

Measuring Country-Specific, Regional, and Composite Fiscal Stress for Emerging and Developed Countries

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Abstract

This study proposes a new conceptual framework for measuring fiscal stress and empirically builds fiscal stress indices at country, composite, and region levels for emerging and developed countries. This framework emphasizes political risk as a crucial factor in fiscal stress besides fiscal risk. The findings suggest that a rise in political risk amplifies fiscal risk, especially in emerging countries. The regional analysis concludes that the European region significantly contributed to fiscal stress during the post-global financial crisis period. In contrast, the Latin American region accounted for most of the fiscal stress during the early 2000s. The author proposes a countercyclical fiscal policy besides accumulating fiscal buffers to eradicate contagion and adverse bank-sovereign loops. The study further recommends complimenting fiscal sustainability frameworks with monetary unions for the EU. It may help them maintain fiscal discipline. Fiscal policy should address the issue of excessive private sector leverage through subsidized long-term credit.

Keywords: Fiscal stress, Rollover risk, Fiscal sustainability, Political risk

JEL Classification: F34, H62, H63, E62

Introduction

The global financial crisis (GFC) and subsequent European debt crisis (EDC) have cautioned academicians and policymakers to reassess fiscal policy. Fiscal policy is a tool to respond to and recover from budgetary problems. Fiscal policy's role as a stabilizing tool has gained prominence, especially when monetary policy fails to stabilize financially weak economies. In addition, a high degree of uncertainty and deteriorated public balance sheet positions thwarted public debt sustainability. Both developed and emerging countries experienced economic and productivity slowdowns. This showdown requires the design of fiscal policy to enhance employment, capital accumulation, and economic growth (IMF, 2017a).

A misperception prevailed in the literature that fiscal sustainability concerns were only relevant to emerging economies.ⁱ Later, the eruption of the sovereign debt problems in developed countries in 2011 changed this conviction. High debt stayed unnoticed in developed countries until the full-blown crisis appeared in 2011. Structural vulnerabilities and soaring debt-to-GDP ratios in the pre-crisis periods remained prominent features of these countries. Further, they lacked fiscal buffers to counter downturns and financial crises.

The risks associated with the rollover of public debt are crucial. However, a single dimension of fiscal events cannot accurately capture them. A more rigorous rollover risk management framework comprises an aggregate fiscal stress index (FSI), which enriches the risk management toolkit.ⁱⁱ

Many studies pointed out that political risk (PR) is vital in elevating fiscal stress (Qian, 2012; Reinhart et al., 2003). Political leaders generally interfere with macro-prudential policies. The success of a policy requires political support and influence on policymakers (Danielsson & Macrae, 2016). Moreover, economic reforms also need political will (WEF, 2015). Also, Waszkiewicz (2015) acknowledged the role of political uncertainty in the debt market. If the PR is high, the credibility of the sovereign in paying back debt is low. It raises the probability of debt default and fiscal stress (FS). However, none of the existing fiscal studies incorporated PR as an essential component of FS.

This study aims to extend the conceptual frameworks for measuring FS. The new framework incorporates PR as an indicator of FSI besides short-, medium-, and long-term dimensions of rollover risk. Further, the author develops new FSIs at the country, region, and composite levels for emerging and

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developed countries to provide novel evidence in contrast to the earlier studies conducted by Baldacci et al. (2011a) by incorporating PR while constructing FS.

These indices are a barometer of fiscal sustainability as they help curtail and predict rollover risk. They also serve as risk assessment tools for investors, who prefer to invest in an environment where rollover risks are manageable. In addition, this study assesses the stress contribution of the various components of FS in composite FSI for both country groupings.

The introduction follows a review of the literature on measuring FSI in section 2. Section 3 discusses methodological aspects. Section 4 provides results and discussion. The last section concludes the study and provides policy guidelines.

Literature Review

FS refers to the government's inability to roll over the risk. Although the literature on FS dates back to 1975 at the municipal and state levels in US states, it has gained substantial importance after the European sovereign debt crisis in 2011. The pioneering study of Baldacci et al. (2011a) constructs aggregate FSI. However, they only account for fiscal variables. The study shows that the pressure of the aging population and weak fundamentals amplify rollover risk in developed countries. Exposure to maturity, exchange rate risks, high debt levels, and fiscal imbalances contribute to rollover risk in emerging countries. In a subsequent study, Baldacci et al. (2011b) extend the definition of fiscal crisis by incorporating an absolute fiscal crisis and extreme financing problems. The empirical results confirm elevated FS for developed countries compared to emerging countries. Berti et al. (2012) analyze FS for 27 European Union (EU) countries and find that financial and macroeconomic factors are far more significant than the fiscal variables in predicting FS. Based on the work of Berti et al. (2012), De Cos, Moral-Benito, Koester, and Nickel (2014) introduce country-specific thresholds in early warning indicators of FS to cater to the heterogeneity of the dataset. The results indicate that these thresholds contribute to the predictive power. In another study, Magkonis and Tsopanakis (2016) built FSIs for G5 countries using quarterly data from 1980 to 2014. The study used principal component analysis (PCA) and a variance-equal approach. It combines five variables, namely interest rate growth differential, structural balance, net debt, fertility rate, and age dependency ratio, to construct a composite FSI. The empirical findings confirm the deterioration of fiscal stress and a rise in fiscal burden in G5. A few recent studies used market-based measures of FS. For example, Dufrenot, Gente, and Monsia (2016) propose methodologies to assess fiscal disturbances in Euro Area countries.ⁱⁱⁱ The study reveals that high financial stress and macroeconomic imbalances exert pressure on public finances, which raises FS for the selected countries.

The empirical literature measuring FSI relies on economic risk transmitted into public accounts. Previous studies extensively used only fiscal factors to measure FS. In reality, politicians and interest groups govern the policymaking process. Thus, poor governance generates PR, which affects FS. To date, no study has incorporated PR in constructing FSI. This study considers the role of fiscal, macroeconomic, and institutional factors in developing FSI.

Methodology

This section discusses theoretical underpinnings, econometric procedures, and data for building FSIs for both country groupings.

Definition and Conceptual Framework for FSI

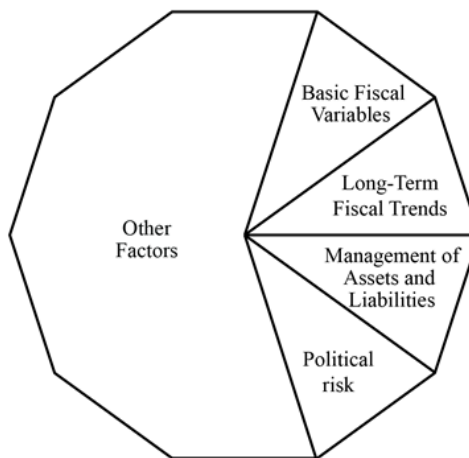
FS and fiscal crises are closely related but interchangeably used concepts in the early literature (Gold, 1995). However, recent literature has differentiated between these concepts using the state of government's financial conditions. The FS and crisis reflect the government's inability to meet its obligations and provide public services. The former is a weak financial condition, while the latter indicates deplorable financial conditions.^{iv} In recent literature, FS stems from the debt crisis. The traditional definition of FS revolves around debt defaults, implicit defaults, and restructuring. Later, Manasse et al. (2003) recommend implicit default events to indicate a debt crisis. Besides these traditional definitions of FS, Baldacci et al. (2011b) extend the definition of fiscal crisis to include extreme financial constraints of the sovereign. A fiscal

crisis indicates the inability of the government to repay interest on its debt and principal amount (Bordo & Meissner, 2016).

The author alters the risk octagon framework proposed by Cottarelli (2011) and Cottarelli et al. (2014) into a new framework for measuring FS. The new framework is a risk decagon, as shown in Figure 1. In contrast to the existing risk framework, the proposed new framework accounts for ten dimensions of rollover risk, each represented by a line segment of the risk decagon. The risk decagon redefines the role of fiscal policy. Besides demand management and stabilizing roles, a new function has evolved, especially after the EDC. Fiscal policy aims to assess the basic fiscal variables and minimize the fiscal risk from shocks to these variables. Only four dimensions, each dedicated as a pie of risk decagon, are relevant for measuring FSI. The three dimensions are similar to Cottarelli et al. (2014). The PR is a fourth dimension of rollover risk. These four dimensions are as follows:^v The first dimension is basic fiscal variables (BF). BF explains whether debt dynamics are consistent with government solvency conditions.

Figure 1. Risk Decagon: Conceptual Framework for Measuring Fiscal Risk

This diagram indicates the four dimensions of fiscal risk for measuring FS: basic fiscal variables, long-term fiscal trends, management of assets and liabilities, and political risk.



Source: Author's Construction.

Fiscal solvency requires a primary balance that stabilizes the debt-to-GDP ratio. This dimension consists of three components, namely growth-adjusted interest rate on the public debt (IRGD), gross government debt as a percent of GDP (GD), and cyclically adjusted primary balance (CAPB). The second dimension, long-term fiscal trends (LTFT), explains long-term demographic and fiscal pressures that affect the budget. Demographic changes are significant for long-term fiscal pressures. The components of LTFT are the current fertility rate (FR), the old age dependency ratio (ODR) that disturbs the inter-temporal budget and increases fiscal sustainability risks, and populating aging (PA). The third dimension is the management of assets and liabilities (ALM). The composition of ALM in public accounts affects the public exposure to rollover risk. Shocks to the balance sheet impair the conduct of fiscal policy (IMF, 2016). Five components to capture rollover risk related to ALM are gross financing needs (GFN), short-term public debt as a ratio to total debt (SRD), debt held by non-residents as a proportion of total debt (DNR), weighted average maturity of outstanding government debt (WAM), and short-term external debt as a ratio of international reserves (STED). The last component (STED) is relevant for only emerging countries as central banks of developed countries hold large precautionary foreign currency reserves intending to provide a cushion in times of crisis (Baldacci et al., 2011a; Cottarelli, 2011; Cottarelli et al., 2014).

