WHAT DETERMINES BORROWING COSTS OF EU COUNTRIES?

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Working Paper

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Abstract

This paper finds that public debt and a range of other economic variables are surprisingly weakly correlated with sovereign spreads in EU countries. Democratic capital, on the other hand, was a powerful predictor of spread heights between 2003 and 2007, while its relevance disappeared in late 2008, when only credit ratings were correlated with the investors' estimate of default probabilities.

These results suggests that (1) institutional characteristics may sometimes play a central role in determining borrowing costs and (2) investors attach different weights to relevant variables depending on global macroeconomic conditions.

1 Introduction

> *"Our basis of knowledge for estimating the yield ten years hence of a railway, a copper mine, a textile factory, the goodwill of a patent medicine, an Atlantic liner, a building in the city of London amounts to little and sometimes to nothing."*

> — John Maynard Keynes (1936)

What factors, in addition to public debt, determine the borrowing costs of advanced countries? Are any macroeconomic variables more important, and do bond buyers look beyond raw numbers and evaluate the political and institutional characteristics of countries, their historical experience with democracy, or even the democratic traditions in the neighboring countries?

This paper attempts to answer these questions by examining the evolution of sovereign spreads in the European Union since the first group of its member states adopted the common currency. The period covered in this paper includes the months of what has now become known as the Great Recession. As we shall see the behavior of sovereign spreads changed dramatically during the financial crisis.

We know from recent studies that not only fiscal, but also political factors have an impact on credit risk (Baldacci, Gupta, and Mati, 2008).[1] Still, given very similar long-term rates across euro area countries before 2008, it seemed natural to assume that political factors should predominantly be a concern for emerging—not developed—markets.Emerging economies are known to have low debt tolerance: they can easily lose credibility at debt levels that would be viewed in a benign fashion if they were observed in advanced economies.[2]

The assumption that members of the euro zone are credible debtors (reflected in low long-term interest rates and fairly low spreads over German bonds) came under fire in 2008, as the risk associated with holding many of the available assets had to be reevaluated due to a wave of bankruptcies in the United States and elsewhere, and as the spreads of numerous EU countries reached record heights (since the adoption of the common currency). A vigorous debate ensued: some commentators suggested that markets overreacted (De Grauwe, 2009) while others speculated that markets had simply mispriced risk in the past (Greenspan, 2008, p. 507, among others, suggested that there was an "underpricing of risk worldwide" before the crisis).

It is natural that owners of capital should "flee" to safe assets at a time of a crisis. But why would they perceive the risk of country A with a debt-to-GDP ratio of less than 40% to be higher than the risk of country B with a debt-to-GDP ratio approaching 100%[3] when both are members of the same club (EU) and use the same currency (implying that

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[1]An early example of an empirical study aiming to explain risk premia (spreads over LIBOR) is Edwards (1984), who found external debt and debt service to determine the ease of access to credit. Since then, Reinhart and Rogoff (2009) have emphasized that internal debt can be an equally powerful source of future risk.

[2]The notion of debt (in)tolerance is due to Reinhart, Rogoff, and Savastano (2003).

[3]Not even counting the liabilities of local governments within that country, which should probably also fall under "public debt."

there is no currency risk)?[4] Or imagine two countries with debts 23% and 52% of their respective GDP. Why could the latter (Portugal) borrow for 55 basis points less than the former (Slovenia) in December 2008?[5] It is this apparent puzzle that his paper seeks to address.

This paper attempts to identify the sources of risk premia and, in the process, evaluates three distinct hypotheses that have been advanced to explain recent events (complete rationality, late correction and panic, addressed in Sections 3.1, 3.2 and 3.3 respectively). It presents evidence that a number of "obvious" variables that should influence borrowing costs of sovereigns (like debt levels and budgets deficits) seem to have often mattered less than institutional quality (or the reputation resulting from a long democratic tradition).

Section 1.1 gives a brief description of international capital markets, Section 2 sets the stage by giving more background about the European bond market, Section 3 briefly evaluates unsatisfactory hypotheses, Section 4 introduces a simple model of the probability of default, Section 5 describes the dataset used for testing the preferred hypothesis, Section 6 presents the empirical results and Section 7 concludes.

1.1   What can we learn from sovereign spreads?

Countries can borrow from foreign and domestic institutions by issuing (often, but not always, long-term) bonds but no two countries pay the same interest, even if they are economically and politically similar. Conversely, countries with different historical experiences and unequal macroeconomic conditions sometimes borrow at similar rates.

The usual explanation is that investors demand payment for additional risk, so long-term interest rates vary because countries have different *probabilities of default*. In the efficient market view, all market participants process available information in order to assess these probabilities; while individual estimates may differ, those institutions that are too optimistic will go out of business over time and the average guess reflected in the official market interest rate will be correct. Participants with biases could in principle allow arbitrageurs to make temporary profits but the official rate should be an accurate estimate of the objective probability of default, given the past and present performance of a particular country.

One source of noise that needs to bring modesty on any analysis of interest rates is that disentangling *currency risk* from *default risk* can be extremely challenging, since countries often issue debt in their domestic currencies.[6] Beliefs about the currency can be an important source of interest rate variation: if the currency in which the debt is issued is weak or expected to depreciate in the future then investors charge higher premia. Even though exchange rates models are notoriously unreliable,[7] many investors engage in bets against (or "for") particular currencies, partly because they are able to charge

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[4]This is an interesting question in the abstract, but actual countries can be easily substituted in the text instead of letters. Slovakia (A) and Italy (B), for example, would work.

[5]Naturally, in addition to the present ratio of debt to GDP, the trend of its growth (or a possibility that it may shrink) is also important. Empirical evidence presented later in the paper will generally suggest, however, that there is little — if any — correlation between budget deficits and borrowing costs.

[6]This paper uses the most reliable way of dealing with this issue by focusing on a currency union; the obvious cost of this approach is it limits the sample size.

[7]The widely-known Meese and Rogoff (1983) result is that a random walk performs as well as any model of exchange rates.

liquidity premia for the more obscure currencies.

A currency union is a particularly useful sample for studying borrowing costs because relative currency risk does not exist: all countries in the union have the same currency risk, so if the long-term rates of two countries are compared, they reflect the difference in the probability of default. Relative rates (or spreads with respect to the strongest member of the union) do not move because of changing expectations of the currency outlook.

The sources of the variation of long-term interest rates in the eurozone, then, should simply measure the probability of default, assuming, of course, that German debt is riskless. (All EU countries are examined in this paper but EMU membership is generally a control variable in the empirical analysis.) This paper explores (1) why sovereign spreads vary across Europe and (2) why they rose sharply late 2008.

2 Motivation

"When an accident is waiting to happen, it eventually does."

