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

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Working Paper

- Preliminary version -

Abstract

In this paper, we explore the institutional investors' assessment of relative creditworthiness across selected country groups with a special focus on the impact of public debt on the perception of sovereign risk. Our results show that general government debt is among the most important determinants of credit risk in industrialized countries and emerging markets alike. When using a multivariate framework, we further find that the influence of debt on ratings does not differ between both groups. Also, our results point towards a rating penalty for highly-indebted advanced countries when their debt ratio is associated with a growing one. By contrast, a high debt level alone does not lead to an additional rating decline. Finally, we show that peripheral euro area economies (GIIPS) received a rating privilege before the financial crisis that turned into a penalty after 2008.

JEL Classification: E62, F34

Keywords: Sovereign Risk, Public Debt, European Monetary Union, Debt Sustainability

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1 Introduction

Credit rating agencies play an important role for governments and their creditors alike: Their ratings serve as a pooled assessment of the respective country's default risk and they are used by institutional investors when choosing the optimal portfolio.

However, the escalation of the sovereign debt crisis in Europe has given rise to doubts about the adequacy of sovereign ratings: Recently, European politicians have claimed that the sudden decline of credit ratings was rather driven by fading market sentiment and not by a decline in economic fundamentals. Also economists have often criticized the agencies: A number of studies find that the agencies have aggravated crises in countries although fundamentals appeared to be stable (Ferri *et al.* (1999), Gaertner *et al.* (2011)). Contrary to these results, others find that ratings serve as a good predictor of sovereign creditworthiness in the long-run (they rate "through the cycle"). For instance, Mora (2006) and Afonso *et al.* (2011) show that ratings are rather driven by inertia than being pro-cyclical. This said, they argue that credit rating agencies only respond to a change in a country's fundamentals if they consider those as having a long lasting impact. To sum up, it seems that the historical performance of the agencies is still disputed among academics.

In this paper, we seek to shed more light on the impact of government debt on sovereign creditworthiness. By using survey data among institutional investors instead of ratings from the Big Three, we avoid three problems: First and foremost, credit rating agencies (CRAs) are currently subject to a lot of criticism regarding their business model and timing (see Eijffinger (2012), de Haan and Amtenbrink (2011)). Second, the survey data are not biased by the use of a specific rating model or possibly skewed by inclusion into regulatory frameworks (Opp *et al.* (2013)). And third, rating agencies use a scale of only 21 different alphabetical notches leaving a lot of room for interpretation: First, we cannot treat the distances between the notches equally (ordinal scale) and second, the number of rating classes is restricted.[1] This paper contributes to the literature in three respects: First, we ask whether advanced countries enjoy a higher tolerance to (changes in) their debt ratios than emerging markets by investors. Second, we analyze the dynamics of ratings for

[1] We will introduce our measure in more detail in section 2.2.

highly indebted industrialized countries. Finally, we explore whether ratings of euro area members react more or less sensitive to changes in public debt than in other industrialized countries.

Regarding our first question the existing literature provides several explanations for the persistent gap in creditworthiness between industrialized countries and emerging markets. 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. All three approaches focus on structural weaknesses within emerging markets which lead to lower overall sovereign rating scores. Below, we summarize the aforementioned channels that have been used in the literature to explain sovereign risk disparities between advanced countries and emerging markets.

The adherents of the original sin hypothesis argue 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, countries 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 country may hold foreign assets in the 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 developing countries to accumulate comparable levels of debt as advanced countries with their history of defaults and high inflation. Due to weaker institutions the countries 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)).

In this paper, we ask whether industrialized countries still observe a privilege when we account for the above-mentioned factors. The second and third part of this paper deal with heterogeneity within the group of advanced countries: Below, we provide two rationales why they may be treated differently by investors concerning the development of debt.

First, public debt ratios in industrialized countries have for a long time been considered as sustainable. According to Bohn (1998), the United States have followed a path of sustainable fiscal policy between 1916-1995 by satisfying a pre-defined inter-temporal budget constraint. This result has also been confirmed for European countries by others (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 country 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. 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 explore 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 benefited from the import of a credible monetary policy. Thus, the issuance of bonds has become more attractive for governments, in particular for those with large stocks of public debt (Pagano and von Thadden (2004)).[2]

[2]Although 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

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 government 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 the monetary policy instrument to inflate away excessive deficits. However, the authors find no significant increase of interest rate spreads after the start of EMU.