The current framework considers an explicit consideration of PR as the fourth dimension of rollover risk. Macroeconomic factors measure the ability to pay back debt. On the other hand, political factors refer to political feasibility and the government's willingness to pay back debt. Modern investors account for the

debt-paying ability and the desire to make decisions. Persistent PR hampers the future solvency of the government, which in turn discourages investment in politically unstable economies (Waszkiewicz, 2015). Thus, the author believes PR raises rollover risk and FS.

Econometric Procedure and Data

The existing literature provides various methodologies for aggregating the individual components into composite indices. In the present context, the author uses PCA as an aggregation method. PCA has many advantages. First, it preserves the maximum possible variations in data. Second, this method assigns the highest factor loading to the components that explain the highest variation across countries. This feature makes it highly relevant for cross-country comparisons.^{vi} This aggregation scheme relies on a few linear combinations of original data on a relatively large number of mutually correlated variables representing similar attributes to capture the variations in the observed data.

The author initially considered a broad sample of 35 emerging and 40 developed countries starting from 1990. However, SRD and DNR data are available only from 2000 onwards in the *OECD database*, *Quarterly Public Debt*, and *Joint External Debt Hub*. Similarly, the author dropped those countries from the analysis where consistent data from 2000 onwards are unavailable. Finally, the sample consists of 17 emerging and 19 developed countries from 2000 to 2016, which comprise 289 and 323 annual observations, respectively. Table A2 in Appendix 1 reports the list of countries. This study incorporates rollover risk and PR in the construction of FSIs. FSIs aggregate 12 components for emerging and 11 for developed countries, respectively.^{vii} Table A3 in Appendix 1 lists these components, their description, and the data sources. The study uses the World Bank's definition of short-term debt. Debt with an original maturity of one year or less refers to short-term debt.

Results and Discussion

This study uses PCA on the normalized components of FS to construct composite FSIs for emerging and developed countries, as shown in Table 1.

Table 1. Results for Principal Component Analysis: Fiscal Stress Indices

Country Groups Components	Emerging countries			Developed countries		
	Eigenvalues	Proportion	Cumulative Proportion	Eigenvalues	Proportion	Cumulative Proportion
Component 1	3.0191	0.2516	0.2516	2.6353	0.2396	0.2396
Component 2	2.0749	0.1729	0.4245	2.5438	0.2313	0.4708
Component 3	1.4502	0.1208	0.5453	1.4395	0.1309	0.6017
Component 4	1.3417	0.1118	0.657	0.9862	0.0897	0.6913
Component 5	0.9740	0.0812	0.7383	0.9014	0.0819	0.7733
Component 6	0.8235	0.0686	0.8069	0.7005	0.0637	0.8370
Component 7	0.7676	0.0640	0.8709	0.6376	0.0580	0.8949
Component 8	0.6506	0.0542	0.9251	0.6270	0.0570	0.9519
Component 9	0.4207	0.0351	0.9602	0.3210	0.0292	0.9811
Component 10	0.3071	0.0256	0.9858	0.1126	0.0102	0.9913
Component 11	0.1303	0.0109	0.9966	0.0953	0.0087	1
Component 12	0.0405	0.0004	1	-	-	-

Source: Author's Estimates

The literature suggests that a composite index for emerging and developed countries should account for at least 50-60 percent of the total variation. Thus, the author constructs FSIs for emerging and developed

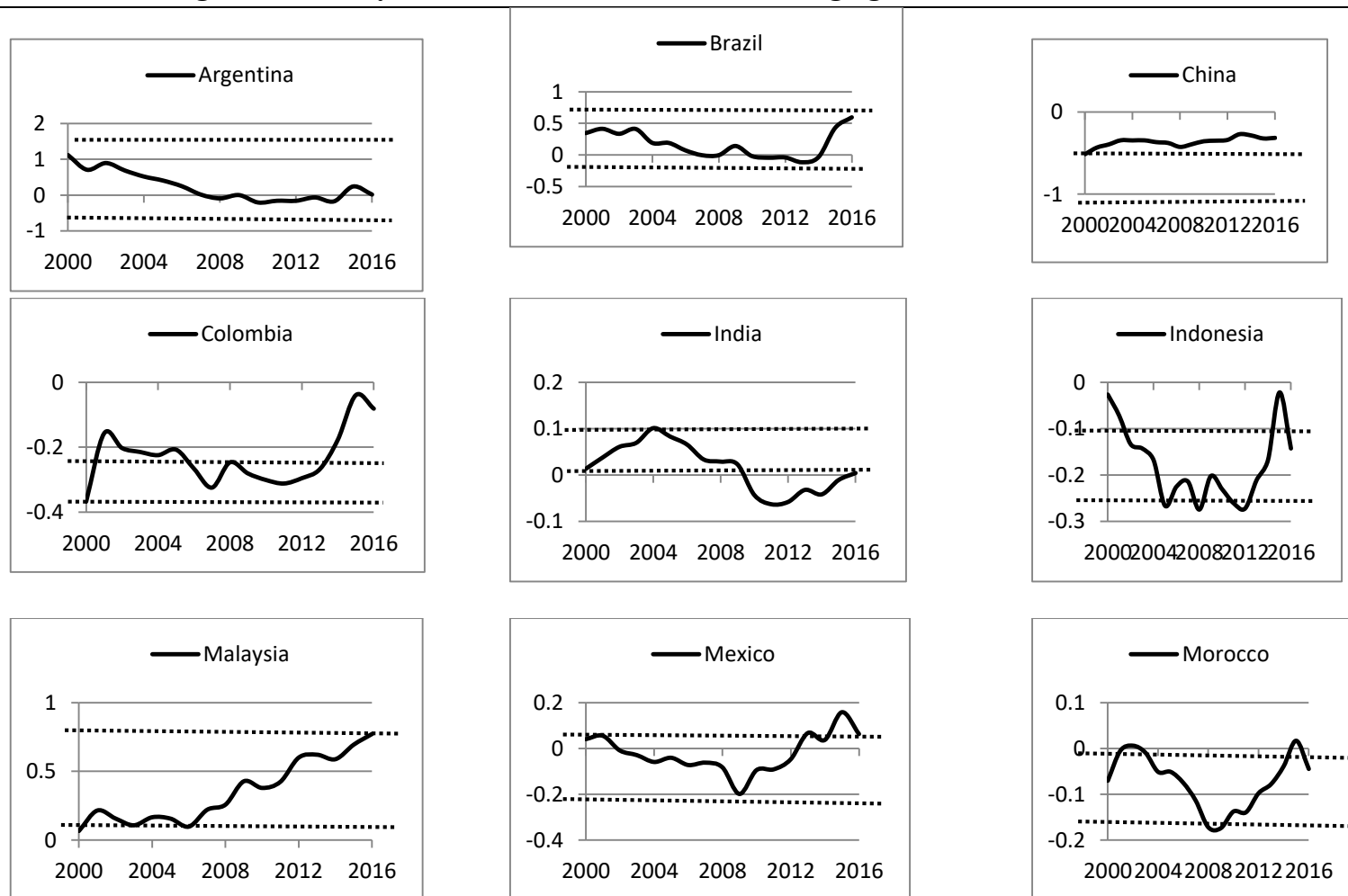
countries using a non-standardized average of the first three components having eigenvalues greater than 1. Constructed FSIs explain 54.53 and 60.17 percent of the cumulative proportion of variation for emerging and developed countries, respectively.

Next, the author conducts a graphic analysis of FSIs. For simplicity, this study applies an expert-based approach. It exploits the chronology of FS and fiscal crisis events provided by Baldacci et al. (2011b) and Gerling, Medas, Poghosyan, Farah-Yacoub, and Xu., (2017). The study uses political stress events listed in Caceres and Kochanova (2012) for PR.