— Reinhart and Rogoff (2009)

The rapid increase in the spreads of sovereign debt within the euro area has recently attracted considerable attention. De Grauwe (2009), for example, views the rising interest rate differentials as the result of a "panic in the financial markets" and argues that it "is difficult to understand ... why the market (and the rating agencies) forecast a default of the Spanish government debt, while they do not forecast trouble for the UK, which has a debt build up similar to Spain's and a more serious banking problem."[8] In February 2009, Italy's Finance Minister Giulio Tremonti called for the creation of an "EU bond,"[9] almost certainly motivated by the rising spreads, knowing that his country would pay less for borrowing if the bonds were explicitly guaranteed by the whole monetary union.[10]

On the other hand, rising yields can be viewed in a positive light if they impose discipline on governments (Bernoth, Hagen, and Schuknecht, 2004). Still, it can be argued that fiscal restraint is not appropriate during a crisis (particularly if the latter is demand-driven) so budgetary discipline could actually be counterproductive.

2.1 Other signs of turmoil

At the end of March 2009 the United Kingdom was not able to sell all of the bonds it tried to auction (only 93% were successfully sold). By 2010, a group of prominent economists warned the British government that "[i]n the absence of a credible plan, there is a risk

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[8]His argument that markets simply made unreasonable predictions in 2009 led him to conclude that the "ECB should privilege the buying of Irish, Greek, Spanish and Italian government bonds to eliminate the distortions and the externalities" caused by the large spreads.

[9]"Now my feeling—I am speaking of a political issue not an economic issue—is ... we need a union bond" (Giulio Tremonti, quoted in Willis, 2009).

[10]Still, some argue that, in spite of unfortunate timing, the creation of an EU "super-bond" has its appeal because "a common eurozone market for government debt would be a powerful rival to the US Treasury market and it could bring substantial financial and economic benefits" (Münchau, 2009).

that a loss of confidence in the UKs economic policy framework" which would result in rising long-term interest, possibly accompanied with currency instability.[11]

In the summer 2009, Hungary was able to sell its five-year (euro denominated) bonds at 6.7% (in Hungarian Forints the rate would probably be around 10%). This rate suggested at least a 3 percent per-year probability of default, even though the country had recently been bailed out by the International Monetary Fund.

A month later, Paul Krugman warned that Austria's default was a real possibility due to its exposure to Eastern European banks, magnifying the fears that the global crisis could lead to a total collapse of the financial system should a catastrophic scenario materialize in Europe.

Compared to that worry, it is almost mundane that Poland was able to borrow at strange rates in mid-2009. Specifically, its rating was A at the time, but its long-term rates on ten-year bonds were 6.3%, meaning and it had to pay 1% more per annum than software firm Oracle which had the same rating. Although comparing countries to companies can be very misleading, countries have multiple possible sources of funding, both domestically and internationally, and they do not disappear from the map because of a bankruptcy (reputational concerns, then, are stronger than in the corporate sphere where a bankrupt company can simply be seized or liquidated). Countries do default but corporate bankruptcies are on average much more common.

2.2 Could the hight of the spreads be warranted?

Skeptics of the European Monetary Union such as the late Milton Friedman would would probably remark that even during the crisis the spreads of numerous EU countries were too low. In the debates about the sustainability of the monetary union, those who found it to be an overly ambitious project speculated that the euro zone would disintegrate after a major global economic crisis.

Martin Feldstein has on numerous occasions argued that Europe's monetary union is too heterogeneous and said at the January 2009 American Economic Association's meeting that "the past decade has been, until recently, a lucky time in Europe," adding that "the possibility of one or more countries choosing to withdraw from the EMU cannot be ruled out" (quoted in Wall Street Journal, 2009).[12]

The heterogeneity of countries in Europe stems to a large degree from a sentiment that *"every country should determine for itself what kind of economic and social system it wants."*[13] It follows that some countries will be more inclined than others to borrow large quantities of money on international markets, hoping to achieve outcomes that markets by themselves may be unable to provide.

One example is welfare or, more narrowly, payments to seniors through a public pension system. Developed countries, partly as a result of democratically chosen policies (and possibly a taste for altruism or solidarity), tend to have publicly funded pension

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[11]The sentiment was expressed in a recent letter by Besley, Davies, Goodhart, Marcet, Pissarides, Quah, Desai, Turnbull, Attanasio, Meghir, Vickers, Muellbauer, Newbery, Pesaran, Rogoff, Sargent, Sibert, Wickens, Bootle, and Rosewell (2010).

[12]It should be noted, however, that as of late 2009, the euro has actually attracted many buyers and the Economist explained this development in June 2009 by writing that "the financial crisis has made the euro look more alluring."

[13]As articulated by Cooper (1990), an American.

systems which can function well if the number of pension recipients is much smaller than the number of workers. Problems arise when the constituency of older individuals expecting pensions becomes so large that the pressures on the government budget make it unable to pay benefits without running persistent deficits, assuming constant tax rates. This can first lead (old and potential) lenders to question the sustainability of the system and could eventually result in outright insolvency. Many Western European countries indeed face difficult choices due to their aging populations.

2.2.1 The role of the Euro

The deepening of the Euro bond market has been described as beneficial to "the entire world" (Rogoff, 2005), but it also means the EU countries that have not yet joined the monetary union can be viewed as less reliable and more risky. This skepticism could be justified not only due to the volatility of their national currencies but also due to the fact that a common currency encourages trade[14] and due to lower pressures to respond quickly to the crisis. For example, Darvas and Pisani-Ferry (2008) warned that "a new political and economic divide within Europe may emerge" because non euro-area EU members (1) are macroeconomically vulnerable and (2) have had slow policy reactions to the crisis.[15]

Conversely, even the members of the monetary union can lack credibility due to the absence of fiscal coordination or of some kind of federal institution which would be able to make financial choices (specifically, decisions to bail out an unlucky or irresponsible member of the union) quickly and without the need for approval of national governments.

2.2.2 A rational flight to safety

Not surprisingly, when frequency and volume of private transactions decrease (as happens during financial crisis), bonds of (some) governments become more popular among investors than corporate bonds. If most investors interested in holding euro-denominated bonds simply stopped buying other than German debt then the rise of spreads across the European Union would be a natural consequence of that choice. Indeed, consistent with the hypothesis that risk tolerance fell dramatically in 2008 is a report by the ECB (2009) which states that loans of monetary and financial institutions to the private sector contracted in early 2009.[16]

2.2.3 An implicit guarantee?

Naturally, investors may expect that countries in distress (having difficulties with interest payments) will be supported by the large (or macroeconomically healthier) members of the monetary union. One source of the 2008 increase in rates (and spreads) could be that this expectation was terminated (or that the likelihood of bailouts decreased).

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[14]Transaction costs are lower (e.g. Alesina and Barro, 2002; Rose, 2001).

[15]Alesina and Grilli (1993) were already skeptical about the consequences of a "multi-speed" European Monetary Union.

[16]"In the first quarter of 2009 the annual growth rate of MFI credit to general government increased significantly to stand at 5.7%, up from 1.7% in the previous quarter" (ECB, 2009, p.21).

2.3 A word of caution

It is easy to over-interpret events, find explanations in random shocks, or speculate about the importance of history.

Oakley and Parker (2010), for example, explain the underperformance of British bonds in late 2009 and early 2010 by the fact that the result of parliamentary elections may not be a sufficiently decisive victory by the Tories: while it is true that governments can act more quickly when their legitimacy is indisputable and election results are decisive, it is far from clear that markets punished the UK because of the then recent opinion polls. Global factors, or national nonpolitical factors could have easily been equally, if not more important, than a collection of surveys.

