0.00859	-0.00314	-0.00949	-0.00316
	(0.0104)	(0.0108)	(0.0103)	(0.0136)	(0.0103)	(0.0139)
GrowthLn (-1)		-0.133***	-0.122***	-0.171***	-0.119***	-0.171***
		(0.0476)	(0.0452)	(0.0643)	(0.0451)	(0.0645)
Effectiveness			-0.483***	-0.394***	-0.460***	-0.394***
			(0.0699)	(0.0955)	(0.0710)	(0.0969)
InterestLn				0.239***		0.239***
				(0.0702)		(0.0737)
InflationLn					0.0128*	7.34e-05
					(0.00767)	(0.00977)
Constant	4.216***	4.737***	4.691***	4.402***	4.646***	4.402***
	(0.227)	(0.258)	(0.248)	(0.417)	(0.249)	(0.424)
N	435	389	386	227	386	227
R^2	0.148	0.152	0.242	0.251	0.248	0.251
$\bar{R}^2$	0.142	0.143	0.232	0.231	0.236	0.227
F	24.94	17.21	24.31	12.30	20.82	10.50

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The suffix "Ln" indicates that the variable has been log-transformed

From the results in Table 5.7 we find that a country's spreads shrink by 39 to 48 percent its government's capability to implement IFDs (government effectiveness) increase by 1 percent. In Column 5, we replace interest rate with CPI inflation and find that the coefficient on FRI again becomes statistically significant and that on "Inflation" this time acquires the correct sign and becomes significant within the 90 percent confidence interval (Column 5). In Column 6, we include both interest rate and CPI inflation and find that the variable FRI, although continues to be correctly signed, again loses its statistical significance; while the coefficient on interest rate continues to be

significant at the 1 percent level. But, in presence of interest rate, "Inflation" loses its statistical significance.

B. Fixed effects estimates. Now we test our third hypothesis with the fixed effects estimator. Our estimates with cluster-robust standard errors are reported in Table 5.8. The direction of the correlation between FRI and SBS in our results is not found to be constant (Part A); but the results are not statistically significant at any of the usual levels of significance. All other variables in these models, however, largely maintain their theoretically plausible direction of correlation with SBS and, in case of government debt, GDP growth and interest rate, they are statistically significant as well. In Columns 3 and 4, we add an interaction term to ascertain the joint effect of stronger rules (FRI) and government debt. The presence of the interaction term does not much change the direction, or significance, of the correlation between FRI and SBS, on one hand; and between FRI and most of the control variables, on the other. However, the interaction term establishes that for an IFDer with more stringent rules in place, each unit increase in its debt leads to a slightly higher increase in its SBS than for a non-IFDer (Column 3) – although the finding is not statistically significant. But when we use our fully developed model, with all our control variables (Column 4), the effect of the interaction term becomes meaningful in that, with each unit increase in debt, the SBS of a non-IFDer developing country expands by 0.47 percent while that of an IFDer expands by 0.46 percent – thus, an IFDer has to pay 0.01 percent less in the premium on each unit increase in its government debt.

Next, we retest our models by adding the square of FRI (FRI^2). The results reported in Part B of Table 5.8 show that the variable FRI takes on a negative sign

(indicating an inverse correlation with SBS). Though these results are not found to be statistically significant, the coefficient on the term FRI^2 acquires a fairly high statistical significance. As the correlation between FRI^2 and SBS is found to be direct (or positive), the effect of FRI on SBS continues to change with each unit change in its stringency.

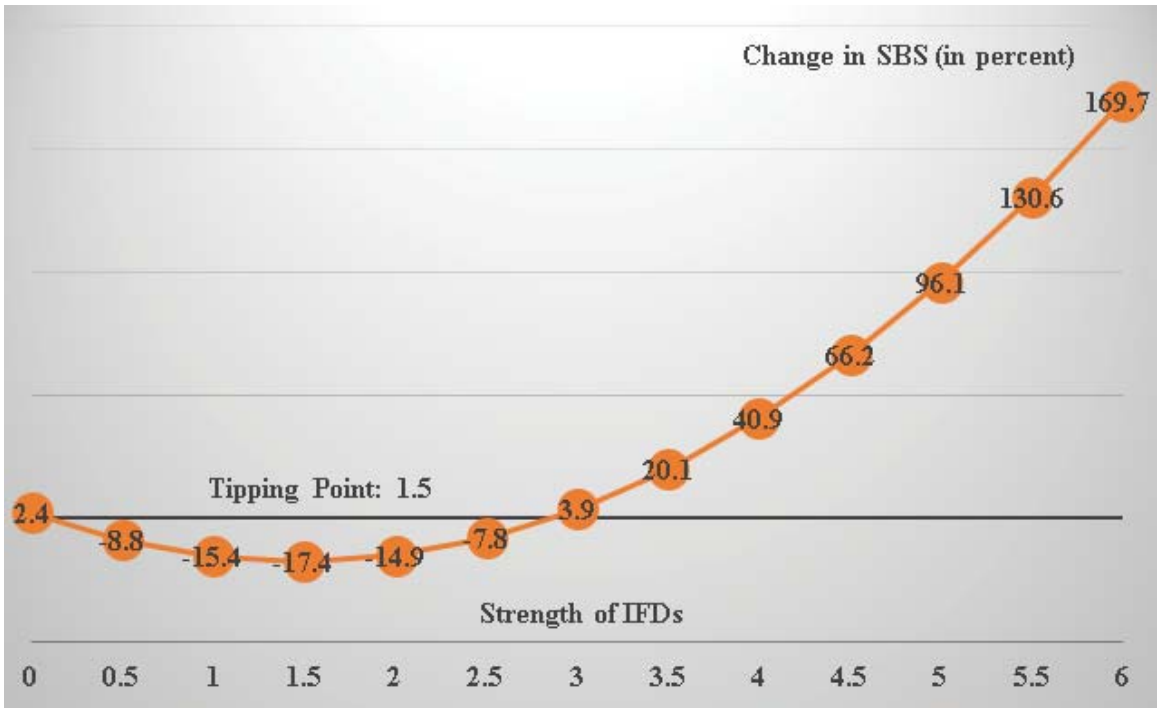

Figure 5.3: **Sovereign Bond Spreads and Strength of IFDs**

The joint effect of the level and squared forms of "FRI" indicates that IFDs result in tiny contractions in sovereign bond spreads with each unit increase in their stringency. But beyond a tipping point any further increase in the stringency results in a less marginal inverse (beneficial) effect on SBS. Figure 5.3 plot these effects for our model in Column 6. Figure 5.4 plots the effects of the squared term when we also include in the model the interaction term for FRI and debt (Column 8). Our results suggest that the tipping points

beyond which the strength of IFDs begin to be less effective range between 1.5 and 2.8, depending on other control variables included in the analysis.