The remainder of the 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

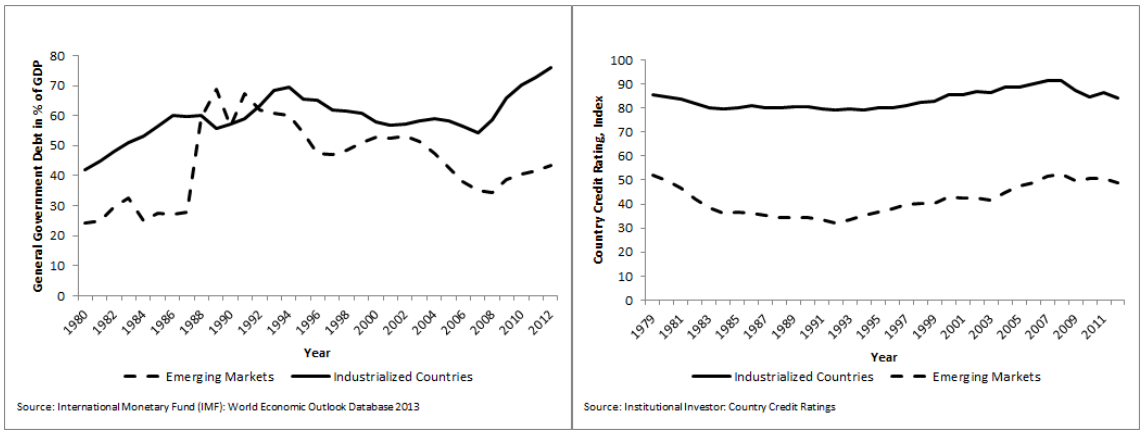
In the empirical analysis, we use country-level data of 18 advanced and 17 emerging market economies ranging from 1993-2012 (unbalanced panel, see Table 10 in the appendix). Following Reinhart *et al.* (2003) and others (Haque *et al.* (1996), Celasun and Harms (2011)), the Institutional Investor's country credit rating (CCR) is our left-hand side variable and serves as a proxy for the perceived creditworthiness by 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).[3] Ratings are running on a scale from 0-100, with 0 representing the least creditworthiness of a country. In fact, one may consider them as an unbiased credit risk assessment of the countries' creditors. Furthermore, the country credit ratings have a larger variance compared to the Big Three ratings. The fact that the ratings of the Big Three 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

et al. (2011)).

[3]The responses are weighted according to the institutions' global exposure (for details see the description by the Institutional Investor magazine.

to the perception of credit risk in countries like Germany which enjoy a AAA rating (or slightly below) by the Big Three agencies since many years. However, the sovereign debt crisis in Europe has shown that former investment-grade rated countries may experience a sudden decline to speculative grade status within a few months (Greece, Portugal, Ireland). In this paper, we contribute to the literature by exploring the responsiveness of the CCR to changes in a country's ratio of government debt to GDP. Thereby, we allow to test for small changes in creditworthiness which are not captured by the usual suspects, namely the Big Three.

Figure 1: Dynamics of General Government Debt and Ratings



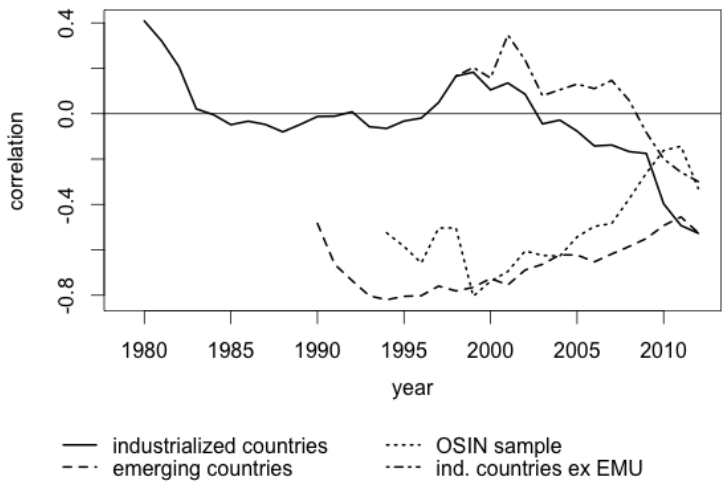
Data Source: International Monetary Fund (IMF), Institutional Investor

In figure 1, we show the development of this measure over time and compare it with the dynamics of public debt across advanced and emerging economies. Obviously, economic fundamentals such as government debt ratios 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 (left-hand panel). Still, advanced countries have received considerably better ratings by investors until recently (right-hand panel).

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.[4] Clearly, one can observe

[4]In Figure 2, we distinguish between those emerging markets that appear in our sample (OSIN) and those for which data on domestic debt securities were not available.

Figure 2: Correlation between Debt and Country Credit Ratings



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

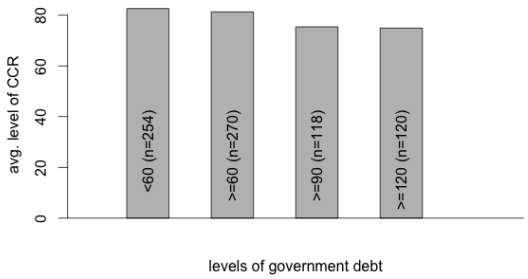
that higher debt ratios are always related to lower ratings for emerging markets whereas industrialized countries enjoy only a slight negative or even positive correlation between public debt and creditworthiness. This result is in line with previous findings in the literature (see for instance Dell'Erba *et al.* (2013) and De Grauwe and Ji (2013)). However, the relationship has changed during the previous ten years: It became negative for the industrialized world in 2003 and has strongly decreased since then (to -0.3 in 2012). The more recent literature provides also empirical support to this finding: Greenlaw *et al.* (2013) show that debt levels of more than 80% 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 negative correlation between public debt and ratings although heterogeneity across countries remains substantial. In the following empirical analysis, we will explore whether this relationhip 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 testing whether highly indebted countries experience an additional rating penalty compared to other advanced economies. The empirical evidence on the impact of debt on growth is unclear: Whereas Reinhart and Rogoff (2010) find that economic growth is negatively affected

