# Financial Distortions: Sovereign Borrowing and Firm Access to International Capital Markets*

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**Abstract**

This paper examines the impact of increases in sovereign borrowing on firms' ability to access international capital markets during different credit market conditions in the financial center (U.S.) and in the periphery. Conditions in the financial center are captured by the U.S. broker-dealer leverage, as a proxy for booms and busts in global liquidity. Conditions in the periphery are captured by different levels of sovereign credit risk and sovereign debt. Using a structural VAR approach, we identify shocks to government issuance by exploiting the fact that current macroeconomic conditions do not respond to issuance of longer-term debt. This is because longer-term financing is not used immediately as it typically finances long-term investment projects such as infrastructure. We find that, in emerging countries, government issuance crowds out firms' access to international capital markets during periods of low global liquidity and high sovereign risk. By contrast, in advanced countries, government issuance increases, i.e. crowds in, firm issuance during periods of high sovereign debt and low sovereign risk. These results imply that, depending on market conditions, government borrowing has the ability to crowd in or crowd out firm borrowing.

*Keywords:* sovereign and private capital flows, crowding out, financial fractures
*JEL Classifications*: F30, F34, F65

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# 1 Introduction

Worldwide government debt has been increasing dramatically since the Covid-19 pandemic started in 2020 with government debt to GDP reaching, on average, 65% in emerging economies and 123% in advanced economies (IMF (2023)). This is not the first wave of surges of government debt. The late 1970s and early 1980s were witnesses to a boom in government borrowing by developing countries, mostly financed by large commercial banks in the United States.[1,2] The 1990s experienced another surge in government debt in developing countries as governments rescued financial institutions in distress in the wake of banking and currency crises. In the aftermath of the Global Financial Crisis there was another surge in government debt. Although this surge was concentrated in advanced economies, it was also driven in large part by the bailouts to the banking sector. In this paper, we study whether sharp increases in sovereign borrowing adversely affect the ability of corporations to tap international capital markets, therefore reducing investment and income growth.

Most of the literature on government debt has focused on the crowding out effects of government debt financed by domestic banks. It is in domestic markets where frictions abound, not just in emerging but also in advanced economies. Domestic markets are segmented preventing capital from flowing across banks and investors.[3] These local markets are also constrained in expanding their credit supply to satisfy an increasing demand for credit.[4] It is in these markets, where previous literature has documented crowding out.[5]

In contrast, research on crowding out effects in international capital markets is rare. These markets are usually considered to be highly integrated across all countries and extremely liquid. In fact, since the collapse of the Bretton Woods System in 1973, countries have started removing restrictions to capital flows which has led to new markets being created, such as the Eurocurrency,

1. The 1973 collapse of the Bretton Woods System with the abandonment of the fixed exchange rate regime allowed countries to eliminate barriers to international capital flows while maintaining independent monetary policies. Financial globalization restarted, with U.S. banks expanding internationally. The easy monetary policy in the United States in the 1970s together with the increase of OPEC Countries' savings (which were channeled mainly via U.S. banks to emerging markets) triggered the first international capital flow bonanza since the Great Depression.

2. This episode ended in 1982 with Mexico defaulting on its debt. The sovereign debt crisis in Mexico spread to developing countries in Africa, Asia, Eastern Europe, and Latin America. This financial distress even made its way to the United States, where commercial banks suffered colossal losses.

3. See, Houston et al. (1997)

4. For example, Martín et al. (2021) find that the Spanish housing boom reduced non-housing credit growth. These patterns can be rationalized by financial constraints for banks since constrained banks accommodated higher housing credit demand by reducing non-housing credit. Chakraborty et al. (2018) document that banks that are active in strong housing markets increase mortgage lending and decrease commercial lending.

5. For example, Pinardon-Touati (2021) studies the crowding out effects of local governments expenditures financed by French provincial bank loans on corporate credit, investment, and output. The estimates indicate that when the local government borrows an additional €1 from a bank, this bank reduces corporate credit by €0.5. The results indicate that at the core of this large crowding out effect is the limited credit supply and the segmentation of the market preventing capital from flowing across banks and borrowers. Ongena et al. (2019) also examine the crowding out effects of government debt on domestic banks' balance sheets. Their research indicates that not all the banks purchase government bonds, only small banks with weaker balance sheets and receiving government support. These are the banks particularly susceptible to "moral suasion."

syndicated loan, bond, and derivative markets. With little to no barriers across countries, a new era of financial globalization started. Naturally, with perfect capital mobility, changes in government debt should have no effects on corporate access to financial markets. However, this is not always the case. Research on international capital flows has shown that there are a variety of frictions in international capital markets. For example, the covered interest parity condition has been failing.[6] Also, there have been several episodes when the international markets operate under stress and experience widespread asset mispricing.[7]

In this paper, we examine the effect international government borrowing has on firms' access to international capital markets. Our analysis examines the interaction between government borrowing and corporate borrowing during market imperfections. Importantly, episodes with financial cracks can start in the financial center and spread to the periphery (Global Fragility), or they can be confined to a country or region (Local Fragility). We identify episodes with financial fractures in the United States (the financial center) and the thirty countries in our sample, which includes both advanced and emerging economies. Since our goal is to capture access to international capital markets, our focus is on international gross primary issuance. We construct a new database of international primary issuance which starts in 1973, when financial globalization restarted following the collapse of the Bretton Wood System, and includes 50 years of data. The database is granular and consists of primary issuance of international syndicated loans and bonds for both corporations (financial and non-financial) and governments. For each bond and syndicated loan, we have information at the issue level.

There are two challenges we face in estimating the crowding out effects in international capital markets. First, we need to identify financial fractures for the 1973-2022 period across thirty countries. Second, we need identify the effects of government issuance on corporate issuance.

To identify episodes of financial fractures, we collect indicators capturing local and global fragilities. We capture local fragilities with sovereign credit ratings and levels of government debt (as a % of exports). To capture global fragilities, we use the U.S. Broker-Dealer Leverage to identify global liquidity booms and busts.

To identify the effect of government issuance on corporate issuance we use a structural VAR approach. To achieve identification, we rely on the timing of spending from issues with longer maturities to construct the response of economic activity to government issuance, and thus, to identify the shocks to government issuance. Our dataset only includes issues with a maturity of one year or longer, and on average, government issuance in our dataset is approximately 10 years. This longer term financing is not used immediately. It is typically used to finance long-term

6. Du et al. (2018) show that deviations are large and persistent indicating systematic arbitrage opportunities in one of the largest asset markets in the world.

7. Calvo (2004) examines the near collapse of Long-Term Capital Management highly leveraged hedge fund coupled with a financial crisis in Russia, and how this crisis spread and triggered the collapse in emerging markets unrelated to LTCM at fire sale prices. In this paper, a leveraged investor facing margin calls needs to sell asset holdings. Because of information asymmetries, assets can only be sold at a fire sale price. For this reason, the strategy will be not to sell the asset whose price has already collapsed, but other assets in the portfolio. In doing so, however, other asset prices fall and the original disturbance spreads across markets.

investments, such as infrastructure projects, which take many years to complete, and as such, do not affect economic activity immediately.[8]

We first examine the responses of firm issuance to government issuance for the whole sample without accounting for financial cracks. We use Jordà (2005) Local Projections and estimate the effect of sovereign borrowing on corporate international issuance for both emerging and advanced economies over the whole sample. We then use Jordà (2005) Local Projections methodology together with the Ramey and Zubairy (2018) modifications and examine whether these responses depend on different financial market imperfections.

Our results can be summarized as follows. In emerging countries, we find that government issuance crowds out firm issuance in international capital markets during collapses in global liquidity and periods of high sovereign risk. In particular, we find that a $1 increase in government issuance decreases firm issuance by $0.60 during periods of low liquidity and $0.50 during periods of high sovereign risk. In contrast, in advanced countries, we observe that government issuance enhances firms' ability to tap credit markets during periods when sovereign risk is low and when sovereign debt is high. We find that a $1 increase in government issuance increases firm issuance by $0.60 during episodes of low risk. During episodes of high government debt, for an equivalent increase in government issuance, the effect on firm issuance is smaller (an increase of $0.30) but still significant.

The rest of the paper is organized as follows. Section 2 reviews the empirical literature on the links between sovereign and corporate borrowing in international capital markets. Section 3 presents our database of capital flows as well as our indicators identifying financial distortions. Section 4 discusses our VAR estimation and our identification methodology. Section 5 first reports our baseline estimates for the links between corporate and government international issuance. Second, it reports our estimates for the state dependent local projections in which we examine the differing effect of government issuance on corporate issuance during periods of high and low sovereign risk, sovereign debt, and global liquidity. Section 6 presents the conclusion.

# 2 Related Literature

The first decade following the restart of financial globalization in the early 1970s was mostly characterized by a boom in sovereign borrowing of developing countries. This bonanza ended with a wave of sovereign defaults in Africa, Asia, Eastern Europe, and Latin America starting in 1982. Naturally, the early research on capital flows solely focused on the relationship between sovereign borrowing and sovereign default risk.

One of the earliest works on the links between sovereign debt and default risk is Edwards (1984). This paper examines the determinants of sovereign default risk using data on syndicated loans denominated in Eurodollars for the 1976-1980 period. The focus of this paper is on 727

8. See, Martinez Peria and Schmukler (2017)

public and publicly guaranteed loans granted to 19 Less-Developed countries. Edwards (1984) finds that increases in sovereign debt increases default risk through two different channels: one via higher indebtedness (indicating unsustainability of the debt) and the other via higher debt service to exports ratio (indicating potential liquidity problems).[9]

Most of the early empirical literature on sovereign borrowing focused on explaining sovereign indebtedness and sovereign spreads but, for the most part, ignored the problem that countries might be cut off from credit markets completely, either temporarily or permanently. Reinhart et al. (2003) filled this gap by highlighting the critical role of sovereign risk for cross-border external capital flows. They show that countries tend to lose all access to private capital markets when sovereign ratings fall below a critical threshold. In contrast, countries with very high ratings tend to have continuous access to capital, even during recessions and crisis periods. They also find an intermediate group of countries, mostly middle-income countries with highly volatile access to international capital markets. In bad times, with ratings falling and fundamentals deteriorating, these countries suffer rapidly increasing costs of borrowing and may even lose access to international capital markets. Richmond and Dias (2008) analyze the duration of capital market exclusion by sovereign defaulters from 1980 to 2005. Their findings indicate that countries regain partial market access after approximately 6 years while it takes about 8 years on average to regain full market access. They also find that partial market access depends mostly on external financial markets conditions while full market access depends primarily on long term market expectations and the size of the losses inflicted to creditors. Gelos et al. (2011) studies what triggers market exclusion. Their research focuses on 144 developing countries. Their database includes 2053 individual government bond issues and 5065 commercial bank syndicated loans. Using a variety of techniques, they find that governments' ability to tap international capital markets is mostly explained by the perceived quality of its policies and institutions. Interestingly, they find that indebtedness and previous defaults do not prevent countries from further accessing international credit markets.