There are also frequent speculations in the media about what specific macroeconomic or historical indicators are important to creditors:

> *Italy has a debt-to-GDP ratio slightly above 100 percent, yet its borrowing costs are manageable, in part because the country hasn't defaulted since the Benito Mussolini era. That history, plus the perceived protection that comes from being part of the euro zone, helps Italy sustain its debt burden* (Kaiser, 2009).

The above analysis may be correct but could potentially mislead since its list of variables central to investors' choices may be incomplete.

This paper does not argue that it is not important to monitor movements of interest rates, that investors make systematic mistakes (or that panic is in principle impossible and therefore the debt markets must be a perfect reflection of the real financial health of the sovereigns). Fearful investors could account for some part of the observed spreads, given that preferences for debt levels, institutional quality and credit ratings appear to be not to be either constant or the same everywhere. This paper shows that there are *historical* and *institutional* factors that are correlated with long-term interest rates and could, with caution, be used to shed light on the divergent paths of the EU countries' rates during the crisis.[17]

It would be easy to assert that investors are irrational in stormy times. But their beliefs appear to be (at least to a large extent) based on relevant data.

3 Four hypotheses

3.1 Rationality in bond markets

The first possibility is that markets reacted rationally to the deteriorating macroeconomic situation throughout Europe in 2008 and incorporated the price of the newly-emerging risk of default into sovereign spreads. In other words, markets are always efficient.

But consider a simple coordination game, where two investors (A and B) can choose to lend or flee. If both players choose to lend, their payoff is θ. If both of them flee, their payoffs are zero. If player A lends and player B flees then payoffs received are $(\theta - 1, 0)$.

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[17]See, for example, Rodrik (1991); Alesina, Ozler, Roubini, and Swagel (1996) for evidence that political instability leads to lower growth rates (which will be related to long-term rates in Section 4).

Alternatively, they are $(0, \theta - 1)$ if player A flees and player B lends. There is a unique Nash equilibrium (lend,lend) if θ (which can be interpreted as the degree of confidence or absence of credit risk) is greater than 1.[18]

Coordination problems arise when $\theta \in [0, 1]$.[19] It is natural that the risk profile of county i (θ_i) could fall below one because of a global crisis, particularly if θ is a function of debt, deficits, inflation and output. In such a case, a speedy departure of investors from country i can be a rational response to new events and information.

This model of rational behavior fails a simple empirical test: consider the example of Germany and Greece. From 2000 to 2009 Greece grew faster (or fell more slowly) than Germany (see Figure 1). But it is clear from the long-term rates that $\theta_{GERMANY} > 1$ while, given rise in Greek rates in late 2008, it is difficult to argue that θ_{GREECE} remained above one. Given our intuition about the composition of θ, it would appear that this hypothesis cannot adequately explain what happened in the capital markets between 2008 and 2009.
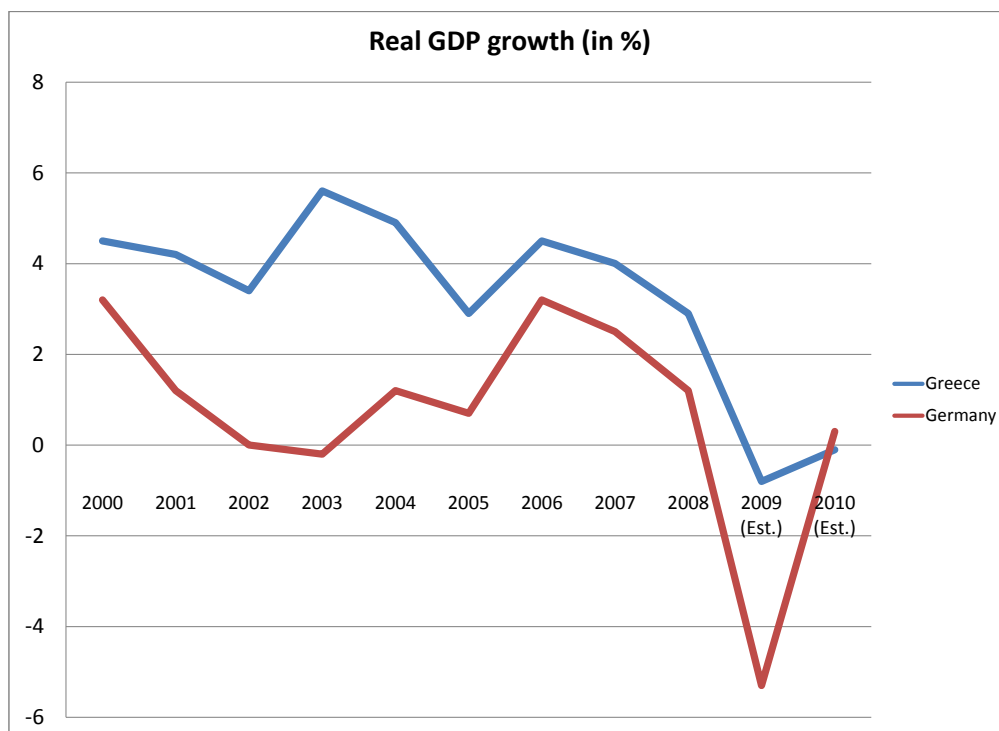
Figure 1: Real GDP growth in Greece and Germany (Source: IMF)

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[18]Sale of bonds by the government becomes impossible as $\theta \to 0$.

[19]Trivially, borrowing is impossible if $\theta \leq 0$.

3.2 Return to normalcy?

A different hypothesis is that we observed a "return to normalcy" in the late months of 2008. According to this view, risk had been underpriced in the past and there was a correction in the market for government debt once the the financial crisis rang a wake-up bell.[20]

Given that the European Union lacks fiscal coordination and the demographic trends in some of the member states, the high spreads observed in later 2008 and early 2009 could, in fact, not reflect panic[21] but instead reflect the real situation and creditworthiness of some countries (which may have enjoyed a "free ride"—low borrowing costs—during the global boom period when their debt had seemed to be low-risk). This hypothesis is supported by the fact that spreads of corporate bond yields over government bond yields were astonishingly low in the past (ECB, 2004).[22]

This hypothesis by itself, however plausible, does not explain why sovereign spreads in the EU spiked in late 2008 but then decreased almost across the board by mid-2009. A volatile behavior of this sort could indicate that the market is still trying to find the correct price for risk, but it is difficult to argue that we witnessed normalcy in both 2008 and 2009.

3.3 Panic

The third hypothesis is that panic (or other irrational behaviors, like herd mentality or excessive pessimism) explain the widening of spreads in 2008 and their subsequent narrowing.

It has since been argued that spreads may have narrowed in the second half of 2009 because of increased appetite for risk or as a direct consequence of ECB liquidity provision (Hugh, 2009), so perhaps the height of spreads in 2008 simply reflected extreme risk aversion but no panic. This hypothesis is possibly the hardest one to evaluate unless we discover "historical brain imaging data" which could reveal whether fear really pushed investors to act in way they would not have chosen otherwise.