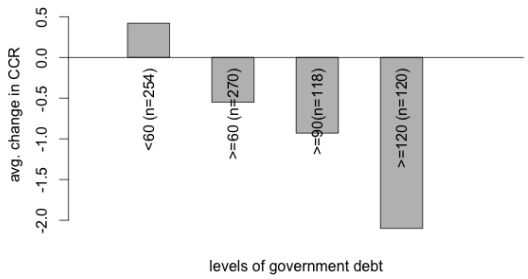
when debt ratios exceed 90% of GDP, Panizza and Presbitero (2014) observe no causal relation when they control for endogeneity. The left-hand panel of Figure 4 shows that CCR levels are on average six points lower when countries' debt ratios increase from 60% to 90% of GDP. However, some countries seem to be able to increase their debt ratios even

Figure 3: CCRs at different levels of debt

(a) CCRs at high levels of debt



(b) Changes in CCRs at high levels of debt



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

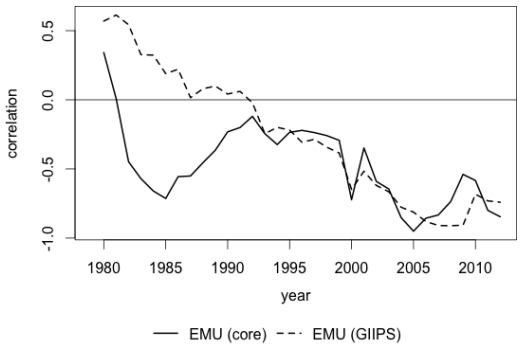
further (more than 120% of GDP) without any additional downgrades. The right-hand panel of Figure 4 shows that countries with debt levels above 60% are facing an average decline in CCRs by -0.5 rising to -0.9 (-2.1) points with debt ratios being equal and above 90% (120%) of GDP. Taking the two pictures together, one could argue that some industrialized countries get sanctioned for increasing their public debt ratios beyond 90% whereas others seem to be shielded against downgrades or at least maintain solid rating levels (for instance Japan).

As a third step, we explore whether monetary integration in Europe has led to a debt privilege compared to other industrialized countries. In Figure 3, the left-hand panel shows the correlation between debt and ratings over time for the GIIPS countries and the rest of the euro area.[5] 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 explore this relationship in more detail we have to

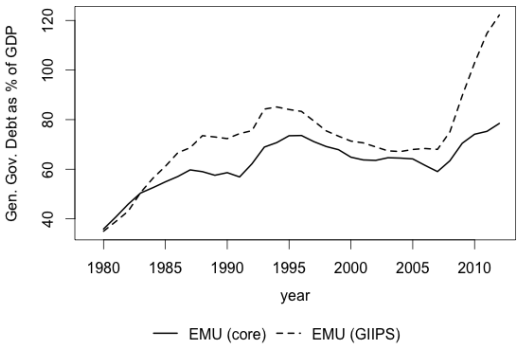
[5]The core economies are Austria, Belgium, France, Germany and the Netherlands.

Figure 4: Debt and Ratings in the EMU

(a) Correlation between Debt and CCR



(b) Debt levels



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

proceed with a multivariate analysis.

In order to control for the 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 our 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 remain usually stable for a long period of time and can therefore be interpreted as a part of the country fixed effect. Moreover, we found political stability and government effectiveness to be strongly correlated with GDP per capita.

Our choice of controls largely follows the studies by Cantor and Packer (1996) and Afonso *et al.* (2011). Stated below, we provide summary statistics and a correlation table of our set of exogenous variables. 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

Table 1: Summary Statistics of Control Variables

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

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 country'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 cover only 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 international debt securities (for instance we use this kind of multiplicative dummy for the U.S. and Switzerland), we set this variable equal to zero.[6] $MISMATCH$ 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 crises, currency crises and sovereign debt crises by using the dataset by Carmen Reinhart.[7] Three of the crises take the form of multiplicative dummies as they never occurred in industrialized countries within our sample. The crises events are included in our models for the reason that high debt ratios may not necessarily be the consequence of unsustainable fiscal policy but rather the outcome of a banking or a currency crisis. Thereby, we do not

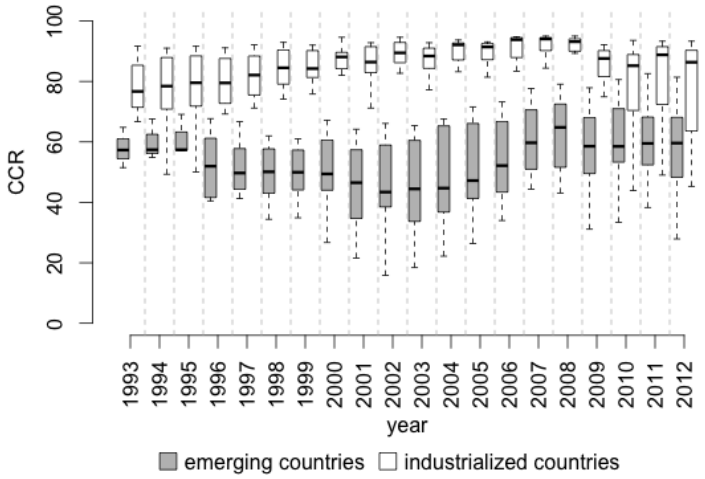
[6] For a detailed discussion of the definition see Eichengreen *et al.* (2007)).
[7] see `http://www.carmenreinhart.com/data/browse-by-topic/topics/7/`

blame governments for large increases in sovereign debt if the debt surge is for instance driven by the takeover of private debt.