In the 1990s, corporate borrowing in international capital markets started to increase again, especially surging in the years prior to the global financial crisis in 2008. This new development fueled new empirical research on corporate international borrowing. At the core of this literature was the effect of sovereign debt crises on the ability of the corporate sector to tap international capital markets. For example, Arteta and Hale (2008) examine the impact of sovereign defaults on corporate borrowing. They use aggregated firm-level data on syndicated loans and bond issues from Dealogic for 30 emerging countries from 1984 to 2004. They find that sovereign debt crises and restructurings have a strong negative impact on firm borrowing. After controlling for fundamentals and common shocks, they find that defaults are followed by over a 20% drop in foreign loan and bond issuance by domestic firms. In a similar spirit, Das et al. (2010) study the impact of sovereign debt crises, debt restructurings, and overall sovereign default risk in developing countries

9. In contrast, using data on spreads of 102 public and state-guaranteed syndicated loans for 1973-1974, Feder and Just (1977) do not find any effects from debt (as a % of GNP) on the likelihood of default as captured by the spreads.

on corporate sector access to international capital markets. As in Arteta and Hale (2008), Das et al. (2010) use corporate issuance data for 31 emerging economies from 1980 to 2007, and link it to sovereign risk. The novelty in this paper is that authors capture sovereign risk in a variety of ways. They use information on defaults and associated restructurings as wells as sovereign bond spreads and sovereign ratings. They find that sovereign default risk and sovereign defaults are crucial determinants of firms' access to international capital markets. These two papers, however, do not examine whether government issuance crowds out the ability of the corporate sector to access international capital markets.

Another line of research has focused on the role of sovereign issuance on firm issuance, with a focus on the pricing of corporate bonds. Several authors have argued that sovereign borrowing promotes corporate borrowing. The idea is that sovereign bonds provide benchmarks against which to value corporate bonds, and hence stimulate the development of the country's corporate bond market (Fabella and Madhur (2003)). This claim is supported by the casual observation that the liquid corporate bond markets in developed countries are often accompanied by active government bond issuance and trading. Sovereign bonds can improve the corporate market by making it more complete, reducing adverse selection costs, and improving liquidity by acting as hedging instruments.[10,11] This liquidity service can translate into reduced liquidity premiums and decreased bid-ask spreads. Sovereign bonds may also benefit corporate bonds by fueling price discovery. With sovereign bonds helping investors to better hedge adverse selection costs, they also fuel investors' acquisition of more systematic and firm-specific information, leading to an improvement in pricing securities. Dittmar and Yuan (2008) use daily data (spanning the 1996-2000 period) from eight emerging economies in Latin America and Asia to examine the effects of sovereign bonds on corporate bonds. They find that the presence of sovereign bonds lowers both the yield spreads and the bid-ask spreads of existing corporate bonds in emerging markets, that is, sovereign bonds enhance corporate bond markets in emerging economies by providing more information, stimulating information production, and thereby generating reduced adverse selection costs and improved liquidity. Ağca and Celasun (2012) also studies the role of sovereign debt on corporate borrowing costs. The hypothesis they examine is whether increasing foreign sovereign borrowing triggers a reassessment of country risk and leads to higher borrowing costs of corporate borrowers. They test this hypothesis using data on syndicated loan issuances from 1990 to 2006 for 15 countries and find that an increase in sovereign debt by one standard deviation from its sample mean is associated with 9% higher loan yield spreads.

10. For example, Shiller (1993) points out that macro securities, i.e., securities that represent systemic risk factors, help to complete the market by allowing investors to hedge against major income risks.

11. For example, Yuan (2005) indicates that in the presence of information asymmetries, benchmark securities help to complete the market and help investors with heterogeneous information to hedge against adverse selection.

# 3 Data

An important contribution of the paper is the construction of a new database on government and corporate gross international issuance for both advanced and developing countries since the restart of financial globalization following the collapse of the Bretton Woods System in 1973. We also construct a variety of indices capturing idiosyncratic and global financial fractures.

## 3.1 Capital Flows

Most of the empirical literature on issuance and debt has focused on developing countries using databases created by the World Bank.[12] However, there is no equivalent data for advanced economies.[13,14] The database we constructed allows us to examine a longer episode of capital flows booms and busts that can provide further insight on the effects of sovereign issuance on corporate borrowing. The database combines data collected from the archives of the World Bank and is complemented with data from Dealogic, Bloomberg, and SDC Platinum. This new database allows us to examine a period spanning fifty years (1973-2022). The database we compiled includes sovereign and firm issuance of syndicated loans and bonds. The measure of capital flows we collect is what is known as international gross primary issuance. This measure of capital flows captures gross capital inflows and is defined as purchases of domestic assets by foreign residents. The database is granular, containing information at the issue level. For both syndicated loans and bonds, the data includes the date of the issue, the name of the borrower, the purpose of the issue, the type of business of the borrower, the amount issued, the currency of issue, the interest rate, the maturity, the banks participating in the syndicates for loans, and the markets where the bonds are issued.

We identify bonds as international when they are issued in the euro market, foreign market, or global market. For syndicated loans, we follow the BIS methodology (See, Gadanecz (2004)) and identify international loans as those loans in which the nationality of at least one of the senior syndicate banks differs from that of the borrower. This database includes all the countries that participated at least once in international capital markets for the 1973-2022 period.

In this paper, we study capital flows to advanced and emerging periphery countries that heavily tap international capital markets. We focus on issuance of 30 countries, 17 advanced economies and 13 emerging economies.[15] For each country, we construct a measure of total gross capital inflows which includes primary issuance of bonds and syndicated loans, and then divide total

12. Importantly, these databases identify sovereign and corporate international issuance.

13. Even the data from the World Bank does not provide data on issuance and debt for some important emerging economies, such as Chile, Poland, and Uruguay, and data on other countries starts in the 1980s or even later.

14. Kalemli-Ozcan and coauthors have worked to construct a database on gross capital inflows and outflows, and have been able to separate capital flows issued by sovereigns, banks, and corporates. Their data starts in 1993.

15. The advanced economies are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, New Zealand, Norway, Portugal, Spain, and Sweden. The emerging economies are Argentina, Brazil, Chile, China, Colombia, Indonesia, Korea, Malaysia, Mexico, Peru, Thailand, Turkey, and Uruguay.

issuance into corporate issuance and sovereign issuance. Corporate issuance includes issuance by both financial and non-financial corporations. Sovereign issuance includes issuance from central governments, states (provinces), and municipalities as well as both financial and non-financial state-owned corporations. To construct a measure of participation in international capital markets relative to the size of the economy, we study total issuance as a share of exports. Since exports are quite volatile, to capture the volatility of capital flows, we use trend exports as the scale variable.[16]

Figure 1 shows the evolution of total, corporate and government international issuance (as a share of exports) since the collapse of the Bretton Woods System in 1973.

## 3.2 Financial Distortion Indicators

Most of the literature on financial frictions is primarily associated with domestic capital markets. Apart from the United States, countries around the world rely on bank-based domestic credit systems.[17] Credit in these countries is mostly provided by local and state banks, which lack access to networks with large financial corporations such as global banks, hedge funds, foreign exchange brokers, and institutional investors. Consequently, local and state banks heavily rely on a limited supply of deposits, leading to persistent distortions in their operations.

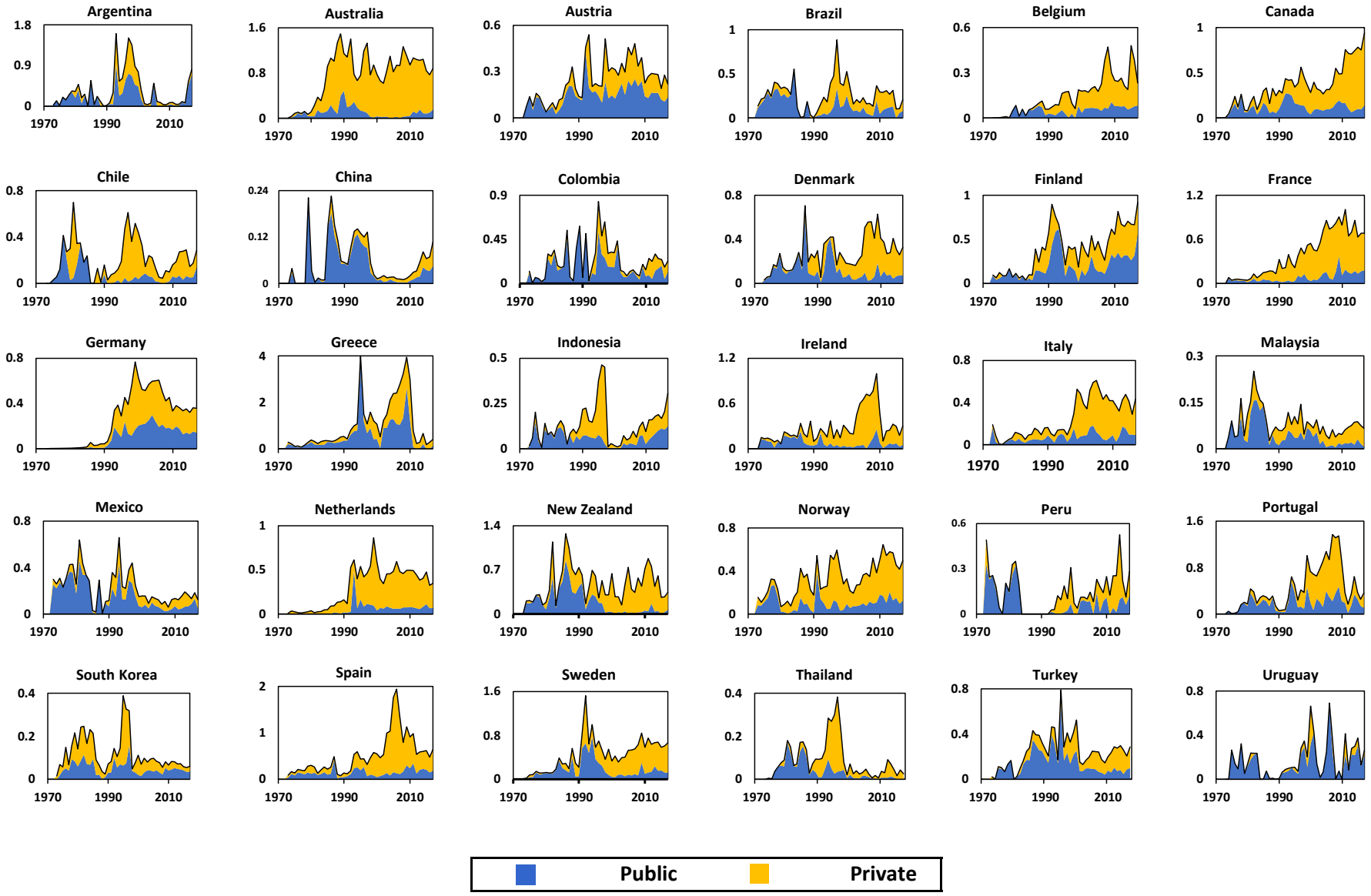
In contrast, international capital markets are highly liquid and characterized by the presence of global banks and Eurobond markets, enabling capital flows to move freely across countries. However, these markets are not immune to transitory adverse shocks. For instance, one such fracture occurred in the international syndicated loan market. The crack was preceded by a surge in lending to developing countries in the mid-1970s, which collapsed in the early 1980s following a sharp contraction in monetary policy in the United States. This contractionary shock had devastating effects, leading to defaults by countries like Mexico and many others in Africa, Asia, Eastern Europe, and Latin America. Another financial fracture was triggered by a housing boom and a capital flow bonanza in the United States in the early 2000s. By 2007, the U.S. housing bubble burst, disrupting overall financial markets and resulting in the collapse of major financial institutions such as Bear Stearns and Lehman Brothers. The ensuing financial panic and credit disruption also spread to Europe, particularly affecting Eastern European and Mediterranean countries.

