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Public Debt & Sovereign Ratings - Do Industrialized Countries Enjoy a Privilege?

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Public Debt & Sovereign Ratings - Do Industrialized Countries Enjoy a Privilege?

February 23, 2015

1 Introduction

In the past, advanced economies have enjoyed continuous access to capital markets, never scrutinizing their general creditworthiness. This has been reflected by credit ratings which remained virtually unchanged on a high level. On the contrary, emerging markets were relatively often confronted with a sharp decline of their ratings leading to restricted access to capital markets and eventually to sovereign debt crises.

In this paper, we contribute to the literature about the relation between sovereign creditworthiness and public debt. By using historical survey data from the Institutional Investor magazine, we ask three questions: First, do industrialized countries enjoy a debt privilege relative to emerging markets? Second, are advanced countries with high public debt ratios treated differently than those with low and medium debt levels? And finally, do euro area members receive a debt privilege or a debt penalty compared to non-euro area members?

The first question has already been asked 10 years ago by Borio and Packer (2004) who found that emerging markets' credit ratings are more sensitive to changes in public debt than those of advanced economies. Most prominently, Reinhart *et al.* (2003), Eichengreen *et al.* (2007) concentrated on the phenomena of debt intolerance, the original sin and currency mismatches to explain the difference between ratings in developed and emerging economies/ developing countries. Whereas debt intolerance is often considered as a mea-

sure for country risk, the original sin and currency mismatches are rather considered as currency risks.

The original sin hypothesis maintains that the lack of capital flows from advanced to developing countries is a result of the poorer countries' inability to issue debt in their own currency. As a consequence, they are vulnerable to exchange rate depreciation making it hard for the affected countries to service foreign currency denominated debt. This in turn leads to lower capital flows *ex ante* (Eichengreen *et al.* (2007)).

Further, sovereigns suffering from original sin may become vulnerable to currency mismatches when they use the same funds to lend in local currency. During more turbulent times, the exchange rate depreciates and the value of liabilities quickly exceeds the value of assets, leading to financial and sovereign debt crises. Alternatively, the sovereign may hold foreign assets in form of reserves in order to prevent currency mismatches. However, in every case the economy has to incur additional costs compared to a situation in which it can borrow abroad in its own currency and invest those funds in productive activities (Eichengreen *et al.* (2007)).

The idea of debt intolerance offers a different approach: Reinhart *et al.* (2003) explain the inability of emerging markets and developing countries to accumulate high levels of public debt (comparable to the indebtedness of advanced countries' governments) with their history of defaults and high inflation. Due to weaker institutions the governments often experience external defaults after surges in debt ratios during a boom phase. The authors argue that internal factors like corruption, policy-induced macroeconomic stability or less developed financial systems prevent access to foreign debt markets (Reinhart *et al.* (2003)). To sum up, it seems to be non-controversial that governments of advanced countries enjoy better ratings than emerging markets. However, the dynamics of this rating advantage have not yet been thoroughly discussed.

Likewise, the heterogeneity of sovereign creditworthiness across advanced countries has been rarely examined. In the following, we provide two rationales why the relation between creditworthiness and public debt might have changed within the industrialized world.

First, public debt ratios in industrialized countries have been considered as sustainable for a long time. According to Bohn (1998), the United States have followed a path of

sustainable fiscal policy between 1916-1995 by satisfying a predefined intertemporal budget constraint. This result has also been confirmed for European countries by Afonso and Rault (2010). However, in a more recent study, Ghosh *et al.* (2013) show that fiscal space - defined as the difference between the current debt ratio and the debt limit - does not decrease proportionally with higher levels of government debt but rather follows a cubic trend. A sovereign may be able to finance high debt ratios with low interest rates for some time before refinancing costs suddenly increase when a negative fiscal shock occurs. This phenomenon is triggered by the so called "fiscal fatigue" when the primary balance of a country responds more slowly to rising debt ratios than the interest-growth differential. Besides, empirical findings on the impact of debt on growth are still contradictory: Whereas Reinhart and Rogoff (2010) find that economic growth is negatively affected when debt ratios exceed 90% of GDP, Panizza and Presbitero (2014) observe no causal relation when they control for endogeneity. Add to this, the current debate about the introduction of a Sovereign Debt Restructuring Mechanism in the euro area points to a general change in the perception of default risk in advanced countries (Buchheit *et al.* (2013)). In line with the idea of "fiscal fatigue" by Ghosh *et al.* (2013), we will study how ratings respond to deficits at high ratios of public debt to GDP.

Second, the privilege might emerge as a consequence of the membership in a currency union. The monetary unification in Europe has led to significantly lower interest rates in some member countries who have benefited from the import of a credible monetary policy and the common bond market has also contributed to a higher liquidity of the issued bonds (Pagano and von Thadden (2004)).¹ Thus, it has become more attractive for governments to issue new debt, in particular for those with large stocks of public liabilities.

Otherwise, one could argue that the membership has led to lower overall ratings for its members with countries being no longer able to issue debt in domestic currency (original sin hypothesis). Dell'Erba *et al.* (2013) test this hypothesis and find that EMU members experience higher interest rates with increasing debt ratios compared to other advanced countries. Bernoth *et al.* (2012) use data of primary market spreads for European govern-

¹Although interest rates have converged strongly in the early years of EMU, bonds have never become perfect substitutes due to small differences in liquidity and risk perception (Christiansen (2007), Ehrmann *et al.* (2011)).

ment bonds between 1993 and 2009 in order to explore whether euro members have to incur an additional risk premium on public debt because they lost monetary independence. In contrast to Dell’Erba *et al.* (2013), the authors find no significant increase of interest rate spreads after the start of EMU. Thus, it is yet an open question whether the membership in the euro area has led to a debt privilege or a penalty.

Our results point to the non-existence of a debt privilege relative to emerging markets. We even observe a debt penalty for the industrialized world when we control for their ability to issue debt in the own currency. Further, advanced countries with high ratios of public debt are subject to an additional penalty when debt ratios exhibit a negative trend. Finally, we find that members of the euro area periphery enjoyed an (albeit insignificant) debt privilege before the crisis which turned into a penalty after 2008.

The remainder of this paper is organized as follows. Section two gives an overview of the data and presents some stylized facts. Section three presents the empirical framework and discusses the results. Section four concludes.

2 Data & Stylized Facts

In the empirical analysis, we use country-level data of 18 advanced and 17 emerging market economies ranging from 1993-2012 (unbalanced panel, see Table 7 in the Appendix of this paper). Following Reinhart *et al.* (2003) and others (Haque *et al.* (1996), Celasun and Harms (2011)), the Institutional Investor’s country credit rating (CCR) is our dependent variable and serves as a proxy for the perceived creditworthiness of investors. The index is based on weighted survey data of senior economists and sovereign-risk analysts of the 75-100 leading financial institutions being reported twice a year (in March and September).² Ratings are running on a scale from 0-100, with 0 representing the least creditworthiness of a sovereign.

In our view, the survey variable offers three considerable advantages compared to other measures of sovereign creditworthiness: First, the country credit ratings provide a more segmented scale compared to the CRAs’ ratings. The fact that the ratings of the Big Three

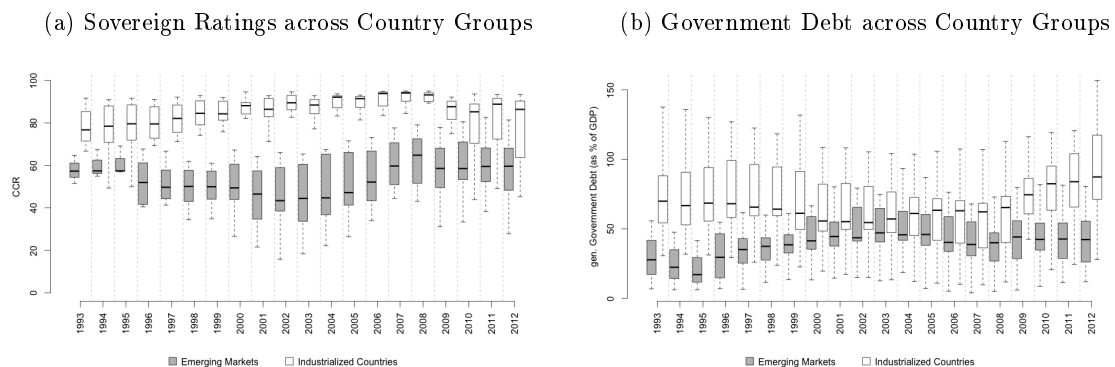
²The responses are weighted according to the institutions’ global exposure (for details see the description by the Institutional Investor magazine).

have remained constant for many years makes it difficult to measure (smaller) changes in perceived creditworthiness especially in the industrialized world. For instance, it is impossible to study small changes to the perception of credit risk in countries like Germany which have enjoyed a AAA rating (or slightly below) by the Big Three agencies for many years. However, the sovereign debt crisis in Europe has shown that initially investment-grade rated countries may experience a sudden decline to speculative grade status within a few months (Greece, Portugal, Ireland). Overall, we find a strong correlation of the CCRs with the Big Three agencies in our sample when using Spearman’s rank correlation coefficient (with a ρ of 0.94-0.96).