Table 5.8: ***Fixed Effects Regressions on Strength of IFDs***

	EMBIGLn							
	A				B			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FRI	0.0392	0.0555	-0.0147	0.0859	-0.220	-0.269	-0.543	-0.557
	(0.0601)	(0.0757)	(0.406)	(0.436)	(0.162)	(0.158)	(0.388)	(0.442)
FRI^2					0.0716*	0.0913**	0.0825**	0.101**
					(0.0364)	(0.0339)	(0.0394)	(0.0393)
DebtLn	0.471**	0.459*	0.454*	0.469*	0.452**	0.439**	0.358*	0.354*
	(0.217)	(0.242)	(0.229)	(0.244)	(0.186)	(0.200)	(0.194)	(0.207)
FRI*DebtLn			0.0152	-0.00867			0.0797	0.0725
			(0.106)	(0.117)			(0.0833)	(0.0945)
Balance	-0.0282	-0.0213	-0.0286	-0.0211	-0.0288*	-0.0172	-0.0312*	-0.0183
	(0.0172)	(0.0202)	(0.0172)	(0.0200)	(0.0160)	(0.0184)	(0.0164)	(0.0180)
GrowthLn (-1)	-0.0974***	-0.114***	-0.0967***	-0.115***	-0.0917**	-0.110**	-0.0872**	-0.105**
	(0.0326)	(0.0385)	(0.0340)	(0.0394)	(0.0343)	(0.0417)	(0.0359)	(0.0431)
Effectiveness	-0.354	-0.190	-0.355	-0.187	-0.435	-0.236	-0.452	-0.265
	(0.423)	(0.410)	(0.422)	(0.407)	(0.387)	(0.372)	(0.377)	(0.365)
InterestLn	0.297**	0.281**	0.297**	0.281**	0.298**	0.276**	0.298**	0.276**
	(0.117)	(0.130)	(0.117)	(0.131)	(0.116)	(0.127)	(0.115)	(0.127)
SavingLn		0.00253		-0.000293		-0.0840		-0.0696
		(0.170)		(0.168)		(0.153)		(0.151)
XchangeLn		0.310		0.310		0.394		0.401*
		(0.225)		(0.227)		(0.236)		(0.227)
FDILn		-0.0298		-0.0297		-0.0156		-0.0148
		(0.0231)		(0.0230)		(0.0248)		(0.0255)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.705**	2.224	2.774**	2.193	2.772***	2.383*	3.140***	2.654*
	(1.026)	(1.472)	(1.058)	(1.462)	(0.915)	(1.379)	(0.909)	(1.354)
N	227	212	227	212	227	212	227	212
Number of Groups	30	28	30	28	30	28	30	28
R^2	0.658	0.674	0.658	0.674	0.670	0.691	0.672	0.692
$\bar{R}^2$	0.619	0.628	0.618	0.626	0.630	0.645	0.631	0.645
F	20901	.	22297	.	10655	.	2168	.

Cluster-robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The suffix "Ln" indicates that the variable has been log-transformed

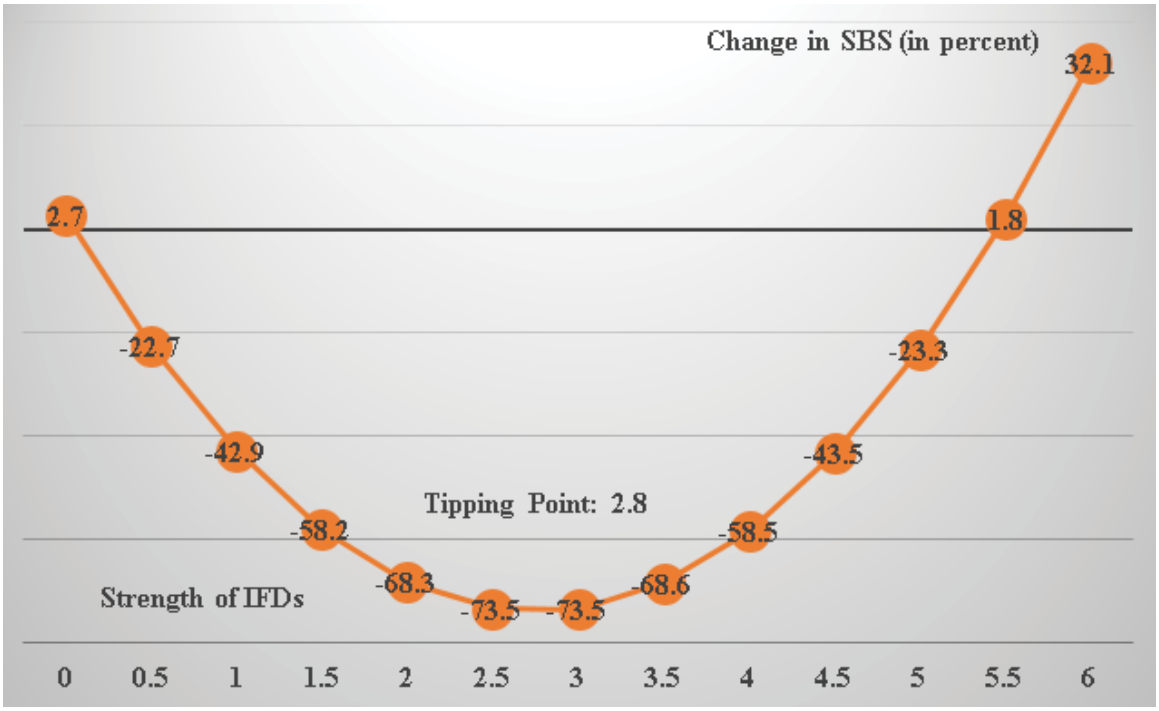

Figure 5.4: **Sovereign Bond Spreads and Strength of IFDs (with interaction term)**