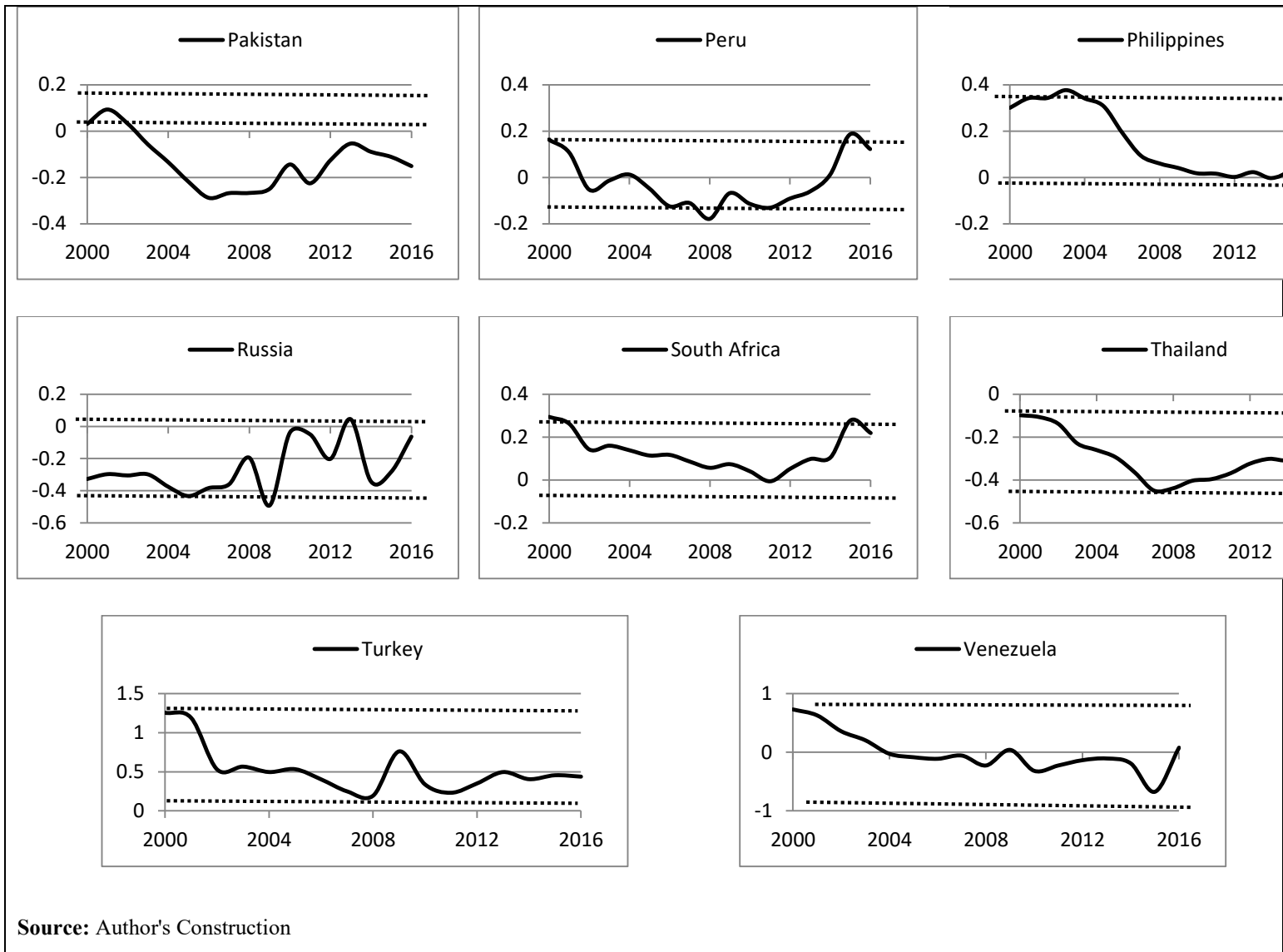
Analyzing FSIs for Emerging Countries

This sub-section explains the evolution patterns of individual, composite, and regional FSIs for 17 emerging countries covering 2000 to 2016.^{viii} The author plots country-wise stress indices for the emerging countries in Figure 2. The analysis pinpoints several interesting observations. First, country-specific FSIs show that emerging economies experienced FS in the early 2000s as they faced sovereign debt problems. Second, FS stayed low during 2004-2008 in most emerging countries. However, Turkey is an exception, as the government experienced high FS in 2005 and approached the IMF for a bailout. Third, FS regained momentum in the aftermath of the GFC. Emerging countries faced extreme financial constraints with the decline in global liquidity. However, these effects were short-lived and manageable in most countries. Lastly, during the last three years of analysis, almost all the countries realized high FS, which was attributed to various factors, such as inflation-targeting regimes, falling commodity prices, and debt crises.

Figure 2. Country-wise Fiscal Stress Indices for Emerging Countries



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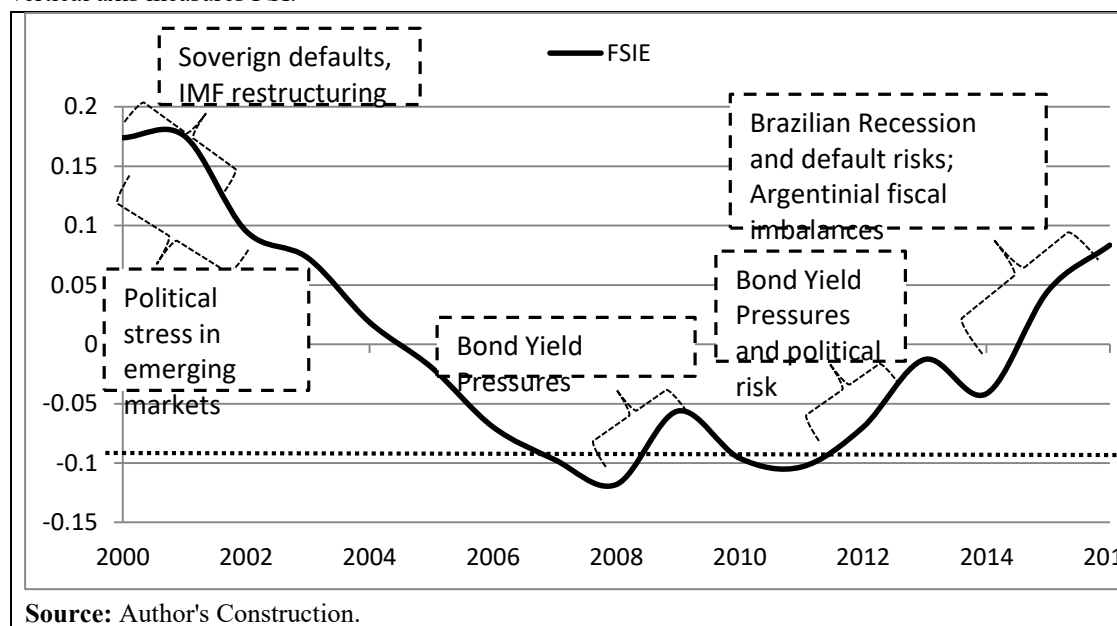
Source: Author's Construction

Figure 2 plots FSIs at the country level in the sample of emerging countries. The horizontal axis measures time, whereas the vertical axis labels FSI.

Next, the author constructs FSI for emerging countries (FSIE). Figure 3 plots the annual FSIE countries during 2000-2016. The FSIE identifies five broader peaks in FS. The first spike in FSIE appeared in the early 2000s when several emerging countries faced sovereign default and restructuring. The first and the most severe debt crisis surfaced in Argentina with the Argentinian Peso devaluation and severe fiscal imbalances. The Argentinian government imposed a deposit freeze in December 2001. Interest rates and, hence, sovereign bond spread rose steeply. Finally, the government announced sovereign default in December 2001. Owing to the close direct trade linkages between Argentina and Brazil, contagion occurred due to the sovereign debt crisis in Brazil. The Brazilian economy experienced fiscal imbalances and rising interest rates. Thus, these economies experienced an overlapping financial and fiscal crisis when currency and sovereign bond risks started to pile up. Indonesia's third serial sovereign default emerged in 2001 and 2002.^{ix}

Figure 3. Fiscal Stress Index for Emerging Countries

Figure 3 explains the patterns of FSIE. The horizontal axis measures the analysis period, whereas the vertical axis measures FSIE.



The roots of the Indonesian crisis go back to the Asian crisis, where the Indonesian currency devalued sharply. Besides that, vulnerabilities in the banking and corporate sectors raised the banking crisis, which translated into a sovereign debt crisis in 2001. Almost half of the Indonesian corporations became insolvent. They underwent external debt restructuring, which raised FS to unprecedented levels. Brazil's fiscal crisis was short-lived (1-2 years). However, the Argentinian and Indonesian sovereign defaults lasted for several years as they underwent restructurings to receive IMF-supported bailouts, which escalated FS. The second cluster of FS episodes emerged in the early 2000s. Even though this episode had some similarities with the first one, it also involved some PR. The political uncertainty in Indonesia exacerbated FS as the government failed to restore investors' confidence through a stable policy environment. Likewise, banking panics and sovereign default in Argentina raised PR. Thus, flawed policies ultimately compelled the president to resign. In addition, political instability in Colombia (2003), Peru (2000), Turkey (2001), and Venezuela (2002) stimulated FS in emerging countries in the early half of the 2000s. The author finds empirical support for the notion that politics and FS overlap, as mentioned in Caceres and Kochanova (2012). These findings highlight that PR is a significant component affecting FS.