To examine the impact of international government issuance on international firm issuance during times of financial market fragility, we construct indices for tranquil and friction times, focusing on three indicators: country credit risk, sovereign debt burden, and the U.S. broker-dealer leverage. The first two are indices identifying idiosyncratic shocks while the last one is a global index that captures the changing level of financial liquidity in the United States.

- Country Credit Risk: We estimate credit risk indices for each of the 30 countries in our sample, using two indicators starting from 1973. Our primary source is Moody's Credit

16. Trend exports are estimated by applying the Hodrick-Prescott filter to the series of nominal exports.
17. See Darmouni and Siani (2021).

Figure 1: International Government and Firm Issuance (Share of Trend Exports)




*Note*: Capital flows are captured with international gross primary issuance of bonds and syndicated loans. Total capital flows are divided into capital flows to the government and capital flows to the corporate sector.

Ratings. For developing countries and some advanced economies not covered by Moody's in the earlier years, we use Institutional Investor's Ratings of Country Credit. Figure 9 shows the index we created.

- Sovereign Debt Burden: We estimate international government debt for each of the 30 countries in our sample. We include all bonds and syndicated loans issued by central governments, states (provinces), municipalities, and public corporations. For each year, we estimate the remaining balance of each bond and syndicated loan using issuance and maturity dates as well as repayment schedule characteristics for these instruments. The sovereign debt series also includes restructurings following defaults in the 1980s, 1990s, and 2000s.[18] Importantly, this series only includes debt from bonds and loans issued in private capital markets by private creditors, excluding multilateral loans from international financial institutions. The sovereign debt burden is calculated as the ratio of sovereign debt to trend exports, and Figure 10 illustrates the evolution of international government debt as a share of exports.

- Liquidity in the Financial Center: As mentioned earlier, credit excesses are typically followed by tightening in monetary policy and asset fire sales, causing bond and equity prices to collapse, transaction volumes to decline sharply, and bid-ask spreads to increase. Our focus is on the United States, and to capture episodes of booms and busts in liquidity, we follow the approach of Bruno and Shin (2015). We use the leverage of the US broker-dealer sector from the US Flow of Funds series published by the Federal Reserve as an empirical proxy for episodes of high and low global liquidity. The US broker-dealer leverage is shown in Figure 11.

Overall, our analysis aims to shed light on the dynamics of financial markets during different types of fractures, providing insights into the interplay between international government issuance and firm issuance.

# 4 Empirical Methodology

## 4.1 The VAR

Our VAR specification is

$$Y_t = AY_{t-1} + U_t \tag{1}$$

where $Y_t = [X_t, I_t]'$ is a vector with real GDP growth and government issuance (as a percent of exports). $U_t = [x_t, i_t]'$ is the corresponding vector of reduced-form residuals. $A$ is a time-invariant $(2 \times 2)$-matrix .

18. Information on restructurings of sovereign debt was collected from various sources, including the Institute of International Finance, World Bank publications, IMF publications, the Bloomberg Platform, and studies by researchers like Sturzenegger and Zettelmeyer (2007).

## 4.2 Identification

We now discuss our identification strategy. We can rewrite the reduced-form as the structural-form of the model by pre-multiplying equation (1) by matrix $B$, which describes the contemporaneous effects of each component in $Y$ on the other variables:

$$BY_t = BAY_{t-1} + BU_t \tag{2}$$

where

$$B = \begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix} \quad \text{and} \quad \varepsilon_t = BU_t = \begin{bmatrix} \varepsilon_t^y \\ \varepsilon_t^i \end{bmatrix}$$

$b_{12}$ gives the contemporaneous effect of government issuance on real GDP growth and $b_{21}$ gives the contemporaneous effect of real GDP growth on real government issuance. $\varepsilon_t$ is the vector of mutually uncorrelated structural shocks that we want to recover.

To achieve identification, we rely on the timing of government spending using funds from longer-term financial instruments. By capturing this timing of government spending, we construct a model that explains the relationship between economic activity and government issuance.

An essential aspect of our analytical methodology revolves around the unique attributes of the dataset we have constructed. Our sources for issuance only include debt issues with maturities of more than one year. This allows us to focus exclusively on longer-term financing mechanisms. Consequently, our dataset's scope excludes the inclusion of shorter-term financial instruments which might exhibit effects on economic activity at different horizons.

A notable feature of longer-term financing is the time delay between issuance and utilization. Unlike shorter forms of financing that immediately infuse capital into the economy, longer forms of financing operate on an extended timeline. They are tailored to support the funding requirements of large and long-lasting projects, most notably infrastructure development and other sizeable, long-term investments. These projects, often characterized by complex logistical, planning, and implementation phases, necessitate considerable timeframes for completion. Consequently, the effects of such financial instruments on overall economic activity are not readily apparent in the immediate aftermath of their issuance. Instead, their impact gradually materializes over time, as the phases of the projects unfold and exert a tangible influence on the economy. This manifests itself in our model by setting $b_{12} = 0$:

$$B = \begin{bmatrix} 1 & 0 \\ b_{21} & 1 \end{bmatrix}$$

Pre-multiplying equation (2) by $B^{-1}$ gives:

$$Y_t = AY_{t-1} + U_t \tag{3}$$

where

$$U_t = B^{-1}\varepsilon_t \quad \rightarrow \quad \begin{bmatrix} x_t \\ i_t \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ b_{21} & 1 \end{bmatrix}^{-1} \begin{bmatrix} \varepsilon_t^x \\ \varepsilon_t^i \end{bmatrix} \quad \text{where} \quad B^{-1} = \begin{bmatrix} 1 & -b_{21} \\ 0 & 1 \end{bmatrix}$$

With our identifying restriction we are left with the following two equations:

$$\begin{aligned} x_t &= \varepsilon_t^x - \varepsilon_t^i b_{21} \\ i_t &= \varepsilon_t^i \end{aligned} \tag{4}$$

Since the structural residuals are white noise processes and uncorrelated:

$$\begin{aligned} Cov[x_t, i_t] &= \mathbb{E}[(\varepsilon_t^x - \varepsilon_t^i b_{21})(\varepsilon_t^i)] - \mathbb{E}[(\varepsilon_t^x - \varepsilon_t^i b_{21})]\mathbb{E}[\varepsilon_t^i] \\ &= \mathbb{E}[(\varepsilon_t^x \varepsilon_t^i - \varepsilon_t^i \varepsilon_t^i b_{21})] \\ &= \mathbb{E}[\varepsilon_t^x \varepsilon_t^i] - b_{21}\mathbb{E}[\varepsilon_t^i \varepsilon_t^i] \\ &= 0 - b_{21}\sigma_i^2 \\ \rightarrow b_{21} &= \frac{-Cov[x_t, i_t]}{\sigma_i^2} \end{aligned} \tag{5}$$

Plugging $b_{21}$ into the equations 4 gives us the values of the structural shocks. We use the estimated structural shocks to international government issuance in our local projections.

# 5 Estimations

This section examines the links between government and firm issuance. We examine whether sovereign issuance in international capital markets helps to create a market for corporate international issuance (crowding in) or whether sovereign international issuance reduces the ability of the corporate sector to tap international capital markets (crowding out). We first examine whether the links are different across advanced and emerging economies. We then allow for time-varying relationships between sovereign borrowing and firm borrowing for both advanced and emerging economies.

## 5.1 Linear Estimations

We first examine whether sovereign borrowing in advanced and in emerging economies affects the participation of corporations in international capital markets. We estimate the effect of government issuance on firm issuance at different horizons using the Jordà (2005) local projections method. Fluctuations in government issuance are in general endogenous and respond to current and expected economic conditions making it difficult to identify truly exogenous shocks to government issuance. To address this endogeneity issue, we identify exogenous shocks to government issuance using our structural VAR model. We use these exogenous shocks in the Local Projections.

We control for a variety of country factors that may affect both government and firm issuance, such as country GDP growth and country sovereign risk. We also control for a variety of push factors, such as GDP growth in the financial center and global financial liquidity.

We estimate the following model separately for advanced and emerging economies at different horizons: $h = 0$, 1, 2, 3, 4, and 5 (years) using our whole sample period:

$$PRI^i_{t+h} = \alpha_h + \delta^i_h + \beta_h \times PUI^i_t + \theta^{pull}_h(L) \times Z^{pull,i}_{t-1} + \theta^{push}_h(L) \times Z^{push}_{t-1} + \varepsilon^i_{t,h} \tag{6}$$

$PRI$ is international firm issuance as a share of exports and $PUI$ is international government issuance as a share of exports. $Z^{pull}$ is a vector of controls that includes the pull factors: international government debt (as a share of exports), country real GDP growth rate, and country sovereign ratings. $Z^{push}$ is a vector of push factors: U.S. real GDP growth rate and the U.S. Broker-Dealer Leverage Cycle. $\theta^{pull}_h(L)$ and $\theta^{push}_h(L)$ are polynomials in the lag operator. The coefficient $\beta_h$ gives the response of firm issuance at time $t + h$ to a shock to government issuance at time $t$. $\delta^i_h$ are country fixed effects where the superscript $i$ identifies the country in the panel.

The results are shown in Figure 2. This figure shows the response of international firm issuance to a shock to international government issuance at different horizons: 0, 1,..., 5 years. For advanced economies, our results indicate that firms ability to tap international capital markets is not affected by sovereign issuance. In contrast, emerging economies seem to face markets with persistent distortions. The results indicate that international government issuance crowds out international firm issuance starting two years after the shock and continuing for at least 3 more years. Our results indicate that a \$1 increase in government issuance decreases firm issuance by around \$0.30 cents.

The results above, however, may not capture the role of various transitory imperfections in financial markets. In the next section, we will examine the role of various transitory distortions, both at the local and global level.

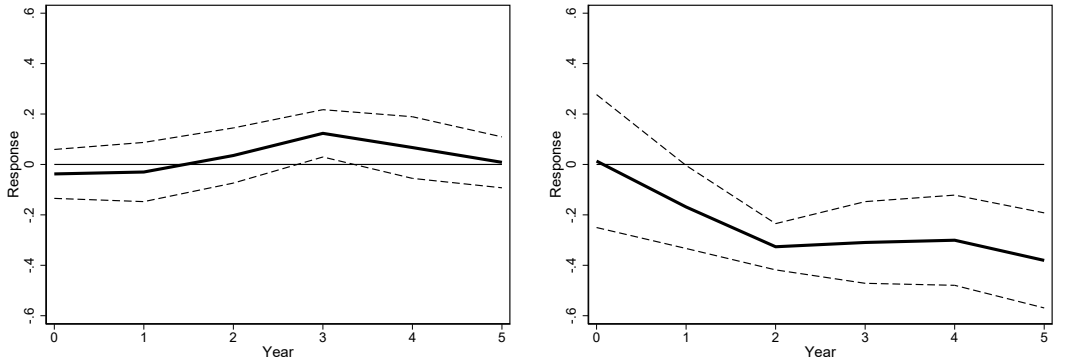
## 5.2 Estimations Across States

We now allow for three types of non-linearities. We use the Jordà (2005) Local Projections methodology together with the Ramey and Zubairy (2018) modifications to examine the links between government and firm issuance in episodes of high and low sovereign risk, in episodes with high and low sovereign debt, and in times of global liquidity booms and busts. As before, we estimate the following model separately for advanced and emerging economies.