C. System GMM estimates. Finally, we subject our third hypothesis to the Blundell-Bond System GMM estimations. We repeat the same one-step estimations that we performed on our first two hypotheses. Our results are reported in Table 5.9. The results from the regressions without the year dummies (Part A) show that as IFDs become stronger or more stringent, they cause the spreads to shrink. These effects become statistically significant when we add year fixed effects to our model (Part B).

Table 5.9: ***System GMM Regressions on Strength of IFDs***

	EMBIGLn					
	A			B		
	Lags 2-2	Lags 3-3	Lags 4-4	Lags 2-2	Lags 3-3	Lags 4-4
	(1)	(2)	(3)	(4)	(5)	(6)
FRI	-0.0369	-0.00948	-0.0177	-0.0665***	-0.0391*	-0.0557**
	(0.0368)	(0.0385)	(0.0384)	(0.0223)	(0.0235)	(0.0234)
DebtLn	0.280***	0.315***	0.287***	0.570***	0.544***	0.481***
	(0.0993)	(0.0985)	(0.0919)	(0.0633)	(0.0621)	(0.0557)
Balance	0.00583	0.00959	0.0111	0.0313***	0.0316***	0.0268***
	(0.0128)	(0.0126)	(0.0124)	(0.00800)	(0.00788)	(0.00756)
GrowthLn (-1)	-0.153***	-0.156***	-0.142***	-0.0905***	-0.108***	-0.100***
	(0.0495)	(0.0491)	(0.0489)	(0.0331)	(0.0330)	(0.0324)
Effectiveness	-0.321***	-0.370***	-0.410***	-0.356***	-0.404***	-0.457***
	(0.0917)	(0.0896)	(0.0909)	(0.0569)	(0.0548)	(0.0561)
InterestLn	0.289***	0.289***	0.270***	0.244***	0.249***	0.182***
	(0.0618)	(0.0606)	(0.0621)	(0.0420)	(0.0408)	(0.0423)
SavingLn	-0.0779	-0.0580	-0.0823	-0.0314	-0.0224	-0.0382
	(0.0782)	(0.0804)	(0.0775)	(0.0467)	(0.0478)	(0.0453)
XchangeLn	-0.0289	-0.0263	-0.0336	-0.0274**	-0.0217	-0.0288**
	(0.0227)	(0.0226)	(0.0225)	(0.0134)	(0.0134)	(0.0131)
FDILn	-0.0152	-0.00489	-0.00563	-0.0245	-0.0169	-0.0147
	(0.0307)	(0.0316)	(0.0308)	(0.0197)	(0.0200)	(0.0194)
Year Dummies	No	No	No	Yes	Yes	Yes
Constant	4.541***	4.326***	4.553***	2.487***	2.570***	0
	(0.539)	(0.535)	(0.499)	(0.418)	(0.412)	(0)
N	212	212	212	212	212	212
Number of Groups	28	28	28	28	28	28
Instruments	155	155	154	155	155	154
AR-2	-4.110	-3.498	-3.532	-0.380	-0.492	-0.515
AR-2 p-value [a]	3.95e-05	0.000469	0.000412	0.704	0.623	0.607
Sargan	345.7	328.2	352.3	537.6	495.6	592.3
Sargan df	145	145	144	124	124	123
Sargan p-value [b]	0	0	0	0	0	0

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The suffix "Ln" indicates that the variable has been log-transformed

[a] Test for 2nd order serial correlation (null hypothesis of no autocorrelation of residuals)

[b] Test for the null hypothesis that identifying restrictions are valid

Gmmstyle instruments: l.EMBIGLn IFD DebtLn Effectiveness InterestLn

Ivstyle instruments: Balance l.GrowthLn SavingLn XchangeLn FDILn

IV. Summary of the findings

This study has investigated the role of institutions of fiscal discipline (IFDs) on sovereign bond spreads (SBS) of a set of 33 developing and emerging countries. It has attempted to explore the question: *Does increased fiscal discipline reduce sovereign borrowing costs for developing countries?*

The empirical analysis in the current chapter dealt with the following three hypotheses:

H1: Presence of an IFD reduces sovereign borrowing costs for developing countries.

H2: Each additional IFD further reduces SBS of developing countries.

H3: More stringent IFDs effect larger reductions on sovereign bond spreads of developing countries.

We used the OLS, fixed effects and Blundell-Bond System GMM estimators to test each of these hypotheses. From our results, by and large, we were able to reject the null that IFDs do not have a beneficial effect on SBS of developing countries. Our naïve OLS estimates provided ample evidence to support our hypotheses. But, since naïve estimates usually contain bias as they ignore factors other than treatment effect that influence the outcome, we use those results just as reference points.

Our results with the fixed effects lacked statistical significance, but showed a theoretically correct, inverse, correlation with the SBS, buttressing the OLS findings. The fixed effects estimates would acquire considerable statistical significance if the unidirectional nature of the hypotheses is considered and the coefficients obtained are subjected to one-tailed *t-tests*. Such a test, by focusing on just one direction could attribute enhanced significance to the observed effects. But it is computationally

cumbersome to undertake a one-tailed significance test with Stata – more so when the analysis involves several specifications of each model. In this backdrop, while restricting ourselves to the two-tailed test for our hypotheses, we can consider statistically significant the results that are close to the 10 percent significance level.[54] However, the most important evidence in favor of our hypotheses came from the one-step regressions with the Blundell-Bond System GMM estimator, which consistently showed an inverse (beneficial), and quite significant, effect of IFDs on SBS.

