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Ryota Nakatani

ABSTRACT

How do intergovernmental policies and public-sector institutions shape the dynamics of fiscal unsustainability within decentralized systems? Can intergovernmental transfers, controls by the central government over local fiscal borrowing, or institutional quality serve as effective safeguards against fiscal crisis risk? Using a cross-country panel fiscal dataset, we employ the instrumental variable probit estimation method to address potential endogeneity concerns. We find that intergovernmental transfers are generally associated with a lower probability of a fiscal crisis, likely reflecting their role in facilitating interregional risk sharing among local governments. The stabilizing effects of transfers are particularly evident during episodes of fiscal distress triggered by credit events, large-scale official financing, and extreme market pressures, although their effectiveness appears to vary according to local public finance conditions. In contrast, central controls such as subnational fiscal rules are associated with a higher likelihood of a fiscal crisis during crisis periods, while such relationships reverse when countries have good governance. We also uncover evidence of moral hazard associated with intergovernmental transfers in countries exhibiting high levels of vertical fiscal imbalance. Yet, we could not find statistically significant direct evidence on the effects of public-sector institutions with respect to fiscal crisis occurrence under decentralization. These findings underscore the importance of fiscal architecture and intergovernmental policy design in shaping fiscal resilience within decentralized systems.

JEL Classification Numbers: H77; H72; H74; H71; D73

Keywords: Fiscal Crisis; Decentralization; Intergovernmental Transfers; Subnational Fiscal Rules; Public Sector Institutions; Moral Hazard

1. Introduction

Many public services are provided by subnational governments worldwide because they know local needs better than the central government. However, this may come at a cost to fiscal sustainability since local governments do not internalize the effect of their actions on the country-wide fiscal position. Indeed, recent studies find that fiscal decentralization may increase sovereign risk (Eichler and Hofmann, 2013) and raise the probability of a fiscal crisis (Nakatani, 2023, 2024ab). This raises questions about how fiscal sustainability can be maintained when fiscal responsibilities are decentralized. Prevention and management of crises are critical for policymakers, as fiscal crises hurt people's daily lives, while fiscal decentralization is ubiquitous across countries.

In this paper, we study institutional policy tools that can associate with fiscal crises under decentralization. These tools include intergovernmental transfers, controls by the central government (i.e., subnational fiscal rules and administrative constraints), and institutional governance. The extant literature has studied related policy topics, but to the best of our knowledge, no studies have quantitatively investigated their effects on the occurrence/onset of fiscal crises. Saxena (2022) discussed policies such as controls on subnational borrowing and the fiscal management framework to manage fiscal risks from subnational governments, although there was no quantitative analysis to examine their effectiveness.[1] Plekhanov and Singh (2006) studied the effects of policy instruments on subnational fiscal balances, but they did not cover general government or fiscal crises at the national level. It is important for countries to empirically analyze the effectiveness of policies and institutions on fiscal sustainability at the general government level because the central government may have to bail out subnational governments. Martinez-Vazquez and Vulovic (2017) studied the effects of subnational borrowing regulations on general or subnational government primary balance, but the authors did not analyze their relationship with fiscal crisis or decentralization. To fill this gap, we use a cross-country panel dataset concerning fiscal decentralization, which is published by the International Monetary Fund (IMF),[2] and employ binary choice models addressing endogeneity issues—the instrumental variable (IV) probit model.

This paper contributes to the literature by providing empirical interactions among decentralization, institutional quality, and fiscal crises in a broad international sample. Three main novel contributions of this research are (i) distinguishing between crisis occurrence and crisis onset in relation to intergovernmental policies; (ii) conducting a granular analysis of different types of fiscal crises; and (iii) performing a cross-country analysis on the effects of controls by the central government over local public finance (i.e., subnational fiscal rules and administrative constraints).

The new findings of this paper are threefold. First, control by the central government, such as subnational fiscal rules, is positively associated with the probability of a fiscal crisis under fiscal decentralization. Second, the effects of intergovernmental transfers could be state dependent, as the effects in countries

[1] Other policy tools to mitigate the materialization of subnational fiscal risks, which are outside the scope of our paper, include establishing an intergovernmental relations unit in the central Ministry of Finance to track early warning indicators and to prepare periodic reports on fiscal risks from subnational governments (Saxena, 2022). In addition, an establishment of a subnational insolvency framework for debt restructuring and timebound fiscal adjustment program helps limit the moral hazard of subnational governments.

[2] The IMF's Fiscal Decentralization Dataset contains information on indicators widely used by academics and policymakers to assess the degree to which the revenue and expenditure functions of the general government are carried out by subnational governments. The dataset covers all economies that have reported fiscal data to the IMF's Government Finance Statistics Database for at least one subnational government level (https://data.imf.org/?sk=1C28EBFB-62B3-4B0C-AED3-048EEEBB684F).

with local fiscal surpluses and deficits differ. Finally, we could not find evidence that public sector institutions play a role.

The remainder of this paper is organized as follows. We present the literature survey in the next section. After that, we explain our data and methodology and discuss the results. Finally, we conclude.

2. Literature Review

Fiscal decentralization could change fiscal discipline at the national level. This is because fiscal decentralization is accompanied by a variety of advantages and disadvantages and involves multiple intergovernmental policy instruments. In this section, we discuss the theoretical and empirical literature on related topics.

2.1. Intergovernmental Transfer

The trade-off between interregional insurance and moral hazard caused by intergovernmental transfers lies at the core of the fiscal federalism literature. Favorable effects of intergovernmental transfers include risk pooling mechanisms among local governments. Central government tax-transfer programs implicitly provide extensive insurance to regions as risk sharing against regional shocks (Boadway 2001). A system of intergovernmental assistance that is sensitive to local shocks can provide much needed assistance to jurisdictions experiencing negative shocks to their economic/fiscal well-being (Persson and Tabellini, 1996). Additionally, unemployment insurance is often a central responsibility since it is an instrument through which the central government can share shocks with regional labor markets. They act as a countercyclical policy since central government spending is less procyclical than subnational one (Abbott and Jones, 2012) and facilitates interstate risk-sharing (Buettner, 2002). Furthermore, central governments are better off retaining a steering role where local governments are unable to fulfill the center's priorities in areas such as health, education, and infrastructure (Gilley and Laochankham, 2024). Another associated aspect is the advantage of the collection of revenues by the central government. Local tax authorities often lack effective tax collection capacity, making it more efficient for the central government to collect taxes and then redistribute revenues via intergovernmental transfers (Bird and Smart, 2002). The coordination of fiscal policies under revenue centralization could result in some benefits through the following mechanisms. Revenue centralization combined with intergovernmental transfers serves as a mechanism for sharing risk against regional shocks (Lockwood 1999). Additionally, revenue collection by the central agency could utilize economies of scale by having a large revenue administration capacity to achieve tax compliance.

With respect to the unfavorable effects of intergovernmental transfers, common pool/soft budget constraint problems are the main reasons that fiscal decentralization could cause moral hazard in local governments and weaken their fiscal discipline.[3] The literature by Qian and Roland (1998), Persson and Tabellini (1996), and Rodden (2002) revealed that bailout expectations and intergovernmental transfers cause moral hazard

[3] The common pool problem of public finances refers to the situation in which central and subnational government revenues are pooled together from the same sources, while each government body wants to maximize its share of the common revenue pool, resulting in the collective outcome of excessive public spending and unsustainable deficits (Tang et al., 2014). This collective action problem arises from the incompletely internalized cost of subnational fiscal actions owing to the subnational government's tendency to overuse common revenue sources.

in local governments. Guo et al. (2022) developed a model with vertical fiscal imbalances[4] and demonstrated that when the central government cannot precommit to the future amount of transfers to local governments, local governments have overborrowing incentives, as transfers create a common pool problem. Saxena (2022) reported that compared with unitary countries, federal countries, which tend to be more fiscally decentralized, are likely to have more subnational debt. In contrast, Schaltegger and Torgler (2007) empirically reported that Swiss cantons in which voters participate directly in the political process through initiatives and public referenda have lower levels of indebtedness.