3 Empirical Analysis

We now turn to explore the determinants of Country Credit Ratings across time and countries. As a first step, the differences between advanced and emerging economies are

Figure 5: Between- and within-variation of Ratings



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

examined. Next, the analysis focuses on the dynamics of sovereign ratings in highly-indebted countries. As a third step, we pursue with a comparison of credit risk between members of the European Monetary Union and other industrialized countries.

As related to the empirical strategy, we proceed with three specifications for each question at hand. Thereby, we can exploit both the between- and within-variation of ratings. Figure 5 illustrates 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. Also, the Figure shows a convergence of ratings for the two country groups.

In the analysis, we begin with a static fixed-effects model (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 $x'_{i,t}$).

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

This model covers both dimensions (between-country and within-country variation) and is quite easy to interpret but it potentially leads to some econometric problems. Due to the fact that most of the variables seem to be non-stationary the estimated coefficients can be the result of a spurious correlation rather than showing a fundamental link between the variables. Another problem can be the potential bias when estimating the coefficients or computing the t-statistics. The strong 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.[8] Therefore, the interpretation of the coefficients differs somewhat from the other models.

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

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 being taken as first differences (except for economic growth). From an econometric point of view this model is the most conservative. 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 takes also the path dependency of ratings into account.

As a third approach, we use a dynamic panel-data specification related to Blundell-Bond (System GMM) (equation 3). In order to explore level effects (see the large distance between ratings of advanced and emerging economies in Figure 5) and to avoid endogeneity

[8] For details see the variance decomposition in Table 12 of the appendix

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

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

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 crises in order to control for situations when 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 measure whether a potential privilege is merely driven by the ability of countries to issue debt in their own currency.

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 explain between 80-95% of the variation in ratings. 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 the debt ratio increases by 1 standard deviation, CCRs

Table 2: Industrialized vs. Emerging (OLS)

	(1) Baseline	(2) incl. crises	(3) incl. debt burden
GDP per capita	0.219***	0.225***	0.199***
	(0.0392)	(0.0393)	(0.0369)
Inflation, 4y avg.	-0.241***	-0.274***	-0.230***
	(0.0386)	(0.0495)	(0.0530)
Unemployment	-0.245***	-0.250***	-0.255***
	(0.0468)	(0.0508)	(0.0481)
External Balance, 4y avg.	-0.0217	-0.0234	-0.0230
	(0.0473)	(0.0437)	(0.0418)
Growth, 4y avg.	0.0379	0.0362	0.0413
	(0.0508)	(0.0496)	(0.0510)
Fiscal Balance, 4y avg.	0.0716**	0.0490	0.0580*
	(0.0314)	(0.0323)	(0.0301)
Gen. Gov. Debt	-0.243**	-0.296**	-0.278***
	(0.119)	(0.122)	(0.0977)
Gen. Gov. Debt * Ind	0.000787	0.0452	0.0618
	(0.213)	(0.200)	(0.172)
Stockmarket Crash		0.0221	0.0283
		(0.0393)	(0.0352)
Currency Crisis		0.0997*	0.111**
		(0.0523)	(0.0475)
Inflation Crisis		0.197*	0.157
		(0.113)	(0.112)
Domestic Debt Crisis		0.189	0.128
		(0.235)	(0.204)
External Debt Crisis		0.109	0.109
		(0.202)	(0.153)
Banking Crisis		-0.0941	-0.0387
		(0.0635)	(0.0516)
Original Sin			-0.494***
			(0.0916)
Curr. Mismatch			0.0102
			(0.0693)
Constant	0.911**	0.917***	0.398
	(0.358)	(0.318)	(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
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

are between 0.28-0.49 standard deviations lower.

The interaction term for government debt in industrialized countries is positive but not significant. 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. For instance, the default history or other political and socio-economic characteristics of a country are captured here, which usually remain in place for a long period of time. Ignoring country fixed effects would lead to a significant debt privilege. The inclusion of crises and original sin/ currency mismatch in columns (2) and (3) do not affect this result.

When we use differences instead of levels (Table 3), the debt coefficient for emerging markets is reduced to -0.1-0.2 standard deviations. Industrialized countries are exposed to a tiny and insignificant rating penalty which turns into a large and significant disadvantage when we control for original sin and currency mismatch (columns (2) and (3)). Thus, if a country does not have the ability to issue debt in its own currency, an increase in public debt leads to higher downgrades in those countries with a higher exposure to original sin.[9]

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 include only the first year of the crisis, the coefficients become negative. One may conclude that the quick recovery of ratings after the first crisis year leads to this result.

In the dynamic panel, we use system 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. The debt coefficient becomes insignificant for all country groups here. Also the interaction term does not show a significant difference between both country groups in all specifications.

To sum up our results, we find that general government debt ratios explain a large

[9]Country examples are Australia, Canada, Denmark and Sweden.