[54] Generally, the easier way to deal with one-tailed hypotheses is to halve the obtained p-statistic to determine the coefficient's statistical significance.

Chapter 6: Conclusions

Our estimations have produced fairly strong support for a beneficial effect of IFDs on SBS of developing countries. Even in cases where the results are not statistically significant, the direction of the effect is found to be negative – implying that when countries implement IFDs, their SBS experience a decline. An interesting finding of this study is that the effectiveness of IFDs in developing countries also depends on their count and strength. Too much of fiscal discipline in these countries – characterized by numerous and/ or more stringent IFDs – may turn out to be counterproductive. Our results show that as the quantity of IFDs implemented increase, the positive effect of fiscal discipline begins to taper off and, at some point, it ceases to be rewarding.

Our results agree with our third hypothesis that as IFDs get tighter (or more stringent), their beneficial effects on SBS continue to increase. This is in line with the finding that stricter fiscal rules result in stronger fiscal performance for advanced countries (Debrun et al., 2008b). However, our results also show that, for developing countries, too much discipline (tighter IFDs) can be counterproductive after a certain threshold. After a tipping point is reached, any further enhancements in the stringency of IFDs start to have less positive impact and ultimately become harmful.

In Chapter 2, we discussed IFDs in the light of suboptimal policies by the government. We also attempted to explain the factors behind lax policymaking. The main cause can be as simple as ignorance from long-term effects of suboptimal policies. It can also be as wicked as attempting to secure political mileage and serving personal interests. Imperfect optimization (Congdon et al., 2011) does not just influence the behavior of ordinary citizens, it is equally relevant in the context of creating policies. Desire to be

reelected makes politicians susceptible to pressure from lobbies and specialized groups. Because fiscal behavior of politicians affects millions of people and transforms the destinies of generations, there is no alternative to subjecting fiscal policy-making to strict institutional controls.

As highlighted in detail, IFDs play a major role in the life of nations and of countries at various levels of governance. They keep in check the behavior of politicians. Fiscal discipline can go a long way in ensuring intergenerational equity, as continually running high budget deficits would ultimately burden the next generations with excessive taxation. IFDs offer valuable insights to investors about the macroeconomic fundamentals of the country enabling them to make more informed investment decisions. We have cited several empirical studies that highlight the role of IFDs as signaling devices for the market about the credibility of the government regarding fiscal discipline (Debrun et al., 2008a; Kaufmann et al., 2010; and Andrews et al., 2014). This information creates a distinct indirect "channel" that influences borrowing costs in addition to the direct impact on these costs of the performance of fiscal variables, for investors base their investment decisions on anticipated changes in fiscal fundamentals of a country. As such, the types and quality of available fiscal institutions "reveal" the government's fiscal policy preferences (Debrun et al., 2008a).

Presence of fiscal institutions can give politicians a potent justification to disallow unreasonable demands of interest groups and specialized lobbies and constituencies. But, even more, the very presence of such institutions will discourage vested interests from expecting undue favors of elected representatives. Fiscal institutions can also serve as a

keystone of "choice architect" with smart defaults (Thaler & Sunstein, 2009, p. 95) that may tie the hands of policymakers (Debrun et al., 2008b).

While plenty empirical evidence is available regarding benefits of IFDs, nothing has come forth so far indicating that IFDs are detrimental to a country's economy. Even if they were not found to have any beneficial economic effects on SBS, simple presence of IFDs would tie the hands of politicians (Alesina & Peroti, 1995; Debrun et al., 2008b) of developing countries with weak political and governance institutions against any fiscal and financial "populism" (Webb, 2004). Developing countries, therefore, should consider adopting an IFD credibly, but provisionally, and carefully monitoring the effects on SBS, relative to those of similarly-situated countries. Institutions of fiscal discipline need to be adopted as part of a larger consolidation package that should also include public financial management (PFM) systems.

I. The contribution of this study

This study contributes to the literature in several ways. First, we expand the analysis of the effects of institutions of fiscal discipline on sovereign bond spreads – which was largely confined to advanced countries and, to a limited extent, to emerging economies – to a larger set of developing countries. Second, to the best of our information, this is the first study to use the IMF's Fiscal Rules database to study the impact of fiscal rules on the sovereign bond spreads of even the emerging economies, not to mention all the developing countries featured in our analyses. A data set similar to the IMF's fiscal rules index developed by the European Commission has been available and used in a number of studies (e.g., Iara & Wolff, 2011; Afonso & Guimarães, 2014; Heinemann et al., 2014). But that data set – and the studies based on it – covers only the

countries of the European Union. So, our study appears to be the first to make use of the IMF's both fiscal rules data set and fiscal rules Index to study the impact of fiscal discipline on a larger set of developing countries.

Another unique aspect to this study is its treatment of fiscal policy adventures from a "behavioral public finance" perspective. Behavioral public finance is bringing together politics and behavioral economics within the realm of public policy. Further, we do not know of any other noteworthy study that has employed the Emerging Market Bond Index Global (EMBIG) to study the behavior of developing country bond yields in response to the fiscal policy choices these countries make. It also goes to the credit of this paper that it uses the Blundell-Bond System GMM technique to study the effects of fiscal discipline measures on sovereign bond spreads.

Fiscal institutions is a dynamic concept subject to innovation and reform. New and better fiscal institutions keep emerging based on the past experience and new data on the effectiveness and weaknesses of the existing institutions. The availability of more reliable and diverse data kindles the desire to develop better, more sophisticated, fiscal institutions.

It is pertinent to point out that the IMF has been engaged in designing next-generation fiscal rules that will simultaneously meet the objectives of long-term sustainability and short-term flexibility (Schechter et al., 2012). Our study offers insights to governments and international institutions as to how to tailor fiscal institutions of the future to be more effective in various individual country-settings and different economic-development stages.