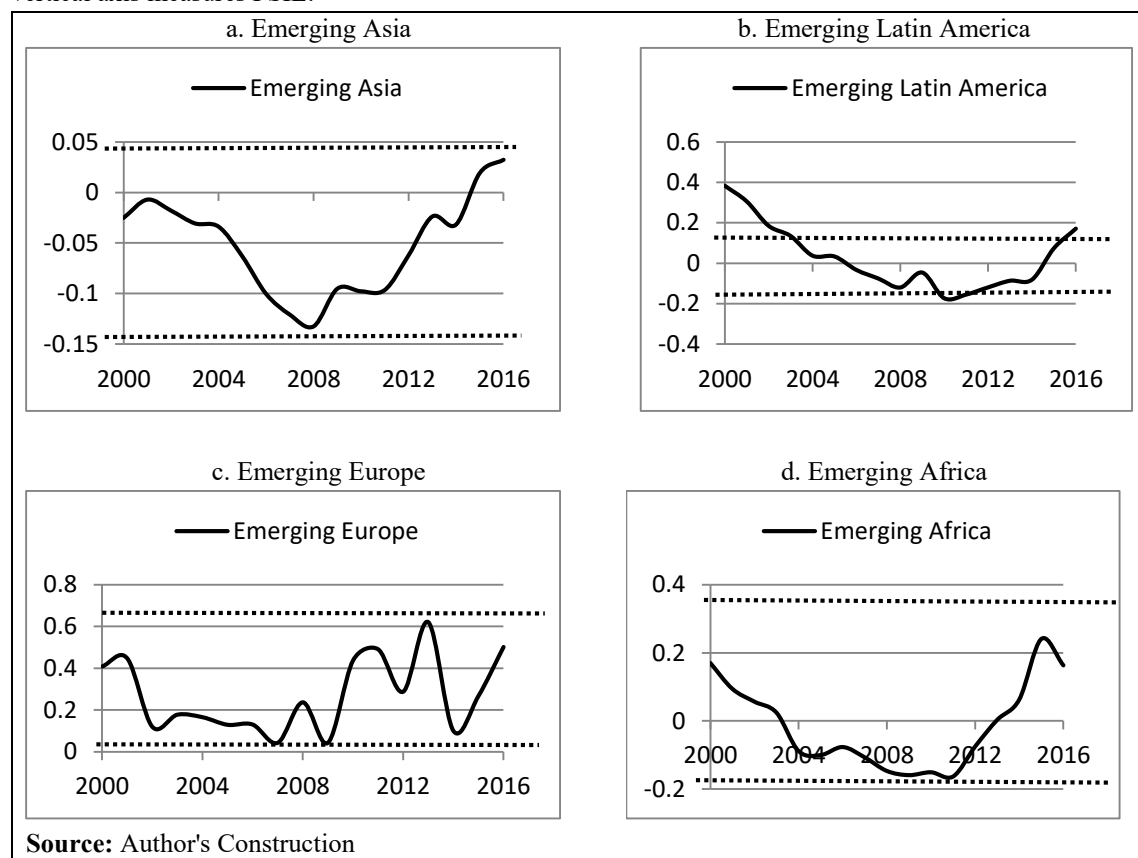
The next few years were stable periods when rollover risk stayed low for emerging countries. The third stressful period appeared in 2008 with excessive risk aversion, and the deleveraging process in the global market squeezed credit supply from international markets.^x Emerging countries confronted two adverse shocks: falling export demand and credit supply from the world market. Excessive liquidation in domestic bond markets exerted pressures on bond yields and FS. The fourth spike in FSIE originated from the crisis prevalent in Venezuela. In 2012, bond yield pressures led to a fiscal crisis, a growing public deficit, and overvalued currency. The economy faced numerous issues, including currency crises, heavy reliance on oil, widespread mismanagement, and corruption. Charges of fraud and corruption marked the presidential elections in 2013. Further, the decrease in oil prices also impacted the revenue generated from oil exports in 2014. The government's decision to reduce the oil supply also exacerbated the situation. Thus, revenue shortfalls grew with hyperinflationary trends. This economic crisis became a political issue with street protests against the government's mismanagement and corruption. Therefore, economic and political problems pushed the country and region into a fiscal crisis, which raised FSIE. The last episode of FSIE persisted from 2014 to 2016, capturing multiple events. A severe recession occurred in the Brazilian economy as commodity prices fell sharply. This recession not only lowered real GDP but also raised inflation. Brazil, Colombia, and Mexico implemented inflation-

targeting policies. To combat increasing inflation, they decided to raise interest rates. This interest rate hike led to a tradeoff with widening government yield spreads, elevating default risks and FSIE (Arellano, Bai, & Mihalache, 2019). A record-high Argentinian fiscal imbalance of 6.7 percent of GDP created fiscal sustainability issues and high FS in 2015. FS was worsened by the trade slowdown caused by the tariff war between China and the US, leading to decreased revenues for both countries. FSIE shows that FS has stayed high due to debt crises, fiscal imbalances, global market conditions, and political risks in emerging countries.

The study categorizes the countries included in the sample into four regions: Emerging Asia (EA), Emerging Latin America (ELA), Emerging Europe (EE), and Emerging Africa (EAF). The author aims to study regional contributions in FSIE. Figure 4 draws regional FSIs for the sampled period.

Figure 4. Regional Patterns of Fiscal Stress in Emerging Countries

Figure 4 elaborates on the regional patterns of FSIE. The horizontal axis measures the time, whereas the vertical axis measures FSIE.



Panel (a) indicates FS decreased in EA until the emergence of the GFC in 2007. Despite deep trade linkages between China and the USA, the Chinese economy stayed highly resilient during the financial crisis. However, high FS in the Malaysian economy triggered FSI in EA. *Panel (b)* plots FSI for ELA. The figure shows that FSI was high in the early 2000s due to sovereign debt problems in Argentina and Brazil and PR in other emerging countries. However, FSI stayed manageable after the GFC as these economies put substantial efforts into lowering the debt-to-GDP ratio, building fiscal buffers, and enjoying positive growth. *Panel (c)* portrays FSI for EE, which was high in 2001 owing to the Turkish financial crisis that carried adverse feedback effects when the banking sector bailed out to avoid default. It raised public debt and, hence, FS in the region. After a relatively calm fiscal environment, FSI rose after the GFC as European countries caught contagion from the US. FS reached unprecedented heights after EDC in 2011. *Panel (d)* draws FSI for EAF. The index followed a downward trend in the early 2000s owing to a falling debt trajectory in the region. This trend reversed when the governments of the EFA adopted the countercyclical fiscal policy after the GFC of 2008. The recessionary trends lowered tax receipts. Besides, governments ran deficits in budget. These deficits compelled the governments to borrow. The ultimate impact of such actions was high FSI after the GFC.

However, FS halted in the last two years of analysis. Thus, fiscal deficits and debt started to decline, and FS subsided. Regional analysis suggests that ELA contributed the most to FSI in the early 2000s. In contrast, the elevated FS in EE regions accounted for high FSIE from 2008 onwards. The regional analysis supports the viewpoint of Gerling et al. (2017) that various crisis episodes (financial, political, and fiscal crises) overlap through bank-sovereign feedback loops and political uncertainty.

Evolution of Fiscal Stress in Developed Countries

This section explores the patterns of FS for 19 developed countries. Figure 5 plots the country-specific FSIs. A close look reveals the following observations. First, there exists much heterogeneity in the pattern of FSI. Diverse fiscal positions in these economies explain the heterogeneity. The countries characterizing high expenditure growth and insufficient fiscal buffers (Greece, Ireland, and Portugal in our sample) experienced elevated FSI in the last years of analysis. Strong revenue growth sometimes raised the downturn risks (Ireland and Spain before the 2007 crisis). Asset and real estate boom contributed to high growth (Cottarelli et al., 2014). Second, FSI stayed low in most countries during 2000-2008. However, FS was substantial for a few countries (Austria, France, Germany, Greece, Italy, Norway, and Portugal in our sample). Third, a hike in FSIs appeared in 2009 in almost all the developed countries as the GFC spread across the US. However, the response to this turmoil relied on the state of fiscal discipline in the pre-crisis period. For example, countries that obeyed strict fiscal discipline (Belgium, Canada, Czech Republic, Denmark, Ireland, Netherlands, and Sweden in our sample) through a set of fiscal rules and institutions experienced a very short-lived increase in FSI in the wake of the GFC. These countries are known as fiscally sustainable countries. In contrast, the countries characterized by a long-term history of fiscal deficits, high debt-to-GDP ratio, and fiscal indiscipline (Austria, France, Germany, Greece, Italy, Portugal, the UK, and the USA in our analysis) suffered the most as they were already facing sustainability problems. The impact of the GFC on FSI damped down in one to two years in most countries that maintained fiscal discipline (Canada, Czech Republic, Denmark, and Ireland). For countries lacking fiscal discipline, the effects lasted for years (for example, Greece, Italy, Portugal, the UK, and the USA). Fourth, EDC affected not only the countries with an established history of persistent deficits and public debt; it did not even spare those countries that fought against debt accumulation. The reason was the accumulation of the private sector debt as a house price bubble blew up. Thus, excessive private sector debt compelled the governments to bail out ailing banking sectors. Fifth, FSI stayed remarkably low for certain countries during GFC and EDC. For example, Canada lowered the budget deficit and the debt-to-GDP ratio in the 1990s. It helped the country maintain fiscal sustainability. FSI stayed manageable, but the trend reversed after a rise in public debt and fiscal deficits in 2009. Canada enjoyed a fiscal surplus and low debt. Likewise, high intergenerational savings in the Petroleum fund helped the Norwegian government maintain fiscal order. Another exception is China, where fiscal discipline enabled the country to maintain fiscal sustainability and manageable FS. These findings are consistent with Wyplosz (2012).

Figure 5. Country-Specific Fiscal Stress Indices for Developed Countries

Figure 5 plots fiscal stress indices at the country level in the sample of developed countries. The horizontal axis measures time, whereas the vertical axis labels FSI.