Table 3: Industrialized vs. Emerging (OLS Diff)

	(1) Baseline	(2) incl. crises	(3) incl. debt burden
D.GDP per capita	0.0956***	0.0961***	0.0969***
	(0.0238)	(0.0234)	(0.0233)
D.Inflation, 4y avg.	-0.0168	-0.0181	-0.000351
	(0.0610)	(0.0642)	(0.0661)
D.Unemployment	-0.176***	-0.193***	-0.217***
	(0.0525)	(0.0587)	(0.0566)
D.External Balance, 4y avg.	-0.0305	-0.0147	-0.0185
	(0.0243)	(0.0285)	(0.0296)
Growth, 4y avg.	0.374***	0.362***	0.295***
	(0.0902)	(0.0877)	(0.0806)
D.Fiscal Balance, 4y avg.	0.0259	0.0328	0.0269
	(0.0522)	(0.0534)	(0.0561)
D.Gen. Gov. Debt	-0.184***	-0.182***	-0.127***
	(0.0335)	(0.0352)	(0.0296)
D.Gen. Gov. Debt * Ind	-0.0488	-0.0232	-0.131**
	(0.0509)	(0.0523)	(0.0588)
Stockmarket Crash		0.113*	0.155**
		(0.0660)	(0.0597)
Currency Crisis		0.250**	0.261**
		(0.0979)	(0.101)
Inflation Crisis		-0.0804	-0.212
		(0.388)	(0.337)
Domestic Debt Crisis		-1.018**	-1.159**
		(0.390)	(0.432)
External Debt Crisis		-0.214	-0.365
		(0.595)	(0.600)
Banking Crisis		-0.161	-0.138
		(0.113)	(0.107)
D.Original Sin			-0.847***
			(0.235)
D.Curr. Mismatch			0.673***
			(0.155)
Constant	-0.173***	-0.207***	-0.116***
	(0.0429)	(0.0535)	(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
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Industr. vs. Emerging (Panel GMM)

	(1) Baseline	(2) incl. crises	(3) incl. debt burden
L.Rating	0.683***	0.660***	-0.00904
	(0.0418)	(0.128)	(0.221)
L.Rating * Ind.	0.0195	-0.164	0.606
	(0.202)	(0.321)	(0.438)
GDP per capita	0.0684***	0.0134	0.0329
	(0.0211)	(0.0869)	(0.0784)
Inflation, 4y avg.	-0.0951***	-0.0953	0.0383
	(0.0148)	(0.0866)	(0.0768)
Unemployment	-0.102***	-0.124**	-0.172**
	(0.0191)	(0.0517)	(0.0683)
External Balance, 4y avg.	0.00606	-0.0104	-0.0507
	(0.0271)	(0.0426)	(0.0431)
Growth, 4y avg.	0.0757***	0.0818***	0.0623*
	(0.0126)	(0.0232)	(0.0325)
Fiscal Balance, 4y avg.	0.0443	0.0347	0.0705
	(0.0294)	(0.0426)	(0.0452)
Gen. Gov. Debt	-0.0943***	-0.0536	-0.0285
	(0.0252)	(0.0819)	(0.194)
Gen. Gov. Debt * Ind	-0.0373	0.00403	-0.0250
	(0.0929)	(0.208)	(0.239)
Stockmarket Crash		0.0326**	0.0562***
		(0.0134)	(0.0148)
Currency Crisis		0.0339	0.0929***
		(0.0218)	(0.0266)
Inflation Crisis		-0.0585	-0.494**
		(0.287)	(0.242)
Domestic Debt Crisis		-0.194	0.00267
		(0.138)	(0.253)
External Debt Crisis		0.0740	-0.170
		(0.0986)	(0.143)
Banking Crisis		-0.0530**	0.0485
		(0.0222)	(0.0385)
Original Sin			-1.869***
			(0.670)
Curr. Mismatch			0.133
			(0.125)
Constant	0.0160	0.0144	-0.0216
	(0.0109)	(0.0209)	(0.0245)
No. of Observations	559	559	559
Sargan Test	30.31	26.53	14.55
AR1	-4.504	-3.606	0.536
AR2	0.192	-0.00868	1.542

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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. Add to this, being exposed to original sin seems to be an important predictor of lacking creditworthiness confirming earlier studies which find that some industrialized countries have a considerable advantage from not being exposed to original sin. Apart from this, we do not find evidence for a debt privilege in advanced countries against 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 find a debt privilege for advanced countries. However, they use a different estimation strategy, they do not include crises and their data miss the last ten years (see figure 2).