2.2. Local Fiscal Balance

Tiebout (1956) and Oates (1972) laid the foundation for local public finance, demonstrating that subnational governments can efficiently provide public goods through better preference matching. Additionally, fiscal decentralization helps overcome informational asymmetries between governments and service providers, enabling more effective policymaking based on local economic conditions (Boadway 2001), and can prevent agency problems caused by hidden information on the costs of building and operating local schools, hospitals, and welfare delivery agencies (Boadway et al., 1999). Boetti et al. (2012) reported that fiscally autonomous municipalities tend to spend more efficiently.

2.3. Central Controls

The public administration literature emphasizes that fiscal control by the upper level of government could influence the fiscal discipline of local governments by controlling their fiscal positions. For instance, Park et al. (2022) analyzed how local governments respond to such fiscal controls. They reported that in response to fiscal controls such as state preemptions (the use of state law to nullify a municipal ordinance or authority in certain policy areas), local governments can choose either to cut public services or find ways to reduce the costs of those services. Local politicians may find the latter option more attractive, as their residents want them to continue providing the same level of local public service, regardless of municipal fiscal status.

Administrative constraints such as central government approval of subnational borrowing or subnational fiscal rules on the budget balance, debt, and spending can be viable policy options to prevent local fiscal mismanagement (Saxena, 2022). In fact, Bröthaler et al. (2015) reported that municipal debt limits closely monitored and supervised by upper-level governments effectively stabilized local government debt and improved municipal primary surplus in response to rising public debt. Plekhanov and Singh (2006) reported that centrally imposed borrowing rules became more impactful when vertical fiscal imbalances widened. Martinez-Vazquez and Vulovic (2017) found that administrative constraints and centrally imposed fiscal rules improve the general government primary balance. Dove (2016) noted that outright prohibitions on debt accumulation and hard budget constraints reduced the risk of municipal defaults in the U.S. Additionally, Park (2018) indicated that balanced budget requirements and debt limitations could help municipalities avoid excessive debt. Akin et al. (2016) concluded that fiscal decentralization promoted better tax collection only if local governments must adhere to balanced budgets; otherwise, it worsened fiscal discipline if persistent local budget deficits occurred because of shared resources. On the other hand, when

[4] Vertical fiscal imbalances occur when spending decentralization outpaces revenue decentralization so that subnational governments have to rely on central government transfers and borrow to finance local expenditures (Mitra and Chymis, 2022). The larger the vertical fiscal imbalance is, the more inclined local politicians are to behave opportunistically by increasing public outlays (Meloni, 2016).

balanced budget constraints are in place, local governments must cut expenditures and lay off workers during recessions, undermining fiscal policy countercyclicality.

2.4. Institutional Quality

On the other hand, the creation of a grant system requires a bureaucracy to monitor the distribution and disposition of the grants, which could lead to administrative costs (Bahl and Linn, 1994). Excessive reliance on intergovernmental transfers may render local governments less accountable to their constituents and inefficient in collecting local taxes and providing public services. This is called the "flypaper effect" (Deller and Maher, 2005; Mehiriz and Marceau, 2014). Furthermore, intergovernmental transfers may weaken fiscal discipline at the subnational level by reinforcing bailout expectations and soft budget constraints. These administrative costs and flypaper effects, as well as weakened fiscal discipline caused by moral hazard, are negative aspects of transfers. Empirically, Nakatani (2023) reported that the adverse effect of decentralization on the probability of a fiscal crisis is mitigated by a stronger rule of law, indicating the need for better governance quality and stronger law enforcement.

This paper differs from the fiscal crisis analyses of Nakatani (2023, 2024ab) in several aspects. The main difference in topics is that this study analyzes the roles of intergovernmental policies and public sector institutions, both of which have not been previously explored in the literature on fiscal crises. It is important to include intergovernmental transfers in the analysis because fiscal decentralization often comes with a package of transfers from the central government to subnational or local governments. Excluding such a variable could lead to potential omitted variable bias. We also empirically study the effects of central government controls over subnational borrowing on national fiscal crises. Such controls include administrative constraints and subnational fiscal rules imposed by the central government. Since these controls aim to preserve the fiscal sustainability of local governments under fiscal decentralization, it is essential for policymakers to empirically gauge the effects of these constraints. Moreover, we address possible endogeneity in the econometric estimation by using IV probit estimation with geographical variables as instruments, which have not been used in the aforementioned studies. Furthermore, we analyze the state-dependent effects of spending decentralization by comparing how decentralization variables affect crisis probability in countries with local budget deficits and surpluses. Finally, our analysis is much more granular in the sense that we distinguish between crisis occurrence and crisis onset and examine the effects on four different types of fiscal crises, both of which have never been explored thus far.

3. Data and Methodology

The data sample in this study covers a reasonably broad range of 60 advanced, emerging market, and developing countries from 1990 to 2019, as listed in Table 1. We intentionally dropped data after 2020 to exclude effects from the unprecedented COVID-19 crisis. The criteria for selecting the 60 countries are that they have all the variables used in this analysis.[5] Note that if there are any missing values, those

[5] Please note that some large economies are not included in the analysis. For example, India is not included in the IMF's Fiscal Decentralization Dataset, while Italy and France do not report data on the share of local governments' expenditure to the IMF. The U.S. and China are not included in regressions because there is no variation in the dependent variable (no observation of fiscal crisis during the data sample period). The latter could lead to a selection bias, as countries that experienced fiscal crises are only included in the estimation. Thus, the estimated coefficients can be interpreted as the upper bound of the effects of decentralization since there are fiscally decentralized countries that did not result in crises.

observations are automatically dropped from the analysis. Thus, the data period included in the regression analysis differs across country groups. For instance, advanced economies have a relatively long data sample period because of their better ability to produce economic statistics, while low-income countries tend to enter the sample after the 2000s. To account for such differences, we conduct estimations across different country groups. The sources and definitions of the variables are summarized in Table 2. Fiscal decentralization data are taken from the IMF's Fiscal Decentralization Dataset. Macroeconomic variables are taken from the IMF's World Economic Outlook Database. The dates of fiscal crisis occurrence are taken from Moreno Badia et al. (2022), who defined fiscal crises as credit events, exceptionally large official financing, implicit domestic defaults, or loss of market confidence.[6] They extended the fiscal crisis database originally constructed by Medas et al. (2018). We also use alternative dependent variables of fiscal crisis onset. When we define the onset of the fiscal crisis, we omit observations if the fiscal crisis has already started in the previous year and continued in the current year. The dummy variables for banking crises and currency crises are taken from Nguyen et al. (2022). The commodity terms of trade index are taken from the IMF's Commodity Terms of Trade Index.

We use the spending share of local governments[7] in the general government to measure the degree of fiscal decentralization, where subscript i is a country and t is a year.

$$Spending\ Decentralization_{i,t} = \frac{Expenditure_{i,t}^{Local\ Government}}{Expenditure_{i,t}^{General\ Government}} \quad (1)$$

The intergovernmental net transfer ratio is defined as the ratio of net transfers (i.e., transfers received from other levels of government less transfers paid to other levels of government) to the own revenue of local governments.

$$Transfer\ Dependency\ Ratio_{i,t} = \frac{Net\ Transfers_{i,t}^{Local\ Government}}{Own\ Revenue_{i,t}^{Local\ Government}} \quad (2)$$

The vertical fiscal imbalance, which we use for moral hazard analysis later, is the indicator that captures the
difference between own spending and own revenue at the local government level.

$$Vertical\ Fiscal\ Imbalance_{i,t} = 1 - \frac{Own\ Revenue_{i,t}^{Local\ Government}}{Own\ Spending_{i,t}^{Local\ Government}} \quad (3)$$

Fiscal crises can occur through several mechanisms. For example, if decentralized fiscal operations loosen fiscal discipline through moral hazard, the probability of a crisis increases. Not only fiscal factors but also macroeconomic conditions can affect the probability of a fiscal crisis (Medas et al. 2018). Stronger

[6] Fiscal crises are identified in any given year if any of the following four criteria are met: (1) credit events that include sovereign default, restructuring, or rescheduling of substantial size (larger than 0.5 percent of GDP) and substantial nominal growth of the defaulted amount (by 10 percent); (2) episodes where the country receives exceptionally large official financing from the IMF with fiscal adjustment objectives in place (high-access IMF financial arrangement, which is larger than 100 percent of quota) or financial support from the European Union (the EU program); (3) implicit domestic public debt default, such as (i) periods of high inflation (higher than 35 percent in advanced countries and 100 percent in developing countries), usually associated with monetary financing of the budget; or (ii) a steep increase in domestic arrears (by at least 1 percentage point of GDP); and (4) episodes associated with extreme market pressures that include (i) loss of market access, capturing sovereign defaults or bond issuance coming to a halt; or (ii) very large borrowing costs (level of spread higher than 1,000 bps) or sovereign yield spikes (annual change in spreads higher than 300 bps in advanced countries and 650 bps in developing countries).