3.4 Multiple-regime investing

The final (fourth) hypothesis is that investors operate in various regimes. At times, "soft indicators" like quality of democratic institutions are an important determinant of their willingness to lend, but in other times, it is not. Reputation of countries (which is sticky) is not always equally important—just as the importance of macroeconomic variables in not fixed. (This path of reasoning is certainly not revolutionary: Glode, Hollifield, Kacperczyk, and Kogan (2009), for example, show that investor rationality is time-varying[23]) This is the hypothesis that is most plausible given recent empirical

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[20]One possible answer is that low spreads were a logical consequence of the reduction of home bias. ECB (2004) indeed reports that the home bias of euro-area investors was reduced by the adoption of the common currency.

[21]Contrary to De Grauwe (2009).

[22]An important factor was decreasing corporate leverage and the solvency implications.

[23]They present evidence that the marginal investor in mutual funds does not behave in the same fashion across different market conditions.

evidence and is explored in the rest of the paper.

4   Simple model

The following static model is a slight modification of the framework used in Baldacci, Gupta, and Mati (2008). It shows why democratic institutions should lead to lower borrowing costs through lower long-term rates.

Definition 1. *In a country populated by N agents with a simple economy where all consumption is chosen by the government, let D denote total government debt, $c = Y/N$ the per capita consumption level, r the market interest rate, g the domestic growth rate and Γ the cost of default. Let $U(c, D, \Gamma)$ be the utility function that the government seeks to maximize.*

Assumption 1. *$U_c(\cdot) > 0$, $U_\Gamma(\cdot) < 0$, D and Γ are non-negative. The behavior of U_D is more subtle: for small or moderate values of D and $g > 0$ (particularly when $(g - r) > 0$), $U_D(\cdot) > 0$ because smooth consumption is preferable to sudden shocks. When $D \to Y$,[24] U_D is no longer positive because the ability to borrow in the future may disappear (consumption smoothing becomes impossible). Governments are assumed to be aware of the trade-off between debt-financed consumption and easy access to capital markets.*

Assumption 2. *Although the model is static, its iteration would require $C_t \leq Y_t + (D_t - D_{t-1})$, where C is the aggregate consumption.*

When $D \ll Y$ a country wants to borrow since it leads to higher utility (ceteris paribus). If the debt reaches a high level, however, the (real and perceived) probability of a default increases. There are usually high costs associated with a default[25] (such as seizure of assets, damaged reputation and a more difficult access to global capital markets), but even such a drastic action may pass the cost-benefit test in some situations. Some countries could expect that creditors will not be able to enforce their rights and thus perceive the costs of default to be relatively small (see Shleifer, 2003, for an excellent discussion of the issues involved).[26]

Naturally, countries can simply owe so much that the expected sum of various costs borne after a default will be smaller than the present value of the debt itself ($D > E(\Gamma)$). If P is the probability of default then the rational government will indeed suspend repayments immediately:

Prediction 1. $D > E(\Gamma) \Rightarrow P = 1$. *Conversely, if $D < E(\Gamma)$ then $0 \leq P < 1$.*

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[24] For debt-intolerant countries, this condition becomes $D \to Y/2$ or even $D \to Y/3$.

[25] I ignore the costs levied on neighboring countries, but it obviously does not follow that they do not exist or are not relevant. A country whose neighbor has defaulted will generally suffer for a variety of reasons, especially the introduction of a belief that the whole geographical area may be in trouble. These "regional costs" are neglected in this paper, but merit further study.

[26] For a more formal introduction to debt as a contract, the reader is referred to Hart (1995). For a description of reputational (implicit) contracts, see Bulow and Rogoff (1989).

$E(\Gamma)$ and, implicitly, the likelihood of a default depend on the quality of domestic financial institutions, as shown in (as shown in Gennaioli, Martin, and Rossi, 2009). Given the the first definition and assumption, we can define the probability of default with the following equation

$$P = \begin{cases} 1 - min\left\{1, \frac{E(\Gamma)}{D}\right\} & \text{if } D > 0, \\ 0 & \text{if } D = 0. \end{cases} \tag{1}$$

It is clear that $\left.\frac{\partial P}{\partial E(\Gamma)}\right|_{P>0} < 0$, $\frac{\partial P}{\partial D} > 0$ and $\left.\frac{\partial P}{\partial E(\Gamma)/D}\right|_{P>0,(E(\Gamma)/D)<1} < 0$.

Assumption 3. *Countries are never rewarded for defaulting. In other words, P is a probability function $(\frac{E(\Gamma)}{D} \geq 0)$.*

Definition 2. *Let $f(R) = E(\Gamma)$ be an increasing and concave loss function where R is the reputation of the country, given by the mapping $\phi : c \times K \times \Lambda \rightarrow \mathbb{R}^+ \cup \{0\}, (c \in \mathbb{R}^+, K \in [0,1], \Lambda \in \mathbb{R}^+)$. The country's reputation is a function of the per capita output (c), institutional quality (or democratic capital, denoted K) and the budget deficit (Λ).*

Assumption 4. $R_c(\cdot) > 0$, $R_K(\cdot) > 0$ and $R_\Lambda(\cdot) < 0$.

It is natural that richer countries are more credit-worthy and more democratic countries are more likely to keep its promises. Deficits, on the other hand, can deplete a country's reputation over time since they signal a lack of discipline and (plausibly) an unsustainable fiscal path (particularly if g is small). The definition and assumption above leads us to this probability of default equation

$$P = \begin{cases} 1 - min\{1, \frac{f(\phi(c,K,\Lambda))}{D}\} & \text{if } D > 0, \\ 0 & \text{if } D = 0. \end{cases} \tag{2}$$

where $\left.\frac{\partial P}{\partial c}\right|_{P>0} < 0$, $\left.\frac{\partial P}{\partial K}\right|_{P>0} < 0$, $\frac{\partial P}{\partial D} > 0$ and $\left.\frac{\partial P}{\partial \Lambda}\right|_{P>0} > 0$. It follows that a country that is able to produce more (or has been democratic for a longer period of time) is less likely to default and should be required to pay lower interest on its loans. Countries with high debt level and large budget deficits, on the other hand, are more likely to default on their debt and it is natural for investors to be less willing to lend (or to be only willing to lend at higher rates).

Prediction 2. *If investors can accurately predict the probability of default of country i and the debt of a benchmark country (Germany, for the purposes of this paper) is riskless then investors will demand at least a return of at least p_i percent per year. If there is a very small secondary market, a liquidity premium may be required: in that case the required interest rate will be $P_i + \epsilon_i$ (for some $\epsilon_i > 0$).*

Prediction 3. *For two countries i, j if $c_i = c_j, \Lambda_i = \Lambda_j, D_i = D_j$ and $K_i < K_j$ then $R_i < R_j \Rightarrow P_i > P_j$.*

Prediction 4. *For two countries i, j if $K_i = K_j, \Lambda_i = \Lambda_j, D_i = D_j$ and $c_i < c_j$ then $R_i < R_j \Rightarrow P_i > P_j$.*

Prediction 5. *For two countries i, j if $c_i = c_j, K_i = K_j, D_i = D_j$ and $\Lambda_i < \Lambda_j$ then $R_i > R_j \Rightarrow P_i < P_j$.*

Prediction 6. *For two countries i, j if $R_i = R_j$ and $D_i < D_j$ then $P_i < P_j$.*

Remark 1. *It is worth noting that governments may in reality not wish to maximize $U(c, D, \Gamma)$: considerations like rent extraction or excessive spending before elections are ignored in this model.*

Remark 2. *In some countries, the electorate can tolerate high debt levels, while in other countries there may be political costs associated with loose fiscal policy. In the latter case, government officials could be motivated to decrease debt by reelection concerns rather than by rising borrowing cots alone.*

5   Data description

The long-term interest data (from which spreads can be calculating by subtracting the rate of Germany from the given country's 10-year rate) comes from the European Central Bank.