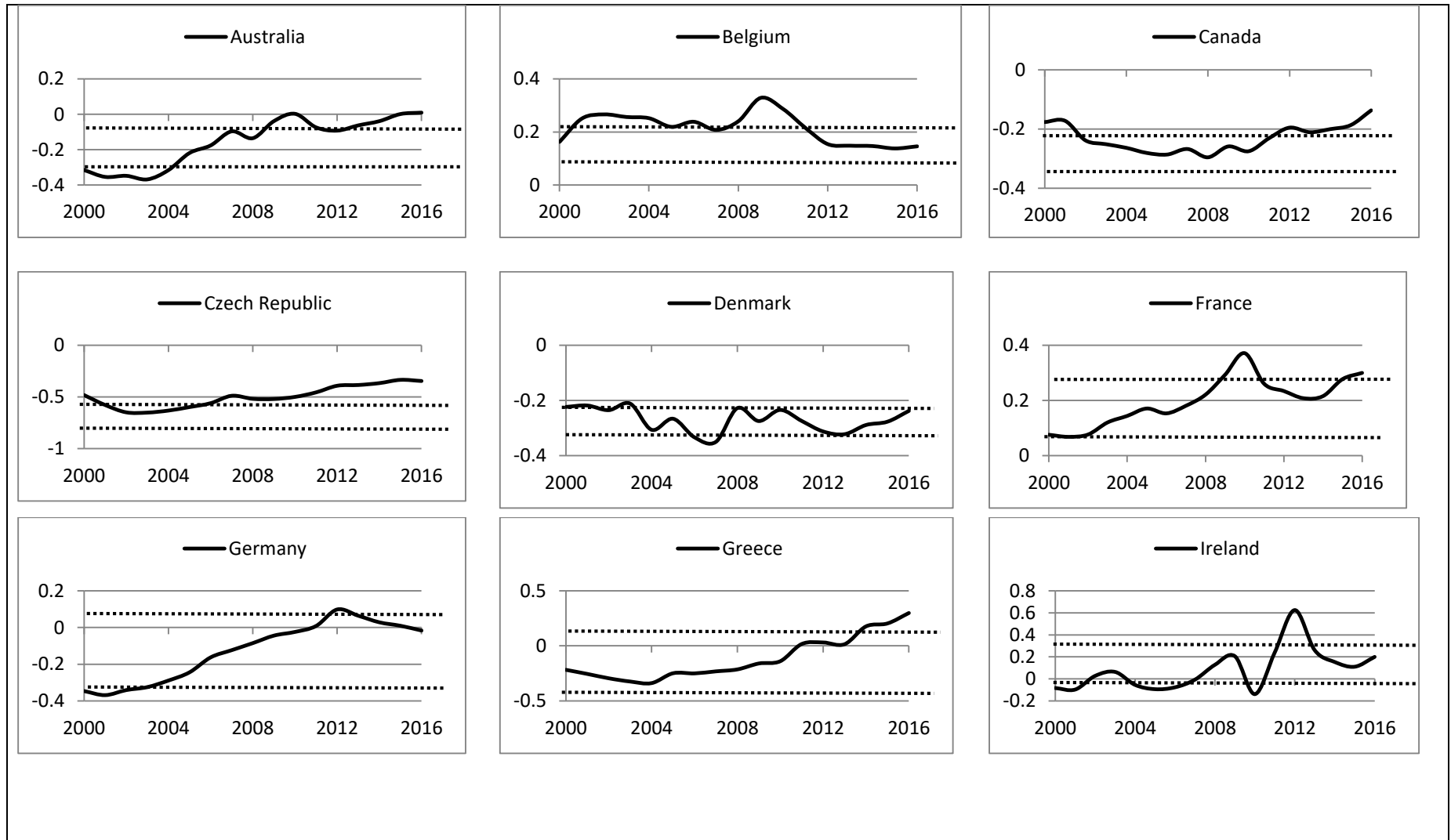
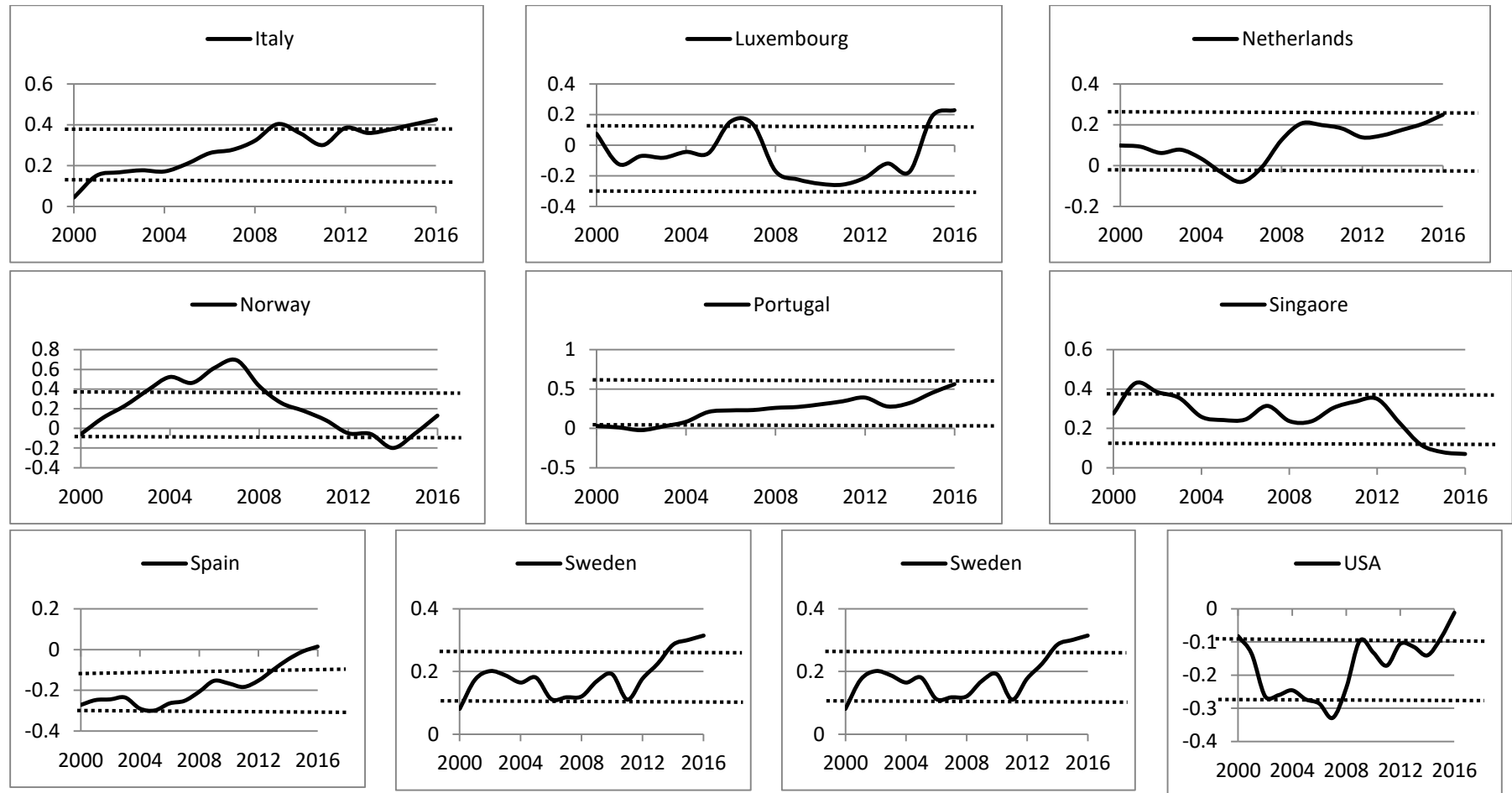


Figure 5 Country-Specific Fiscal Stress Indices for Developed Countries

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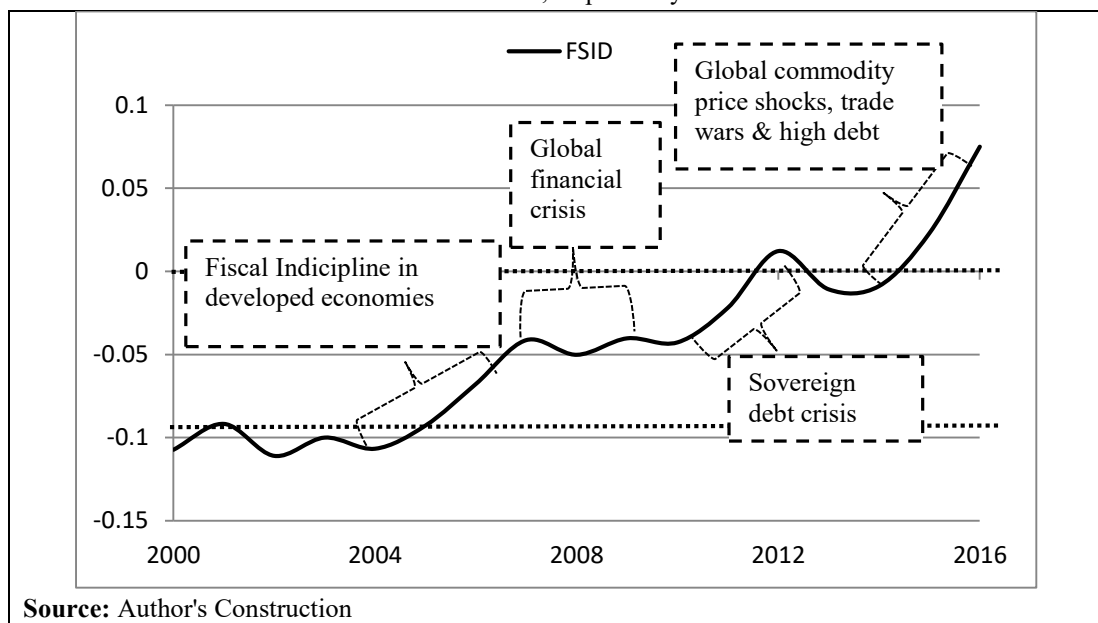