[7] The IMF Fiscal Decentralization Dataset classifies general government into three different components of governments: (1) central government; (2) state/regional government; and (3) local government. Among subnational governments, state/regional government is the upper level of government, such as states and provinces, while local government is the lower level of government, such as municipalities. We use the share of local governments in our analysis because devolution of government power to the lowest level of government is the true fiscal decentralization.

economic activity and higher income[8] could be associated with a lower probability of a crisis. Thus, we include both GDP growth rates and income per capita to capture such factors. External imbalances could also trigger crises, as receipts from exports of goods and services can be a source for the repayment of sovereign debt denominated in foreign currency. Therefore, we include the current account balance to control for such external vulnerability. Furthermore, higher government debt and interest rate costs could also lead to a crisis, so we also include the level of debt and interest costs of the general government as control variables. In addition, we include political and constitutional variables to control each country's political environment. Political constraints may significantly shape fiscal decentralization by altering how lower-level governments spend money and collect taxes. Thus, we include the index representing legislative constraints on the executive from the Varieties of Democracy (V-Dem) Dataset to capture the legislator's political power. Federalism and fiscal decentralization are interrelated (but not the same concepts) since constitutional factors, such as the competence of the subnational levels to veto national legislation, play a major role (Blume and Voigt, 2011); thus, we include a dummy variable for constitutional federalism to control for constitutional factors.

Following the methods of Cerovic et al. (2018), we use a probit model to estimate the probability of a fiscal crisis. The regression equation is as follows:

$$Pr\left(y_{i,t} = 1 \middle| x_{i,t}\right) = \Phi\left(\boldsymbol{x_{i,t}}'\boldsymbol{\beta} + \varepsilon_{i,t}\right) \quad (4)$$

where Pr is the probability; the subscript i denotes the country, while t denotes the year; y is a dummy variable that takes a value of one if a fiscal crisis occurs and zero if not; $\boldsymbol{x}$ is the set of independent variables; Φ is the normal cumulative distribution; $\boldsymbol{\beta}$ is a vector of the maximum likelihood estimates; and ε is an error term. As stated above, the explanatory variables include fiscal decentralization, the transfer dependency ratio, the government debt level, interest cost, the GDP growth rate, the natural logarithm of income per capita, the current account balance, a banking crisis dummy, a currency crisis dummy, legislative constraints, federalism, and a commodity terms of trade index. The last regressor is included because commodity price shocks can lead to a twin balance of payments and fiscal crisis (Nakatani, 2018).

One common concern in econometric work is potential omitted variable bias. However, this bias is relatively less severe in binary choice models under certain conditions. Wooldridge (2002) and Cramer (2007) showed that this bias does not carry over to the effect of the remaining regressors on the outcome when omitted variables are orthogonal to the included variables in the probit and logit models.

Another potential concern is the endogeneity of the explanatory variables. That is, the fiscal crisis itself can affect the contemporaneous fiscal and macroeconomic variables, imparting bias in the estimated coefficients. To address this concern, we conduct an IV probit estimation. The IV method requires (i) a relevance condition, (ii) an exogeneity condition, and (iii) an exclusion restriction. The relevance condition requires that the instrumental variable must be strongly correlated with the treatment variable. The exogeneity condition means that the instrumental variable must be uncorrelated with the error term or any unobserved confounding factors that affect both the treatment variable and the outcome variable. The exclusion restriction is that the instrument has a direct effect on the outcome strictly through its influence on the treatment. We use geographical variables commonly used as instruments in the fiscal

[8] High income is usually a reflection of more effective policy institutions, so we can assume that income level is a proxy for institutional quality. In fact, we find that the impact of decentralization is less pronounced in higher-income countries.

decentralization literature: country size, which is measured by the size of land area and population size (Sima et al., 2023). When the size of land becomes larger, the distance between the central government and local government becomes remoter, and thus, the degree of informational asymmetry increases, resulting in a tendency for local governments to implement more autonomous local fiscal policies. The size of land area is exogenously determined by geographical conditions; thus, it does not trigger a fiscal crisis by itself. Similarly, when the population becomes larger, the population in local regions is also likely to increase; thus, intergovernmental transfers also tend to increase so as to stabilize local economic shocks among local governments. Population statistics are among the most precisely predicted statistics for long future horizons; thus, population does not typically trigger abrupt crises of fiscal operation by itself. For other (control) variables, such as GDP growth, income per capita, and current account balance, finding the corresponding instruments is not straightforward; thus, we use relevant lagged explanatory variables as instruments. We employ the lagged variables as instruments because these variables appear strongly correlated with the contemporaneous control variables and exogenous in the sense that they are predetermined before the fiscal crisis occurs in the current period.[9] Stock variables such as the level of debt and its interest cost are primarily determined by the past accumulation of debt; thus, they are less likely to suffer from endogeneity. The banking and currency crisis dummy variables are by themselves unpredictable shocks to the economy, and there are no good candidates for exogenous instruments. Please note that early warning indicators for such financial crises are already included in our regression equation as control variables (e.g., debt, GDP, and interest costs). Having said that, we conduct a robustness check using other estimation methods. Table 3 shows summary statistics.

4. Results

The baseline estimation results for crisis occurrence are presented in the first two columns of Table 4, and the results for crisis onset are presented in the last two columns of Table 4. The area under the receiver operating characteristic curve (AUROC) exceeded 0.8 (and 0.9 in the last column), indicating the excellent (and outstanding) explanatory power of our model. With respect to the relevance condition of the instruments, the estimated coefficients of the first-stage regressions demonstrate that the instrument variables are highly correlated with the treatment variables with one percent statistical significance. In addition, the rejections of the null hypothesis for the Wald test of exogeneity justify the use of the IV probit method.

The results show that spending decentralization to local governments is not statistically significant. In contrast, the transfer dependency ratio is negatively associated with the probability of a fiscal crisis except in the case of crisis onset in the third column. These findings underscore the importance of intergovernmental transfers as an economic stabilization tool by providing an interregional insurance mechanism against local shocks, particularly in developing countries where local governments have relatively low capacity (in the second and fourth columns of Table 4). Fiscal transfers to local governments are part of how governments balance spending across regions. This fiscal equalization scheme could serve as risk sharing among local governments because the central government can transfer resources to regions facing adverse economic shocks, especially during a crisis (in the first two columns of Table 4).

[9] The exclusion restriction is that the instrument affects the dependent variable only through the instrumented variable. Yet, the assumption that the instruments are not correlated with the error term in the equation of interest is not testable in exactly identified models.

The interpretations of the control variables are as follows. We find that a stronger GDP growth rate and a higher income per capita are sometimes associated with a lower probability of a fiscal crisis. This is consistent with economic theory because in fast-growing and richer economies, economic agents have higher incomes, making it easier for them to pay taxes; in addition, tax collection is generally stronger in richer countries even during a crisis. Moreover, a stronger external balance measured by a larger current account balance is consistently associated with a lower probability of a fiscal crisis. A positive current account balance means that domestic residents receive net income from the rest of the world, which generally correlates positively with the availability of financing for budget purposes; thus, the government will be less likely to default. The positive and statistically significant coefficient of the banking crisis dummy for the onset of the fiscal crisis in all countries is an intuitive result. This makes economic sense because a banking crisis could lead to a fiscal crisis because of the fiscal costs of government intervention, such as recapitalization, liquidity support, bailouts, deposit guarantees, and regulatory forbearance (Honohan and Klingebiel, 2003).