Second, credit rating agencies (CRAs) are currently subject to a lot of criticism regarding their business model and timing with regards to sovereign ratings (Eijffinger (2012), de Haan and Amtenbrink (2011)). By studying the condensed assessment of sovereign risk analysts, one may consider the CCR as an unbiased credit risk assessment of the countries’ creditors. Also, rating decisions by the Big Three receive more attention by financial markets and therefore may often initiate market reactions (changes in interest rates) and thereby cause problems of endogeneity.

Third, the survey data used in this study are not biased by the application of a specific rating algorithm and it is not skewed by inclusion into regulatory frameworks (Opp *et al.* (2013)).

Figure 1: The Debt Privilege

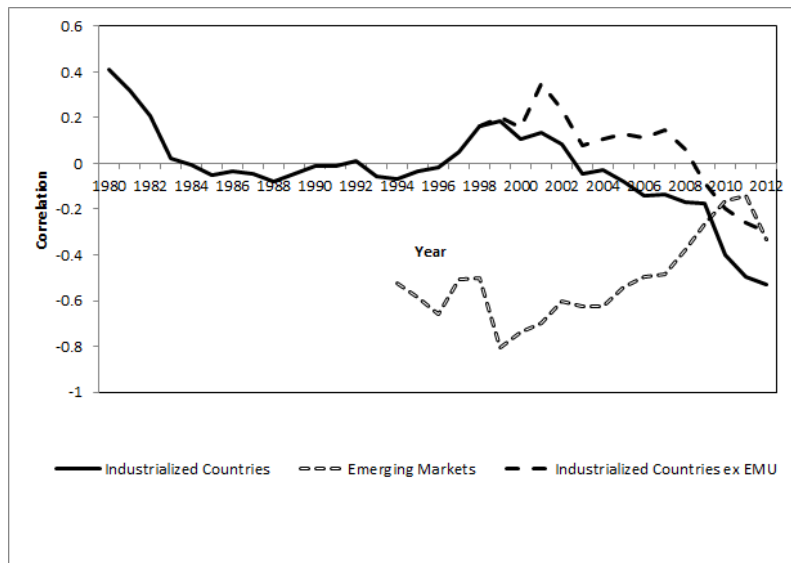


Data Source: International Monetary Fund (IMF), Institutional Investor

In the left-hand panel of Figure 1, we show the development of CCRs over time and

compare it with the dynamics of public debt across advanced and emerging economies (right-hand panel). Obviously, economic fundamentals declined strongly especially in the industrialized world during the financial crisis: Public debt ratios have increased by 30% in advanced economies whereas emerging markets were able to reduce their debt ratios by 20% during the past ten years. Still, advanced countries have received considerably better ratings by investors until recently.

Figure 2: Correlation between Debt and Country Credit Ratings



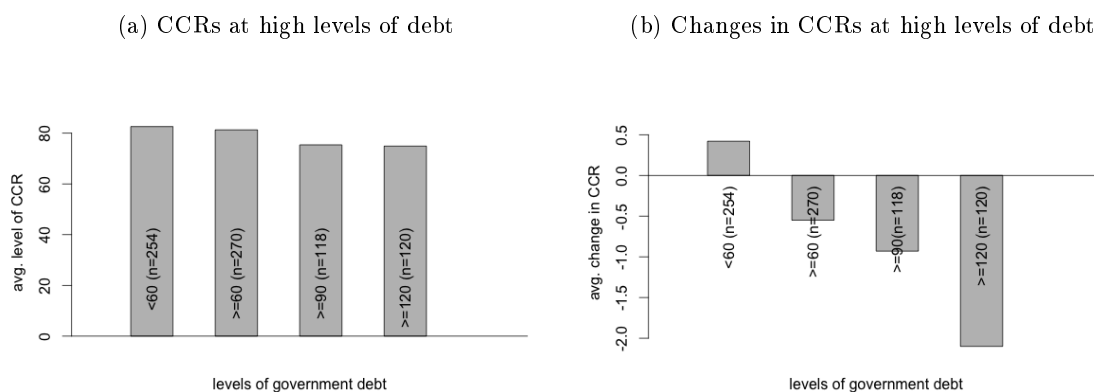
Data Source: International Monetary Fund (IMF), Institutional Investor

However, if we compare the correlation between general government debt to GDP with the CCRs across country groups and time (see Figure 2) it appears that the perception of sovereign creditworthiness across the two groups has changed. Clearly, one can observe that higher debt ratios are always related to lower ratings for emerging markets whereas industrialized countries enjoy only a slight negative or even positive correlation between public debt and creditworthiness. This result is in line with previous findings in the literature (see for instance Dell'Erba *et al.* (2013) and De Grauwe and Ji (2013)). However, this relationship has changed during the previous ten years: The correlation became negative for the industrialized world in 2003 and has strongly decreased since then (to -0.3 in 2012). Euro area economies seem to have been even stronger affected than other industrialized countries (gap between the solid and the dashed black line). The more recent literature

provides also empirical support to this finding: Greenlaw *et al.* (2013) show that debt levels of more than 80% of GDP in advanced economies lead to strong fiscal deterioration and rising yields when interest rates are not held constant. The opposite is true for emerging markets: They have experienced a positive trend in the correlation between public debt and ratings although heterogeneity across countries remains substantial. In the following empirical analysis, we will study whether this relationship also holds when we test the relationship by using a multivariate framework.

In the second part of the analysis, we focus on debt sustainability by exploring whether highly indebted countries experience an additional rating penalty compared to other advanced economies. The left-hand panel of Figure 3 shows that CCR levels are on average six points lower when countries' debt ratios increase from 60% to 90% of GDP. However,

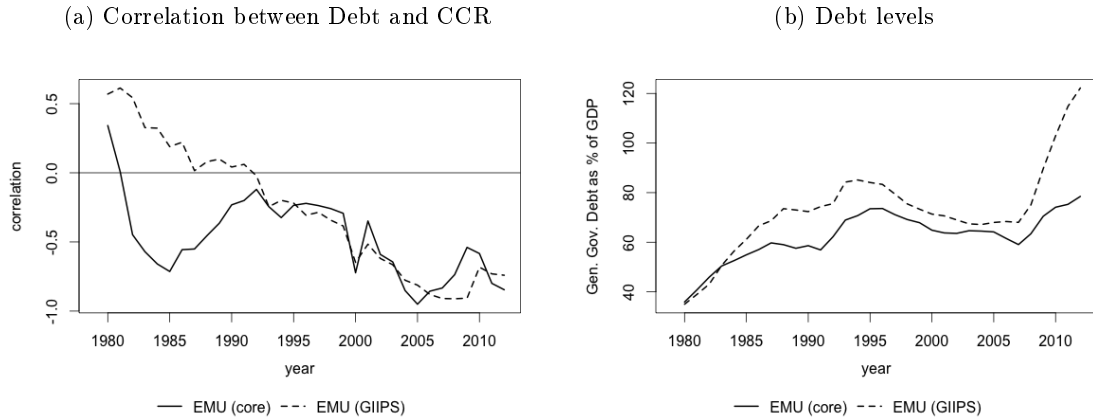
Figure 3: CCRs at Different Levels of Debt



Data Source: International Monetary Fund (IMF), Institutional Investor

some countries seem to be able to increase their debt ratios even further (more than 120% of GDP) without any additional downgrades. The right-hand panel of Figure 3 shows that countries with debt levels above 60% are facing an average decline in CCRs by -0.5 rising to -0.9 (-2.1) points with debt ratios being equal and above 90% (120%) of GDP. Taking the two pictures together, it seems surprising that the highest indebted countries still enjoy favourable ratings but at the same time they are subject to the largest downgrades. Thus, we seek to shed more light on the relationship between debt levels and their momentum in the following analysis.