Figure 6: Cooks's Distance for Fixed effects estimates

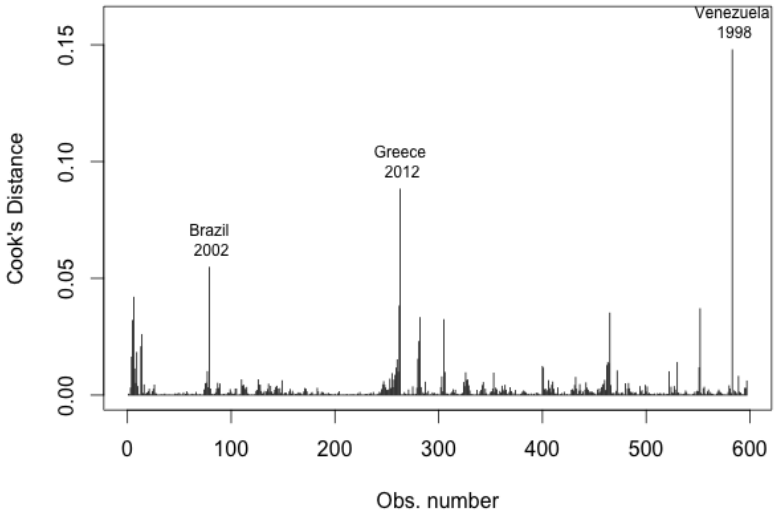
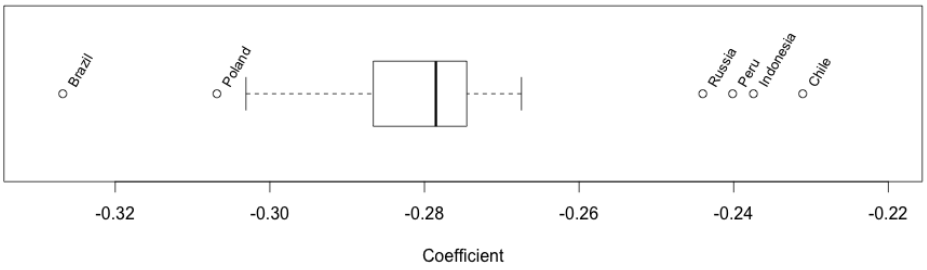


Figure 7: Jackknife Resampling for Fixed effects estimates



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. However, we have only accounted for cross-country heterogeneity by distinguishing between the two groups and by including country fixed effects. Nevertheless, we still 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.

First, Cook's distance estimates the relative influence of a data point (see Figure 6). Here, we observe 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 is usually captured in our model. The exclusion of the three observation from the sample has neither 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 7 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 penalty (by 0.06 standard deviations). To sum up, the overall results seem to be neither biased by single observations nor by a particular country.

3.2 Rating and debt dynamics in industrialized countries

We now turn to explore the dynamics of ratings in industrialized countries. According to our descriptive findings in Figure 4, CCRs decline with debt ratios above 90%. However, we observe no further downgrades at debt levels beyond 120% (albeit heterogeneity across countries increases). In Figure 4, we also displayed the change in ratings for countries with high levels of public debt. It shows that economies with debt ratios below 60% are subject to an average increase in creditworthiness by 0.4 CCR points annually. With rising debt, 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 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 CCR (+0.4 points), government debt (64.4%) and changes in government debt (0.02 percentage points). The contingency tables (see appendix) confirm that countries with a debt level above 64% do not experience stronger downgrades than others. The same holds if we only consider changes in government debt. However, when interacting high debt levels with positive changes in debt, we find that the country-year observations with a downgrade of at least -1 percentage point ($\Delta CCR = p(25)$) double from 9% to 18% whereas 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 observations is complementary to the work by Ghosh *et al.* (2013) who find that governments with high debt levels tend to have also 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 7 (column (1)), we use squared changes of public debt as an additional regressor (again with country fixed effects and including macroeconomic controls) in order 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 lead 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.

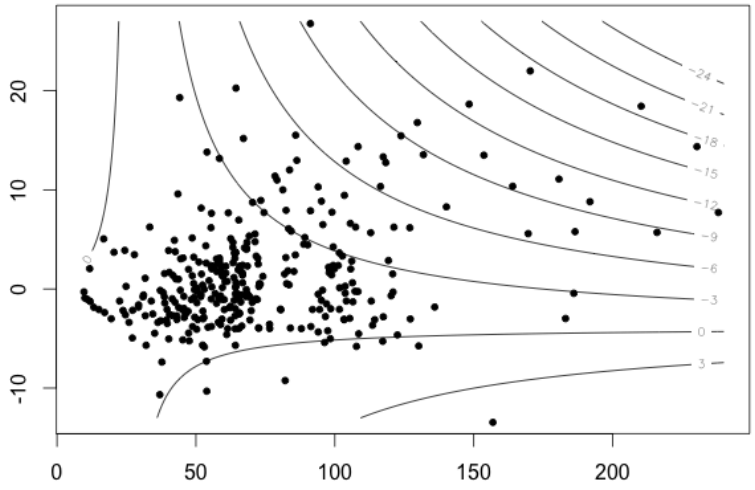
Figure 6 illustrates our results in column (2) by showing the rating change for different combinations of debt levels and changes in debt. The isoquants are based on the interaction term in table 5 (column 2) and illustrate that high debt levels interacted with a growing one lead to additional rating 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 country faces either a strong debt increase or when it 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 experience the same rise in public debt of 3%. A country with a debt level of only 20% does not receive a penalty at all.

The presented results in table 5 are based on a restricted sample which excludes Greece and Japan. When using the full sample of industrialized countries, our results remain basically the same, however, the Jackknife re-sampling (see figure 9) reveals that both tend to be outliers in the debt dimension - albeit in different directions. Whereas Japan leads to on 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 when excluding both countries is shown in figure 10.

Figure 8: 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, columns (2).