Period	N	Average rates	Std. Dev.	Min	Max
2003-2007	26	4.51	0.88	3.89	7.13
2008Q1	26	4.66	0.94	3.93	7.70
2008Q2	26	4.99	0.93	4.22	8.20
2008Q3	26	5.10	0.99	4.13	7.96
2008Q4	26	5.00	1.55	3.19	9.10
2009Q1	26	5.46	2.78	2.89	14.32
2009Q2	26	5.60	2.83	3.32	14.50

Table 1: Summary statistics I: Long-term interest rates

The average long-term rates of EU countries from 2003 to 2007 (including the countries that joined the union in 2004[27]) was 4.51% and rose gradually to 4.66%, 4.99%, 5.10% and 5% in the first four quarters of 2008 and 5.46% and 5.60% in the first two quarters of 2009 (as shown in Table 1). The consequences of the changing financial circumstances are also apparent in the rising maximum (quarterly) average rates which approximately doubled between the first quarter of 2008 and the second quarter of 2009.

Average spreads for the same sample are shown in Table 2. They rose threefold from early 2008 to mid 2009 and their standard deviation increased from 0.94 to 2.83 and the standard deviation rose steadily from the second quarter of 2008.

The data on the current account deficit, foreign direct investment, trade, government expenditure and government debt come from the World Development Indicators database. The measures of bank soundness (bank liquid reserves to assets) comes from the IMF. The data on budget balance, unemployment and total population comes from

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[27]Excluding Estonia which has a small debt and "there are currently no suitable long-term government bonds available on the financial market" according to ECB.

Period	N	Average spreads	Std. Dev.	Min	Max
2003-2007	26	0.62	0.88	0	3.24
2008Q1	26	0.73	0.94	0	3.77
2008Q2	26	0.74	0.93	-0.03	3.95
2008Q3	26	0.84	0.99	-0.13	3.70
2008Q4	26	1.51	1.55	-0.30	5.60
2009Q1	26	2.39	2.78	-0.18	11.24
2009Q2	26	2.28	2.83	0	11.18

Table 2: Summary statistics II: Average spreads

the Economist Intelligence Unit. Credit rating data were transcribed from the Standard&Poor's website.[28]

An unusual variable in the setting of government bonds is democratic capital, which Persson and Tabellini (2009) use to measure a nation's depth of democratic institutions and the incidence of democracy in its neighborhood.[29] Democratic capital is defined on the unit interval as a depreciable asset that is accumulated every year a country remains democratic (as defined by a positive score in the Polity IV database). Revolutions, logically, destroy democratic capital. While Persson and Tabellini (2009) use two depreciation rates, $\delta = .99$ and $\delta = .94$, the latter is generally used here in order to avoid making the assumption that democracy is extremely persistent. The binary variable *socialist legal origin* comes from the same dataset.

All these variables, which may in some ways have an impact on a country's borrowing costs are summarized in Table 3.

5.1 Recent history

For almost all countries, 2007 was a calm period and there was only moderate activity in the first three quarters of 2008. But in a time of crisis, investors take their hands off risky assets, including the debt of countries that do not reach the German standard. Spreads were quite large in the first quarter of 2009 but fell moderately in April and May 2009. Long-term interest rates of Ireland and Greece exceeded 5%, suggesting that the implicit likelihood of their default may have been higher than 2% per year.

Another powerful effect of the crisis on the bond market was the rapidly rising standard deviation of average long-term rates. From 2003 to 2007, the standard deviation of average rates across EU was 0.88—in the last quarter of 2008 it rose to 1.55 and reached 2.83 in the second quarter of 2009 (Table 1).[30]

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[28]Ratings are generally based on output per capita, strength of government balance sheets, likelihood of a crisis and institutional maturity. The first two variables are often included and reported in regressions but having *rating* as a separate variable is useful because it is an easily accessible statistic that many investors follow and take seriously.

[29]In their sample of 150 countries, they find that physical and democratic capital have been reinforcing one another in the past 150 years.

[30]It is appropriate to ask whether spreads rose because of the decrease in German long-term rates: their fall does explain some of the rise in spreads, but certainly not all of it.

Variable	Obs	Mean	Std. Dev.	Min	Max	Source
Average between 2003 and 2007						
CA balance	26	-2.30	5.83	-12.37	10.37	WDI
FDI	26	19.20	66.00	0.83	341.97	WDI
Trade in services	26	29.14	31.88	10.26	169.30	WDI
Government expenses (% of GDP)	25	36.48	5.86	24.81	45.40	WDI
Government debt	23	56.75	32.97	4.33	126.39	WDI
Exports	25	54.41	28.75	22.22	151.95	WDI
Bank capital to assets ratio	25	6.87	1.98	3.13	10.98	IMF
Bank liquid reserves to assets	25	5.68	9.84	0.38	48.10	IMF
Average between 2008 and 2009 (estimated)						
Budget balance	26	-3.85	2.93	-10.26	0.80	EIU
Unemployment	26	7.81	2.49	3.03	14.91	EIU
Total population	26	19.00	23.41	0.42	82.77	EIU
As of 2009						
Credit rating	26	3.62	1.24	1.00	5.00	S&P
Euro (Binary)	26	0.62	0.50	0	1.00	EU
As of 2000						
Democractic capital	26	0.38	0.27	0	0.81	P&T

Table 3: Summary statistics III

6 Results

6.1 Pre-crisis period (2003-2007)

6.1.1 Long-term rates

Table 4 shows a collection of simple regressions, where average long-term interest rates (between 2003 and 2007) are on the left hand side and some combination of variables (public debt, current account balance, inflation[31] and the binary euro variable) is on the right hand side. The simplest univariate regression (1) shows that there was no correlation between public debt on its own and long-term rates in the 23 EU countries for which the data is available. When inflation added to this simple regression, public debt remains uncorrelated with interest rates, while high inflation is associated with higher rates. These two regressions do not control for currency, so the premium charged because of currency risk must bias the coefficients in the first two regressions.

Regressions 3 through 5 include a control variable that is equal to one if a given country is a member of the euro zone and equal to zero otherwise. When public debt and this binary variable are the only two independent variables, *Euro* is negatively correlated with long-term rates, while public debt remains uncorrelated with them. When the current account balance is also added to the linear regression (regressions 4 and 5), it is not significantly associated with long-term rates (and does not even have the same sign, though a reasonable expectation would be that surplus countries should pay less to borrow). In regression 5, debt is positively correlated with long-term interest rates, euro area membership is negatively correlated and inflation is positively correlated with borrowing costs (controlling for the current account balance).