II. Problems encountered in the research

While undertaking this research, we encountered a number of issues – some of which we were able to easily tackle – but a few of them turned out to be trickier. First, we needed a reliable, and long enough time series data set on "country risk" to control for various risk factors attributed to countries in various stages of their economic development. In the absence of a representative panel variable to control for country risk, we had to settle on foreign direct investment (FDI) as a proxy for the "risk." The logic behind using FDI here is that international investors avoid places they consider risky on various counts.

The second problem we encountered was related to the institutional differences between the countries under our study. Fiscal institutions can take a variety of forms. As we saw in our literature review the effectiveness and success of contemporary institutions depend on the historical trajectory of institutional development of a nation (Acemoglu & Robinson, 2012). Political variables such as electoral system and the number of parties in coalition governments too may affect the nature and behavior of fiscal institutions (Strauch, Hagen & Hallerberg, 2009). A study like this therefore has to build in its research design techniques to deal with sociopolitical and economic and institutional diversities among the countries. But more difficult to tackle than the inter-country heterogeneity is the endogenous nature of fiscal policy itself. Because of these differences, it is possible that the positive correlations we observe regarding the effects of IFDs on SBS result due to a collective influence of omitted variables, giving a misleading impression of a strong causal linkage.

III. Further research

Our research can be augmented in several ways. First, more elaborate panels, with longer time series, as they become available, will go a long way in isolating the true impact of fiscal policy on sovereign bond spreads. The data on bond spreads of several developing countries are not available. Reliable data on the impact of IFDs that several developing countries have recently introduced will begin to be available after a few years; it will substantially increase the statistical power of the study.

To determine the true impact of IFDs on SBS, it was important to control for both transparency in government and the level of risk attributed to each of the countries. However, we could not lay our hands on long-and rich-enough data sets on budget transparency and country risk for developing countries. We hope that over next few years the currently available data sets on the two variables will be made more comprehensive in terms of their inclusiveness and length of time series, affording better opportunities for research.

Poterba and Hagen (1999) insist that the single most pressing problem in the analysis of the effects of fiscal policy relates to endogeneity. Our attempt to use the Blundell-Bond System GMM is a small step but in the right direction. We are not satisfied with the robustness of the instruments we included in our SGMM technique. The SGMM technique requires two different sets of instruments. The *gmmstyle* instruments are taken from the lags of internal variables in the model. However, the *ivstyle* instruments are supposed to be exogenous – i.e. they are correlated with the endogenous variable without directly affecting the dependent variable (Studenmund, 2006). We do not believe we could put together truly exogenous *ivstyle* instruments for our SGMM

estimations. Further work needs to be done to identify truly exogenous variables to use as *ivstyle* instruments to make the results of our SGMM estimation more reliable and robust. In addition, we had to adapt our SGMM estimator to analyze a static model – as because of serial correlation the LDV in our dynamic model tended to soak up the effects of other variables of interest. Further work, therefore, is indicated to correct the problem of serial correlation and accordingly make adjustments to use SGMM estimator for a dynamic model.

Another area of research could be to look at how other institutions impact fiscal institutions in a developing country. As Hallerberg and Wolff (2008) state that performance of fiscal institutions is contextual, there is no guarantee that one kind of fiscal institution found to be effective in one country will be equally effective in a different country. The differences in the evolution of political, social and economic institutions over the last couple of centuries in various regions, in the context of colonization and decolonization, need to be looked into and contextualized to ascertain the true effects of IFDs on macroeconomic variables, generally, and on sovereign bond spreads, particularly.

Finally, further research is recommended to determine the optimal level of the strength and count of institutions to know how much is too much. Such research will help identify the most important and primary fiscal institutions, and their dimensions, which could be termed as indispensable for all countries and those for developing countries with weak supporting institutions. As a result of such research, we may also be able to determine the scope and stringency of fiscal institutions appropriate for countries according to the level of their economic and institutional development.

IV. Concluding remarks

To abstract from our findings in this paper, institutions of fiscal discipline are as important for developing countries as they are for rich countries. However, in the complicated world we live, endogeneity is a recurring feature. Moreover, any quasi-experimental design can at best confirm the existence of correlation – rather than covariance. In this backdrop, our otherwise encouraging results regarding the effectiveness of IFDs need to be viewed with cautious optimism.

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Appendix A: Data and Descriptive Statistics

Table A-I: *Countries with IFDs*

#	Country	SBS Year	IFD Year	Total IFDs	Income
1	Argentina	1993	2000	2	2
2	Armenia	2013	2008	1	3
3	Australia	2012	1998	4	1
4	Brazil	1994	2000	2	2
5	Bulgaria	1994	2003	5	2
6	Chile	1999	2001	1	2
7	Colombia	1997	2000	2	3
8	Costa Rica	2012	2001	1	2
9	Cote d'Ivoire	1998	2000	2	4
10	Croatia	1996	2009	5	2
11	Ecuador	1995	2003	1	3
12	Gabon	2007	2002	2	2
13	Georgia	2008	2013	3	3
14	Hungary	1999	2004	2	2
15	India	2012	2004	1	3
16	Indonesia	2004	1993	2	3
17	Jamaica	2007	2010	2	3
18	Latvia	2012	2004	2	2
19	Lithuania	2009	1997	5	1
20	Malaysia	1996	1993	2	2
21	Mexico	1993	2006	2	2
22	Mongolia	2012	2013	2	3
23	Namibia	2011	2001	2	2
24	Nigeria	1993	2007	1	4
25	Pakistan	2001	2005	2	4
26	Peru	1997	2000	2	3
27	Poland	1994	1999	4	1
28	Romania	2012	2007	3	2
29	Russia	1997	2007	1	2
30	Senegal	2011	2000	2	4
31	Serbia	2005	2011	2	3
32	Slovak Republic	2013	2004	3	1
33	Sri Lanka	2007	2003	2	3

Legend	
SBS Year	The earliest year when the country featured on EMBIG
IFD Year	The earliest year when an IFD was implemented
Total IFDs	The highest number of IFDs in place at a time in any year
Income	Income group of the country (High Income: 1; Upper Middle Income/ Emerging Market: 2; Middle Income: 3; Low Income: 4