As a robustness check, in the Annex Table, we employed a logit model[10] in the first two columns and ordinary least squares estimation with country fixed effects in the last two columns. We found that the results of the negative coefficients of the transfer dependency ratio did not change for crisis occurrence in either estimation method, but they are statistically insignificant for crisis onset. On the other hand, we found that spending decentralization is associated with a higher probability of an occurrence of a fiscal crisis in both estimation methods, which is consistent with the extant findings of Nakatani (2023, 2024b). Thus, a new finding of this analysis is that the literature, which did not use the relevant instrumental variable method, could have overstated the undesirable effect of spending decentralization on the occurrence of fiscal crises. We also found a statistically significant coefficient of government debt, which is similar to that reported in the literature, in the linear model case of crisis occurrence.[11]

Taking advantage of the granularity of the fiscal crisis data, we further analyze the effects of fiscal decentralization on the four subcategories of the crisis in Table 5. The dependent variable in each column of Table 5 is a different type of fiscal crisis occurrence. We only show the results of the occurrence of fiscal crises because the regressions of some types of fiscal crisis onset did not converge. We find that intergovernmental transfers are associated with a lower probability of a fiscal crisis in most cases, except for implicit defaults. In terms of the magnitude of the effects of transfers measured by the size of the coefficient, the extreme market pressure case is the largest, as it is the case where the country is enduring a difficult fiscal situation without materializing explicit or implicit default. Among the control variables, more stringent legislative constraints are interestingly associated with a higher probability of a fiscal crisis during credit events. The external imbalance captured by the current account deficit is the relevant crisis driver for large official financing (i.e., the IMF program) and extreme pressure episodes (e.g., cancellation of issuance of Eurobond, sovereign yield spikes), as these are often the situations when countries face the assistance

[10] The econometric package required to estimate the IV logit model is still under development because determining the appropriate bivariate distribution for the error terms in the structural equation is significantly more complex. We do not include country fixed effects in logit and IV probit models to avoid an incidental parameter problem.

[11] The extant fiscal crisis literature, such as Moreno Badia et al. (2022) and Medas et al. (2018), does not use models such as the instrumental variable method to address endogeneity. In such empirical settings, the debt variable generally shows high statistical significance, similar to what we observe in the crisis occurrence case of ordinary least squares in the Annex Table. However, countries that accumulate higher debt can be correlated with other characteristics of the fiscal system and political variables. In my analysis, various fiscal decentralization strictures are controlled explicitly in regressors as well as political environments and institutions. Therefore, after controlling all these institutional and structural factors as well as intergovernmental policies, our results imply that the government debt may not be the highly significant sole factor of predicting fiscal crises."

for balance of payments need and pressures in the external debt markets, respectively. In the implicit default cases, most of the regressors are not statistically significant due to the relatively large number of explanatory variables compared with the small size of the data sample, while countries with higher income levels tend to experience these episodes, as they have more capacity to address fiscal crises through devaluation of government debt via high domestic inflation, which often comes with monetary financing of the fiscal deficit.

Next, to study the state-dependent impacts, we split our data sample into countries with a local government budget surplus and those with a budget deficit in the previous year, as shown in Table 6. Our results show an interesting contrast between the two country groups. The negative and statistically significant coefficients of the transfer dependency ratio are observed only in deficit countries in cases of both crisis occurrence and onset. Thus, when local governments are running budget deficits, intergovernmental transfers from the central government serve as insurance against local shocks. In contrast, in countries with local budget surpluses, the transfer dependency ratio does not affect crisis occurrence; instead, spending decentralization is negatively associated with crisis occurrence. This confirms the desirable role of fiscal devolution for local governments, as they are better placed to implement local fiscal policies because of the advantage of information asymmetry regarding local economic conditions (see section 2.2 of the literature review). Contrastingly, with respect to crisis onset in surplus countries, the transfer dependency ratio is positively associated with the onset of a fiscal crisis. This implies that the moral hazard effects of intergovernmental transfers are prevalent in the case of crisis onset. Specifically, if intergovernmental transfers are provided to local governments in a way that creates moral hazard for the government, such as through the undisciplinary purposes of possible bailouts of local governments under fiscal consolidation, the probability of a fiscal crisis onset should elevate. Therefore, one policy implication of our research is that policymakers and practitioners need to consider state-dependent intergovernmental policy advice, as intergovernmental transfers could have opposite effects on fiscal stability depending on the local fiscal condition in the fiscally decentralized system.

As a penultimate analysis, we study whether controls over local borrowing by central government and public sector institutions influence local fiscal discipline so that the country can avoid fiscal crises. Controls by center include administrative constraints on borrowing and fiscal rules for local budgets controlled by the central government. The data on dummy variables for controls by center (zero for no controls and one for administrative constraints or subnational fiscal rules)[12] are constructed from various sources, which I further updated, as presented in Table 2. Administrative constraints include annual controls on the debt of individual subnational jurisdictions, the authorization of individual borrowing operations, and the centralization of all government borrowing with on-lending to local governments. Subnational fiscal rules include restrictions on subnational debt levels, budget deficits and spending. The evolution of the number of countries that have central controls, subnational fiscal rules, and administrative constraints as well as fiscal crises over the data sample period is shown in Figure 1. In column (1) of Table 7, these dummy variables are multiplied by the spending decentralization variable to examine whether such controls mitigate

[12] Saxena (2022) presents four approaches to classify control over subnational borrowing: (i) administrative controls; (ii) rule-based constraints; (iii) cooperation; and (iv) market discipline. We consider the first two types as controls by center in our analysis because compliance with cooperative arrangements is generally voluntary and the constraint only by market-enforced discipline means complete borrowing flexibility.

or magnify the effects of decentralization on the probability of a fiscal crisis in a statistically significant way.[13] Note that we do not include the controls by center variable individually in the regression because (i) the number of instruments becomes too large, (ii) a potential multicollinearity problem arises from a very high correlation of approximately 0.8 between the interaction term and the individual term due to its dummy variable nature, and (iii) the regressions did not converge because of these multiple issues. Our results indicate that the interaction term between the central government's control and spending decentralization is positively associated with the probability of a fiscal crisis. To further analyze this effect granularly, we performed the same analysis for only the subnational fiscal rules in column (2).[14] The results for the subnational rules confirmed the same positive association. In contrast, the interaction term of spending decentralization and public institutions, which was proxied by government effectiveness from the Worldwide Governance Indicators, was statistically insignificant in column (3) of Table 7. The results for the joint inclusion of central controls and public institutions in column (4) are the same as those for the individual case in the previous three columns. These new findings can be explained by the procyclical nature of fiscal policies when spending power is transferred to local governments, as documented by a recent study by Nakatani et al. (2026), although such analysis is beyond the scope of this paper. Nakatani et al. (2026) documented corroborative empirical evidence that subnational fiscal rules enhance the procyclicality of fiscal policy operations, as most such rules are defined as the GDP ratio, which forms business cycles.

Finally, we further delve into the effects of intergovernmental transfers through mechanism analysis by extracting the element of moral hazard. Following the method of Rodden (2002) and the theoretical foundation of Guo et al. (2022), I included vertical fiscal imbalance as an additional fiscal variable to capture the elements of the moral hazard model in the first column of Table 8. The result of the positive interaction term of transfers and vertical fiscal imbalance demonstrates moral hazard effects. Namely, in countries with a higher degree of vertical fiscal imbalance, intergovernmental transfers cause moral hazard through soft budget constraints, which could eventually lead to a fiscal crisis. In contrast, the negative individual term of intergovernmental transfers indicates the desirable effects of lowering the crisis probability via risk pooling and sharing.

In the second column of Table 8, we check whether the unfavorable effects of central controls depend on the degree of governance quality of the government. Specifically, we multiply the interaction term of spending decentralization and central controls by the government effectiveness variable, which captures public sector institutions. Our results show that in countries where the government has high quality of governance, controls by the central government are negatively associated with the probability of a fiscal crisis. Thus, the governance channel is important for fiscal decentralization so that the central government's control of subnational borrowing has an intended original effect on fiscal sustainability.

We further examined whether transfers from the central government and central controls are substitutable in the last column of Table 8 by including the triple interaction term, but we could not obtain a statistically significant result.

[13] Ai and Norton (2003) show that in nonlinear models, the sign, magnitude, and significance of an interaction term cannot be read off the actual interaction effect and vary across observations. Thus, we report the marginal effects based on the estimated coefficients, standard errors, and statistical significance of the interaction terms using the method developed by Ai and Norton (2003).