On average, countries that have adopted the euro paid 0.88 percentage points less per annum for every euro they borrowed (before the crisis), compared to countries with other currencies. Under this specification, a three percentage point increase in inflation would be associated with a premium increase of more than 100 basis points (a fairly important effect). Overall, almost 60% of interest rate variation is explained by the variables included in regression 5 (but the regression is obviously not bias-free, since few independent variables are included and it is not inconceivable that large debt and inflation could be correlated; in an ideal world, at least from a "Brussels perspective" euro area membership and debt would be negatively correlated, but this has not necessarily been the case).

In Table 5 more control variables are introduced. Specifically, almost all regressions include annual GDP growth, PPP GDP per capita, the percentage of GDP devoted to exports, and half of the regressions control for total government size (measured in terms of public expenses over GDP) and the socialist legal origin. If the post-communist countries are different in ways that are not captured by macroeconomic variables, this control variable should capture some of these historical or institutional factors.

In none of the regressions in Table 5 is public debt significantly correlated with long-term rates (although the sign of its coefficient is always positive, as one would expect). Exports, GDP growth and government size are also uncorrelated with ten-year interest rates. Interestingly human capital appears to be uncorrelated with them as well, although

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[31]Given the findings of Min (1998), inflation and trade are included as independent variables in some regressions.

one would expect countries where the population is on average more educated to have better growth prospects and to be less reliant on financing from abroad. The only truly important variable in Table 5 is euro area membership which is negatively and generally significantly correlated with borrowing costs of sovereigns in the European Union.

6.1.2 Sovereign spreads

Table 6 examines if macroeconomic variables (along with total population and socialist legal origin) were correlated with average spreads before the crisis (between 2003 and 2007). Consider regressions 5 through 7: if we control for euro area membership, average current account balance, average budget deficits, the socialist legal origin, inflation (adding the share of bank reserves in the domestic banking system that are liquid into regression 6, and total population into regression 7), then a 10 percentage point increase in public debt is predicted to be associated with approximately hundred basis points increase in spreads. Interestingly, country size does not appear to be correlated with sovereign spreads, just as budget deficits or surpluses have no predictive power in these linear regressions. As before, EMU members have an advantage and on average have lower spreads.

Democratic capital

The story becomes more interesting in Table 7, where democratic capital is introduced as an independent variable (average spreads before the crisis remain on the left-hand side of the regressions). In 5 out of 6 regressions, democratic capital is significantly and negatively correlated with sovereign spreads and the size of the coefficients is orders of magnitude larger than the coefficients on other independent variables.

Consider Slovakia, which has a democratic capital of 0.35; in order to reach the Spanish or Portuguese level of democratic capital, it would need to more than double its current democratic capital. That may seem extreme, but reaching Slovenia's level of democratic capital may be a realistic prospect. To do so, Slovakia's democratic capital would need to rise by 0.08. Even this small increase in democratic capital is associated with a significant decrease in borrowing costs according to the regressions in Table 7: holding public debt, euro area membership, current account balance, bank characteristics and total tax rate constant, the increase in democratic capital of this magnitude is predicted to lead to spreads lower by 30 basis points.

This is a very accurate prediction: according to the European Central Bank data, the average difference between Slovak and Slovenian spreads between December 2008 in December 2009 was 31.8 basis points.[32] Admittedly, the model performs less well when differences in democratic capital are huge. Spain has more than twice as much democratic capital Slovakia, so the model predicts that the Spanish spreads should be lower than Slovak spreads by approximately 1.5 percentage points. That almost happened in July 2006, but in general Spanish spreads were no more 1 percentage point lower than Slovak

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[32]Here we are checking whether pre-crisis data can possibly be used to predict spreads in 2009: to some extent, it can, but usual limitations of simple regressions apply. The point is to check whether some variables perform better than others, and it is democratic capital that at least comes close to being a satisfactory "guide" to differences between sovereign spreads.

spreads between 2003 and 2007 (and they averaged 73 basis points between December 2008 and December 2009).

6.2 The crisis hits (2008Q4)

Let us return to the framework without democratic capital and check whether, and to what degree, economic variables influenced spreads in late 2008. Inflation and euro area membership were significantly correlated with sovereign spreads before the crisis (even when democratic capital was held constant) but even these two variables fail to predict the behavior of sovereign spreads in the fourth quarter of 2008. As can be seen in Table 8, almost no variables were significantly correlated with sovereign spreads at that time. The only consistent predictor of spreads in late 2008 were credit ratings. The coefficients are fairly large: an improvement from a single A rating to AA (or, equivalently, from from AA to AAA) was associated with spreads lower by 90 to 120 basis points (holding constant public debt, euro area membership, current account balance, budget balance and inflation).

Table 9 also includes democratic capital as one of the independent variables: under simple specifications, democratic capital remained significant even in late 2008 but when the control variables like inflation and GDP growth are added, democratic capital is no longer correlated with sovereign spreads (in this specific time window). Interestingly public debt, euro area membership and budget balance were not associated with sovereign spreads in 2008. It is possible, however, that investors did pay attention to credit ratings which enter the regressions with significant and negative coefficients.[33]

6.3 The weight of credit ratings

In Table 10, dependent variables change in every column. For example, spreads in the first quarter of 2008 are the dependent variable in regression 1; regressions are run for the following 5 quarters (with the same set of independent variables on the right-hand side). Democratic capital, debt, EMU membership, current account balance and exports are held constant to check whether credit rating was correlated in with spreads in early 2008. In fact, its correlation with spreads depends on the specific time window.

In the third quarter of 2008, credit rating started to matter significantly (one move up the grading scale was associated with lower spreads by 53 basis points, ceteris paribus). In the following quarter, credit rating remained significant (but its effect rose more than twofold to 124 basis points) and in the first quarter of 2009 it stayed significant and its coefficient exploded to 265 basis points. No other variable included in these regressions was significantly correlated with sovereign spreads. While the equations are problematic (some correlation between independent variables cannot be avoided), the results could be interpreted as suggesting that the importance of a good credit rating increased dramatically during the toughest period of the financial crisis.

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[33]Naturally, credit ratings are correlated with total public debt, and even with democratic capital, as can be seen in the last two figures.

7 Conclusion

In a way, it is a puzzle that some variables (most conspicuously, democratic capital) can be very important in one period (2003-2007) and become virtually irrelevant only months later. The regressions alone do not "prove" that tastes (preferences of creditors) have changed, since an obscure omitted variable could, in principle, be the true explanation of the observed results. The evidence does suggest that political institutions matter even if they fail to achieve their stated goals, like capping total debt. A reasonable conjecture is that their impact would be even stronger if governments were less prone to overspending and willing to live within (or sufficiently close to) their means.