Source: Author's Construction

Next, the author draws the composite FSID in Figure 6. The figure shows that fiscal deficits declined in the late 1990s and early 2000s. This trend halted with a mild recession and increasing expenditure pressures for health and public pensions in the early 2000s. Public debt stayed unsustainably high despite a slight improvement in fiscal balance during 2004-2007 but lacked fiscal discipline. Despite the countercyclical nature of the fiscal policy, its magnitude was insignificant. Therefore, these economies realized a steady rise in FSI in the early 2000s. This high FSI indicated high public debt. The elevated debt level was overlooked, with the misperception that emerging countries are more prone to sovereign debt crises. In reality, emerging countries' debt was relatively sustainable as their interest-rate growth differential stayed negative in the early 2000s, which helped reduce the debt-to-GDP ratio. In contrast, this differential stayed positive for developed countries, reflecting that despite temporary improvements in fiscal balance^{xi}, the debt-to-GDP ratio remained very high. This ratio stood at 60 percent of GDP in 2007, whereas it was as low as 44 percent in emerging countries in the same year.^{xii}

Figure 6. Overall Fiscal Stress Index for Developed Countries

Figure 6 explains the patterns of fiscal stress for developed countries through composite FSID. The horizontal and vertical axis measures time and FSI, respectively.



A high FS episode surfaced in 2009 owing to the GFC. This episode pinpointed that the fiscal improvements in the pre-crisis period overstated the structural refinements. These recoveries did not signal fiscal order as developed countries characterized insufficient fiscal buffers to manage upcoming economic downturns and financial crises. GFN rose immediately after the GFC as governments decided to rescue financial institutions from bankruptcy and feedback loops from financial to real economy. To complicate matters further, a decline in asset prices reversed the healthy trends in government revenues in countries like Spain and Ireland. The rising asset prices and capital gains brought a temporary jump in government revenue. These incidences placed public debt at unprecedented high levels besides deteriorating CAPB. An increase in rollover risks ended up with a high level of FSID.

The next spike in FSID surfaced as a sovereign debt crisis hit the Euro Area in 2011. It initiated from Greece with a loss of investor confidence as public debt and deficit rose steeply in late 2009. Fiscal vulnerabilities in other European Union (EU) countries triggered contagion in Europe in less than three years. The debt crisis highlighted several flaws in the fiscal surveillance framework of the EU. First, it was an incomplete and compromised union since its initiation. It has nothing to do with fiscal discipline. Second, it lacked any central banking supervision and debt restructuring mechanisms, which limited its efficacy as a policy entity to curb banking-sovereign adverse feedback loops. Sovereigns shared an excessive burden of adjustments even in systemic events.^{xiii} Third, the member countries (especially those with large banking sectors) recorded divergent fiscal positions and policy actions. The EU should have built fiscal buffers during booms and to monitor debt trajectory in bad times. Instead, market forces or national governments were responsible for the institutional adjustments. All these intrinsic

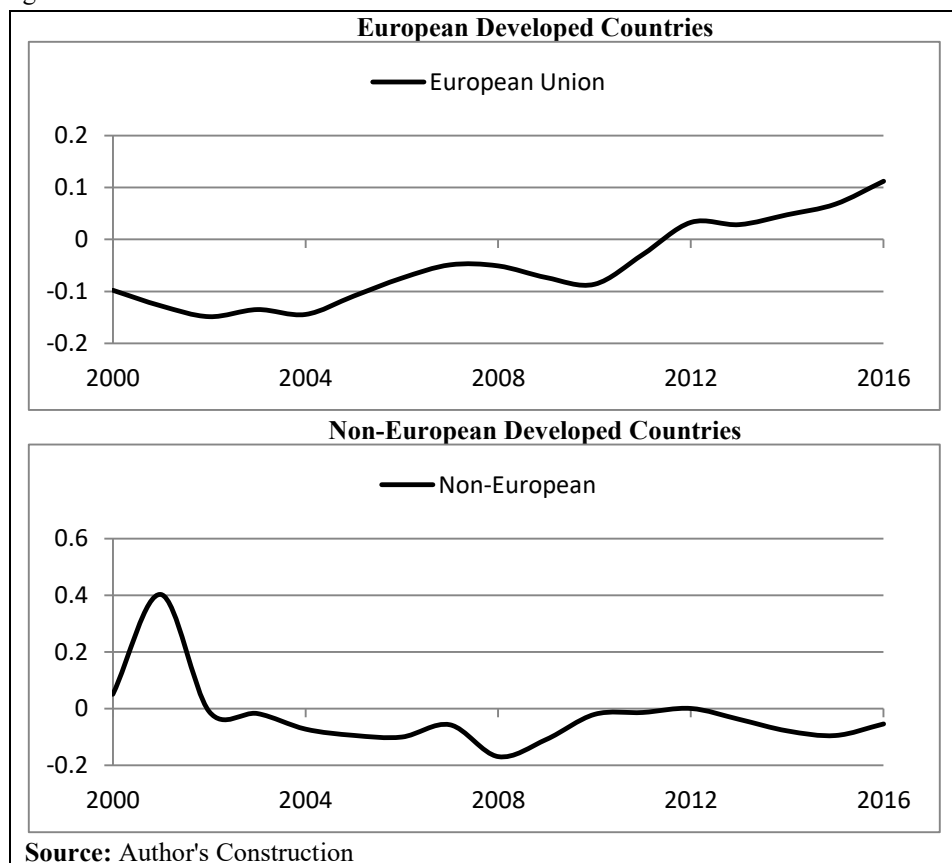
institutional weaknesses in the EU set the stage for the sovereign debt crisis. FS followed an increasing trajectory until December 2012, when the EU crafted policies to share the adjustment burden with the national governments.

PR was another risk factor prevalent in the European debt market. Political uncertainty in France and the breakdown of the coalition government in the Netherlands intensified debt crises further during the sampled years. Our analysis is the first empirical inquiry highlighting political uncertainty as a vital component in developing FSI. This study conforms to the theoretical insights provided by Waszkiewicz (2015). Emerging economies observed the last escalation in FSI in 2015 following a series of events. First was the recession in China, which lowered commodity prices and aggravated the fiscal position of the commodity-exporting developed countries.^{xiv} Most developed countries caught the contagion of slow growth in China. Moreover, debt reached a record high level of 106 percent of GDP in developed countries. It raised rollover risks and, hence, FS. Second, a decrease in trade volumes in many developed countries also directly influenced fiscal position as export revenue fell significantly.

Next, the author develops regional FSID by subdividing the developed countries into two regions, namely European and non-European regions. Figure 7 describes the evolution of regional FSIs.

Figure 7. Regional Patterns of Fiscal Stress in Developed Countries

Figure 7 depicts regional patterns of FSID. The horizontal axis measures time, whereas the vertical axis labels regional FSI.