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

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) D.Rating	(2) D.Rating
D.Gen. Gov. Debt	-0.302	0.114
	(0.176)	(0.137)
Gen. Gov. Debt		-0.0172
		(0.0243)
D.Gen. Gov. Debt sq.	0.00674	
	(0.00652)	
Gen. Gov. Debt * D.Gov. Debt		-0.00447***
		(0.00145)
Constant	-0.314	0.778
	(0.747)	(0.976)
Observations	137	290
Adjusted R^2	0.321	0.426
Country FE	Yes	Yes

Clustered Standard errors in parentheses

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

Figure 9: Jackknife Resampling for the interaction term full sample

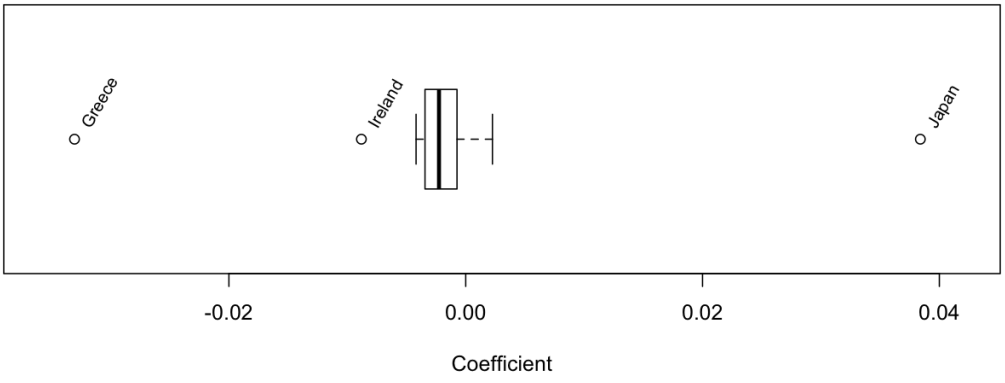
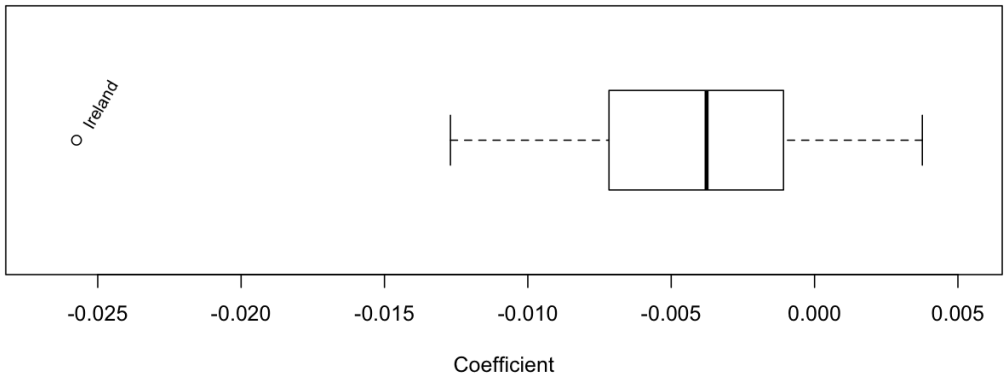


Figure 10: Jackknife Resampling for the interaction term excl. Greece/Japan



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 country is subject to an additional penalty. Nevertheless, investors seem to worry about the dynamics of debt with one exception, namely Japan.

3.3 Debt and Ratings in the European Monetary Union

We now turn to explore 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 the creditworthiness of a respective country (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 country's public debt. 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.*

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 in table 11 of the appendix.

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

p-values in parentheses, coefficients for other macroeconomic controls are not displayed
Stand-alone countries: Australia, Canada, Denmark, Japan, Sweden, UK, USA
EMU core: Austria, Belgium, Finland, France, Germany, Netherlands
GIIPS: Greece, Ireland, Italy, Portugal, Spain

(2011) who find that large parts of the recent downgrades which have been 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 investors expect these countries to be responsible for the bail-out of defaulting members, we should observe a decline in ratings relative to non-EMU industrialized countries. In addition, we include the years between entry to the common currency area and before the onset of the crisis (1999-2008) in order to identify how institutional investors assessed changes in public debt ratios relative to stand-alone countries. 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 effects in order to measure the quantitative difference in the response to changes in debt across the three country groups (EMU core, GIIPS, stand-alone industrialized 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 rather the relative strength of effects on ratings within the respective country group. In this paper, we are primarily

interested in the comparison of investors' reaction to the change of public debt across countries.

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 three country groups and two periods based on the regression in table 11 of the appendix. First, we find on statistical significant change in the credit risk perception for changes in the debt ratio of stand-alone countries 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 (although not significant) which turned into a penalty after 2008. As shown in table 11 of the appendix, our model explains more than 40% of the variation in ratings which is remarkable when considering 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 reveals 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 euro area economies received markedly lower ratings with high debt ratios than other industrialized economies. In addition, we find that euro area countries had already received lower ratings and experienced more pronounced downgrades before they formally introduced the common currency. One may suggest that anticipation effects may explain this finding, since the agreement on the introduction of a common currency was already signed by the European Council in 1992.