### 5.2.1 Sovereign Risk

The restart of financial globalization was accompanied by international capital flow booms and busts. Some of these events ended with crashes as countries defaulted on their sovereign debt and could not continue to tap international capital markets. In other milder events, sovereigns

Figure 2: Effect of Government Issuance on Firm Issuance




(a) Advanced Economies (b) Emerging Economies

*Note*: This figure shows the response of international firm issuance to a one unit shock to international government issuance (at different horizons: 0, 1, 2, 3, 4, 5 (years)) for advanced and emerging economies. The shaded region is the 90% confidence interval.

continued to have access to international capital markets but at higher costs. To capture these various degrees of risk we use two indices: *Moody's Investors Service* and *Institutional Investors*.

Moody's index uses multiple letters and numbers to rate a sovereign's credit worthiness. Moody's uses a combination of 21 letters and numbers to capture the following categories: prime, high rate, upper medium rate, lower medium rate, lower medium, non-investment grade speculative, highly speculative, substantial risk, extremely speculative, and in default. We convert these letters and numbers into an index that spans from 100 (prime) to zero (default). Moody's ratings, however, do not fully cover our sample period.[19] To expand our database on sovereign risk, we collect data from Institutional Investors. The Institutional Investor Index was a country risk assessment model available to investors. This index incorporated information of risks related to investing in a foreign country, including political risk, exchange rate risk, economic risk, sovereign risk, and transfer risk. The Institutional Investor data begins in 1979 and ends in 1999. The Institutional Investor ratings span from 0 (least creditworthy) to 100 (most creditworthy). To extend our database, we splice both series.[20]

Reinhart et al. (2003) discuss whether there are Debtors' Clubs. They study whether some economies have continuous access to capital markets, intermittent access to capital markets, or do not have access to capital markets. They relate those clubs to history of defaults that are mainly reflected in country ratings. In this section, we examine whether those rating thresholds capture changing interactions between international government and firm issuance. As in Reinhart et al. (2003), we create three clubs. The club with high sovereign risk has ratings lower than 25, the club with medium sovereign risk has ratings higher than 25 but lower than 75, and the club with low risk has ratings higher than 75. While Reinhart et al. (2003) only focus on developing

19. For our sample, Moody's earlier ratings include Australia, Canada, Denmark, and New Zealand. For these countries the ratings start in 1973. Most of the other country ratings start in the earlier 1990s.

20. The combined series are shown in Figure 9.

countries, in our research we also include advanced economies.

Figure 9 in Appendix A shows the evolution of sovereign credit risk for the thirty countries in our sample. Credit ratings for advanced economies are typically stable and high, the exceptions being Greece, Ireland, Italy, Portugal, and Spain (GIIPS). The GIIPS suffered currency crises in the 1970s and 1990s and, as a result, credit ratings declined during these periods. However, Moody's, as well as Standard & Poor's and the Fitch Group raised these countries' ratings amid the tranquil times of the 2000s. This episode, however, was short-lived as the debt crises in these five European countries exploded and credit ratings declined sharply once more. Figure 9 also shows the credit ratings for emerging markets. Compared to the credit ratings in advanced economies, the ratings for emerging markets are lower and far more volatile. Countries in this group never reach the highest ratings and oscillate between medium ratings in good times and low ratings in crisis times.

We estimate the following model at different horizons: $h = 0$, 1, 2, 3, 4, and 5 (years):

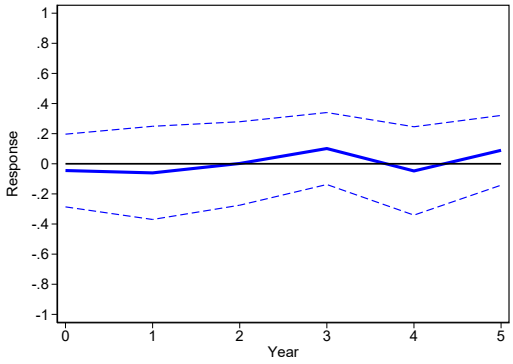
$$PRI^i_{t+h} = \alpha_h + \delta^i_h + [\beta^{high}_h \times PUI^i_t] \times I^{high}_t + [\beta^{medium}_h \times PUI^i_t] \times I^{medium}_t + [\beta^{low}_h \times PUI^i_t] \times I^{low}_t + \theta^{pull}_h(L) \times Z^{pull,i}_{t-1} + \theta^{push}_h(L) \times Z^{push}_{t-1} + \varepsilon^i_{t,h} \tag{7}$$

As before, the coefficient $\beta_h$ gives the response of international corporate issuance at time $t + h$ to a shock to international government issuance at time $t$. We allow the coefficient $\beta_h$ to vary between episodes of high, medium, and low sovereign risk. $I^{high}$, $I^{medium}$, and $I^{low}$ are dummy variables that indicate the state of sovereign risk when the shock hits and are equal to 1 during high, medium, and low sovereign risk, respectively, and 0 otherwise. Figures 3 and 4 show the responses of firm issuance to shocks to government issuance for different debtors' clubs.

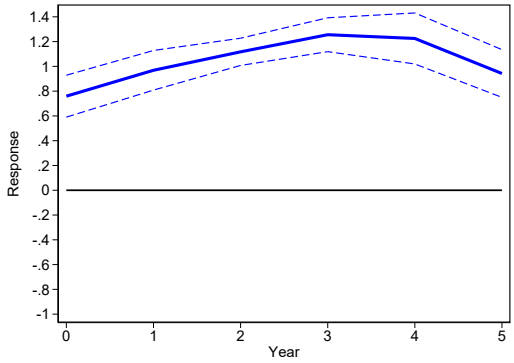
Figure 3 presents the results for advanced economies. Panel (a) shows the results for advanced economies without the GIIPS. Since this group of countries only experienced high ratings throughout our sample we only show the estimations for low risk periods. In this environment, we find that changes in government issuance do not affect firms' issuance. Panels (b) and (c) show the results for periods of low credit risk and medium credit risk, respectively, for the GIIPS. Our estimations reveal large crowding in effects, particularly in low risk periods, indicating that increases in government issuance bolsters firm issuance in the GIIPS. This relationship is not only statistically but also economically significant. Initially, a \$1 increase in government issuance triggers an approximately \$0.80 increase in firm issuance. The magnitude subsequently increases and we observe that firms' issuance overshoots changes in government issuance, with a \$1 increase in government issuance leading to a \$1.20 increase in firm issuance, suggesting that periods of low credit risk fueled euphoria and large credit booms in the GIIPS.

But what was behind the sharp increase in credit ratings in Greece, Ireland, Italy, Portugal, and Spain in the 2000s? In part, it was due to the end of the 1992-1993 European Crisis. This episode

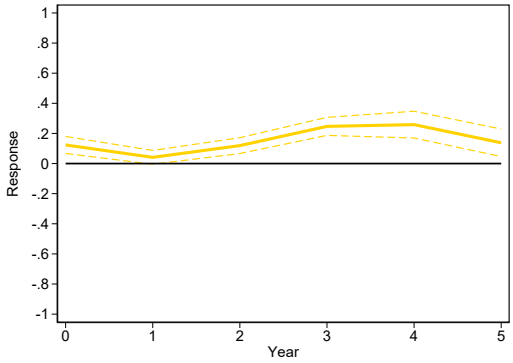
Figure 3: Levels of Sovereign Risk of Advanced Economies




(a) Low Risk (Advanced w/o GIIPS)




(b) Low Risk (GIIPS)

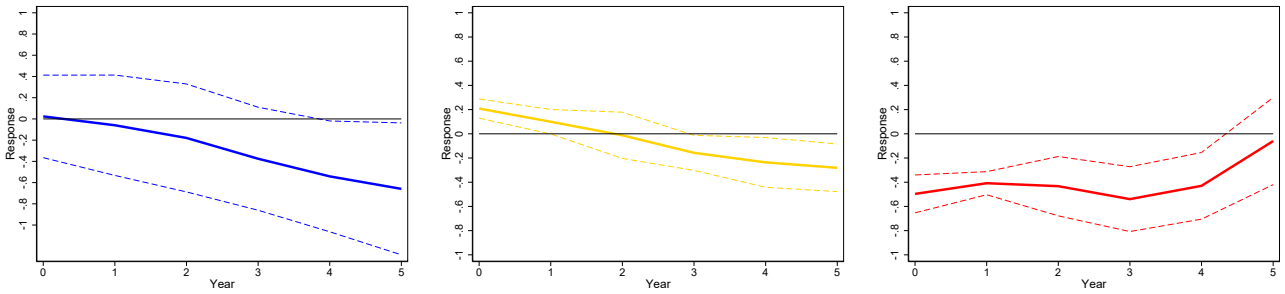



(c) Medium Risk (GIIPS)

*Note*: This figure shows the response of international firm issuance to a one unit shock to international government issuance (at different horizons: 0, 1, 2, 3, 4, 5 (years)) during episodes of low and medium sovereign risk in advanced economies. Figure (a) shows the results for the advanced countries in our sample without the GIIPS. Figures (b) and (c) show the results for the GIIPS: Greece, Ireland, Italy, Portugal, and Spain. Episodes of low and medium risk are identified as those episodes when sovereign ratings are above 75 and between 25 and 75, respectively. The shaded region is the 90% confidence interval.

was also a witness to a dramatic deregulation of capital markets as well as the elimination of capital controls across European countries. As shown in Figure 13, government bond yields in these five countries sharply declined and converged to government bond yield of Germany in 1998 as investors anticipated the creation of the Eurozone. In 1999, these countries adopted the Euro, and currency crises were no longer a concern. Interestingly, not only did investors dismiss idiosyncratic country risks, so did the credit rating agencies. In contrast to the other advanced economies in our sample which exhibited either a small negative or positive net international investment position, the GIIPS started to heavily tap international credit markets and international debt sharply increased. As shown in Figure 15, net international investment indebtedness escalated, indicating debt fragilities. Still, bond yields were stable and rating agencies did not downgrade these countries. Only by the end of 2009 did investors and rating agencies react to debt fragilities following the unexpected finding of a much larger Greek government debt. It was only at this time that rating agencies started to downgrade these countries.

Figure 4: Levels of Sovereign Risk of Emerging Economies




(a) Low Risk (b) Medium Risk (c) High Risk

*Note*: This figure shows the response of international firm issuance to a one unit shock to international government issuance (at different horizons: 0, 1, 2, 3, 4, 5 (years)) during episodes of low, medium, and high sovereign risk in emerging economies. Episodes of low, medium, and high risk are identified as those episodes when sovereign ratings are above 75, between 25 and 75, and lower than 25, respectively. The shaded region is the 90% confidence interval.

Figure 4 studies the relationship between government and firm issuance in emerging markets. As shown in Berckmann et al. (2019), "the deterioration in sovereign credit quality is typically associated with macroeconomic and financial market disruptions that can directly affect the credit worthiness of other issuers that are domiciled in the country."[21] Thus, we would expect increases in government issuance during high risk periods to reduce the ability of the corporate sector to tap international capital markets. As predicted, firm issuance in episodes of high credit risk sharply declines when government issuance increases. In episodes of high risk, a $1 increase in government issuance reduces private issuance by $0.50 at almost all horizons. Similar to advanced countries, we do not find any link between government and firm issuance in the medium risk state. Interestingly, while we found a strong crowding in effect in advanced countries during the low risk state, we do not find an equivalent effect for emerging countries.