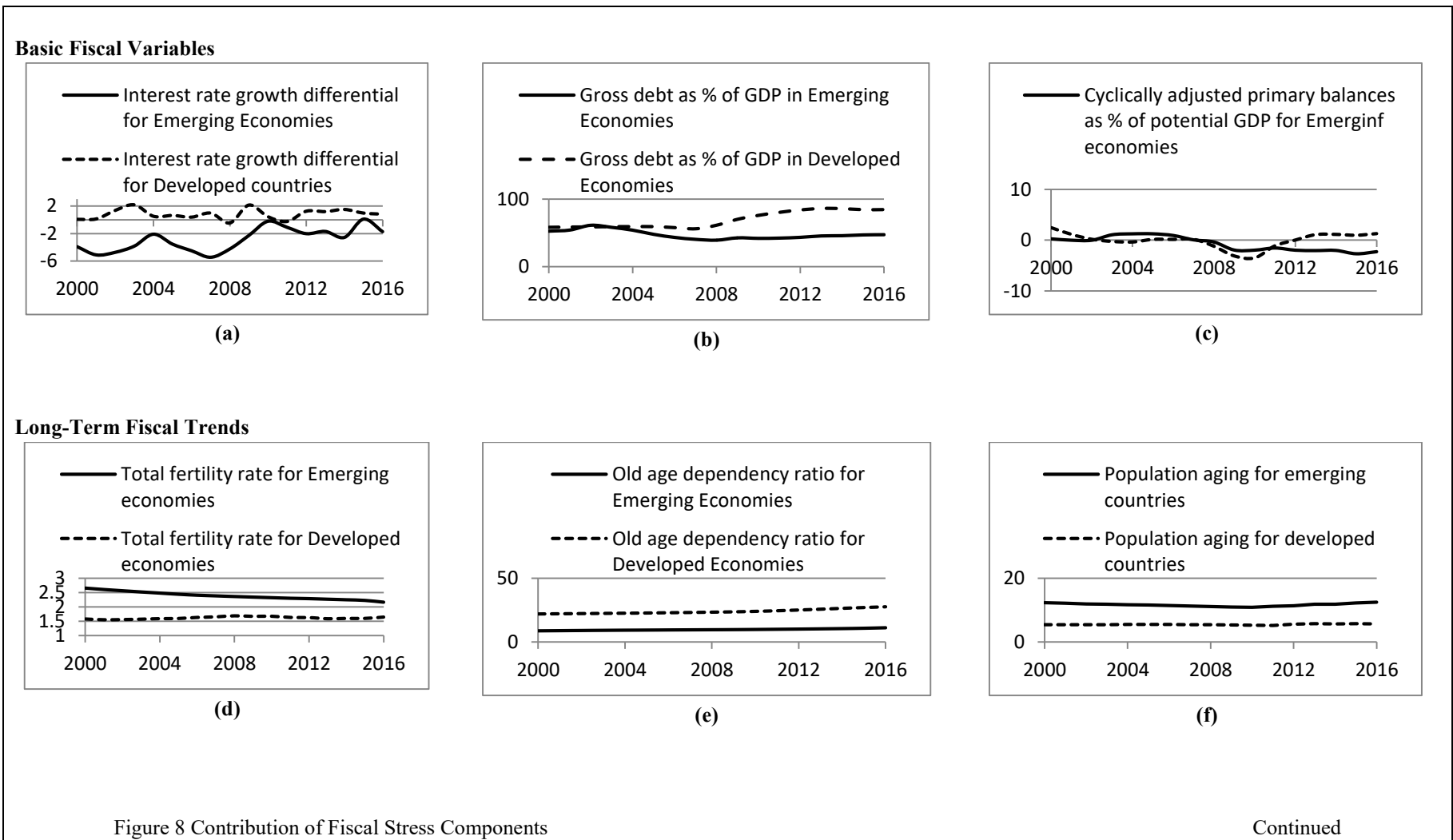
The top panel explains the evolution of FSI in the EU region. This index follows patterns similar to aggregate FSI, which indicates that fiscal risks remained concentrated in the European region (EU, 2018). FSI has increased significantly in the European region since 2004. This high FS pinpointed fiscal indiscipline, sovereign defaults, structural vulnerabilities, and high debt in the region. *Panel (b)* of the figure draws FSI for non-EU. This index followed a declining pattern, except in the early 2000s. This pattern reflected the Singapore government's economic slowdown and expansionary fiscal policy stance during 2001-02. Besides, high public debt in Singapore accounted for increased FSI in the early 2000s. The other spike in FSI for the non-EU region occurred in 2009, after the GFC. These countries recovered quickly, and FS subsided in one to two years. The regional index reflected a period of low FSI after 2010 owing to fiscal discipline in the region.

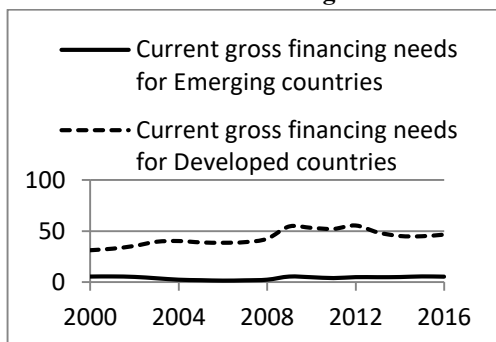
Contributions of Fiscal Stress Components

Figure 8 plots the BF variables that affect rollover risk. Overall, they show declining trends for emerging and developed countries during the sampled period. *Panel (a)* reveals that the IRGD follows a negative trajectory for emerging countries. They experienced financial repression and a low growth rate. Low levels of interest rates hindered borrowing and made the debt-to-GDP ratios non-exploding. This differential was positive for developed countries, highlighting the large rollover requirements as public debt in these countries has been very high. *Panel (b)* mentions the upsurge in debt burden for the developed countries, especially after 2008. The debt burden in emerging countries has been much lower than in developed countries, making the emerging countries relatively resilient to adverse shocks. *Panel (c)* indicates that CAPB deteriorates in both country groups. Next, *panels (d) to (f)* plot LTFTs affecting FS. The visual analysis suggests rising trends in demographic variables, which impose long-term fiscal costs for both the country groups. FR has been lower and almost stagnant in developed countries than emerging countries, whereas the ODR has been rising for developed economies. This hike in ODR in *panel (e)* explains the long-term expenditure pressures for developed countries. Despite being initially high, FR has been declining in emerging countries. *Panel (f)* depicts the phenomenon of PA. Both the country groups faced long-term expenditure pressures. The developed countries encountered enormous expenditure pressures. *Panels (g) to (j)* plot the medium-term solvency indicators. *Panel (g)* reveals that GFN has been substantially higher in developed countries than in emerging ones. The next panel (*panel h*) portrays SRD. A high ratio indicates vulnerability to rollover risk. This ratio exhibits relatively more serious fiscal sustainability problems and high rollover risks in developed countries. Likewise, DNR has been rising in developed countries (*panel i*). This rising trend shows that these countries have been highly affected by the risks prevalent in global markets. This risk stayed low for emerging countries. *Panel (j)* plots STED for emerging countries only. The graph reflects that emerging countries have borrowed from foreign sources to meet their short-term debt servicing costs. This variable is irrelevant for the developed countries that are the net lenders. Finally, *panel (k)* plots the PR index for emerging and developed countries. The index follows a declining trend, which shows that PR is increasing in both country groupings. This finding reconfirms the validity of including PR as a vital component of FS. However, it is higher in emerging countries than in developed countries.

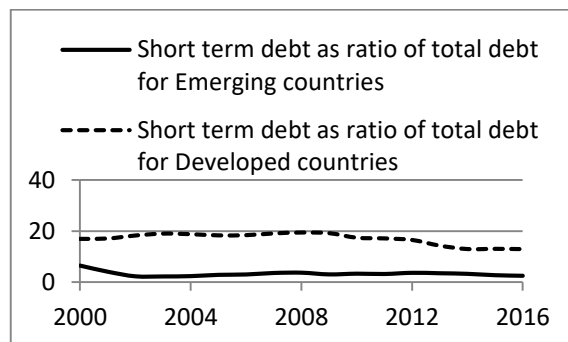
Figure 8. Contributions of Fiscal Stress Components

Figure 8 explains and compares the contribution of various FSI components for developed and emerging countries. The horizontal axis measures years of analysis, while the vertical axis labels FSI components.

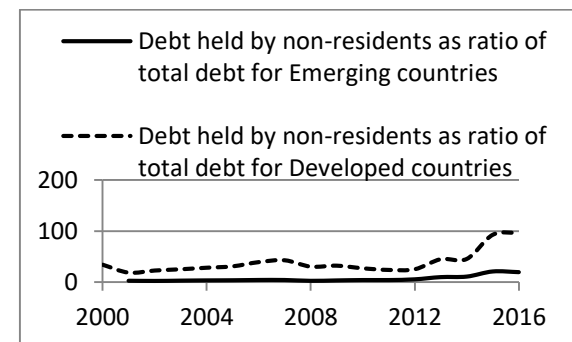


Assets and Liabilities Management

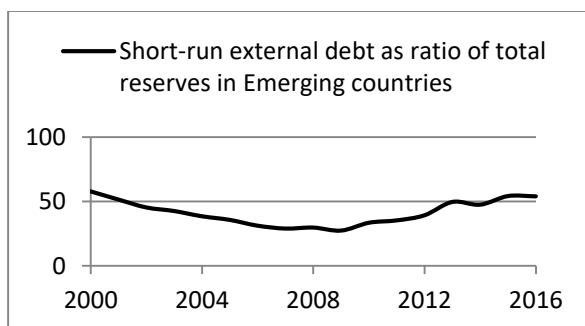
(g)



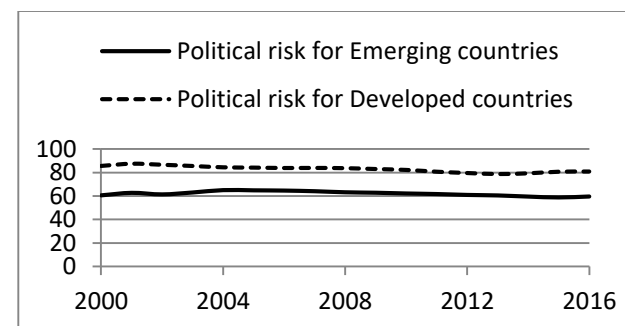
(h)



(i)



(j)



(k)

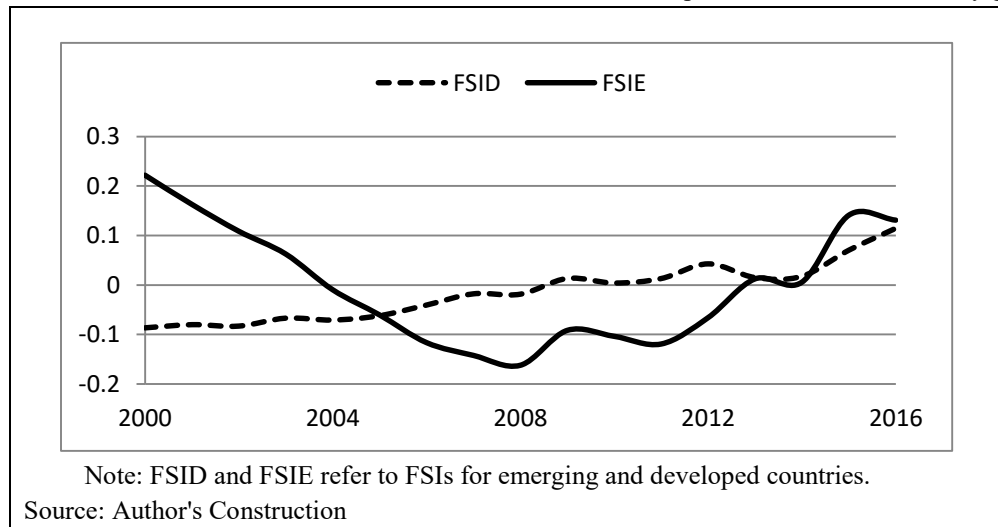
Source: Author's Construction

Comparison of FSIs for Emerging and Developed Countries

Figure 8 plots aggregate FSIs for emerging and developed countries. Comparing FSIs offers a few interesting observations. First, FS spikes frequently overlap with financial stress episodes in developed and emerging countries. This overlap confirms the negative feedback loops between banks and sovereigns, which aligns with Bruns and Poghosyan (2018). Second, there have been prolonged periods of FS in developed countries since the GFC.