[14] The same exercise for administrative constraints was not feasible because of the relatively small sample size of countries that have such constraints.

5. Conclusion

Understanding the occurrence and onset of fiscal crises and the role played by institutional frameworks and intergovernmental arrangements regarding fiscal decentralization is clearly important for both researchers and policymakers. This paper studies whether and how fiscal decentralization influences the probability of a fiscal crisis in relation to intergovernmental arrangements and institutions. Our results show that intergovernmental transfers are negatively associated with the probability of a fiscal crisis. This finding is congruent with the nationwide risk-pooling/sharing mechanism across localities.

The study breaks down fiscal crises into four subtypes and reveals that intergovernmental transfers are generally associated with lower crisis risk, except in cases of implicit default. The strongest transfer effect appears for extreme market pressure episodes, where countries endure difficult fiscal situations without crisis materialization. It also reveals that tighter legislative constraints are associated with crisis risk during credit events because of a lack of flexible adjustment, whereas weak current account balances are linked to large official financing and extreme market pressure crises, which is consistent with the purpose of IMF programs and pressures in external debt markets. With respect to implicit defaults, higher-income countries are more likely to experience them, as they have more capacity to address fiscal crises by devaluing government debt through high domestic inflation and the monetary financing of fiscal deficits.

Our empirical results also reveal that the effects of intergovernmental transfers depend on local fiscal conditions. In countries where local governments had a budget deficit, larger transfers from the central government are linked to lower crisis risk, suggesting that transfers act as insurance against local shocks. In surplus countries, greater transfer dependence is linked to a higher risk of fiscal crisis onset, suggesting that intergovernmental transfers can create moral hazard and weaken fiscal discipline. The broader policy message is that fiscal transfers can have opposite effects on stability depending on whether local governments are in surplus or deficit. Helping local governments' financing through intergovernmental transfers is the easiest policy option for fiscal authorities, while such practices create moral hazards such as the common pool problem and soft budget constraints. If not well designed, transfers can simply shift the costs of economic shocks, risk realizations, or fiscal mismanagement from subnational governments to central government budgets without reducing the costs at the general government level. It is therefore important that transfer systems reinforce the accountability and fiscal discipline of local governments.

The study further looked at two kinds of central controls: administrative borrowing constraints, such as debt approvals and centralized borrowing arrangements, and subnational fiscal rules, such as limits on debt, deficits, and spending. The interaction between spending decentralization and central government control is positively associated with the probability of a fiscal crisis. The same positive relationship holds when the analysis is restricted to subnational fiscal rules. Such findings may reflect the procyclical nature of fiscal policy when more spending authority is given to local governments. The unwanted effects of subnational fiscal rules corroborate prior evidence that subnational fiscal rules can increase procyclicality, partly because such rules are often tied to GDP, which moves with the business cycle. In summary, countries need to consider the unenvisaged costs of stringency caused by subnational fiscal rules and administrative constraints.

Finally, two channels are examined to elucidate the mechanism through which transfers and central controls are associated with crisis probability: the moral hazard channel and the governance channel. Our analysis

reveals that countries need to (i) have good governance quality to have the intended effects of controls by the central government and (ii) reduce the vertical fiscal imbalance to avoid the moral hazard of intergovernmental transfers.

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Figure 1. Fiscal Crises, Central Controls, Subnational Fiscal Rules, and Administrative Constraints (the Numbers of Countries)

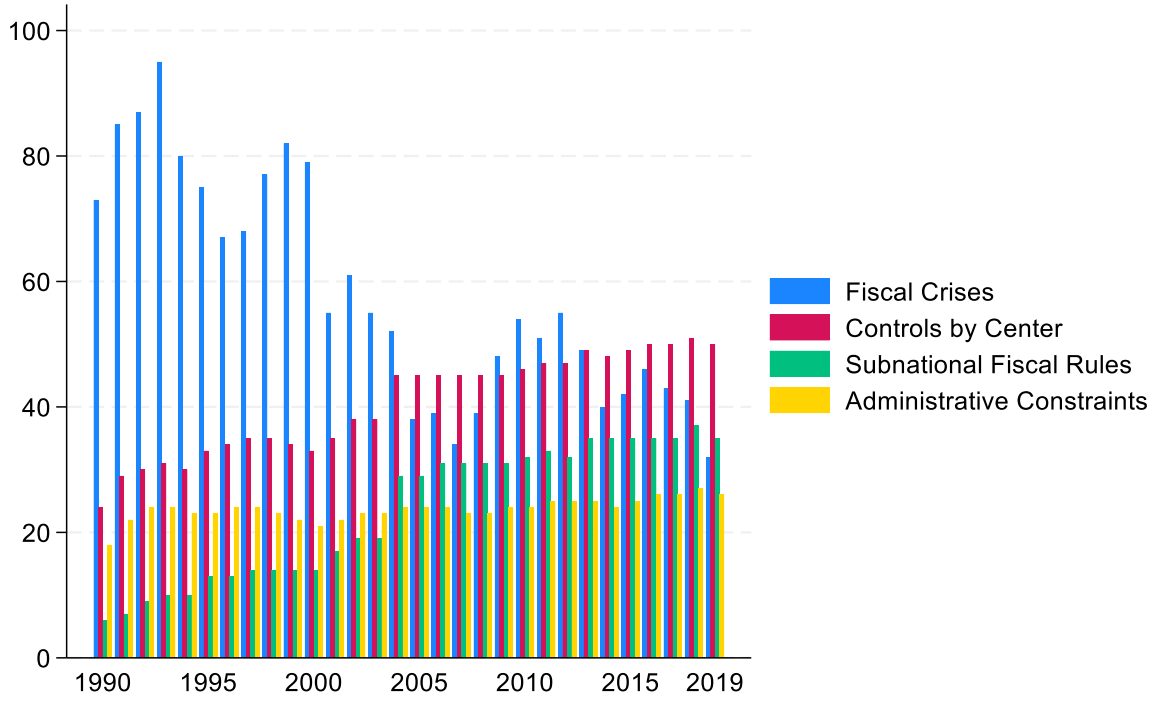


Table 1. List of Sample Countries (60 Countries)

Afghanistan	Germany	Nepal
Albania	Guatemala	Netherlands
Armenia	Honduras	New Zealand
Australia	Hungary	North Macedonia
Austria	Iceland	Paraguay
Azerbaijan	Indonesia	Peru
Belarus	Iran	Russia
Belgium	Israel	Rwanda
Bosnia and Herzegovina	Japan	Senegal
Brazil	Kazakhstan	Serbia
Cabo Verde	Kenya	South Africa
Cambodia	Kiribati	Spain
Canada	Kyrgyzstan	Sweden
Chile	Latvia	Switzerland
Colombia	Mauritius	Thailand
Costa Rica	Mexico	Tunisia
Croatia	Moldova	Turkey
El Salvador	Mongolia	Uganda
Estonia	Myanmar	Ukraine
Georgia	Namibia	United Kingdom