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 are 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

In this paper we have explored the relationship between public debt ratios and sovereign ratings across specific country groups. Our results can be summarized as follows: We do not find a debt privilege for industrialized against emerging markets. However, our three specifications (static fixed effects, Difference OLS and Panel GMM) point to a considerable advantage for countries that are able to issue debt in their home currency (original sin hypothesis). Leaving aside the fact that both country groups are treated differently due to their ability to issue bonds in domestic currency the development of general government debt is among the most important variables in explaining the level and changes in a country's rating. As shown by robustness checks, individual countries and observations have a smaller impact on the size of our debt coefficient and they do neither affect the sign nor the significance level to a considerable extent.

Second, we test whether ratings respond to high debt ratios and fiscal deficits or a combination of both. Our findings suggest that the rating reaction to an increase in the public debt ratio is up to three times larger with high ratios of government debt compared to the reaction at low levels of debt to GDP. Thus, it seems that investors do in fact respond to higher levels of debt in advanced economies which underlines the fact that some countries have reached a limit of debt sustainability. The results are strongly driven by Japan and Greece which led us to exclude these countries from the analysis. Interestingly, Japan drives the coefficient downward (high tolerance of debt dynamics) whereas Greece has a negative impact on the debt coefficient (high intolerance which may driven by the actual default).

Third, we have explored whether the euro area has been treated differently by institutional investors relative to stand-alone countries. We find that this is not the case for the core members of the euro area. Hence, these countries seem not to be held responsible for the bail-out of other members. In the periphery, however, we do find a clear difference relative to the stand-alone countries: The GIIPS economies have received a debt privilege

before the onset of the crisis and a debt penalty (of similar size) after 2008. This leads us to conclude that investors have overrated their creditworthiness after the entry and that they have corrected this view during the crisis.

The major contribution of this paper is to explain how institutional investors respond to the dynamics of public debt across country groups in the first place. Two results are worth highlighting: First, the debt penalty increases in a non-linear fashion if the momentum of debt is positive with higher initial levels. Second, if a country belongs to the euro area periphery it faces a higher volatility regarding the perceived creditworthiness. From this, we derive two policy implications: First, there seems to be a high 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 grounds especially with respect to the bail-out clause. The proposal of a sovereign debt restructuring mechanisms seems to be an adequate framework to deal with this problem (also beyond the euro area). Second, the observed response of ratings to a combination of high debt and its positive momentum should be taken as a warning signal for highly-indebted industrialized and lead them to more consolidation efforts before financial markets suddenly loose their faith.

This paper has studied the impact of explicit general government debt on the perceived creditworthiness of countries. So far, we have ignored the relevance of implicit liabilities such as future pensions for civil servants and the obligations from social security systems. Also, the impact of private debt as a share of GDP may explain a sovereign's creditworthiness if we think of the recent bail-outs or takeovers of private banks by governments. Since data availability is still weak today we leave these questions for further research.

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A Appendix

Table 7: Country Sample

	(1) First obs.	(2) Last obs.	(3) No. of obs.
Advanced Countries (18 countries)			
Australia	1993	2012	20
Austria	1993	2012	20
Belgium	1993	2012	20
Canada	1993	2012	20
Denmark	1993	2012	18
Finland	1993	2012	20
France	1993	2012	20
Germany	1995	2012	19
Greece	1993	2012	20
Ireland	1999	2012	14
Italy	1993	2012	20
Japan	1993	2012	20
Netherlands	1997	2012	16
Portugal	1993	2012	20
Spain	1993	2012	20
Sweden	1993	2012	20
United Kingdom	1993	2012	20
United States	1993	2012	20
Emerging Markets (17 countries)			
Argentina	1997	2012	16
Brazil	2000	2012	13
Chile	1993	2012	20
China	1993	2012	20
Colombia	1996	2012	17
Hungary	1997	2012	16
Indonesia	2000	2012	13
Malaysia	1993	2012	20
Mexico	1996	2012	17
Peru	2003	2012	11
Philippines	1996	2012	17
Poland	1997	2012	16
Russia	2000	2012	11
South Africa	2008	2012	7
Turkey	2004	2012	9
Uruguay	2001	2012	12
Venezuela	1998	2012	15

Table 8: Country Sample

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

Table 9: Variance Decomposition

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

Standard errors in parentheses

Table 10: Contingency Table

ΔCCR	*Government Debt Level* $Debt < p(50)$	$Debt > p(50)$	*Total*
$\Delta CCR > p(75)$	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%)
Total	175 (50.4%)	172 (49.6%)	347 (100%)

ΔCCR	Δ*Government Debt* $\Delta < p(25)$	$p(25) < \Delta < p(75)$	$\Delta > p(75)$	*Total*
$\Delta CCR > p(75)$	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%)
Total	82 (23.6%)	164 (47.3%)	101 (29.1%)	347 (100%)

ΔCCR - only level debt p>50	Δ*Government Debt* $\Delta < p(25)$	$p(25) < \Delta < p(75)$	$\Delta > p(75)$	*Total*
$\Delta CCR > p(75)$	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%)
Total	34 (19.8%)	70 (40.7%)	68 (39.5%)	172 (100%)

ΔCCR - only debt level p<50	Δ*Government Debt* $\Delta < p(25)$	$p(25) < \Delta < p(75)$	$\Delta > p(75)$	*Total*
$\Delta CCR > p(75)$	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%)
Total	48 (27.4%)	94 (53.7%)	33 (18.9%)	175 (100%)

Table 11: 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