Figure 4: Debt and Ratings in the EMU



Data Source: International Monetary Fund (IMF), Institutional Investor

As a third step, we study whether monetary integration in Europe has led to a debt privilege compared to other industrialized countries. In Figure 4, the left-hand panel shows the correlation between debt and ratings over time for the GIIPS countries and the rest of the euro area.³ The descriptive picture leads us to suggest that with the initiation of the European integration process, correlation has converged with a common negative trend despite a decreasing or at least stable public debt ratio until the onset of the crisis (see right-hand panel). However, in order to analyze this relationship in more detail we have to proceed with a multivariate analysis.

In order to control for heterogeneity across countries, we will now present an overview of important macroeconomic determinants of sovereign creditworthiness to be included in our models.

In the empirical analysis, we only find a limited correlation (0.1-0.6) between the macroeconomic variables which leads us to assume that multicollinearity is of minor importance. We decided to refrain from using political variables in our sample due to the fact that the indices usually remain stable for a long period of time and can therefore be interpreted as a part of the country fixed effect. Moreover, political stability and government effectiveness are highly correlated with GDP per capita.

Our choice of controls largely follows the studies by Cantor and Packer (1996) and

³The core economies are Austria, Belgium, France, Germany and the Netherlands.

Table 1: Summary Statistics of Control Variables

	(1)	(2)	(3)	(4)	(5)
	Mean	Std dev.	Min	Max	No. obs
Advanced Countries (18 countries)					
Full sample 1993-2012					
<i>Country Credit Rating</i>	84.4	10.6	19.4	98.2	347
<i>GDP per Capita</i>	31874	11784	9381	67305	347
<i>Government Debt</i>	72.6	36.4	9.7	238	347
<i>Inflation – 4 year avg</i>	2.2	1.4	-0.8	13.8	347
<i>Growth – 4 year avg</i>	2.0	1.8	-6.4	10.5	347
<i>Net Public Balance – 4 year avg</i>	-3.0	3.5	-16.2	4.6	347
<i>Current Account – 4 year avg</i>	-0.2	4.3	-13.0	10.1	347
<i>Unemployment</i>	7.9	3.7	2.5	25	347
<i>Original Sin</i>	0.18	0.31	0	0.98	347
Emerging Markets (17 countries)					
Full sample 1993-2012					
<i>Country Credit Rating</i>	53.9	13.6	16.5	81.8	250
<i>GDP per Capita</i>	5895	3674	467	15410	250
<i>Government Debt</i>	43.5	23.0	3.9	165.0	250
<i>Inflation – 4 year avg</i>	7.8	6.7	-0.9	47.7	250
<i>Growth – 4 year avg</i>	4.5	3.0	-4.9	13.0	250
<i>Public Balance – 4 year avg</i>	-2.1	2.8	-16.6	7.0	250
<i>Current Account – 4 year avg</i>	-0.4	5.2	-7.8	16.0	250
<i>Unemployment</i>	9.0	4.9	2.2	28.2	250
<i>Original Sin</i>	0.73	0.37	0	1	250
<i>Currency Mismatch</i>	-0.6	1.0	-5.2	0.8	250

Afonso *et al.* (2011). Stated below, we provide summary statistics of our set of exogenous variables (see Table 1). Apart from the variable of main interest - general government debt (*GOVDEBT*) - we use the gross domestic product per capita (*GDPPERCAP*) as a proxy for the tax base and the degree of vulnerability to external shocks of a country. Inflation (*INFLATION*) serves as an indicator for monetary and fiscal prudence. The coefficient is assumed to take either a positive or negative sign because inflation may on the one hand reduce the amount of outstanding government debt but can also be an indicator for unsustainable fiscal policy. We further include the unemployment rate (*UNEMPLOYMENT*). The coefficient is expected to be negative with higher social contributions leading to an additional fiscal burden. In addition, we control for the medium-term economic development by including *GROWTH*, the *FISCAL BALANCE*, and the *EXTERNAL BALANCE*. Whereas the first two should contribute to a good reputation of the government and increase the government's ability to repay debt, the external balance is expected to have an ambiguous impact on ratings: If a current account deficit is driven by net foreign investment, it is expected to contribute to the growth of a country. Otherwise, the deficit might also be signaling over-consumption and a lack of international competitiveness.

We also control for original sin (*OSIN*) and currency mismatch (*MISMATCH*). Given the limited data availability for international debt securities from the BIS, our estimations only cover the period 1993-2012. Original sin and currency mismatch serve as indicators for a country's vulnerability towards external indebtedness. *OSIN* is constructed as one minus the share of international debt securities issued in domestic currency over total issues of international debt securities by country *i*. A high value for *OSIN* signals that the country is unable to issue domestic debt. For those industrialized countries with a higher amount of securities issued in domestic currency than their total amount of international debt securities, we bound this variable at zero.⁴ *MISMATCH* is defined as the share of international reserves minus external debt over exports times original sin (see Eichengreen *et al.* (2007)). Here, increasing positive values indicate a lower vulnerability of the country to run out of reserves.

Moreover, we account for times of extreme events like stock market crashes, inflation

⁴For a detailed discussion of the definition see Eichengreen *et al.* (2007).

crises, currency crises, and sovereign debt crises by using the dataset by Carmen Reinhart.⁵ Three of the crises never occurred in industrialized countries within our sample. Hence, we set the dummy variable equal to zero in these cases. The crises events are included in our models because high debt ratios may not necessarily be the consequence of unsustainable fiscal policy but rather the outcome of a banking or a currency crisis.

3 Empirical Analysis

We now turn to explore the determinants of Country Credit Ratings across time and countries. As a first step, we examine the differences between advanced and emerging economies.⁶ Next, we analyse the dynamics of sovereign ratings in highly indebted countries. As a third step, we compare the credit risk between members of the European Monetary Union and other industrialized countries.

We use three specifications for each of the three questions. Thereby, we can exploit both the between- and within-variation of ratings. In Figure 1, we illustrate that the within-variation is relatively small in advanced economies compared to emerging markets but has increased strongly since the outbreak of the financial crisis. However, although the Figure shows a converging trend between the two country groups, a persistent gap between the ratings in advanced and emerging economies remains.

We begin with a static fixed-effects model (see equation 1). The cross-sectional dimension is at the center of our analysis in order to test whether a difference in the impact of public debt on ratings between the respective country groups exists when we control for differences in the macroeconomic stance (captured by $x'_{i,t}$).

$$ccr_{i,t} = \alpha_i + x'_{i,t}\beta + \gamma govdebt_{i,t} + \varepsilon_{i,t} \quad (1)$$

This model covers both dimensions (between-country and within-country variation) but may be biased: Due to the fact that most of the variables seem to be non-stationary the

⁵see <http://www.carmenreinhardt.com/data/browse-by-topic/topics/7/>

⁶Our classification is based on the IMF classification in 2014 and covers only OECD countries. According to the definition of the World Bank, we should have also included Poland, Russia and Uruguay in the group of advanced economies. Here, we follow Ghosh *et al.* (2013) and Cantor and Packer (1996) by using the IMF/OECD classification.

estimated coefficients can be the result of a spurious correlation. Further, we are subject to a potential bias when estimating the coefficients or computing the t-statistics. At the same time, the advantage of this model is that it uses all information in contrast to the next model.

The model in differences accounts for the non-stationarity of the variables (see equation 2). However, the explanatory power is considerably reduced compared to the model in levels because the difference operator drops all of the between-variation and 50% of the within-variation of the *ccr*-variable in our data sample.⁷ Therefore, the interpretation of the coefficients differs somewhat from the other models.

$$\Delta ccr_{i,t} = \alpha_i + x'_{i,t}\beta + \gamma\Delta govdebt_{i,t} + \varepsilon_{i,t} \quad (2)$$

Here, Δ denotes the first differences operator. In comparison to the original time series the country-fixed effect α_i can be interpreted as a country specific time trend. The vector $x_{i,t}$ contains the controls, with most of them also included in first differences (except for economic growth). This model is the most conservative, since it includes only stationary time series and therefore we expect neither the occurrence of spurious correlation nor a bias for the estimates or the inference. This model also takes into account the path dependency of ratings by assuming a maximum of persistence.