The results' implication that democratic capital may (at least sometimes) be even more "guilty" of shaping the height of sovereign spreads than the usual (purely economic) suspects is in some sense disturbing. If democracy (checks and balances, contained corruption, regular election and so forth) make investors willing to lend, where will the incentives to maintain debt levels below 60% of domestic GDP come from?[34] An institutional reform introducing truly painful sanction could in theory discipline governments but the political economy of the "punishment process" is unpredictable and could easily degenerate due to exceptions, extensions for reaching the required fiscal goals or even threats on the part of those who break the rules and know that nobody desires a protracted conflict.

A simple model that ignores political factors and focuses mostly on macroeconomic variables (its only political factor is reputations costs stemming from a default) does not perform well : budget deficits were not correlated with spreads (or long-term interest rates) at all, and public debt was only sometimes truly correlated with spreads, often with negligible coefficients.

The advantages of studying a monetary union are appealing. The fact that currency risk becomes a non-issue in the analysis of spreads motivated this paper in the first place. However, the unavoidable cost is that non-economic issues come into play almost by definition in a union created not by the market but by public officials. There may, for instance, be implicit expectations that the members of the union will "stick together" if one of the countries becomes insolvent; if such expectations (especially on the part of governments) exist, then the costs of default are lower in equilibrium and a default may actually inflict contained losses on creditors if a country is (to a large enough extent) bailed out: these political economy considerations make the analysis of the market for government bonds much more challenging and a satisfactory solution of the game played between stronger and weaker member states may require a book-length treatment.

In spite of these complications, some lessons can be learned from the empirical results. This paper rejected simple explanations of the explosion of spreads in the EU in late 2008 and presented evidence that creditors care about economic and non-economic variables. Investors do not always behave in the same fashion: they probably recalibrate or update the relative importance of county characteristics like credit rating and democratic capital,

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[34]For a serious attempt to start a debate on this subject, see Horvath and Odor (2009) who call for more accountability and transparency through an establishment of a Council for Fiscal Sustainability. Their proposal to adopt rules building on top of those that already exist may indeed be necessary to motivate elected officials to keep medium- and long-term goals in mind. In order to avoid creative accounting, independent monitoring (with sufficient power and legitimacy to influence policy) will be undoubtedly important as dust settles after the most far-reaching economic crisis in recent history.

which suggests that (1) a country's borrowing costs depend not only on local but also on global conditions, (2) countries with long democratic tradition in the EU, relative to its new members, enjoy a reputational advantage and (3) fiscal consolidation is a noble goal but it may not guarantee low rates, because creditors, to some degree, value variables that are beyond the control of present-day policymakers.

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	Dependent variable: Averate pre-crisis interest rates (2003-2007)				
	(1)	(2)	(3)	(4)	(5)
Central government debt	0.00146	0.00290	0.00725	0.00554	0.00919*
	(0.00259)	(0.00286)	(0.00396)	(0.00411)	(0.00374)
Euro			-0.929*	-0.797	-0.878**
			(0.439)	(0.423)	(0.296)
Current account balance (% of GDP)				-0.0305	0.0246
				(0.0191)	(0.0246)
Inflation		0.381*			0.356*
		(0.170)			(0.145)
Constant	4.289***	3.176***	4.566***	4.523***	3.363***
	(0.189)	(0.478)	(0.281)	(0.294)	(0.435)
Observations	23	23	23	23	23
Adjusted R^2	-0.043	0.361	0.247	0.267	0.591

Standard errors in parentheses
* $p<0.05$
** $p<0.01$
*** $p<0.001$

Table 4: Pre-crisis long-term rates

	Dependent variable: Averate pre-crisis interest rates (2003-2007)					
	(1)	(2)	(3)	(4)	(5)	(6)
Central gov. debt (% GDP)	0.0111	-0.0150	0.00768	0.00568	0.00397	0.00413
	(0.00763)	(0.0156)	(0.00586)	(0.00609)	(0.00639)	(0.00613)
Exports of goods, services (% GDP)	0.00640	0.00536	0.0126	0.00470	0.00904	0.00882
	(0.00591)	(0.00449)	(0.00801)	(0.00521)	(0.00746)	(0.00747)
Euro	-1.029+	-0.712*	-0.840+	-0.759	-0.989*	-1.048*
	(0.550)	(0.289)	(0.444)	(0.482)	(0.380)	(0.408)
GDP growth (annual %) 03-07	0.0509	0.0563	-0.0130	0.0591	-0.0682	-0.0696
	(0.0598)	(0.0720)	(0.0539)	(0.105)	(0.0834)	(0.0898)
Interest payments (% of revenue)		0.222				
		(0.147)				
Expense (% of GDP)				0.0219	0.0606	0.0599
				(0.0227)	(0.0367)	(0.0380)
Socialist legal origin				0.0553	0.488	0.399
				(0.930)	(0.479)	(0.406)
Human capital				0.392		
				(0.744)		
Unemployment (%) 08-09					0.135+	0.133+
					(0.0632)	(0.0674)
Past domestic democratic capital						-0.300
						(0.927)
Constant	3.876**	3.600**	4.629**	3.885*	1.213	1.332
	(0.578)	(0.663)	(0.554)	(1.576)	(1.589)	(1.739)
GDP per head (PPP, 08-09) included			YES	YES	YES	YES
Observations	22	21	22	18	21	21
Adjusted R-squared	0.234	0.409	0.318	0.387	0.498	0.458

Standard errors in parentheses
+ $p<0.1$
* $p<.05$
** $p<.01$

Table 5: Pre-crisis long-term rates II

	Dependent variable: Pre-crisis spreads (average spreads between 2003 and 2007)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Central government debt total (% of GDP)	0.00148 (0.00258)	0.00727+ (0.00395)	0.0114+ (0.00608)	0.0148+ (0.00824)	0.0105* (0.00417)	0.0104* (0.00450)	0.00992* (0.00400)
Euro		-0.930* (0.439)	-0.476+ (0.246)	-0.461+ (0.243)	-0.719* (0.333)	-0.564 (0.472)	-0.717* (0.334)
Current account balance (% of GDP)			0.0191 (0.0296)	0.0421 (0.0313)	0.0290 (0.0297)	0.0163 (0.0294)	0.0226 (0.0268)
Recent budget balance (% of GDP)			-0.0225 (0.0323)	-0.0440 (0.0272)	0.0126 (0.0358)	0.0334 (0.0438)	0.0294 (0.0362)
Socialist legal origin			1.115+ (0.550)	1.392* (0.580)	0.421 (0.456)	0.739 (0.724)	0.372 (0.446)
Total tax rate (% of profit)				-0.0121 (0.0108)			
Inflation					0.331* (0.156)	0.289 (0.165)	0.350+ (0.168)
Bank liquid reserves to assets (%)						-0.0498 (0.0758)	
Population (million)							0.00342 (0.00339)
Constant	0.399* (0.188)	0.677* (0.281)	-0.203 (0.398)	0.0157 (0.416)	-0.612 (0.539)	-0.483 (0.541)	-0.634 (0.563)
Observations	23	23	23	21	23	22	23
Adjusted R-squared	-0.043	0.247	0.384	0.398	0.577	0.550	0.564