The above estimations examine the relationship between issuance of the the whole corporate sector and government issuance. However, credit risk may affect this relationship differently if we examine financial and non-financial firms separately. Banks and other financial institutions could suffer more than other firms as sovereign default has a direct effect on bank balance sheets.[22] In future research, we will differentiate between these different types of firms.

### 5.2.2 Level of International Government Debt

The surge in government borrowing starting in the 2000s triggered a growing literature on the impact of debt on growth. For example, Reinhart and Rogoff (2010) find that while there is no discernible connection between growth and debt at "ordinary" debt levels, countries with government debt exceeding around 90 percent of GDP experience a decline in average growth rates by several percentage points. Notably, they also find that the relationship between government

21. See also, Arteta and Hale (2008), and Hébert and Schreger (2017).
22. See Acharya et al. (2014).

debt and growth is remarkably similar across emerging and advanced economies. Similarly, Chudik et al. (2017) also examine the long-run impact of government debt expansion on economic growth and investigate whether the debt-growth relationship varies with the level of indebtedness.[23] They find no evidence for a universally applicable threshold effect in the relationship between government debt and economic growth, once they account for the impact of global factors and their spillover effects. Still, they find significant negative long-run effects of government debt build-up on output growth. Implicitly, these findings indicate that increases in government debt fuel less credit to the corporate sector as increases in government debt increases interest rates which reduce investment and growth.

More recent studies also find links between debt expansion and growth, but in contrast to previous research, these new studies conclude that increases in government debt fuels economic growth. The focus in these new studies is on domestic banks during banking crises. Even in tranquil times, there are financial frictions in the banking sector and credit tends to be limited. When banking crises erupt, corporate credit collapses, and the economy falls into a profound recession. Dinger et al. (2022) study the connection between government debt and growth amid these crises and find that increases in government debt provides liquidity support to the financial system which, in turn, triggers a recovery in economic activity.[24] Other authors also find that corporate borrowers benefit from bailouts. Berger et al. (2019) examine the effects of the Troubled Asset Relief Program (TARP) on loan contract terms. They find that TARP contributed to better borrower contract terms in various dimensions, such as increases in credit supply, longer maturities, less restrictive covenants, lower spreads, as well as less frequency of collateral. These papers are consistent with government debt crowding in firm debt.

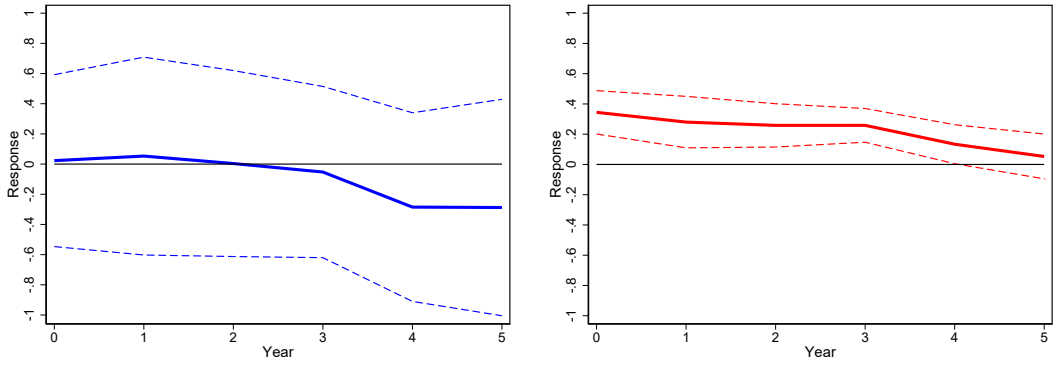
Building upon this foundation, our paper examines a distinct yet related dimension. In particular, we study whether the level of external government debt impacts the effect of government issuance on corporate issuance. From the previous two strands of literature, it isn't obvious what we should expect. In this section, we examine whether episodes of low or high levels of international debt fuel crowding out effects of government issuance. Our threshold for "high" levels of debt is the 75th percentile of external government debt across countries during our sample period in each development group (advanced and emerging).[25] We estimate the following model separately for advanced and emerging economies at different horizons: $h = 0$, 1, 2, 3, 4, and 5 (years):

$$\begin{aligned} PRI^i_{t+h} = \alpha_h + \delta^i_h + [\beta^{high}_h \times PUI^i_t] \times I^{high}_t + [\beta^{low}_h \times PUI^i_t] \times I^{low}_t + \\ \theta^{pull}_h(L) \times Z^{pull,i}_{t-1} + \theta^{push}_h(L) \times Z^{push}_{t-1} + \varepsilon^i_{t,h} \end{aligned} \tag{8}$$

As before, the coefficient $\beta_h$ gives the response of international firm issuance at time $t + h$ to a shock to international government issuance at time $t$. We allow the coefficient $\beta_h$ to vary between

23. They use data on a sample of 40 advanced and emerging countries over the 1965-2010 period
24. They study 147 banking crises in 116 countries both advanced and developing countries from 1970 to 2011.
25. The results are robust to different thresholds.

Figure 5: Levels of Sovereign Debt of Advanced Economies




(a) Low Debt (b) High Debt

*Note*: This figure shows the response of international firm issuance to a one unit shock to international government issuance (at different horizons: 0, 1, 2, 3, 4, 5 (years)) during episodes of high and low international government debt in advanced economies. Episodes of high international government indebtedness for advanced economies are identified as those episodes when government debt is higher than 95% of exports. The shaded region is the 90% confidence interval.

episodes of high and low levels of international sovereign debt (as a share of exports). $I^{high}$ and $I^{low}$ are dummy variables that indicate the state of international government debt when the shock hits and are equal to 1 during periods of high and low levels of international government debt, respectively. Figures 5 and 6 show the impulse response functions of firm issuance to government issuance shocks during episodes of high and low international sovereign debt for advanced and emerging countries. In both figures, the panel on the left shows the results for low debt while the panel on the right shows the results for high debt.

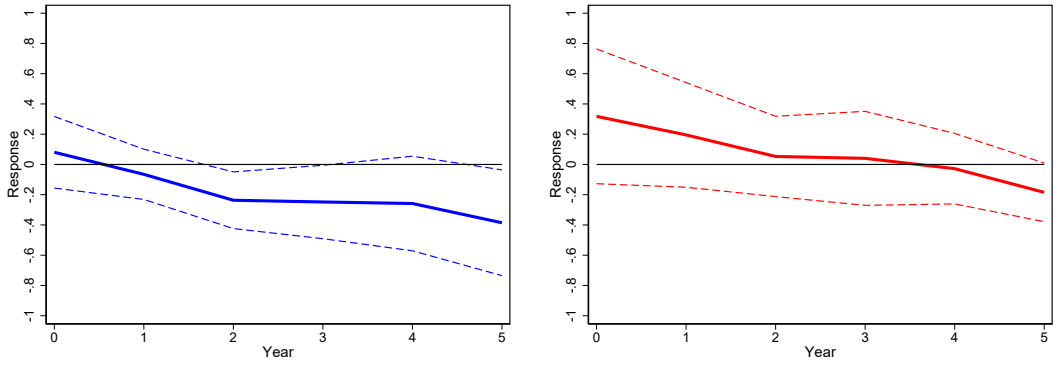
Our results indicate that neither high debt nor low debt affects the response of firm issuance to government issuance in developing countries. This is also the case for advanced countries during the low debt state. However, in the high debt state, there is a positive effect during the initial period and during the subsequent 4 years. This effect peaks during the same period as the shock and gradually decreases: starting at around 0.37 and decreasing to 0.16. This result appears to support the findings in Dinger et al. (2022) and Berger et al. (2019) which conclude that high government debt provides liquidity to the corporate sector, thereby increasing the amount of firm issuance.

### 5.2.3 Global Financial Booms and Busts

Since the restart of financial globalization, researchers have focused on what triggers booms and busts of international capital flows. Initially, research focused on domestic shocks (pull factors) and on global shocks (push factors).[26] More recently, academic research has indicated that global factors are at the heart of fluctuations in capital flows. For example, Rey (2015) shows that "one of the determinants of the global financial cycle is monetary policy in the center country, which

26. See Fernandez-Arias (1996).

Figure 6: Levels of Sovereign Debt of Emerging Economies




(a) Low Debt (b) High Debt

*Note*: This Figure shows the response of International Private Issuance to a one-standard deviation shock to International Public Issuance (at different horizons: 0, 1, 2, 3, 4, 5 (years)) during episodes of high and low international government indebtedness in advanced and emerging economies. Episodes of high international government indebteness for emerging economies are identified as those episodes when international public debt is higher than 60% of exports. The shaded region is the 90% confidence interval.

affects leverage of global banks, capital flows, and credit growth in the international financial system." Whereas prior research has concentrated on the effect of the financial center cycle on total capital flows in the periphery, we complement this research by examining whether government issuance during liquidity booms and busts in the financial center (the United States) either reinforce (crowding in) or weaken (crowding out) firms' access to international capital markets in countries in the periphery.

To examine the effects of global liquidity on interactions between government and firm issuance we follow Bruno and Shin (2015) and capture booms and busts in global liquidity with the U.S. Broker-Dealer Leverage.[27] To identify the boom-bust cycles in the U.S. Broker Dealer Leverage, we use the Bry and Boschan (1971) and Harding and Pagan (2002) algorithm.[28] This algorithm identifies cyclical turning points using two restrictions, a minimum amplitude of the cycle, and a minimum duration of the cycle. In our estimations we impose a minimum amplitude of the cycle to be at least 25 percent.[29] We further impose the restriction that the cycle cannot have a duration of less than 5 years. That is, $y_t$ (U.S. Broker Dealer leverage) is a maximum if:

$$y_{t-2}, y_{t-1} < y_t > y_{t+1}, y_{t+2} \tag{9}$$

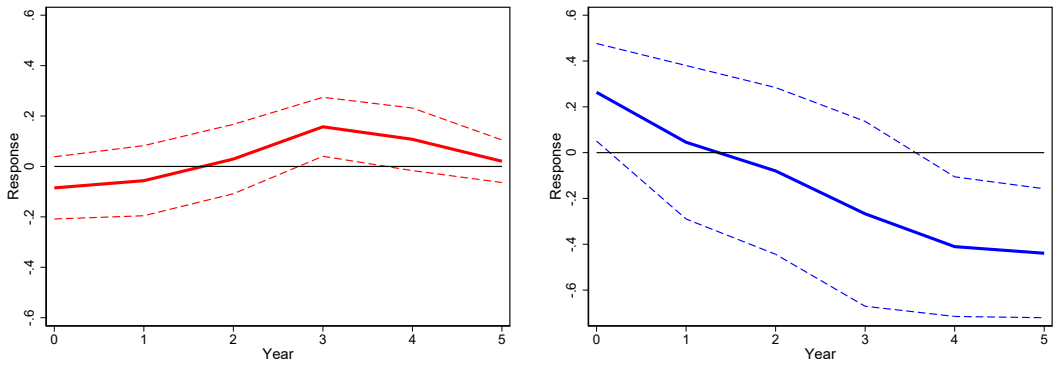
The trough is identified as the minimum value between two local peaks. We identify the episodes

27. The leverage of the U.S. broker dealer sector is from the U.S. Flow of Funds series published by the Federal Reserve.

28. We also obtained the Financial Center Leverage Cycle by detrending the series using the Hodrick-Prescott Filter. This filter identifies the same episodes of booms and busts as those obtained by using the Bry and Boschan (1971) and Harding and Pagan (2002) methodology.