Table 2. Definitions and Data Sources of the Variables

Variable Name	Definition	Data Source
Fiscal Crisis Occurrence	The dummy takes the value of 1 if a country experiences fiscal crisis, 0 otherwise.	Moreno Badia et al. (2022)
Fiscal Crisis Onset	Omit the observations from fiscal crisis occurrence if a country experiences fiscal crisis in the previous year and in the current year.	Moreno Badia et al. (2022)
Spending Decentralization	The ratio of expenditure of local governments to expenditure of general government	IMF Fiscal Decentralization Dataset, 2021 Vintage
Transfer Dependency Ratio	The ratio of net transfers to local governments to own revenue of local governments.	IMF Fiscal Decentralization Dataset, 2021 Vintage
Vertical Fiscal Imbalance	One minus the ratio of the own revenue of local governments to the own spending of local governments	IMF Fiscal Decentralization Dataset, 2021 Vintage
Government Debt	General government gross debt as a percent of GDP	IMF World Economic Outlook Database (WEO), October 2022
Fiscal Interest Cost	Net interest expense of general government as a percentage of GDP, which is calculated as primary balance minus budget balance.	IMF WEO, October 2022
GDP Growth	Annual percent change in constant price GDP	IMF WEO, October 2022
Income Per Capita	Natural logarithm of GDP in constant price thousand international dollars per person.	IMF WEO, October 2022
Current Account Balance	Current account balance as a percent of GDP.	IMF WEO, October 2022
Banking Crisis	The dummy takes the value of 1 if a country experiences banking crisis, 0 otherwise.	Nguyen et al. (2022)
Currency Crisis	The dummy takes the value of 1 if a country experiences currency crisis, 0 otherwise.	Nguyen et al. (2022)
Commodity Terms of Trade	Commodity net export price index, individual commodities weighted by ratio of net exports to GDP.	IMF Commodity Terms of Trade Index, Latest update on September 8, 2023
Legislative Constraints	To the extent that the legislature is capable of questioning, investigating, and exercising oversight over the executive.	Varieties of Democracy (V-Dem) Dataset v16
Federalism	The dummy takes the value of 1 if a country has federal constitution, 0 otherwise.	Center for the Study of Federalism
Land Area	A country's total land area in square kilometer.	World Development Indicators
Population	Total population, which counts all residents.	World Development Indicators
Government Effectiveness	The index ranges from -2.5 to 2.5 (worst and best possible outcome, respectively).	Worldwide Governance Indicators, 2020
Control by Center	The dummy takes the value of 1 if a country has administrative or rule-based control over subnational borrowing, 0 otherwise.	Ter-Minassian and Craig (1997) Dabla-Norris and Wade (2002) Plekhanov and Singh (2006) IMF Fiscal Rules Dataset (2022) De Biase and Dougherty (2022) European Committee of the Regions

Table 3. Summary Statistics

Variable Name	Mean	Standard Deviation	Minimum	Maximum
Fiscal Crisis Occurrence	0.1458	0.3531	0	1
Fiscal Crisis Onset	0.0517	0.2216	0	1
Spending Decentralization	0.1865	0.1063	0.0009	0.4920
Transfer Dependency Ratio	1.3938	2.3097	-0.3755	32.2920
Vertical Fiscal Imbalance	0.4325	0.2493	-0.7592	0.9697
Government Debt	52.0628	33.7749	3.221	236.277
Fiscal Interest Cost	1.8002	1.3619	0.0050	8.369
GDP Growth	3.2670	3.2607	-15.1	20.585
Income Per Capita	2.9744	0.8012	0.4770	4.2579
Current Account Balance	-1.2968	7.4696	-43.825	63.39
Banking Crisis	0.0824	0.2752	0	1
Currency Crisis	0.0263	0.1601	0	1
Commodity Terms of Trade	100.5776	3.6260	72.6738	110.8778
Legislative Constraints	0.7503	0.2468	0.027	0.987
Federalism	0.2843	0.4514	0	1
Log (Land Area)	12.3383	1.8760	7.5994	16.6117
Population	35.0828	47.6403	0.272	266.912
Government Effectiveness	0.6096	0.9316	-1.5117	2.1580
Control by Center	0.5495	0.4979	0	1

Table 4. Baseline Estimation

Dependent Variable	Crisis Occurrence	Crisis Occurrence	Crisis Onset	Crisis Onset
Binary Choice Model	**IV Probit**	**IV Probit**	**IV Probit**	**IV Probit**
Country Coverage	**All Countries**	**Developing Countries**	**All Countries**	**Developing Countries**
Spending Decentralization	-1.3065 (2.0520)	0.7894 (1.9728)	-2.0095 (3.2223)	-0.2331 (3.4677)
Transfer Dependency Ratio	-0.4068*** (0.0566)	-0.3891*** (0.0305)	-0.1619 (0.2255)	-0.3434*** (0.0857)
Government Debt	0.0033 (0.0025)	-0.0004 (0.0064)	0.0060* (0.0036)	-0.0041 (0.0098)
Fiscal Interest Cost	-0.0166 (0.0581)	0.1191 (0.0868)	0.0546 (0.1010)	0.0907 (0.1795)
GDP Growth	-0.1123*** (0.0490)	-0.0558 (0.0641)	0.1499 (0.0814)	-0.0220 (0.0854)
Income Per Capita	-0.9177*** (0.1806)	-1.1708*** (0.1836)	-0.1398 (0.4408)	-1.2486*** (0.3262)
Current Account Balance	-0.0303*** (0.0082)	-0.0325*** (0.0100)	-0.0344*** (0.0107)	-0.0399*** (0.0146)
Banking Crises	0.3910 (0.2390)	0.4164 (0.3556)	0.7715*** (0.2837)	0.3146 (0.4069)
Currency Crises	-0.0183 (0.3782)	0.0478 (0.3805)	0.8645 (0.6155)	0.5063 (0.6566)
Commodity Terms of Trade	0.0239 (0.0160)	0.0007 (0.0163)	0.0410 (0.0305)	0.0203 (0.0407)
Legislative Constraints	0.4197 (0.2328)	0.1027 (0.2780)	0.5657 (0.5570)	0.7583 (0.5045)
Federalism	-0.3598* (0.1934)	-0.4100** (0.1913)	-0.3574 (0.2977)	-0.7192* (0.3747)
Constant	0.2513 (1.7142)	-2.7555 (2.9976)	-5.8702 (3.7886)	0.3639 (4.7422)
First-Stage Regression				
Log (Land Area)	0.0076*** (0.0023)	0.0144*** (0.0029)	0.0068*** (0.0025)	0.0100*** (0.0031)
Population	0.0114*** (0.0020)	0.0148*** (0.0029)	0.0107*** (0.0023)	0.0132*** (0.0032)
GDP Growth (t-1)	0.3512*** (0.0305)	0.3104*** (0.0389)	0.3220*** (0.0343)	0.2938*** (0.0451)
Income Per Capita (t-1)	0.9957*** (0.0014)	0.9998*** (0.0022)	0.9953*** (0.0015)	1.0001*** (0.0023)
Current Account Balance (t-1)	0.8573*** (0.0170)	0.8355*** (0.0234)	0.8508*** (0.0181)	0.8421*** (0.0258)
Year Fixed Effects	Yes	Yes	Yes	Yes
Sample Period	1990-2019	1990-2019	1990-2019	1990-2019
Wald Test of Exogeneity	84.52***	76.32***	33.83***	22.50***
AUROC	0.8824	0.8712	0.8542	0.9044
Number of Observations	786	490	634	411

Notes: Standard errors clustered at the country level are presented in parentheses. AUROC stands for the area under the receiver operating characteristic curve. *Significant at the 10% level, **significant at the 5% level, and ***significant at the 1% level.

Table 5. Types of Fiscal Crisis

Dependent Variable	Credit Events	Large Financing	Implicit Default	Extreme Pressures
Binary Choice Model	**IV Probit**	**IV Probit**	**IV Probit**	**IV Probit**
Country Coverage	**All Countries**	**All Countries**	**All Countries**	**All Countries**
Spending Decentralization	7.6903 (5.0062)	0.4745 (2.8039)	-2.4186 (3.6589)	3.9164 (3.1111)
Transfer Dependency Ratio	-0.4353*** (0.0791)	-0.3976*** (0.0751)	0.3401 (0.1808)	-0.8826*** (0.1146)
Government Debt	-0.0051 (0.0069)	0.0022 (0.0033)	0.0041 (0.0049)	-0.0056 (0.0035)
Fiscal Interest Cost	0.0860 (0.1512)	0.0242 (0.0704)	0.1021 (0.1391)	0.1291 (0.0837)
GDP Growth	-0.1882** (0.0878)	-0.2208*** (0.0825)	-0.0036 (0.1311)	-0.124*** (0.0648)
Income Per Capita	-2.3869*** (0.6706)	-1.0538*** (0.2078)	0.7328** (0.3532)	-0.9451*** (0.1746)
Current Account Balance	-0.0095 (0.0159)	-0.0512*** (0.0175)	-0.0101 (0.0292)	-0.0413*** (0.0158)
Banking Crises	-0.3707 (0.5230)	0.4324 (0.3101)	0.4332 (0.4250)	-0.0870 (0.3187)
Currency Crises	-0.0189 (0.6960)	-0.5987 (0.4106)	omitted	-1.0459** (0.4321)
Commodity Terms of Trade	0.0248 (0.0357)	-0.0163 (0.0185)	0.0130 (0.0503)	-0.0166 (0.0207)
Legislative Constraints	1.6124** (0.5822)	0.0325 (0.4074)	-0.4079 (1.0374)	0.4260 (0.3512)
Federalism	omitted	-0.0397 (0.2488)	-0.3862 (0.3596)	-0.6338 (0.4013)
Constant	1.4332 (3.7168)	4.7283** (1.9672)	-5.2492 (5.2079)	4.2609* (2.2877)
First-Stage Regression				
Log (Land Area)	0.0132*** (0.0031)	0.0063*** (0.0025)	0.0077*** (0.0034)	0.0078*** (0.0029)
Population	0.0158*** (0.0029)	0.0116*** (0.0023)	0.0117*** (0.0030)	0.0099*** (0.0013)
GDP Growth (t-1)	0.3421*** (0.0387)	0.3014*** (0.0340)	0.4447*** (0.0429)	0.3573*** (0.0376)
Income Per Capita (t-1)	0.9960*** (0.0017)	0.9948*** (0.0016)	0.9997*** (0.0018)	0.9933*** (0.0020)
Current Account Balance (t-1)	0.8820*** (0.0222)	0.8035*** (0.0162)	0.9101*** (0.0237)	0.8042*** (0.0203)
Year Fixed Effects	Yes	Yes	Yes	Yes
Sample Period	1990-2019	1990-2019	1990-2019	1990-2019
Wald Test of Exogeneity	44.89***	154.07***	12.14**	146.67***
AUROC	0.9590	0.9343	0.8689	0.9333
Number of Observations	534	626	377	488