Figure 8. Comparing FSIs for Emerging and Developed Countries

Figure 8 draws and compares the composite FSIs for emerging and developed countries. The horizontal axis measures time, whereas the vertical axis measures composite FSIs for each country group.



On the other hand, FSIE shows a shorter duration of stress episodes as these economies experienced better economic growth, low public debt, a low degree of fiscal imbalances, and fiscal buffers before the GFC. Third, despite a series of debt crises in the early 2000s, FSIE followed a declining trend before 2008 owing to a relatively low intensity of debt crises that remained mostly country-specific and short-lived. In contrast, FSID has shown a persistent long-term trend due to the legacy of twin problems over many decades, namely fiscal deficit and high public debt. Fourth, FSIE has exceeded FSID in recent years as the former country group faced a surge in PR and private debt alongside recessionary trends in major emerging countries (Argentina, Brazil, and China).

Conclusion and Policy Guidelines

This study built FSIs for panels of emerging and developed countries from 2000 to 2016. The author develops country-specific, regional, and overall FSIs for each country group. The study considers fiscal and political risks while measuring FSIs through PCA. The findings suggest that FSIs explain fiscal distress significantly in emerging and developed countries. The author further confirms that PR risk contributes to FS, particularly for emerging countries. Regional analysis suggests that the European region explained the FS in the post-GFC period, whereas the Emerging Latin American region explained FS in the early 2000s. Our findings highlight that global events exert more pressure on FSID because developed countries have a long history of fiscal deficits and high debt. SRD, pressures of PA, and GFN explain variation in FSID, whereas CAPB and PR trigger FSIE.

The above findings help to infer the following policy recommendations. First, a countercyclical fiscal policy stabilizes the economy during the recession and financial crisis. This policy, coupled with the accumulation of fiscal buffers, helps to eradicate or at least minimize the risk of contagion and adverse bank-sovereign loops. Second, European developed countries triggered FS and sustainability concerns as their integration was incomplete. EU may adopt such fiscal sustainability framework and design policies that

impose fiscal discipline for the member states. Such a framework can help them cope with future crises and economic downturns. Third, a well-designed fiscal policy should provide some mechanisms to manage excessive private sector leverage, such as subsidizing the creditors who offer loans with longer maturities.

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The author did not receive any funding to carry out this research, so there is no conflict of interest.

Originality and ethics statement:

The work is the author's original contribution and has not been submitted elsewhere for publication. It adheres to the PJSI publishing policy.

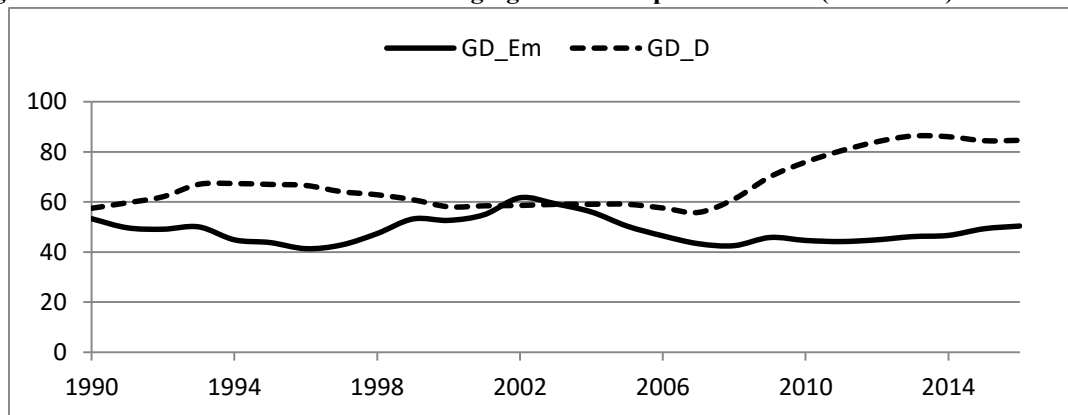
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Appendix 1

Figure A1. Evolution of Gross Debt in Emerging and Developed Countries (1990-2016)



Note: GD refers to gross debt as a ratio of GDP.

Table A2. List of Countries

Emerging Countries	Developed Countries
Argentina, Brazil, China, Colombia, India, Indonesia, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Russian Federation, South Africa, Thailand, Turkey, and Venezuela	Austria, Belgium, Canada, Czech Republic, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Singapore, Spain, Sweden, UK, and the USA

Table A3. Components of Fiscal Stress Index

Components	Description	Source
First Dimension: Basic Fiscal Variables		
The interest rate on general government debt minus real GDP growth rate (r-g) (IRGD)	It is an indicator of solvency. IRGD is the difference between the nominal interest rate paid on government debt and growth in nominal GDP.	Author's construction from WDI data
General government gross/net debt as a percent of GDP (GD)	It reflects the debt burden of the economy.	FM, IMF
Cyclically adjusted primary balances as a percentage of potential GDP (CAPB)	It corrects the overall balance of cyclical factors and explains the extent of adjustment to fulfill inter-temporal budget constraints.	FM; WEO
Second Dimension: Long-term Fiscal Trends		
Total fertility Rate (FR)	It shows the average number of children per woman. It reflects the potentially available tax base to finance increased spending on the aging population.	UN Database
Old-Age Dependency Ratio (ODR)	It is the ratio of the population over age 65 divided by adults. It is an indication of the population aging momentum.	UN Database
Population Aging (PA)	It reflects the population burden and measures expenditure pressure	UN World Population Prospects Data
Third Dimension: Assets and Liabilities Management		
Current Gross Financing Needs as a Percent of GDP (GFN)	It refers to vulnerability to rollover risk. It is the sum of the general government's overall debt and debt with a maturity of less than one year.	WEO and Vulnerability Exercises for Emerging (VEE), IMF
Share of Short-term Debt as Ratio of Total Debt (STD)	A high ratio shows high vulnerability to rollover risk.	Euromonitor , Quarterly Public Debt Statistics, WDI
Debt held by Non-Residents as Ratio of Total Debt (DNR)	It indicates global market risk. A high ratio indicates a greater risk of default and rollover risk.	Joint External Debt Hub,
Weighted Average Maturity of General Government Debt (WAM)	An indicator of vulnerability changes in market sentiments	Bloomberg
Short-term External Debt as Ratio of Total Reserves (STED)	It measures claims on foreign resources to meet the short-term cost of external debt servicing.	WDI, World Bank
Fourth Dimension: Political Risk		
Political Risk Index (PR)	The composite index that captures 12 socio-economic and political dimensions of risk	ICRG, Political Risk Services Group

ⁱ Fiscal sustainability problems refer to the inability of governments to rollover debt

ⁱⁱ FS refers to the inability of the government to meet its debt obligations and maintain fiscal sustainability (Manasse, Roubini, & Schimmelpfenning, 2003).

ⁱⁱⁱ Euro area countries considered for analysis are Austria, Belgium, Finland, France, Germany, Italy, Netherlands, and Spain.

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- ^{iv} Jacob and Hendrick (2013) give a detailed discussion on fiscal health conditions.
- ^v Table A3 in Appendix explains these dimensions in detail.
- ^{vi} A detailed survey of the weighing and aggregation schemes is provided by OECD (2008).
- ^{vii} STED is irrelevant for developed countries.
- ^{viii} The author faced constraints regarding country coverage and the unavailability of data on the ratio of short-term to total debt for emerging countries.
- ^{ix} According to Asonuma (2016), serial sovereign default refers to a situation where the previous history of default on debt repayments makes a country more likely to default again. Emerging countries are more vulnerable to this possibility.
- ^x The GFC raised FS in several countries. These countries include Pakistan in 2008, Venezuela in 2008, Colombia in 2009, Malaysia and Mexico in 2009, and Russia in 2009.
- ^{xi} Strong economic growth, lower cost of borrowing, credit-driven rise in assets' prices, and surge in revenues attributed to transient improvement in fiscal balance during 2004-2007.
- ^{xii} Figure A1 in the Appendix demonstrates the evolution of the debt-to-GDP ratio for both country groupings.
- ^{xiii} Owing to close trade ties with the UK and the US, a banking crisis surfaced in Ireland in early 2008. The country was left alone to bail out banks through private credit and to combat the recession. A soaring private sector debt went unchecked as the EU lacked any mechanism to monitor the private sector imbalances.
- ^{xiv} Canada, Denmark, Italy, Norway, and the US.