As a third approach, we use a dynamic panel-data specification related to Arellano-Bond (Difference GMM) (equation 3). In order to study the level effects (see the large distance between ratings of advanced and emerging economies in Figure 1) and to avoid endogeneity problems, we pursue with a dynamic panel estimation by using lagged levels as instruments. Thereby, we can combine the merits of the first two models (namely exploiting both dimensions and to prevent spurious regressions) by including the lagged dependent

⁷For details see the variance decomposition in Table 9 of this paper's Appendix.

variable as an additional regressor (high explanatory power and robust estimates).⁸

$$ccr_{i,t} = \alpha_i \delta_1 ccr_{i,t-1} + \delta_2 I \times ccr_{i,t-1} + x'_{i,t} \beta + \gamma govdebt_{i,t} + \varepsilon_{i,t} \quad (3)$$

3.1 Industrialized Countries vs. Emerging Markets

We begin by exploring the size of a potential debt privilege for industrialized countries against emerging markets. The analysis consists of three different specifications: In order to identify the debt privilege relative to emerging markets, we first interact the level of general government debt with the industrialized country dummy (*Debt * Ind. Country*) and include our set of macroeconomic controls. In the second specification we account for various types of crisis in order to control for situations in which a rating is affected by country-specific shocks. Here, we use dummies for banking crises, inflation crises, currency crises, stock market crashes, external and domestic debt crises. Crises dummies take the value one in all years when the respective country is in a crisis and zero for all other periods. In our third specification we also include *OSIN* and *MISMATCH* in order to study whether a potential privilege is merely driven by the ability of countries to issue debt in their own currency than by the accumulation of debt in general.

Column 1 of Table 2 shows the results without controlling for crises and original sin/currency mismatch. We report standardized coefficients in order to illustrate the relative impact on ratings across the determinants and include country fixed effects and robust standard errors clustered on the country level.

All coefficients have the expected sign and we can explain between 80-95% of the variation in ratings. Still, this result has to be taken with caution, since we observe a high persistence of ratings across time and countries and we do not yet control for trend behavior which might drive large parts of the correlation.

Together with GDP per capita, the public debt to GDP ratio explains most of the variation in ratings. As expected, the coefficient for government debt is significant and negative. If

⁸Our Difference GMM estimator may be inefficient because this sample entails a large number of periods relative to the number of countries. Further information about this problem can be found in Figure 10 and Figure 11 where we present Monte Carlo simulations for both the Difference and the System GMM estimator in comparison with the performance of the fixed effects estimator.

Table 2: Industrialized vs. Emerging (OLS)

	(1)	(2)	(3)
	Baseline	incl. crises	incl. debt burden
GDP per capita	0.219*** (0.0392)	0.225*** (0.0393)	0.199*** (0.0369)
Inflation, 4y avg.	-0.241*** (0.0386)	-0.274*** (0.0495)	-0.230*** (0.0530)
Unemployment	-0.245*** (0.0468)	-0.250*** (0.0508)	-0.255*** (0.0481)
External Balance, 4y avg.	-0.0217 (0.0473)	-0.0234 (0.0437)	-0.0230 (0.0418)
Growth, 4y avg.	0.0379 (0.0508)	0.0362 (0.0496)	0.0413 (0.0510)
Fiscal Balance, 4y avg.	0.0716** (0.0314)	0.0490 (0.0323)	0.0580* (0.0301)
Gen. Gov. Debt	-0.243** (0.119)	-0.296** (0.122)	-0.278*** (0.0977)
Gen. Gov. Debt * Ind	0.000787 (0.213)	0.0452 (0.200)	0.0618 (0.172)
Stockmarket Crash		0.0221 (0.0393)	0.0283 (0.0352)
Currency Crisis		0.0997* (0.0523)	0.111** (0.0475)
Inflation Crisis		0.197* (0.113)	0.157 (0.112)
Domestic Debt Crisis		0.189 (0.235)	0.128 (0.204)
External Debt Crisis		0.109 (0.202)	0.109 (0.153)
Banking Crisis		-0.0941 (0.0635)	-0.0387 (0.0516)
Original Sin			-0.494*** (0.0916)
Curr. Mismatch			0.0102 (0.0693)
Constant	0.911** (0.358)	0.917*** (0.318)	0.398 (0.323)
Observations	597	597	597
Adjusted R^2	0.924	0.926	0.937
Country FE	Yes	Yes	Yes

Clustered Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

the debt ratio increases by 1 standard deviation, CCRs will be between 0.28-0.43 standard deviations lower.

The interaction term for government debt in industrialized countries is positive but not significant. We find no indication for multicollinearity between the interaction term and the other control variables. (correlation ranges between -0.48 and 0.39 and the variance inflation factor ranges with 0.659 clearly below the critical value of 10). That is to say, industrialized countries receive no rating advantage relative to emerging markets in levels. One should keep in mind that the inclusion of country fixed effects is of crucial importance for this result. Here, we capture variables such as the default history and other political and socio-economic characteristics of a country, which usually remain in place for a long period of time. If we ignore the country fixed effect, our model will lead to a significant debt privilege for the industrialized countries. The inclusion of crises and original sin/currency mismatch in columns (2) and (3) do not affect this result.

We assume that rating analysts assess the current economic performance and fiscal stance of governments. Thus, we use the contemporaneous values of the independent variables. However, in order to make sure that our results are robust to the lagged or updated publication of macroeconomic data, we check whether our results change when independent variables in levels are lagged by one year. We find that the sign and significance of our main variable of interest (government debt) is not affected (see Table 11 of this paper's Appendix).

When we use differences instead of levels (Table 3), the debt coefficient for emerging markets is reduced to -0.1-0.2 standard deviations. Again, industrialized countries do not enjoy a debt privilege in the first two specifications. However, we even find a significant debt penalty when we control for original sin and currency mismatch. Thus, if a country does not have the ability to issue debt in its own currency, an increase in public debt will lead to higher downgrades.

The inclusion of crises does neither affect the debt coefficient nor the gap between industrialized and emerging market economies to a significant extent. Surprisingly, stock market crashes and currency crises have a positive and significant effect on a country's rating. However, if we only include the first year of the crisis, the coefficients become

Table 3: Industrialized vs. Emerging (OLS Diff)

	(1)	(2)	(3)
	Baseline	incl. crises	incl. debt burden
D.GDP per capita	0.0956*** (0.0238)	0.0961*** (0.0234)	0.0969*** (0.0233)
D.Inflation, 4y avg.	-0.0168 (0.0610)	-0.0181 (0.0642)	-0.000351 (0.0661)
D.Unemployment	-0.176*** (0.0525)	-0.193*** (0.0587)	-0.217*** (0.0566)
D.External Balance, 4y avg.	-0.0305 (0.0243)	-0.0147 (0.0285)	-0.0185 (0.0296)
Growth, 4y avg.	0.374*** (0.0902)	0.362*** (0.0877)	0.295*** (0.0806)
D.Fiscal Balance, 4y avg.	0.0259 (0.0522)	0.0328 (0.0534)	0.0269 (0.0561)
D.Gen. Gov. Debt	-0.184*** (0.0335)	-0.182*** (0.0352)	-0.127*** (0.0296)
D.Gen. Gov. Debt * Ind	-0.0488 (0.0509)	-0.0232 (0.0523)	-0.131** (0.0588)
Stockmarket Crash		0.113* (0.0660)	0.155** (0.0597)
Currency Crisis		0.250** (0.0979)	0.261** (0.101)
Inflation Crisis		-0.0804 (0.388)	-0.212 (0.337)
Domestic Debt Crisis		-1.018** (0.390)	-1.159** (0.432)
External Debt Crisis		-0.214 (0.595)	-0.365 (0.600)
Banking Crisis		-0.161 (0.113)	-0.138 (0.107)
D.Original Sin			-0.847*** (0.235)
D.Curr. Mismatch			0.673*** (0.155)
Constant	-0.173*** (0.0429)	-0.207*** (0.0535)	-0.116*** (0.0397)
Observations	578	578	559
Adjusted R^2	0.363	0.377	0.419
Country FE	Yes	Yes	Yes

Clustered Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

negative. One may conclude that the quick recovery of ratings after the first crisis year drives this result.

In the dynamic panel, we use difference GMM in order to explain the variation among CCRs. The coefficients in Table 4 have the same sign, albeit they are smaller in size compared to the OLS model in levels. This is due to the inclusion of the lagged CCR values which explain a large part of the contemporaneous rating. Here, the debt coefficient becomes insignificant in the third specification when we include the coefficients for original sin and currency mismatch. We suppose that this is due to the inefficient estimator (see Tables 10 and 11 in the Appendix of this paper). The interaction term does not show a significant difference between both country groups in our third specification, whereas it is negative and significant in (2) and (3).

To sum up, we find that general government debt ratios explain a large part of the overall variation in ratings compared to other macroeconomic determinants such as growth or the fiscal balance. This is true for both country groups. Also, being exposed to original sin seems to be an important predictor of low creditworthiness. These results confirm earlier studies which find that some industrialized countries have a considerable advantage of not being exposed to original sin. Apart from this, we do not find evidence for a debt privilege in advanced countries versus emerging economies across all three specifications. Hence, it seems that the macroeconomic differences between the two country groups can fully explain the rating differential. This result stands in contrast to the findings by Borio and Packer (2004) who show a debt privilege for advanced countries. However, they used a different estimation strategy, they did not control for times of crises and their data miss the last ten years.