Notes: Standard errors clustered at the country level are presented in parentheses. AUROC stands for the area under the receiver operating characteristic curve. *Significant at the 10% level, **significant at the 5% level, and ***significant at the 1% level.

Table 6. Deficit Countries versus Surplus Countries

Dependent Variable	Crisis Occurrence	Crisis Occurrence	Crisis Onset	Crisis Onset
Binary Choice Model	**IV Probit**	**IV Probit**	**IV Probit**	**IV Probit**
Country Coverage	**Deficit Countries**	**Surplus Countries**	**Deficit Countries**	**Surplus Countries**
Spending Decentralization	0.8356 (2.4025)	-6.9045*** (2.8933)	3.9966 (3.1815)	-2.3962 (4.2665)
Transfer Dependency Ratio	-0.3665*** (0.0367)	-0.3308 (0.3108)	-0.3085*** (0.0862)	0.4903** (0.2384)
Government Debt	-0.0006 (0.0042)	0.0067** (0.0034)	-0.0054 (0.0058)	0.0090** (0.0037)
Fiscal Interest Cost	0.0577 (0.0760)	-0.1003 (0.0966)	0.2399** (0.0999)	0.0729 (0.1422)
GDP Growth	-0.1411** (0.0702)	-0.0896 (0.1017)	-0.0858 (0.1288)	0.3263*** (0.0743)
Income Per Capita	-1.2417*** (0.2443)	-0.4248 (0.3025)	-0.8299** (0.3464)	0.7451*** (0.2333)
Current Account Balance	-0.0208** (0.0095)	-0.0587** (0.0261)	0.0094 (0.0183)	-0.0567* (0.0317)
Banking Crises	0.0611 (0.3801)	0.4454 (0.3114)	0.4585 (0.4988)	-0.0348 (0.3560)
Currency Crises	0.3469 (0.5866)	-0.3636 (0.7316)	1.8267 (1.7734)	omitted
Commodity Terms of Trade	0.0223 (0.0213)	0.0382 (0.0356)	0.0483 (0.0501)	0.0861 (0.0593)
Legislative Constraints	0.6987* (0.3575)	0.4044 (0.5339)	1.8630** (0.8593)	-0.0496 (0.9946)
Federalism	0.2149 (0.2467)	-0.9864*** (0.2375)	0.1461 (0.3394)	0.2046 (0.5296)
Constant	1.0956 (2.1775)	-2.3271 (3.8995)	-4.7728 (6.3746)	-13.4855** (6.3331)
First-Stage Regression				
Log (Land Area)	0.0074** (0.0032)	0.0073** (0.0035)	0.0054*** (0.0039)	0.0082** (0.0048)
Population	0.0114*** (0.0034)	0.0107*** (0.0017)	0.0107** (0.0050)	0.0081*** (0.0026)
GDP Growth (t-1)	0.3379*** (0.0386)	0.3280*** (0.0520)	0.2641*** (0.0544)	0.2065*** (0.0758)
Income Per Capita (t-1)	0.9958*** (0.0019)	0.9953*** (0.0024)	0.9954*** (0.0025)	0.9900*** (0.0036)
Current Account Balance (t-1)	0.8680*** (0.0243)	0.8190*** (0.0269)	0.9063*** (0.0322)	0.8523*** (0.0359)
Year Fixed Effects	Yes	Yes	Yes	Yes
Sample Period	1990-2019	1990-2019	1990-2019	1990-2019
Wald Test of Exogeneity	47.32***	37.16***	151.25***	111.23***
AUROC	0.8976	0.9036	0.9428	0.8818
Number of Observations	410	327	240	182

Notes: Standard errors clustered at the country level are presented in parentheses. AUROC stands for the area under the receiver operating characteristic curve. *Significant at the 10% level, **significant at the 5% level, and ***significant at the 1% level.

Table 7. Effects of Control by Center, Subnational Fiscal Rules, and Public Institutions

Dependent Variable	Crisis Occurrence	Crisis Occurrence	Crisis Occurrence	Crisis Occurrence
Binary Choice Model	**IV Probit**	**IV Probit**	**IV Probit**	**IV Probit**
Country Coverage	**All Countries**	**All Countries**	**All Countries**	**All Countries**
Spending Decentralization	-2.0224 (1.5738)	0.2517 (1.6226)	-3.4028 (2.4569)	-2.4086 (2.4052)
Spending Decentralization x Control by Center	2.3742*** (0.7036) [2.0917***]			2.7195*** (0.7034) [2.9242***]
Spending Decentralization x Subnational Fiscal Rules		3.4308*** (0.6327) [2.8781***]		
Spending Decentralization x Government Effectiveness			0.2806 (1.7333) [0.3249]	2.0024 (1.4606) [1.7878]
Transfer Dependency Ratio	-0.4521*** (0.0380)	-0.4592*** (0.0349)	-0.3564*** (0.1013)	-0.4457*** (0.0377)
Government Debt	0.0015 (0.0023)	0.0039* (0.0023)	0.0048 (0.0045)	-0.0008 (0.0044)
Fiscal Interest Cost	-0.0114 (0.0517)	-0.0361 (0.0514)	-0.0245 (0.1375)	0.1007 (0.1323)
GDP Growth	-0.0668 (0.0538)	-0.0805 (0.0551)	-0.1061 (0.0671)	-0.0342 (0.0821)
Income Per Capita	-1.0657*** (0.1315)	-1.3062*** (0.1333)	-0.8192** (0.3593)	-1.3941*** (0.2172)
Current Account Balance	-0.0139 (0.0112)	-0.0160 (0.0120)	-0.0314*** (0.0101)	-0.0166 (0.0108)
Banking Crises	0.3875 (0.2434)	0.2085 (0.2481)	0.6019*** (0.2294)	0.5889* (0.3120)
Currency Crises	0.0238 (0.3603)	-0.1527 (0.4253)	0.2811 (0.3776)	0.3002 (0.4001)
Commodity Terms of Trade	0.0358*** (0.0140)	0.0244 (0.0150)	0.0333 (0.0313)	0.0271 (0.0348)
Legislative Constraints	0.6107** (0.2621)	0.5417* (0.3026)	0.2898 (0.3523)	0.3476 (0.3515)
Federalism	-0.0150 (0.1913)	0.0052 (0.1748)	-0.4393 (0.3415)	0.2399 (0.3829)
Constant	-0.2279 (1.4372)	1.0404 (1.5504)	-0.5773 (3.4648)	0.8984 (3.4389)
First-Stage Regression				
Log (Land Area)	0.0084*** (0.0023)	0.0117*** (0.0022)	0.0073*** (0.0023)	0.0078*** (0.0023)
Log (Land Area) x Control by Center (t-1)	0.0127*** (0.0004)			0.0124*** (0.0005)
Log (Land Area) x Subnational Fiscal Rules (t-1)		0.0172*** (0.0004)		
Log (Land Area) x Government Effectiveness (t-1)			0.0137*** (0.0008)	0.0124*** (0.0008)
Population	0.0079*** (0.0021)	0.0101*** (0.0020)	0.0135*** (0.0022)	0.0094*** (0.0022)
GDP Growth (t-1)	0.4145*** (0.0307)	0.4083*** (0.0309)	0.3445*** (0.0331)	0.4146*** (0.0335)
Income Per Capita (t-1)	0.9945*** (0.0016)	0.9941*** (0.0016)	0.9995*** (0.0023)	0.9980*** (0.0024)
Current Account Balance (t-1)	0.9151*** (0.2115)	0.8471*** (0.0187)	0.8577*** (0.0184)	0.8452*** (0.0204)
Year Fixed Effects	Yes	Yes	Yes	Yes
Sample Period	1990-2019	1990-2019	1990-2019	190-2019
Wald Test of Exogeneity	115.49***	80.93***	115.77***	167.97***
AUROC	0.8860	0.8851	0.8935	0.9027
Number of Observations	720	707	686	620