Table A-II: ***Countries without IFDs (Comparison Group)***

#	Country	SBS Year
1	Angola	2012
2	Azerbaijan	2012
3	Belarus	2010
4	Belize	2007
5	Bolivia	2012
6	China	1994
7	Dominican Republic	2001
8	Egypt	2001
9	El Salvador	2002
10	Ghana	2007
11	Guatemala	2012
12	Honduras	2013
13	Iraq	2006
14	Jordan	2011
15	Kazakhstan	2007
16	Lebanon	1998
17	Morocco	1997
18	Mozambique	2013
19	Myanmar	2011
20	Panama	1996
21	Paraguay	2013
22	Philippines, The	1997
23	South Africa	1994
24	Tanzania	2013
25	Trinidad & Tobago	2013
26	Turkey	1996
27	Ukraine	2000
28	Uruguay	2001
29	Venezuela	1993
30	Vietnam	2005
31	Zambia	2012

SBS Year: The earliest year when the country featured on EMBIG

Table A-III: *Variables Used in the Study*

Variable Name	Description	Expected Sign	Source
EMBIG	Emerging Market Bond Index Global spreads		J.P. Morgan Chase & Co./ Datastream
IFD	Institutions of Fiscal Discipline	-	Fiscal Affairs Department, IMF
IFDCount	Total number of IFDs implemented	-	Fiscal Affairs Department, IMF
FRI	Fiscal Rules Index – An index of the strength of IFDs	-	Fiscal Affairs Department, IMF
Effectiveness	Government effectiveness – A proxy for willingness to implement IFDs	-	Worldwide Governance Indicators, World Bank
Balance	Budget balance as a share of GDP	-	Government Financial Statistics, IMF; and Global Economic Monitor, World Bank
Debt	Debt-GDP ratio	+	Word Economic Outlook, IMF
FDI	Foreign direct investment as a share of GDP	-	World Development Indicators, World Bank
Growth	GDP growth	-	International Financial Statistics, IMF
Inflation	Average Consumer Price Index inflation, annual	+	World Development Indicators, World Bank
Interest	Short-term interest rate (Treasury Bills rate)	+	International Financial Statistics, IMF
Saving	Gross domestic saving as a share of GDP	-	World Economic Outlook, IMF
Xchange	Exchange-rate (local currency units per US dollar)	+	World Development Indicators, World Bank

Table A-IV: *Summary Statistics*

Variables	All countries					IFDers					Non-IFDers				
	N	Mean	Std. Dev.	Min	Max	N	Mean	Std. Dev.	Min	Max	N	Mean	Std. Dev.	Min	Max
EMBI Global Spreads*	733	5.81	0.83	3.39	8.46	234	5.68	0.99	3.39	8.44	394	5.87	0.78	3.42	8.46
Institutions of Fiscal Discipline	3171	-	-	0	1	1181	1	0	1	1	1990	0	0	0	0
Strength of fiscal rules (FRI)	3171	0.75	1.15	0	5.73	1181	2.02	1	0	5.73	1990	0	0	0	0
Effectivenes	2691	0.11	0.98	-1.98	2.43	1116	0.58	1.06	-1.78	2.43	1575	-0.22	0.75	-1.98	2.12
Balance	2027	-2.11	4.53	-24.34	33.35	888	-2.32	3.84	-19.10	20.96	1139	-1.95	5.00	-24.34	33.35
Government Gross Debt*	2570	3.78	0.79	-0.60	6.84	1114	3.84	0.76	-0.25	5.57	1436	3.73	0.82	-0.60	6.84
Foreign Direct Investment*	2912	0.92	1.32	-10.12	6.15	1099	1.13	1.35	-7.21	6.07	1729	0.79	1.31	-10.12	6.15
GDP Growth*	2690	1.36	0.87	-4.59	5.01	986	1.19	0.88	-4.59	3.64	1645	1.48	0.85	-3.65	5.01
CPI Inflation*	3042	4.89	2.48	-6.91	30.83	1178	5.02	2.82	2.98	30.83	1864	4.80	2.24	-6.91	29.94
Interest Rate*	1875	1.76	1.14	-5.81	5.78	877	1.34	1.10	-5.81	3.15	977	2.14	1.04	-2.66	5.78
Gross Domestic Saving*	2867	2.90	0.76	-3.00	4.48	1106	2.99	0.71	-2.53	4.48	1635	2.83	0.81	-3.00	4.34
Exchange Rate*	2893	2.95	2.80	-12.84	22.63	1001	3.07	2.64	-1.17	10.13	1891	2.89	2.89	-12.84	22.63

*The variable has been log-transformed

Table A-V: ***Correlations Matrix***

Variables	EMBIG*	IFD	IFDCount	FRI	Debt*	Balance	Growth*	Effectiveness	Interest*	Inflation*	Saving*	Xchange*	FDI*
EMBIG*	1.0000												
IFD	-0.2591	1.0000											
IFDCount	-0.1545	0.9012	1.0000										
FRI	-0.1914	0.8778	0.9730	1.0000									
Debt*	0.1909	-0.0514	0.0106	-0.0093	1.0000								
Balance	-0.1782	-0.0688	-0.1091	-0.0652	-0.5306	1.0000							
Growth*	-0.1991	-0.0859	-0.1527	-0.1906	-0.1603	0.1521	1.0000						
Effectiveness	-0.3215	0.2815	0.2422	0.3227	0.1535	0.0442	-0.0737	1.0000					
Interest*	0.3214	-0.2241	-0.2032	-0.2556	0.1186	-0.1724	-0.0122	-0.2781	1.0000				
Inflation*	0.0827	0.2820	0.3114	0.3302	0.1396	0.0043	-0.0935	-0.0381	0.2219	1.0000			
Saving*	-0.1834	0.1472	0.0703	0.1003	-0.4149	0.4406	0.0695	0.1467	-0.0887	0.0246	1.0000		
Xchange*	0.0143	-0.0772	-0.0782	-0.1724	0.0287	-0.1177	0.0190	-0.2952	0.0175	-0.2253	-0.2331	1.0000	
FDI*	-0.0690	0.1206	0.0884	0.1326	-0.1304	0.0918	0.0132	0.1196	-0.1186	0.0133	-0.1108	-0.0077	1.0000

* The variable has been log-transformed.