As an additional robustness check, we have included a structural break in the year 2003 to replicate the sample period used by former studies. We find that the debt privilege is positive but not significant before 2003 and turns negative afterwards.⁹

All three empirical models show that institutional investors do not differ significantly in their response to changes of government debt across the two country groups. Still, we

⁹The results including the structural break for the three specifications are available on request.

Table 4: Industrialized vs. Emerging (Panel GMM)

	(1)	(2)	(3)
	Baseline	incl. crises	incl. debt burden
L.Rating	0.660*** (0.0373)	0.713*** (0.0778)	0.253 (0.160)
L.Rating * Ind.	-0.299** (0.143)	-0.363 (0.333)	0.00991 (0.523)
GDP per capita	0.0824*** (0.0206)	0.0841*** (0.0221)	-0.0696 (0.0757)
Inflation, 4y avg.	-0.0822*** (0.0141)	-0.0648 (0.0458)	-0.0987 (0.0783)
Unemployment	-0.108*** (0.0228)	-0.116*** (0.0297)	-0.167*** (0.0402)
External Balance, 4y avg.	0.000140 (0.0242)	0.0301 (0.0382)	-0.0747 (0.0537)
Growth, 4y avg.	0.0655*** (0.0148)	0.0827*** (0.0209)	0.000826 (0.0313)
Fiscal Balance, 4y avg.	0.0474** (0.0206)	0.0149 (0.0330)	0.0279 (0.0391)
Gen. Gov. Debt	-0.120*** (0.0201)	-0.0820* (0.0472)	-0.0562 (0.0750)
Gen. Gov. Debt * Ind	-0.158* (0.0917)	-0.199* (0.117)	-0.332 (0.234)
Stockmarket Crash		0.0255** (0.00990)	0.0217 (0.0149)
Currency Crisis		0.0248 (0.0175)	0.0464** (0.0237)
Inflation Crisis		-0.0788 (0.145)	-0.0724 (0.234)
Domestic Debt Crisis		-0.145 (0.183)	0.243 (0.240)
External Debt Crisis		0.0215 (0.0924)	-0.0240 (0.0968)
Banking Crisis		-0.0349 (0.0242)	-0.00249 (0.0263)
Original Sin			-0.318 (0.414)
Curr. Mismatch			0.296* (0.165)
Constant	0.0375 (0.0340)	0.0732* (0.0422)	-0.000550 (0.0408)
No. of Observations	521	521	521
Sargan Test (p-values)	1.000	1.000	1.000
AR1 (p-values)	0.000	0.000	0.063
AR2 (p-values)	0.840	0.848	0.182

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 5: Cook's Distance for Fixed Effects Estimates

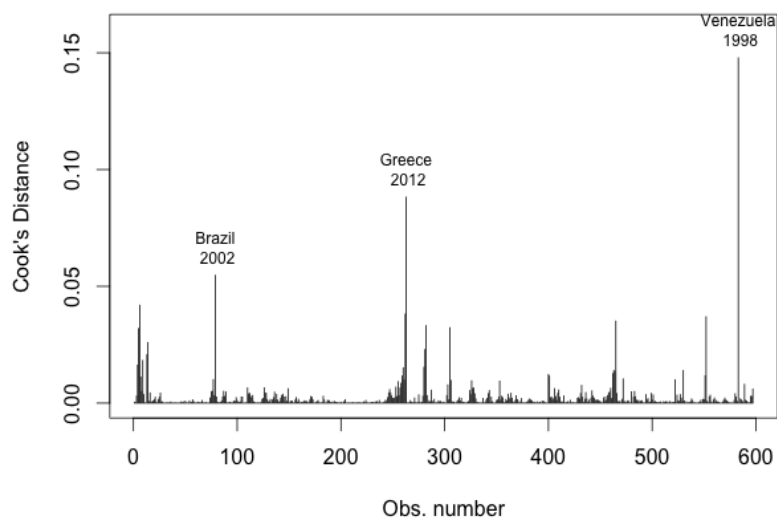
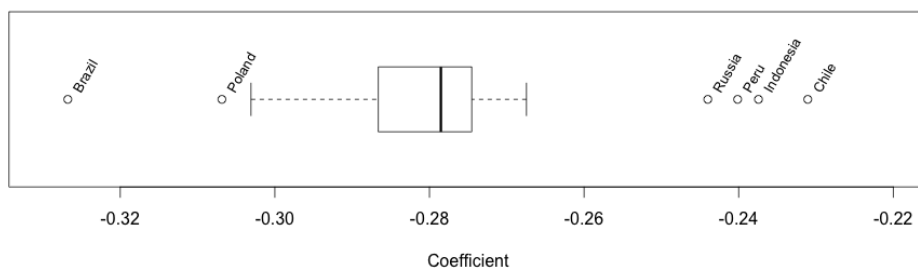


Figure 6: Jackknife Resampling for Fixed Effects Estimates



have only accounted for cross-country heterogeneity by distinguishing between the two groups and by including country fixed effects. Thereby, one cannot exclude that single country-year observations or particular countries have a relatively large impact on the debt coefficient compared to the rest of the sample. In order to account for these potential biases we perform two robustness checks.¹⁰

First, Cook's distance measures the relative impact of a data point on the entire model (see Figure 5). Here, we find that three observations have a relatively large influence. Due to the fact that all three countries (Greece, Brazil and Venezuela) were involved in a debt crisis during the respective year and we control for debt crises, the abnormality should be usually captured by the model. Also, the exclusion of the three outliers from the sample neither has a strong effect on the size nor on the sign of our debt coefficient.

Second, we use the Jackknife procedure as a re-sampling technique to control for the relative influence of a country on the debt coefficient. Figure 6 shows that our estimated coefficient is robust to the exclusion of single countries. The largest deviation is driven by Chile which leads to a small overestimation of the debt coefficient (by 0.06 standard deviations). To sum up, the overall results neither seem to be biased by single observations nor by a particular country.

3.2 Rating and Debt Dynamics in Industrialized Countries

We now turn to study the dynamics of ratings in industrialized countries. According to our descriptive findings in Figure 3, CCRs decline at debt ratios above 90%. However, no further downgrades are observed at ratios beyond 120% (albeit heterogeneity across countries increases). In Figure 3, we also displayed the change in ratings for countries with high levels of public debt. It shows that economies with debt ratios below 60% receive an average increase in creditworthiness by 0.4 CCR points annually. With debt ratios rising further, changes in CCRs turn negative and lead to more pronounced penalties up to an average of 2 points annually.

Taken together with the findings in levels, it seems that some highly-indebted countries still

¹⁰Here, we only discuss the results for the fixed effects specification. However, the other robustness checks are not materially different and available on request.

enjoy favorable ratings but the downgrade probability increases with further rising debt. These findings are confirmed when we sort the observations according to the above/below median values of changes in the CCR (+0.4 points), government debt (64.4%), and changes in government debt (+0.02 percentage points). The contingency tables (see Table 10 in the Appendix of this paper) confirm that countries with a debt level above 64% do not experience stronger downgrades than lower indebted ones. The same holds if we consider (isolated) changes in government debt. However, when interacting high debt levels with positive changes in debt, we find that the share of country-year observations with a downgrade of at least -1 percentage point ($\Delta CCR = p(25)$) doubles from 9% to 18%. Corresponding to our descriptive results in section 4.2, we find no relationship between the change in CCR and the change in debt among the 50% percentile of countries with lower debt levels. This observation is complementary to the work by Ghosh *et al.* (2013) who find that governments with high debt levels also tend to have larger fiscal deficits resulting in higher interest rates or even the exclusion from capital markets.

In the following, we turn to our multivariate framework in order to account for the macroeconomic stance across countries. In the analysis, we only consider the year-on-year change in the CCR, since we are primarily interested in the change of ratings at different levels of debt and its momentum.

In Table 5 (column (1)), squared changes of public debt are used as an additional regressor (again with country fixed effects and including macroeconomic controls) in order to test whether changes of high debt lead to an additional penalty by investors. The sample is restricted to positive changes in debt levels in order to ensure that only increases in debt enter the squared term. We observe that the descriptive findings are confirmed: In general, changes in public debt to GDP led to a lower rating across industrialized countries but we find no additional rating penalty for countries with large changes in debt (the coefficient for squared debt is even positive). In column (2), we look at the reaction of CCRs when the levels of debt ratios are interacted with their annual change. The resulting coefficient suggests that indeed those countries receive an additional penalty whose debt level is associated with a growing one.