Notes: Standard errors clustered at the country level are presented in parentheses. AUROC stands for the area under the receiver operating characteristic curve. *Significant at the 10% level, **significant at the 5% level, and ***significant at the 1% level. The marginal effects (at the mean) based on the method developed by Ai and Norton (2003) are shown in square brackets.

Table 8. Mechanism Analysis: Moral Hazard Channel, Institutional Channel, and Substitutability

Dependent Variable	**Crisis Occurrence**	**Crisis Occurrence**	**Crisis Occurrence**
Binary Choice Model	**IV Probit**	**IV Probit**	**IV Probit**
Country Coverage	**All Countries**	**All Countries**	**All Countries**
Transfer Dependency Ratio (TDR)	-3.9962*** (0.3725)	-0.4568*** (0.0300)	-0.2652 (0.3353)
TDR x Vertical Fiscal Imbalance	4.4867*** (0.3636) [0.1220**]		
Spending Decentralization (SD)	0.7071 (2.0001)	-2.4499 (2.2825)	-1.5891 (1.4493)
SD x Control by Center (CC)		3.9439*** (0.8868) [4.2467***]	3.5720* (1.8975) [3.3354*]
SD x Government Effectiveness (GE)		3.1531** (1.5652) [2.9785*]	
SD x CC x GE		-1.8633** (0.9521) [-2.0985*]	
SD x CC x TDR			-1.2640 (2.0368) [-1.2906]
Government Debt	-0.0004 (0.0025)	-0.0010 (0.0036)	0.0002 (0.0025)
Fiscal Interest Cost	0.1480** (0.0598)	0.1225 (0.1162)	-0.0165 (0.0559)
GDP Growth	-0.0903* (0.0484)	-0.0307 (0.0703)	-0.0709 (0.0571)
Income Per Capita	-0.0228 (0.1932)	-1.4125*** (0.1890)	-1.0832*** (0.1303)
Current Account Balance	-0.0139 (0.0108)	-0.0116 (0.0109)	-0.0094 (0.0124)
Banking Crises	0.0375 (0.2641)	0.6033** (0.2780)	0.4309 (0.2712)
Currency Crises	-0.1695 (0.3518)	0.3036 (0.3851)	0.0459 (0.3685)
Commodity Terms of Trade	0.0108 (0.0166)	0.0210 (0.0308)	0.0314** (0.0154)
Legislative Constraints	-0.4596** (0.2199)	0.3518 (0.3254)	0.7559** (0.3266)
Federalism	-0.5193** (0.2076)	0.2021 (0.3114)	0.0210 (0.1822)
Constant	-0.1700 (2.5908)	1.5428 (3.0084)	-0.0340 (1.4700)
First-Stage Regression			
Population	-0.0288*** (0.0051)	0.0103*** (0.0022)	0.0071*** (0.0034)
Population x Vertical Fiscal Imbalance (t-1)	0.0508*** (0.0065)		
Log (Land Area)	0.0094*** (0.0024)	0.0086*** (0.0023)	0.0062*** (0.0023)
Log (Land Area) x CC (t-1)		0.0114*** (0.0005)	0.0139*** (0.0005)
Log (Land Area) x GE (t-1)		0.0114*** (0.0008)	
Log (Land Area) x CC (t-1) x GE (t-1)		0.0164*** (0.0007)	
Log (Land Area) x CC (t-1) x Population			0.0001** (0.0000)
GDP Growth (t-1)	0.3526*** (0.0324)	0.4145*** (0.0335)	0.4129*** (0.0308)
Income Per Capita (t-1)	0.9953*** (0.0015)	0.9977*** (0.0024)	0.9946*** (0.0016)
Current Account Balance (t-1)	0.8385*** (0.0180)	0.8461*** (0.0205)	0.8465*** (0.0186)
Year Fixed Effects	Yes	Yes	Yes
Sample Period	1990-2019	1990-2019	1990-2019
Wald Test of Exogeneity	217.55***	231.39***	152.62***
AUROC	0.8916	0.9038	0.8890
Number of Observations	740	620	720

Notes: Standard errors clustered at the country level are presented in parentheses. AUROC stands for the area under the receiver operating characteristic curve. *Significant at the 10% level, **significant at the 5% level, and ***significant at the 1% level. The marginal effects (at the mean) based on the method developed by Ai and Norton (2003) are shown in square brackets.

Annex Table. Alternative Estimation Methods

Dependent Variable	**Crisis Occurrence**	**Crisis Onset**	**Crisis Occurrence**	**Crisis Onset**
Estimation Model	**Logit**	**Logit**	**Ordinary Least Squares**	**Ordinary Least Squares**
Country Coverage	**All Countries**	**All Countries**	**All Countries**	**All Countries**
Spending Decentralization	3.7289*** (1.3399)	0.8043 (2.2623)	0.8003** (0.3316)	0.1335 (0.2811)
Transfer Dependency Ratio	-0.1631** (0.0669)	-0.0202 (0.0651)	-0.0349** (0.0167)	-0.0105 (0.0134)
Government Debt	0.0029 (0.0044)	0.0021 (0.0065)	0.0039*** (0.0010)	0.0009 (0.0008)
Fiscal Interest Cost	0.0545 (0.1043)	0.0244 (0.1602)	-0.0300 (0.0186)	-0.0018 (0.0150)
GDP Growth	-0.2218*** (0.0489)	-0.2314*** (0.0803)	-0.0337*** (0.0045)	-0.0213*** (0.0038)
Income Per Capita	-1.8330*** (0.2462)	-1.1644*** (0.3637)	-0.1868 (0.1332)	0.1278 (0.1142)
Current Account Balance	-0.0576*** (0.0165)	-0.0540* (0.0280)	-0.0027 (0.0024)	-0.0341** (0.0020)
Banking Crises	1.1065*** (0.3932)	0.6728 (0.5805)	0.0160 (0.0447)	0.0032 (0.0382)
Currency Crises	0.5396 (0.6946)	0.7936 (1.0236)	0.0539 (0.0736)	0.0210 (0.0646)
Commodity Terms of Trade	0.0718* (0.0410)	0.1124 (0.0734)	0.0007 (0.0045)	0.0027 (0.038)
Legislative Constraints	-0.2382 (0.5675)	0.7015 (1.0202)	-0.1939 (0.1296)	-0.0208 (0.1099)
Federalism	-0.5015 (0.3700)	-0.6850 (0.5698)	0.1756 (0.2359)	-0.2215 (0.2057)
Constant	-5.2302 (4.2933)	-12.3434 (7.6636)	0.6848 (0.6890)	-0.6611 (0.5653)
Year Fixed Effects	Yes	Yes	Yes	Yes
Country Fixed Effects	No	No	Yes	Yes
Sample Period	1990-2019	1990-2019	1990-2019	1990-2019
AUROC	0.8567	0.8175	N/A	N/A
R-Squared	N/A	N/A	0.4189	0.1835
Number of Observations	786	634	838	755

Notes: Standard errors clustered at the country level are presented in parentheses. AUROC stands for the area under the receiver operating characteristic curve. *Significant at the 10% level, **significant at the 5% level, and ***significant at the 1% level.