29. We impose a minimum amplitude of 25 percent to identify bona fide bonanza (bust) cycles and not just blips in the U.S. Broker Dealer Leverage cycle.

Figure 7: Booms and Busts in Advanced Economies




(a) Boom (b) Bust

*Note*: This figure shows the response of international firm issuance to a one unit shock to international government issuance (at different horizons: 0, 1, 2, 3, 4, 5 (years)) during episodes of global liquidity booms and busts in advanced economies. These episodes are identified using the U.S. Broker-Dealer Leverage Cycle. The shaded region is the 90% confidence interval.

of 1975-1985, 1988-1996, and 2000-2007 as boom episodes, with the rest of the years in our sample as episodes of crashes.

We estimate the following model separately for advanced and emerging economies at different horizons: $h = 0$, 1, 2, 3, 4, and 5 (years):

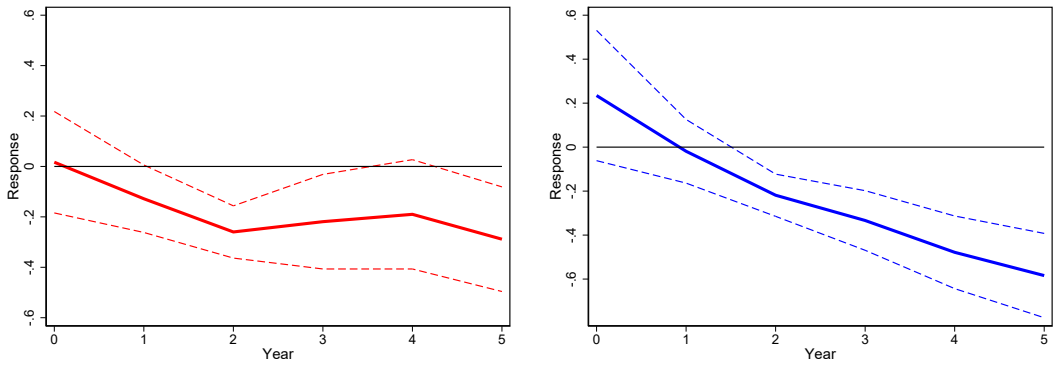
$$PRI^i_{t+h} = \alpha_h + \delta^i_h + [\beta^{boom}_h \times PUI^i_t] \times I^{boom}_t + [\beta^{bust}_h \times PUI^i_t] \times I^{bust}_t + \theta^{pull}_h(L) \times Z^{pull,i}_{t-1} + \theta^{push}_h(L) \times Z^{push}_{t-1} + \varepsilon^i_{t,h} \tag{10}$$

As before, the coefficient $\beta_h$ gives the response of international firm issuance at time $t+h$ to a shock to international government issuance at time $t$. We allow the coefficient $\beta_h$ to vary between episodes of booms and busts in the financial center leverage cycle. $I^{boom}$ ($I^{bust}$) is a dummy variable that indicates the state of the financial center leverage cycle when the shock hits and is equal to 1 during the boom (bust) period. Figures 7 and 8 show the responses of firm issuance to government issuance shocks in episodes of liquidity booms and busts in the financial center for advanced and emerging countries, respectively.

Figure 7 indicates that in advanced countries, an increase in government issuance leads to a decline in firm issuance in times of illiquidity in the financial center. Importantly, the crowding out effects are statistically and economically significant but only at long intervals with a \$1 increase in government issuance leading to a decline in firm issuance of \$0.40 at four- and five-year horizons. In contrast, during episodes of liquidity booms in the financial center, increases in government issuance do not affect corporate issuance at any horizon.

Figure 8 shows the effects of government issuance on firm issuance in emerging countries. In contrast to the responses in advanced economies, we find that during episodes of illiquid markets in the financial center, crowding-out effects are economically and statistically far more significant

Figure 8: Booms and Busts in Emerging Economies




(a) Boom (b) Bust

*Note*: This figure shows the response of international firm issuance to a one unit shock to international government issuance (at different horizons: 0, 1, 2, 3, 4, 5 (years)) during episodes of global liquidity booms and busts in emerging economies. These episodes are identified using the U.S. Broker-Dealer Leverage Cycle. The shaded region is the 90% confidence interval.

at both short- and long-horizons, with a $1 increase in government issuance reducing firm issuance by $0.20 at 2-year horizon, and peaking at a reduction of $0.60 at a 5-year horizon. Interestingly, we still find crowding-out effects even in times of liquidity booms in the financial center. However, these are relatively small effects and are only significant at two isolated horizons.

# 6 Conclusion

As government debt levels surge globally, there is a growing need to understand how government issuance impacts firm borrowing. In this paper, we study the relationship between government borrowing and corporate access to international capital markets during different country-specific and global fractures.

We construct a new database containing government and firm international issuance as well sovereign credit ratings, external sovereign debt, and US broker-dealer leverage. To identify the effect sovereign issuance has on firm issuance, we exploit the fact that our database contains debt issues of long maturities. Long-term government issuance is typically used for large projects, such as infrastructure, which typically take many years to finish and, as such, the funds are not used immediately. This allows us to make an identifying restriction using a structural VAR approach to identify exogenous shocks to government issuance.

Previous research on the interaction between sovereign and corporate debt has focused on domestic financial markets and found significant crowding out effects. This is because these markets are segmented and capital cannot easily flow across banks and investors. While international credit markets have been previously considered to have few imperfections, recent research has found that this isn't the case. We contribute to this area of research by examining distortions in international credit markets that trigger crowding in and crowding out. Our results indicate that the interactions

between government and firm international issuance are non-linear. In particular, we find crowding in effects in advanced economies during high debt and low risk periods, and crowding out effects during liquidity busts. In emerging countries, we observe crowding out during high risk periods and collapses in global liquidity.

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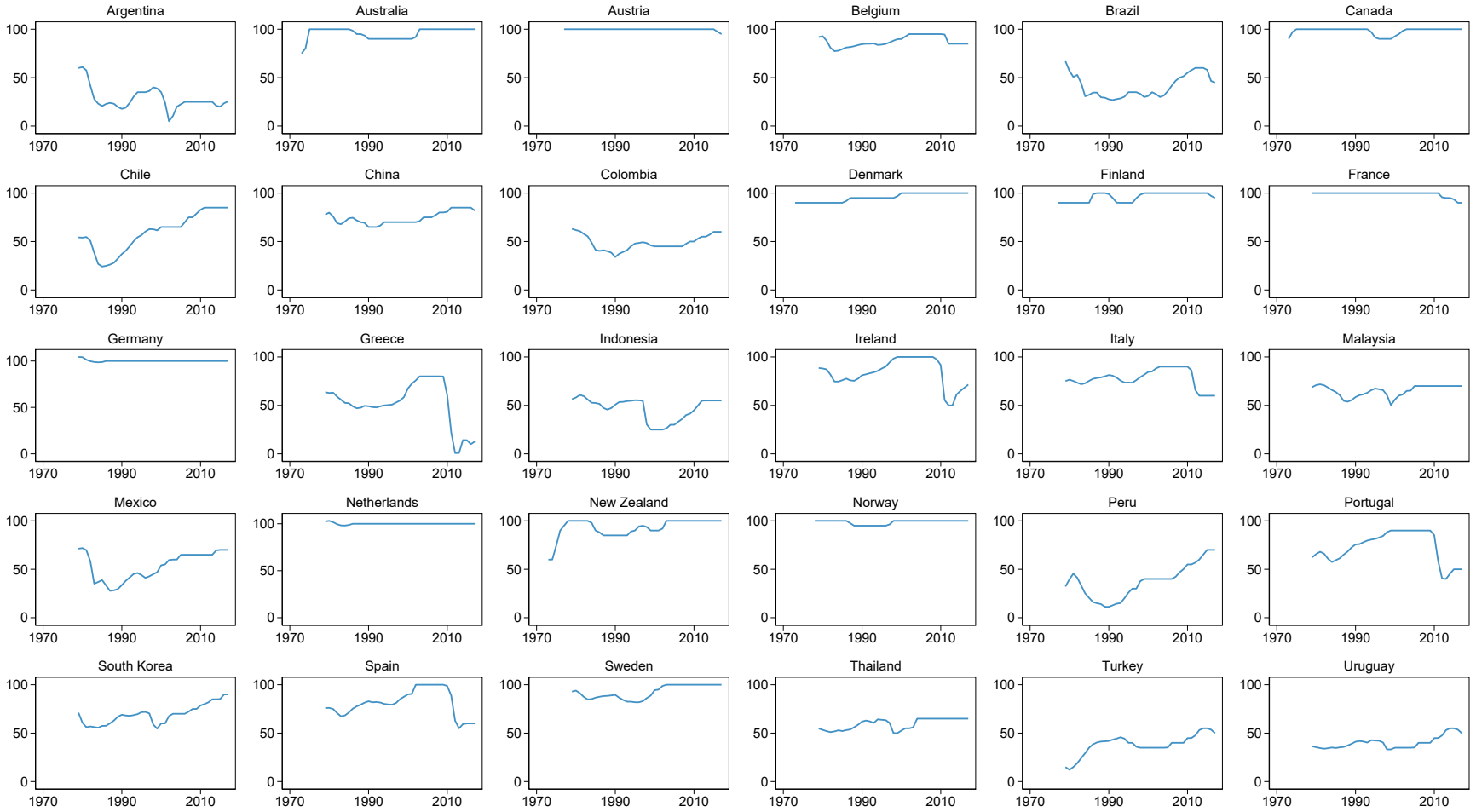
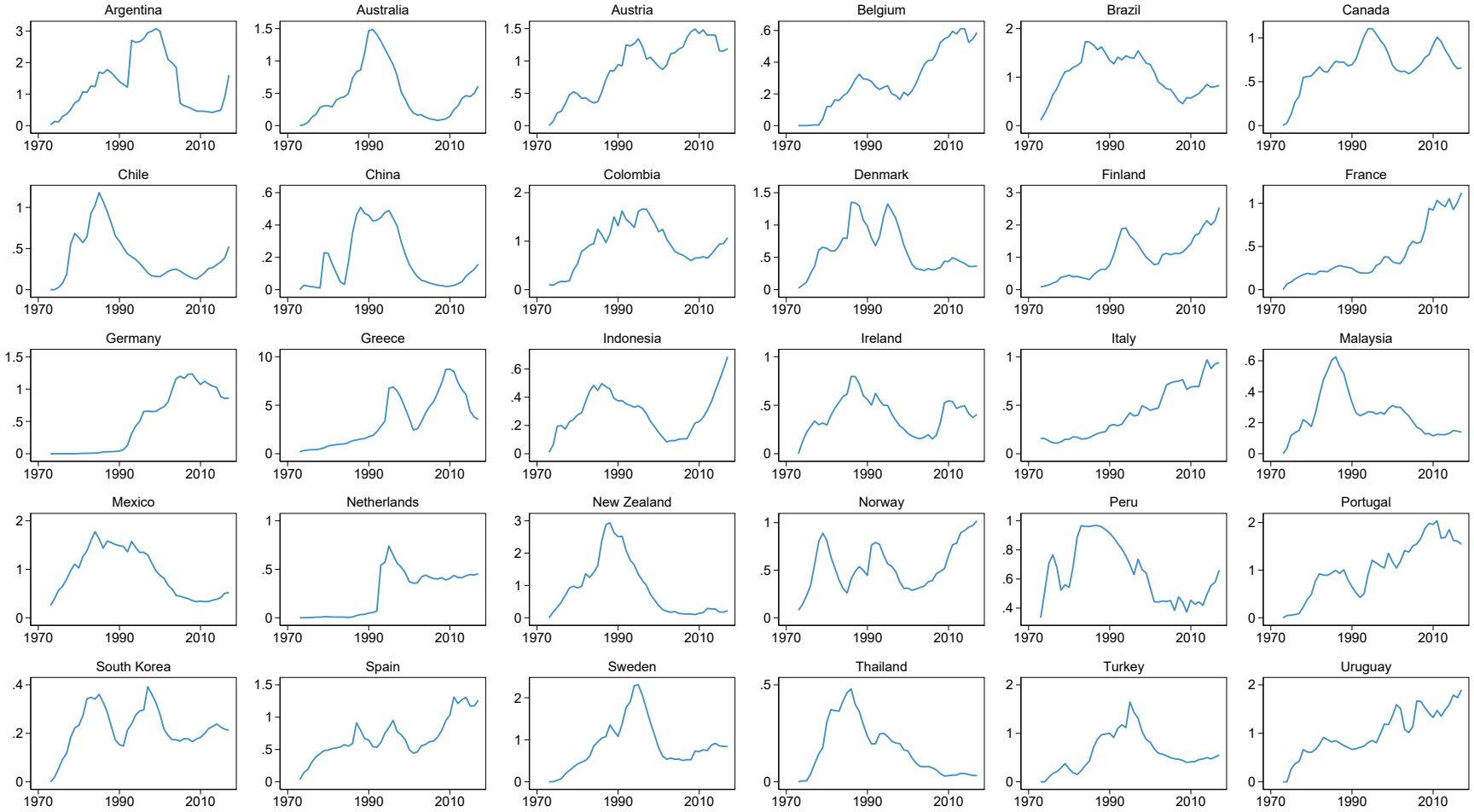
# A Indicators