Figure 7 illustrates our results in column (2) by showing the rating change for different

combinations of debt levels and changes in debt. The isoquants based on the interaction term in Table 5 (column 2) reveal that high debt levels interacted with a growing one lead to additional rating penalties. The convex shape of the isoquants supports the hypothesis that both high debt levels in combination with high deficits lead to larger downgrades than situations in which a government faces either a strong debt increase or has only a high (but stable) level of debt. For instance, a country with a debt level of 90% of GDP receives a penalty of -0.86 CCR points whereas a country with 60% receives a penalty of only -0.46 CCR points given it experiences the same rise in public debt of 3%. A sovereign with a debt level of only 20% does not receive a penalty at all.

The results presented in Table 5 are based on a restricted sample which excludes Greece and Japan. When using the full sample of industrialized countries, our results basically remain the same, however, the Jackknife re-sampling (see Figure 8) shows that both tend to be outliers in the debt dimension - albeit in different directions. Whereas Japan leads to an underestimated coefficient (investors seem to be very debt-tolerant in the case of Japan), the inclusion of Greece leads to an overestimation of the coefficient (Greece receives a strong penalty relative to other countries). The Jackknife results for the interaction term excluding both countries are shown in Figure 9.

To sum up, we do find that countries with high levels of public debt are subject to an additional penalty when the debt level increases further. However, highly-indebted advanced economies do not necessarily receive lower ratings: It depends on the momentum of debt ratios whether a government is subject to an additional penalty. Overall, investors seem to worry about the dynamics of debt with one exception, namely Japan.

3.3 Debt and Ratings in the European Monetary Union

Finally, we study the relationship between changes in public debt and ratings in the European Monetary Union compared to other industrialized economies. We build on the work by Dell'Erba *et al.* (2013) who show that bond spreads are more sensitive towards rising debt levels in the EMU than elsewhere. However, we depart from their analysis in three respects: First, we use the assessments of investors instead of government bond spreads in order to exclude variations in the dependent variable which are not necessarily driven by

Table 5: Ratings in Highly-Indebted Countries (OLS-Diff)

This Table shows the OLS results for the effect of changes in government debt on CCRs. The first column presents the coefficient for large increases in government debt and its effect on ratings. The second column presents the coefficient for the interaction between high debt levels and changes to government debt. We include country fixed effects and a set of macroeconomic controls. We exclude Greece and Japan because they tend to be outliers in the debt dimension.

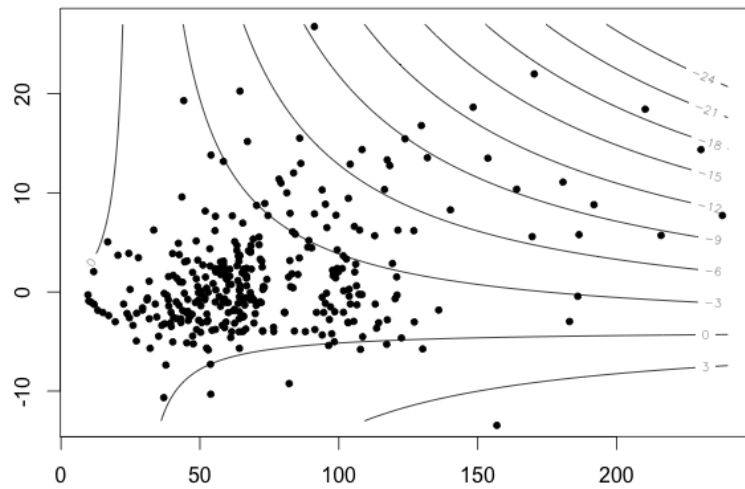
	(1)	(2)
	D.Rating	D.Rating
D.Gen. Gov. Debt	-0.302 (0.176)	0.114 (0.134)
Gen. Gov. Debt		-0.0172 (0.0237)
D.Gen. Gov. Debt sq.	0.00674 (0.00652)	
Gen. Gov. Debt * D.Gov. Debt		-0.00447*** (0.00141)
Constant	-0.314 (0.747)	1.019 (1.737)
Observations	137	290
Adjusted R^2	0.321	0.419
Country FE	Yes	Yes

Clustered Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure 7: Link between Level and Change in Public Debt and the Effect on CCR

This Figure illustrates the reaction of ratings to changes in government debt (vertical axis) in industrialized countries at different levels of indebtedness (horizontal axis). The distance between the isoquants and their convex slope indicate that countries are most vulnerable to downgrades when they increase their debt if initial debt ratios are already high (upper right area). High debt ratios alone or public debt surges at low initial debt levels are not sufficient conditions for a downgrade. The calculation of the isoquants is based on the empirical results in Table 5, column (2).



Data Source: International Monetary Fund (IMF), Institutional Investor

Figure 8: Jackknife Resampling for the Interaction Term Full Sample

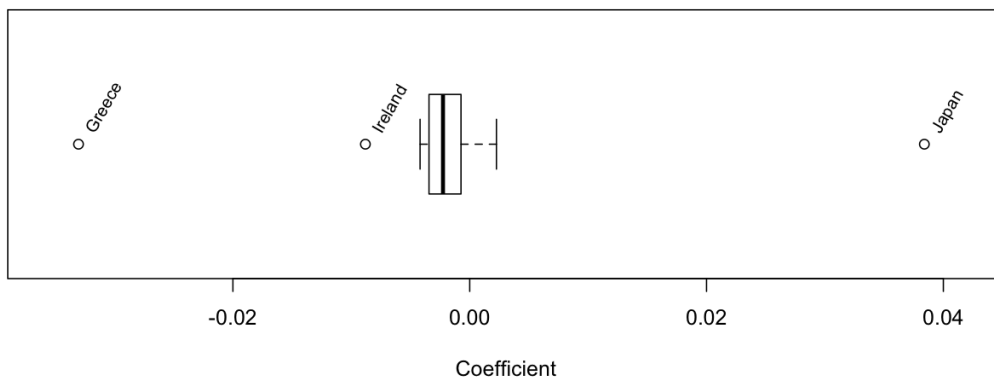
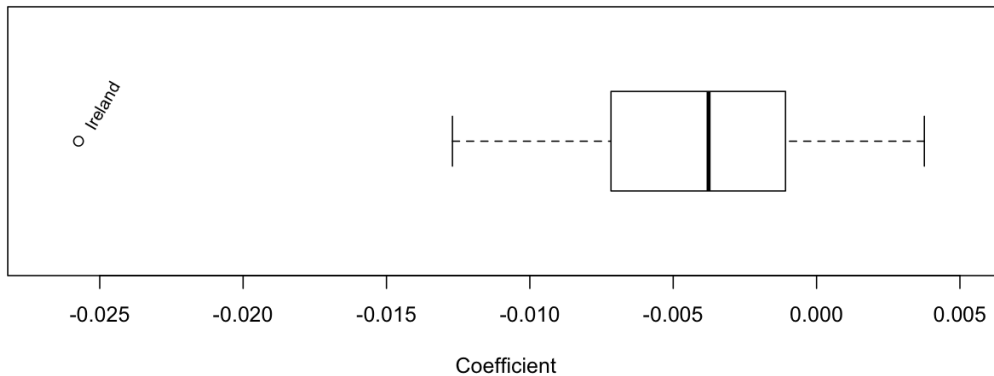


Figure 9: Jackknife Resampling for the Interaction Term excl. Greece/Japan



the creditworthiness of a respective sovereign (for instance the search for yield or liquidity). In particular, one can think of changes in yields determined by changes in general risk-aversion and the flight to safe havens (Bernoth and Erdogan (2012)) which have an effect on sovereign spreads but are not necessarily driven by a country’s economic fundamentals. Here, we are only interested in the investors’ reaction to a change of a sovereign’s public debt ratio.

Second, we distinguish between two groups within the euro area, namely the core countries and the GIIPS economies which have experienced the strongest recessions during the sovereign debt crisis. With this separation, we follow Gaertner *et al.* (2011) who find that large parts of the recent downgrades assigned to the GIIPS cannot be explained by economic fundamentals. The separation further allows us to make a statement about the perception of credit risk in the core EMU. If sovereign risk analysts had expected these countries to become responsible for the bail-out of defaulting members, they would have assigned a debt penalty to these economies. In addition, we include the years between the entry to the common currency area and before the onset of the crisis (1999-2008) in order to identify how analysts assessed changes in public debt ratios relative to countries outside the euro area during the Great Moderation. Thereby, we seek to identify whether the entry to the common currency has already changed the perception towards credit risk before the financial crisis.