Appendix B: Additional Estimation Results

Table B-I: ***Fixed Effects Regressions on lagged IFDs***

	EMBIGLn					
	A			B		
	(1)	(2)	(3)	(4)	(5)	(6)
IFD (-1)	-0.0487	-0.0683	-0.0412	0.0252	0.0348	0.0542
	(0.123)	(0.123)	(0.123)	(0.119)	(0.114)	(0.112)
DebtLn	0.443*	0.416	0.430*	0.444*	0.417	0.431*
	(0.223)	(0.251)	(0.251)	(0.222)	(0.249)	(0.248)
IFD*DebtLn				-0.0318	-0.0463	-0.0430
				(0.0461)	(0.0436)	(0.0438)
Balance	-0.0270	-0.0178	-0.0212	-0.0260	-0.0163	-0.0199
	(0.0165)	(0.0193)	(0.0198)	(0.0166)	(0.0191)	(0.0196)
GrowthLn (-1)	-0.105**	-0.122**	-0.123**	-0.109***	-0.128**	-0.129***
	(0.0393)	(0.0480)	(0.0466)	(0.0384)	(0.0470)	(0.0455)
Effectiveness	-0.403	-0.249	-0.251	-0.420	-0.260	-0.262
	(0.406)	(0.404)	(0.394)	(0.404)	(0.402)	(0.392)
InterestLn	0.305**	0.299**	0.292**	0.308**	0.303**	0.296**
	(0.117)	(0.130)	(0.130)	(0.120)	(0.132)	(0.132)
SavingLn		-0.0172	0.00855		-0.0351	-0.00799
		(0.174)	(0.171)		(0.163)	(0.160)
XchangeLn		0.312	0.274		0.317	0.279
		(0.210)	(0.218)		(0.212)	(0.220)
FDILn			-0.0307			-0.0291
			(0.0233)			(0.0236)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.786**	2.334	2.357	2.776**	2.366	2.383
	(1.032)	(1.476)	(1.465)	(1.031)	(1.435)	(1.423)
N	227	216	212	227	216	212
Number of Groups	30	29	28	30	29	28
R^2	0.657	0.667	0.672	0.658	0.669	0.674
$\bar{R}^2$	0.618	0.623	0.626	0.618	0.623	0.626
F	2909	.	.	6027	.	.

Cluster-robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The suffix "Ln" indicates that the variable has been log-transformed

Table B-II: ***System GMM Regressions on IFDs (One-Step Dynamic Model)***

	EMBIGLn					
	A			B		
	Lags 2-2	Lags 3-3	Lags 4-4	Lags 2-2	Lags 3-3	Lags 4-4
	(1)	(2)	(3)	(4)	(5)	(6)
EMBIGLn(-1)	0.543***	0.534***	0.574***	0.746***	0.724***	0.775***
	-0.0669	-0.0694	-0.0687	-0.0557	-0.0574	-0.0555
IFD	-0.009	0.0585	0.00371	0.0127	0.0608	0.028
	-0.116	-0.119	-0.125	-0.0704	-0.0723	-0.0763
DebtLn	0.0508	0.105	-0.0294	0.136	0.138*	0.0467
	-0.127	-0.12	-0.124	-0.0848	-0.079	-0.0814
Balance	-0.00465	-0.00285	-0.00956	-0.00431	-0.00452	-0.0123
	-0.0159	-0.0155	-0.0159	-0.0103	-0.0098	-0.0101
GrowthLn (-1)	-0.0607	-0.0539	-0.0563	-0.0388	-0.0347	-0.0459
	-0.0638	-0.0639	-0.0653	-0.0429	-0.0426	-0.0437
Effectiveness	-0.142	-0.203*	-0.149	-0.143**	-0.180***	-0.159**
	-0.108	-0.105	-0.107	-0.0692	-0.0663	-0.0682
InterestLn	0.140*	0.156**	0.126	-0.0081	0.0301	-0.0372
	-0.0797	-0.0744	-0.0783	-0.0581	-0.0509	-0.0554
SavingLn	0.0141	0.0278	0.00284	0.0337	0.0252	0.0281
	-0.0974	-0.0985	-0.0978	-0.0588	-0.0589	-0.0588
XchangeLn	-0.029	-0.0307	-0.0324	-0.0165	-0.0183	-0.0193
	-0.0274	-0.0272	-0.0276	-0.0166	-0.0163	-0.0166
FDILn	0.0694*	0.0697*	0.0728*	0.0211	0.0129	0.0206
	-0.0406	-0.0404	-0.0409	-0.0262	-0.0255	-0.0261
Year Dummies	No	No	No	Yes	Yes	Yes
Constant	2.106***	1.847**	2.276***	0.0155	0	0.295
	-0.736	-0.723	-0.755	-0.595	0	-0.611
N	198	198	198	198	198	198
Number of Groups	25	25	25	25	25	25
Instruments	148	149	149	148	149	149
AR-2	-3.621	-3.362	-3.636	0.553	0.347	0.456
AR-2 p-value [a]	0.000294	0.000773	0.000277	0.58	0.729	0.649
Sargan	180.6	181.9	172.2	167.5	168.1	154
Sargan df	137	138	138	116	117	117
Sargan p-value [b]	0.00742	0.00728	0.0255	0.00125	0.00138	0.0123

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The suffix "Ln" indicates that the variable has been log-transformed

[a] Test for 2nd order serial correlation (null hypothesis of no autocorrelation of residuals)