Figure 9: Sovereign Debt Ratings



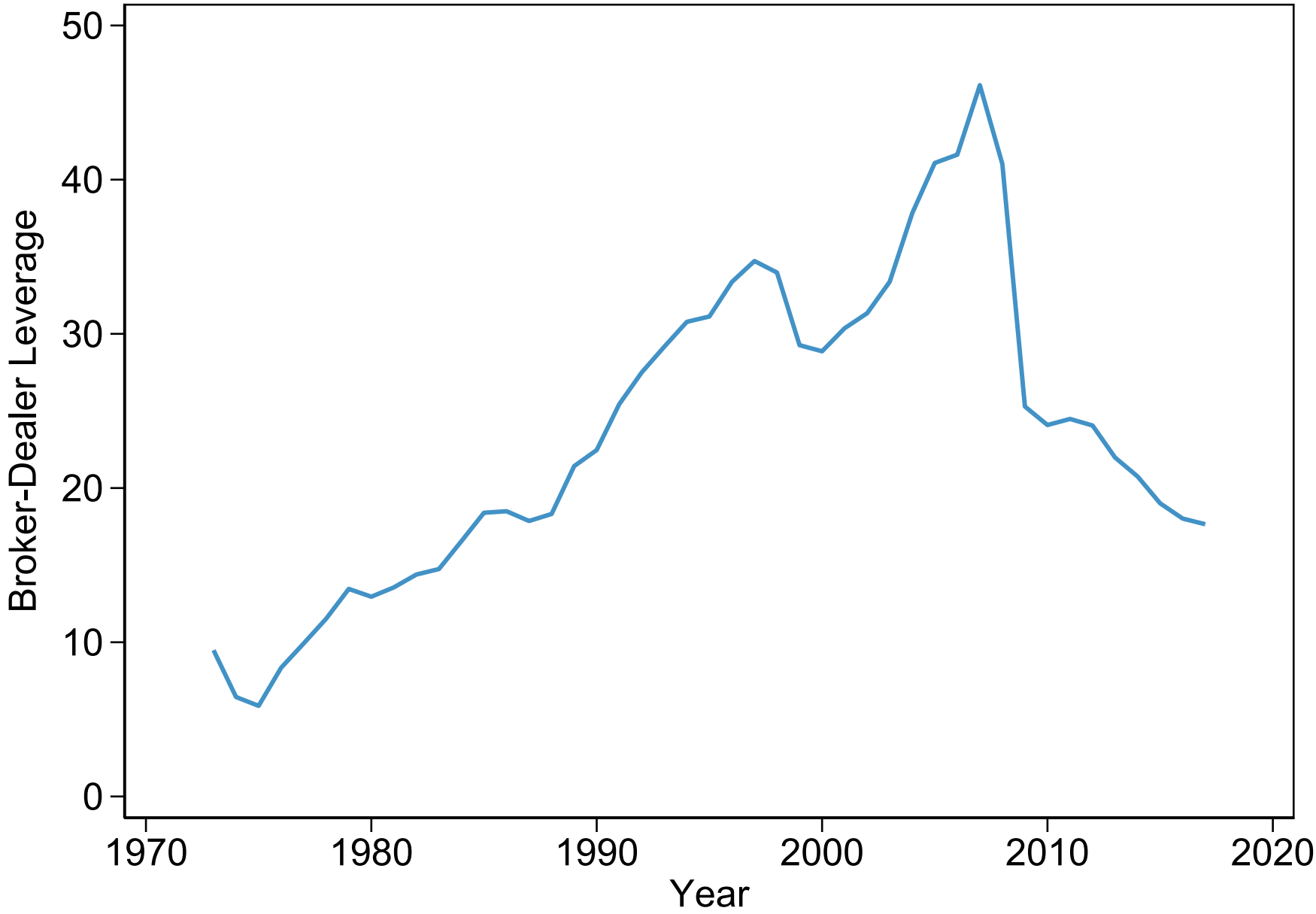

*Note*: This figure presents sovereign ratings for all countries in our sample for the 1973-2017 period.

Figure 10: International Government Debt (Share of Trend Exports)




*Note*: International government debt is estimated with information on maturity and types of repayments of bonds and syndicated loans issued in international capital markets. For those countries with defaults and restructurings, the original repayment characteristics of bonds and loans are modified to reflect the new characteristics of bonds and loans.

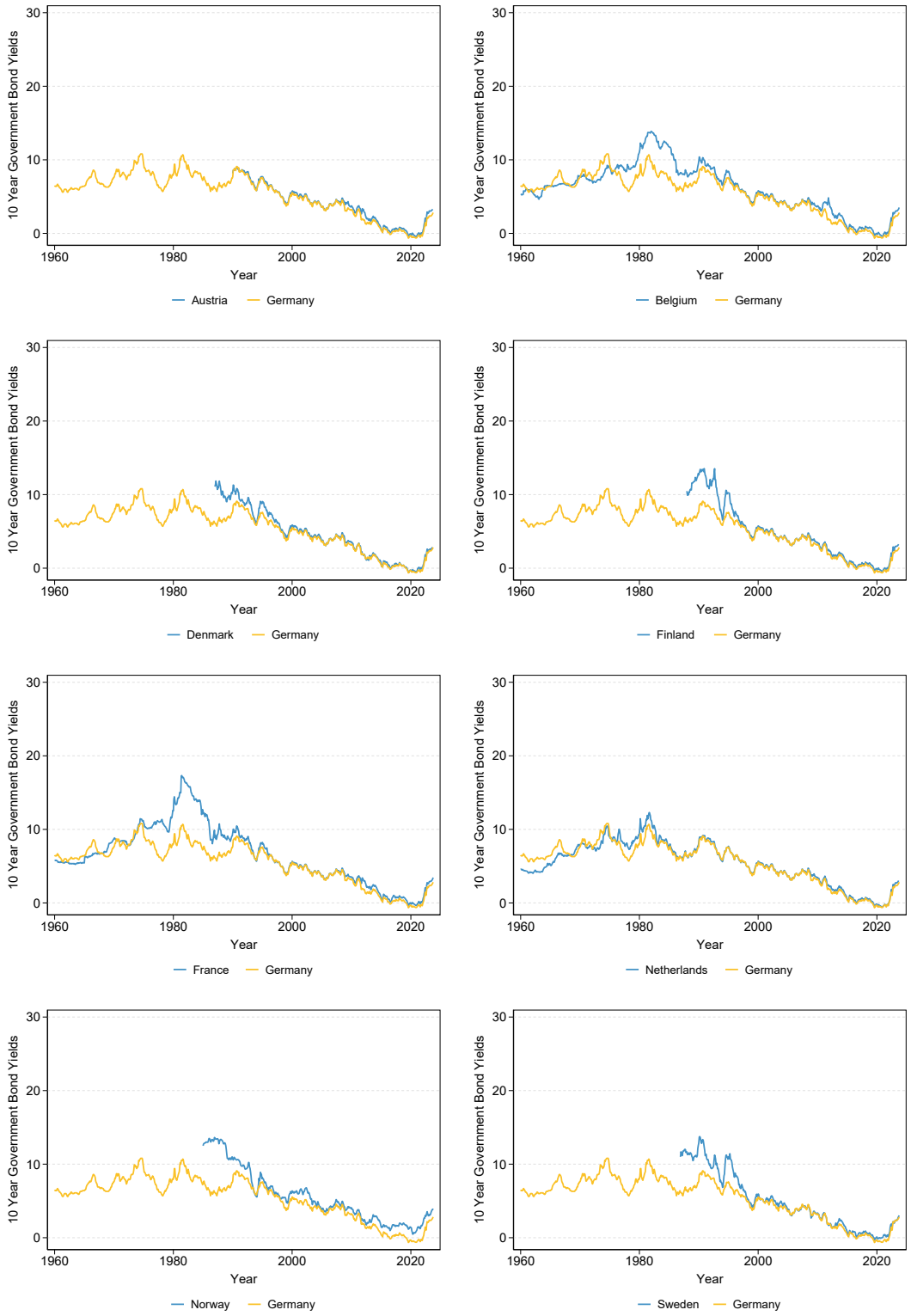
Figure 11: US Broker-Dealer Leverage




*Note*: This figure presents US Broker-Dealer Leverage for the 1973-2017 period.