Our third innovation is grounded in methodology: We build our analysis on interaction terms in order to measure the quantitative difference in the response to changes in debt

Table 6: Debt Coefficients EMU and Crisis using Difference OLS

This Table displays the resulting coefficients of linear combinations of debt coefficients across time and country groups. We explain the change in ratings with a change in the public debt ratio across three country groups and two periods based on the regression results in Table 12.

	(1) Non-EMU	(2) Core EMU	(3) GIIPS
1999-2008	-0.048 (0.520)	0.046 (0.627)	0.295 (0.194)
2008-2012	-0.019 (0.653)	0.075 (0.539)	-0.308*** (0.008)

standard errors in parentheses, coefficients for other macroeconomic controls are not displayed

Non-EMU countries: Australia, Canada, Denmark, Japan, Sweden, UK, USA

EMU core: Austria, Belgium, Finland, France, Germany, Netherlands

GIIPS: Greece, Ireland, Italy, Portugal, Spain

across the three country groups (EMU core, GIIPS, other advanced countries). This is not possible with two separate models where the coefficients do not measure the difference in the reaction of debt on ratings across groups, but account for the relative strength of effects on ratings within the respective country group.

Table 6 displays the resulting coefficients of linear combinations of debt coefficients across time and country groups. We explain the change in ratings with a change in the public debt ratio across the three country groups and two periods based on the regression in Table 12 of this paper's Appendix.¹¹ First, the model shows no statistically significant difference in the credit risk perception for changes in the debt ratio of countries outside the euro area and core EMU economies. This is true for both periods before and during the financial crisis. Second, the coefficients for the GIIPS in column (3) show that these countries have received a privilege between 1999-2008 (albeit not significant) which turned into a (significant) penalty after 2008. As shown in Table 12 of the Appendix, our model explains more than 40% of the variation in ratings which is remarkable when considering

¹¹The coefficients in Table 12 can only be interpreted as linear combinations of the interaction terms as illustrated in Table 6.

the conservative approach of using differences instead of levels.

In line with our previous analyses, we proceed with a robustness check in order to account for country-driven coefficients. Again, the results of the Jackknife procedure reveal that Japan and Greece have a relatively large influence. However, their exclusion does not affect the (in-)significance of our coefficients and the size of the crisis coefficient for the GIIPS is only slightly reduced.

To sum up, we observe that the euro area periphery received a strong debt penalty during the crisis. The core member governments neither seem to benefit nor to suffer from their membership with regard to the treatment of their public debt. One may argue that the higher liquidity is balanced by the inability to issue debt in a national currency and that a change in bailout expectations explains the coefficients for the GIIPS countries.

The analysis does not include a study of level effects due to the fact that we have already sorted countries within the EMU according to their level of public debt. Also, the coefficients will be difficult to interpret if we add another interaction term including the level of debt. We also abstain to report dynamic panel estimates for the crisis, since we cannot exploit enough variation for each country during the four years between 2009 and 2012 to report a robust estimation result.

4 Concluding Remarks

This paper has studied the effect of public debt on ratings across specific country groups. Our results can be summarized as follows: First, we do not find a debt privilege for industrialized versus emerging markets. When we include the ability to issue debt in the home currency, our results even point to a penalty towards industrialized countries. The difference to previous findings can be explained by the time dimension (earlier studies consider only periods until 2003) and our choice of different estimation methods (static fixed effects, Difference OLS, and Panel GMM). When using OLS without fixed effects, our results reveal a positive and significant debt privilege in industrialized countries.

Next, we tested whether ratings respond to high debt ratios and fiscal deficits or a combination of both. The findings suggest that the rating reaction to an increase in the

public debt ratio is up to three times larger at high ratios of government debt compared to the reaction at low levels of debt to GDP. Thus, it seems that sovereign risk analysts indeed respond to higher levels of debt in advanced economies which underlines the fact that some countries have reached a limit of debt sustainability. There are two large outliers, namely Japan and Greece. Excluding these two countries from the analysis does not change the results. Japan leads to a downward biased coefficient (high tolerance of debt dynamics) whereas Greece has a positive impact on the debt coefficient (high intolerance towards public debt possibly due to the recent partial default on government debt).

Third, we studied whether the euro area is treated differently by institutional investors relative to sovereigns outside the euro area. We find that this is not the case for the core members of the euro area. Hence, these countries do not seem to be held responsible for the bail-out of other members. However, we find that the GIIPS economies have received a large but insignificant debt privilege before the onset of the crisis and a large and significant debt penalty after 2008. Thus, one may conclude that analysts have overrated creditworthiness during the initial years of EMU (at least in some of the countries) and that they corrected this view during the crisis.

The major focus of this study was to explain how institutional investors respond to the dynamics of public debt across country groups. The aforementioned results point towards two policy implications for the industrialized world:

First, the observed volatility in euro area CCRs points to a considerable degree of uncertainty among institutional investors regarding the future of the euro area. Therefore, it is advisable that the treaties are revised to put them on more solid and reliable ground especially with respect to the bail-out clause. Besides, the proposal of a sovereign debt restructuring mechanism seems to be an appropriate instrument to deal with investor uncertainty towards sovereign risk (also beyond the euro area).

Second, the response of ratings to a combination of high debt and its positive momentum should be taken as a warning signal for highly-indebted industrialized countries and lead them to more consolidation efforts before financial markets may suddenly lose their faith in the future creditworthiness of the reigning governments.

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A Appendix

Table 7: Country Sample

	(1)	(2)	(3)
	First obs.	Last obs.	No. of obs.
Advanced Countries (18 countries)			
<i>Australia</i>	1993	2012	20
<i>Austria</i>	1993	2012	20
<i>Belgium</i>	1993	2012	20
<i>Canada</i>	1993	2012	20
<i>Denmark</i>	1993	2012	18
<i>Finland</i>	1993	2012	20
<i>France</i>	1993	2012	20
<i>Germany</i>	1995	2012	19
<i>Greece</i>	1993	2012	20
<i>Ireland</i>	1999	2012	14
<i>Italy</i>	1993	2012	20
<i>Japan</i>	1993	2012	20
<i>Netherlands</i>	1997	2012	16
<i>Portugal</i>	1993	2012	20
<i>Spain</i>	1993	2012	20
<i>Sweden</i>	1993	2012	20
<i>United Kingdom</i>	1993	2012	20
<i>United States</i>	1993	2012	20
Emerging Markets (17 countries)			
<i>Argentina</i>	1997	2012	16
<i>Brazil</i>	2000	2012	13
<i>Chile</i>	1993	2012	20
<i>China</i>	1993	2012	20
<i>Colombia</i>	1996	2012	17
<i>Hungary</i>	1997	2012	16
<i>Indonesia</i>	2000	2012	13
<i>Malaysia</i>	1993	2012	20
<i>Mexico</i>	1996	2012	17
<i>Peru</i>	2003	2012	11
<i>Philippines</i>	1996	2012	17
<i>Poland</i>	1997	2012	16
<i>Russia</i>	2000	2012	11
<i>South Africa</i>	2008	2012	5
<i>Turkey</i>	2004	2012	9
<i>Uruguay</i>	2001	2012	12
<i>Venezuela</i>	1998	2012	15

Table 8: Country Sample EMU

	(1)	(2)	(3)
	First obs.	Last obs.	No. of obs.
EMU "core" (6 countries)			
<i>Austria</i>	1999	2012	14
<i>Belgium</i>	1999	2012	14
<i>Finland</i>	1999	2012	14
<i>France</i>	1999	2012	14
<i>Germany</i>	1999	2012	14
<i>Netherlands</i>	1999	2012	14
EMU "GIIPS" (5 countries)			
<i>Greece</i>	2001	2012	12
<i>Ireland</i>	1999	2012	14
<i>Italy</i>	1999	2012	14
<i>Portugal</i>	1999	2012	14
<i>Spain</i>	1999	2012	14

Table 9: Variance Decomposition

	(1)	(2)	(3)
	Between	Within	Total
All countries	309.094 (7.581)	64.574 (8.036)	373.668 (19.330)
Industrialized countries	59.432 (7.709)	57.751 (7.599)	117.183 (10.825)
Emerging markets	114.227 (10.688)	73.68 (8.584)	187.907 (13.708)