[b] Test for the null hypothesis that identifying restrictions are valid

Gmmstyle instruments: l.EMBIGLn IFD DebtLn Effectiveness InterestLn

Ivstyle instruments: Balance l.GrowthLn SavingLn XchangeLn FDILn

Table B-III: ***System GMM Regressions on IFDs (Two-Step Static Model)***

	EMBIGLn					
	A			B		
	Lags 2-2	Lags 3-3	Lags 4-4	Lags 2-2	Lags 3-3	Lags 4-4
	(1)	(2)	(3)	(4)	(5)	(6)
IFD	-0.0782	-0.164	-0.361**	-28.64	-0.489	-1.071
	(0.270)	(0.286)	(0.159)	(24.80)	(0.781)	(1.680)
DebtLn	0.371**	0.238	0.122	18.70	-1.499	0.722
	(0.143)	(0.234)	(0.167)	(15.04)	(1.361)	(1.314)
Balance	0.0101	0.00277	0.00230	1.515	0.107	0.0112
	(0.0194)	(0.0161)	(0.00847)	(1.298)	(0.149)	(0.0976)
GrowthLn (-1)	-0.130***	-0.154***	-0.140***	1.812	0.424	-0.648*
	(0.0219)	(0.0223)	(0.0234)	(1.777)	(0.350)	(0.378)
Effectiveness	-0.0719	-0.0451	0.144	37.55	4.723	2.113
	(0.435)	(0.300)	(0.407)	(32.34)	(3.586)	(5.752)
InterestLn	0.362*	0.384**	0.247**	3.090	0.331	-0.254
	(0.205)	(0.152)	(0.107)	(2.755)	(0.482)	(0.319)
SavingLn	-0.106	-0.0913	-0.151	2.886	-1.365	0.105
	(0.0869)	(0.102)	(0.140)	(2.378)	(0.873)	(0.783)
XchangeLn	-0.0315	-0.0170	0.000933	2.309	0.215	0.0489
	(0.0388)	(0.0263)	(0.0327)	(1.913)	(0.319)	(0.736)
FDILn	-0.00937	-0.00348	-0.0111	-1.200	-0.534	-0.431
	(0.0203)	(0.0191)	(0.0214)	(1.136)	(0.317)	(0.442)
Year Dummies	No	No	No	Yes	Yes	Yes
Constant	4.119***	4.549***	5.466***	0	-12.49	-0.346
	(0.522)	(1.003)	(0.876)	(0)	(19.24)	(12.33)
N	212	212	212	212	212	212
Number of Groups	28	28	28	28	28	28
Instruments	152	152	152	152	152	152
AR-2	-3.205	-3.229	-3.438	0.112	0.457	0.749
AR-2 p-value [a]	0.00135	0.00124	0.000585	0.911	0.648	0.454
Sargan	331.2	320.2	339.6	504.1	490.7	574.9
Sargan df	142	142	142	121	121	121
Sargan p-value [b]	0	0	0	0	0	0

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The suffix "Ln" indicates that the variable has been log-transformed

[a] Test for 2nd order serial correlation (null hypothesis of no autocorrelation of re

[b] Test for the null hypothesis that identifying restrictions are valid

Gmmstyle instruments: l.EMBIGLn IFD DebtLn Effectiveness InterestLn

Ivstyle instruments: Balance l.GrowthLn SavingLn XchangeLn FDILn

Table B-IV: ***Fixed Effects Regressions on Number of IFDs (with $T \geq 5$)***

	EMBIGLn							
	A		B		C		D	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IFDCount	0.0101	0.0185	-0.216	-0.252	-0.172	-0.109	-0.696	-0.682
	(0.0547)	(0.0651)	(0.154)	(0.148)	(0.407)	(0.460)	(0.419)	(0.473)
$IFDCount^2$			0.0573*	0.0690**			0.0746*	0.0827**
			(0.0309)	(0.0288)			(0.0368)	(0.0359)
DebtLn	0.446**	0.436*	0.443**	0.430**	0.379*	0.389*	0.291	0.288
	(0.211)	(0.236)	(0.183)	(0.199)	(0.192)	(0.204)	(0.173)	(0.187)
IFDCount*DebtLn					0.0511	0.0364	0.116	0.108
					(0.102)	(0.118)	(0.0811)	(0.0951)
Balance	-0.0265	-0.0214	-0.0253	-0.0167	-0.0275	-0.0220	-0.0273	-0.0174
	(0.0171)	(0.0205)	(0.0170)	(0.0195)	(0.0173)	(0.0206)	(0.0173)	(0.0191)
GrowthLn (-1)	-0.101**	-0.117**	-0.107**	-0.128***	-0.0994**	-0.115**	-0.105**	-0.124**
	(0.0365)	(0.0431)	(0.0389)	(0.0453)	(0.0381)	(0.0451)	(0.0415)	(0.0478)
Effectiveness	-0.336	-0.187	-0.398	-0.207	-0.340	-0.203	-0.425	-0.257
	(0.410)	(0.394)	(0.383)	(0.366)	(0.404)	(0.384)	(0.365)	(0.350)
InterestLn	0.350***	0.338**	0.340***	0.316**	0.348***	0.336**	0.332***	0.306**
	(0.124)	(0.145)	(0.117)	(0.133)	(0.122)	(0.141)	(0.109)	(0.124)
SavingLn		0.0313		-0.0437		0.0461		-0.0150
		(0.173)		(0.151)		(0.180)		(0.154)
XchangeLn		0.263		0.353		0.263		0.370*
		(0.228)		(0.230)		(0.223)		(0.210)
FDILn		-0.0276		-0.0188		-0.0282		-0.0189
		(0.0270)		(0.0274)		(0.0270)		(0.0281)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.641**	2.136	2.700***	2.268	2.908***	2.284*	3.323***	2.732**
	(1.009)	(1.433)	(0.883)	(1.341)	(0.883)	(1.299)	(0.752)	(1.208)
N	221	207	221	207	221	207	221	207
Number of Groups	25	24	25	24	25	24	25	24
R^2	0.664	0.679	0.675	0.693	0.665	0.679	0.681	0.698
$\bar{R}^2$	0.625	0.632	0.635	0.647	0.624	0.631	0.640	0.651
F	2856	.	786391	.	27534	.	.	.

Cluster-robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The suffix "Ln" indicates that the variable has been log-transformed