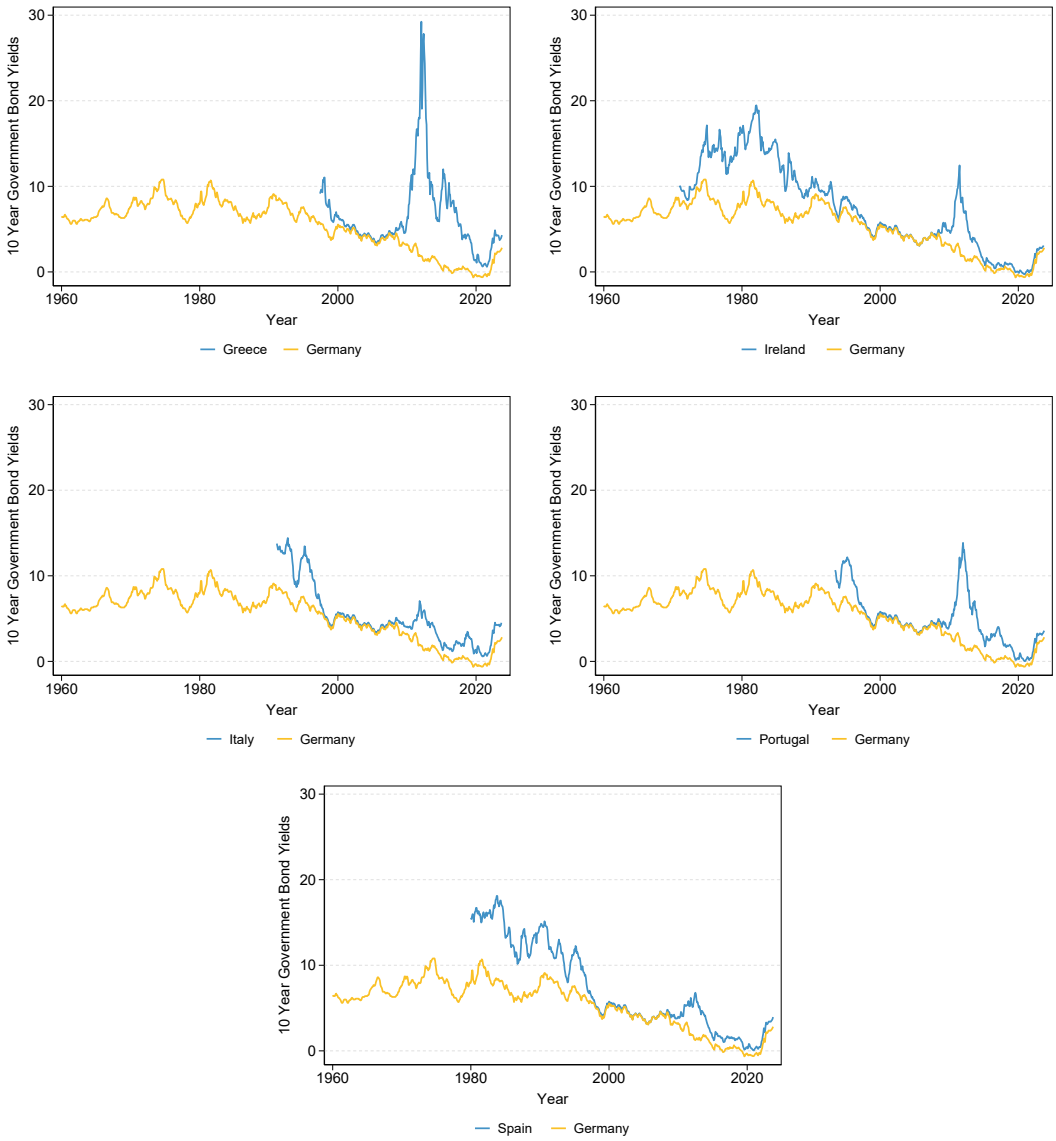
# B European Countries and GIIPS

Figure 12: 10 Year Government Bond Yields (European Countries w/o GIIPS)



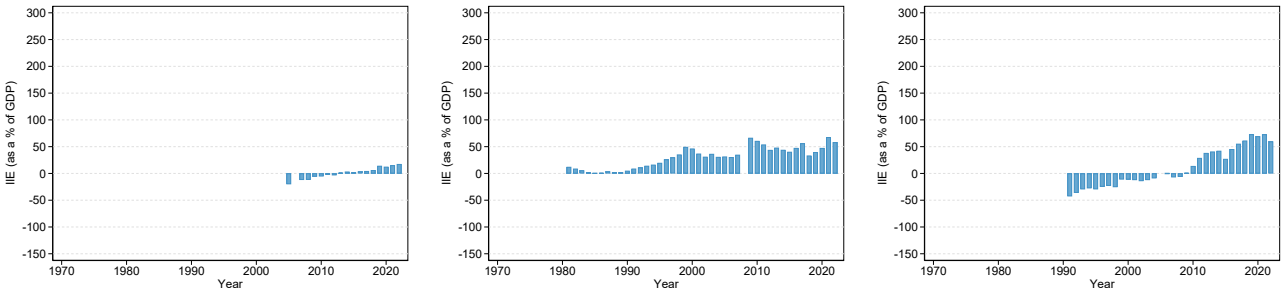

*Note*: This figure presents the 10 year government bond yields for European countries (without the GIIPS) for the 1960-2023 period. In each graph, we use the government bond yield of Germany as our baseline. Data source is the FRED database.

Figure 13: 10 Year Government Bond Yields (GIIPS)

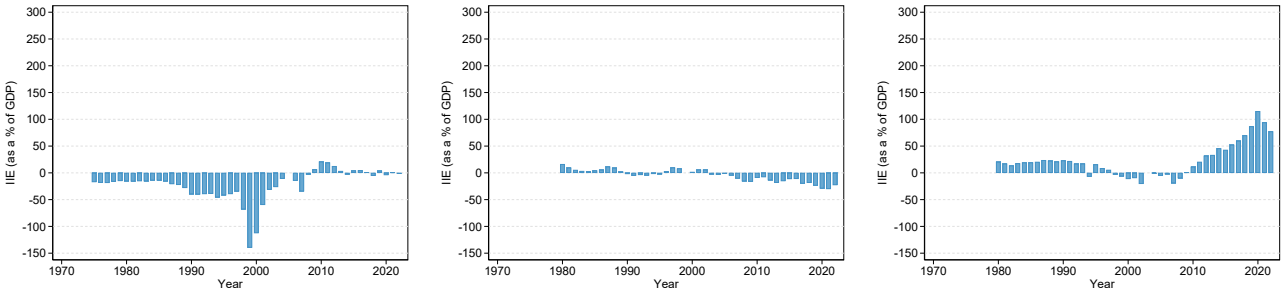



*Note*: This figure presents the 10 year government bond yields for the GIIPS for the 1960-2023 period. In each graph, we use the government bond yield of Germany as our baseline. Data source is the FRED database.

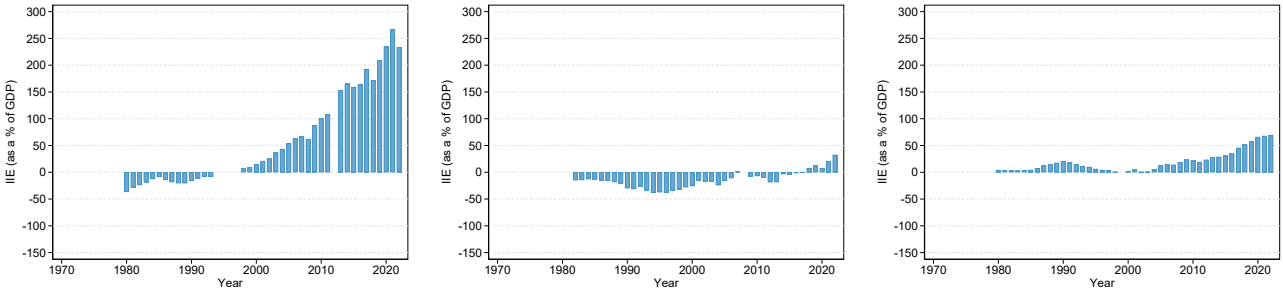
Figure 14: International Investment Position (European Countries w/o GIIPS)




(a) Austria (b) Belgium (c) Denmark



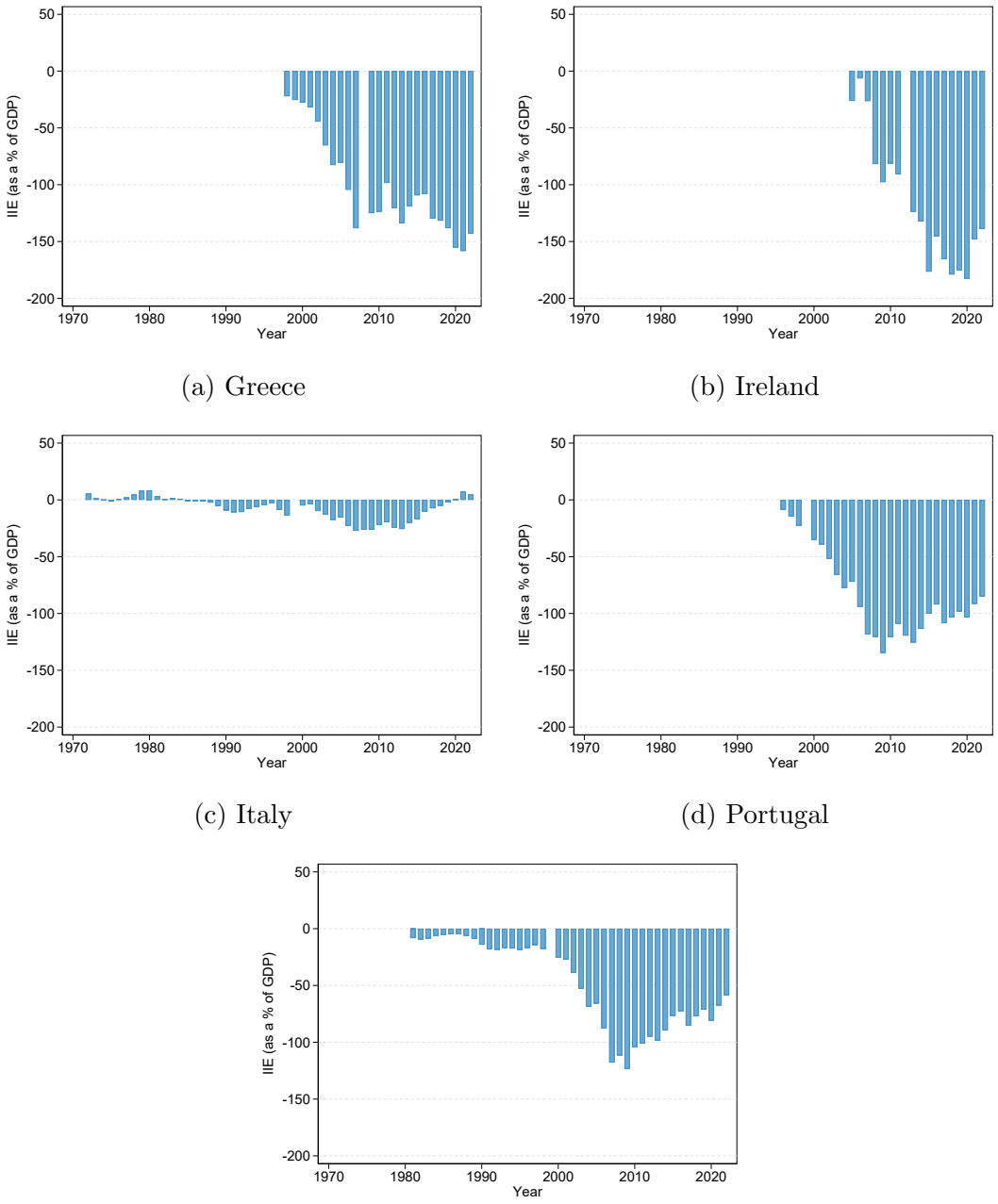

(d) Finland (e) France (f) Netherlands




(g) Norway (h) Sweden (i) Germany

*Note*: This figure presents the net international investment position (as a % of GDP) for European countries (without the GIIPS) for the 1970-2023 period. Data source is the IMF.

Figure 15: International Investment Position (GIIPS)




(a) Greece

(b) Ireland

(c) Italy

(d) Portugal

(e) Spain

*Note*: This figure presents the net international investment position (as a % of GDP) for the GIIPS for the 1970-2023 period. Data source is the IMF.