Standard errors in parentheses

Table 10: Contingency Tables

ΔCCR	<i>Government Debt Level</i>			<i>Total</i>
	<i>Debt < p(50)</i>	<i>Debt > p(50)</i>		
$\Delta CCR > p(75)$	51 (14.7%)	41 (11.8%)		92 (26.5%)
$p(25) < \Delta CCR < p(75)$	94 (27.1%)	80 (23%)		174 (50.1%)
$\Delta CCR < p(25)$	30 (8.6%)	51 (14.7%)		81 (23.3%)
<i>Total</i>	175 (50.4%)	172 (49.6%)		347 (100%)
ΔCCR	<i>ΔGovernment Debt</i>			<i>Total</i>
	$\Delta < p(25)$	$p(25) < \Delta < p(75)$	$\Delta > p(75)$	
$\Delta CCR > p(75)$	30 (8.7%)	36 (10.4%)	26 (7.5%)	92 (26.5%)
$p(25) < \Delta CCR < p(75)$	43 (12.4%)	99 (28.5%)	32 (9.2%)	174 (50.1%)
$\Delta CCR < p(25)$	9 (2.6%)	29 (8.4%)	43 (12.4%)	81 (23.3%)
<i>Total</i>	82 (23.6%)	164 (47.3%)	101 (29.1%)	347 (100%)
ΔCCR - only level debt $p > 50$	<i>ΔGovernment Debt</i>			<i>Total</i>
	$\Delta < p(25)$	$p(25) < \Delta < p(75)$	$\Delta > p(75)$	
$\Delta CCR > p(75)$	11 (6.4%)	14 (8.1%)	16 (9.3%)	41 (23.8%)
$p(25) < \Delta CCR < p(75)$	19 (11.1%)	40 (23.3%)	21 (12.2%)	80 (46.5%)
$\Delta CCR < p(25)$	4 (2.3%)	16 (9.3%)	31 (18.0%)	51 (29.7%)
<i>Total</i>	34 (19.8%)	70 (40.7%)	68 (39.5%)	172 (100%)
ΔCCR - only debt level $p < 50$	<i>ΔGovernment Debt</i>			<i>Total</i>
	$\Delta < p(25)$	$p(25) < \Delta < p(75)$	$\Delta > p(75)$	
$\Delta CCR > p(75)$	19 (10.9%)	22 (12.6%)	10 (5.7%)	51 (29.1%)
$p(25) < \Delta CCR < p(75)$	24 (13.7%)	59 (33.7%)	11 (6.3%)	94 (53.7%)
$\Delta CCR < p(25)$	5 (2.9%)	13 (7.4%)	12 (6.9%)	30 (17.1%)
<i>Total</i>	48 (27.4%)	94 (53.7%)	33 (18.9%)	175 (100%)

Table 11: Industrialized vs. Emerging (OLS lagged 1 year)

	(1)	(2)	(3)
	Baseline	incl. crises	incl. debt burden
L.GDP per capita	0.224*** (0.0462)	0.240*** (0.0441)	0.213*** (0.0425)
Inflation, 4y avg.	-0.286*** (0.0395)	-0.282*** (0.0545)	-0.224*** (0.0584)
L.Unemployment	-0.181*** (0.0488)	-0.182*** (0.0480)	-0.188*** (0.0472)
External Balance, 4y avg.	-0.0102 (0.0545)	-0.0143 (0.0532)	-0.0138 (0.0531)
Growth, 4y avg.	0.157** (0.0590)	0.152** (0.0603)	0.151** (0.0617)
Fiscal Balance, 4y avg.	0.0899*** (0.0327)	0.0719** (0.0342)	0.0830** (0.0334)
L.Gen. Gov. Debt	-0.304* (0.154)	-0.326** (0.144)	-0.305** (0.119)
L.Gen. Gov. Debt * Ind	0.0438 (0.268)	0.0425 (0.245)	0.0546 (0.216)
Stockmarket Crash		0.0347 (0.0314)	0.0309 (0.0319)
Currency Crisis		0.0423 (0.0396)	0.0433 (0.0408)
Inflation Crisis		0.0308 (0.125)	-0.0151 (0.111)
Domestic Debt Crisis		-0.00842 (0.177)	-0.0482 (0.158)
External Debt Crisis		0.159 (0.138)	0.197 (0.120)
Banking Crisis		-0.119* (0.0676)	-0.0699 (0.0564)
L.Original Sin			-0.473*** (0.117)
L.Curr. Mismatch			0.0285 (0.0659)
Constant	0.299 (0.316)	0.291 (0.288)	-0.115 (0.298)
Observations	559	559	559
Adjusted R^2	0.917	0.918	0.927
Country FE	Yes	Yes	Yes

Clustered Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Debt and Ratings in EMU (OLS Diff)

This Table displays the coefficients for the OLS Diff regressions with the interaction terms for the two euro area groups (EMU core and GIIPS). A correct interpretation of the coefficients is only possible by calculation of the linear combinations between the interaction terms. The resulting marginal effects are displayed in Table 6.

	(1)
	D.Rating
D.Gov. Debt	-0.0476 (0.0724)
D.Gov. Debt cris.	0.0289 (0.0804)
EMU core	-0.0904 (0.182)
EMU core*D.Gov. Debt	0.0933 (0.112)
EMU core*D.Gov. Debt*cris	-0.121 (0.175)
GIIPS	-0.257 (0.513)
GIIPS*D.Gov. Debt	0.342 (0.205)
GIIPS*D.Gov. Debt*cris	-0.632** (0.299)
Constant	-1.011*** (0.334)
Observations	231
Adjusted R^2	0.464

Clustered Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

EMU core: Austria, Belgium, Finland, France, Germany, Netherlands

GIIPS: Greece, Ireland, Italy, Portugal, Spain

Figure 10: Monte Carlo experiment using Fixed effects vs. Difference GMM estimator

This Figure illustrates a simulation of our data generating process with the lagged exogenous variable (δ) and the coefficient for government debt (β) in a sample with $N = 35$ and $T = 4 - 20$. Based on the moments in our sample, we set $\delta = 0.8$ and $\beta = 0.5$. The results of the simulation are based on 500 iterations of the dynamic panel model ($y_{i,t} = \delta y_{i,t-1} + \beta X_{i,t} + u_i + \varepsilon_{i,t}$) for each the fixed effects and the Difference GMM estimation (Arellano-Bond). We find that the FE estimator for δ is downward biased but becomes more precise with increasing T as expected. For the estimation of β , we find that the FE estimator provides unbiased results for $T > 6$. The difference GMM estimator leads to unbiased results for both coefficients but it is less efficient than the fixed effects estimator (large variance) and not suited for large T. This result is in line with the findings by Judson and Owen (1999) and Kiviet (1995).

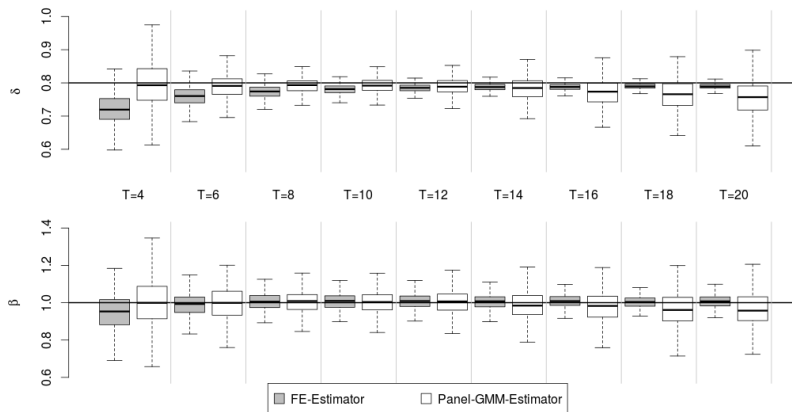


Figure 11: Monte Carlo experiment using Fixed effects vs. System GMM estimator

This Figure illustrates a simulation of our data generating process with the lagged exogenous variable (δ) and the coefficient for government debt (β) in a sample with $N = 35$ and $T = 4 - 20$. Based on the moments in our sample, we set $\delta = 0.8$ and $\beta = 0.5$. The results of the simulation are based on 500 iterations of the dynamic panel model ($y_{i,t} = \delta y_{i,t-1} + \beta X_{i,t} + u_i + \varepsilon_{i,t}$) for each the fixed effects and the System GMM estimation (Arellano-Bover/Blundell-Bond). We find that the FE estimator for δ is downward biased but becomes more precise with increasing T as expected. For the estimation of β , we find that the FE estimator provides unbiased results for $T > 6$. The System GMM estimator leads to strongly biased results for both coefficients. The bias seems to be driven by the inclusion of additional moment conditions.