Standard errors in parentheses
+ p<.1
* p<.05
* p<.001

Table 6: Pre-crisis spreads

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable: Pre-crisis spreads (average spreads between 2003 and 2007)						
Central government debt total (% of GDP)	0.00603	0.00869+	0.0118+	0.0111*	0.0100+	0.0161*
	(0.00354)	(0.00450)	(0.00618)	(0.00389)	(0.00566)	(0.00658)
Democratic capital (δ = .94)	-1.820*	-1.285*	-2.806+	-0.739	-2.392+	-3.584*
	(0.828)	(0.607)	(1.551)	(1.297)	(1.323)	(1.653)
Euro		-0.677*	-0.609	-0.861+	-0.509	-0.589
		(0.312)	(0.397)	(0.409)	(0.333)	(0.427)
Current account balance (% of GDP)			0.0274	0.0524	0.0666	0.0384
			(0.0301)	(0.0301)	(0.0503)	(0.0283)
Bank liquid reserves to bank assets ratio (%)			-0.108	0.00511	-0.141	-0.165
			(0.109)	(0.0642)	(0.126)	(0.115)
Inflation				0.384*		
				(0.152)		
Credit rating					-0.350	
					(0.328)	
Total tax rate (% of profit)						-0.0170
						(0.00959)
Constant	1.607*	1.456*	2.796+	-0.0638	3.954+	4.156*
	(0.682)	(0.585)	(1.493)	(1.177)	(2.123)	(1.691)
Observations	22	22	21	21	21	20
Adjusted R-squared	0.256	0.374	0.355	0.612	0.372	0.369

Standard errors in parentheses
+ p<0.1
 * p<.05
 * p<.001

Table 7: Pre-crisis spreads II

	Dependent variable: Average spreads in 2008Q4						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Central government debt total (% of GDP)	0.00287	-0.00466	-0.00621	-0.00337	-0.000396	-0.00350	0.00171
	(0.00685)	(0.00708)	(0.00763)	(0.00723)	(0.00783)	(0.00559)	(0.00834)
Euro	-1.531+	-0.949	-0.839	-0.922	-0.767	-0.678	-0.761
	(0.862)	(0.726)	(0.717)	(0.683)	(0.719)	(0.480)	(0.476)
Current account balance (% of GDP)		-0.134*	-0.161*	-0.136*	-0.157*	0.0878	0.0752
		(0.0395)	(0.0530)	(0.0631)	(0.0483)	(0.0569)	(0.0505)
Budget balance (% of GDP) 08-09			0.0830	0.0957	0.132+	-0.0494	0.00311
			(0.0874)	(0.0834)	(0.0734)	(0.0433)	(0.0531)
Budget revenue (% of GDP) 08-09				-0.0346			
				(0.0299)			
GDP (% real change pa) 08-09					-0.168+		-0.0771
					(0.0865)		(0.0836)
Credit rating						-1.208*	-0.899*
						(0.268)	(0.288)
Inflation							0.332
							(0.295)
Constant	5.653*	5.463*	5.762*	7.180*	5.250*	9.934*	7.612*
	(0.725)	(0.536)	(0.697)	(1.115)	(0.721)	(1.188)	(1.969)
Observations	23	23	23	23	23	23	23
Adjusted R-squared	0.166	0.420	0.409	0.401	0.462	0.673	0.707

Standard errors in parentheses
+ p<.1
* p<.05
* p<.001

Table 8: Crisis spreads

	Dependent variable: Average spreads in 2008Q4							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Democratic capital (δ = .94)	-4.354*	-3.780*	-2.563	-2.719	-4.691*	-3.264	-0.0196	0.660
	(1.494)	(1.412)	(1.998)	(2.358)	(1.972)	(1.987)	(2.534)	(2.956)
Central government debt total (% of GDP)	0.00501	0.00786	0.00282	0.00356	0.0194	0.0175	-0.00229	-0.00131
	(0.00541)	(0.00679)	(0.00878)	(0.0105)	(0.0115)	(0.0108)	(0.0143)	(0.0139)
Euro		-0.725	-0.696	-0.705	-0.542	-0.715	-0.623	-0.765
		(0.636)	(0.639)	(0.674)	(0.519)	(0.491)	(0.473)	(0.510)
Current account balance (% of GDP)			-0.0638	-0.0541	0.0345	0.0342	0.0750	0.0697
			(0.0606)	(0.0861)	(0.0947)	(0.0879)	(0.0752)	(0.0596)
Budget balance (% of GDP) 08-09				-0.0159	-0.0144	0.0298	-0.0344	0.00706
				(0.0811)	(0.111)	(0.106)	(0.0506)	(0.0637)
GDP (% real change pa) 08-09					-0.257*	-0.246*	-0.0321	-0.0497
					(0.0994)	(0.0925)	(0.102)	(0.125)
Inflation						0.372+		0.328
						(0.202)		(0.334)
Credit rating							-1.159*	-1.016+
							(0.399)	(0.519)
Constant	8.077*	7.916*	7.091*	7.134*	7.360*	5.534*	9.661*	7.766*
	(1.375)	(1.271)	(1.646)	(1.768)	(1.075)	(1.405)	(1.403)	(2.137)
Observations	22	22	22	22	22	22	22	22
Adjusted R-squared	0.446	0.462	0.462	0.429	0.579	0.637	0.634	0.678

Standard errors in parentheses
+ p<.1
* p<.05
* p<.001

Table 9: Crisis spreads with democratic capital

	(1) 2008Q1	(2) 2008Q2	(3) 2008Q3	(4) 2008Q4	(5) 2009Q1	(6) 2009Q2
Credit rating	-0.253	-0.333	-0.531*	-1.124**	-2.654**	-2.671**
	(0.205)	(0.216)	(0.215)	(0.328)	(0.875)	(0.817)
Euro	-0.753	-0.784	-0.563	-0.747	-0.834	-0.964
	(0.476)	(0.510)	(0.441)	(0.583)	(0.660)	(0.599)
Central government debt total (% of GDP)	0.00945	0.00767	0.00300	-0.00184	-0.0294	-0.0337
	(0.00958)	(0.0101)	(0.00855)	(0.0108)	(0.0177)	(0.0161)
Democratic capital (δ = .94)	-0.728	-0.216	0.206	0.802	4.117	3.661
	(1.060)	(1.059)	(1.135)	(1.602)	(2.842)	(2.663)
Current account balance (% of GDP)	0.00873	0.00112	0.00911	0.0179	0.0466	0.0751
	(0.0391)	(0.0429)	(0.0398)	(0.0572)	(0.110)	(0.102)
Exports of goods and services (% of GDP)	0.00794	0.00756	0.00545	0.00666	0.000751	-0.00174
	(0.00881)	(0.00927)	(0.00805)	(0.0102)	(0.0138)	(0.0125)
Constant	5.645***	6.040***	6.767***	8.705***	14.19**	15.24***
	(1.089)	(1.155)	(0.999)	(1.240)	(3.917)	(3.679)
Observations	21	21	21	21	21	21
Adjusted R-squared	0.354	0.343	0.463	0.663	0.633	0.671

Standard errors in parentheses
* p<0.05
 ** p<0.01
 *** p<0.001

Table 10: Spreads from 2008Q1 to 2009Q2
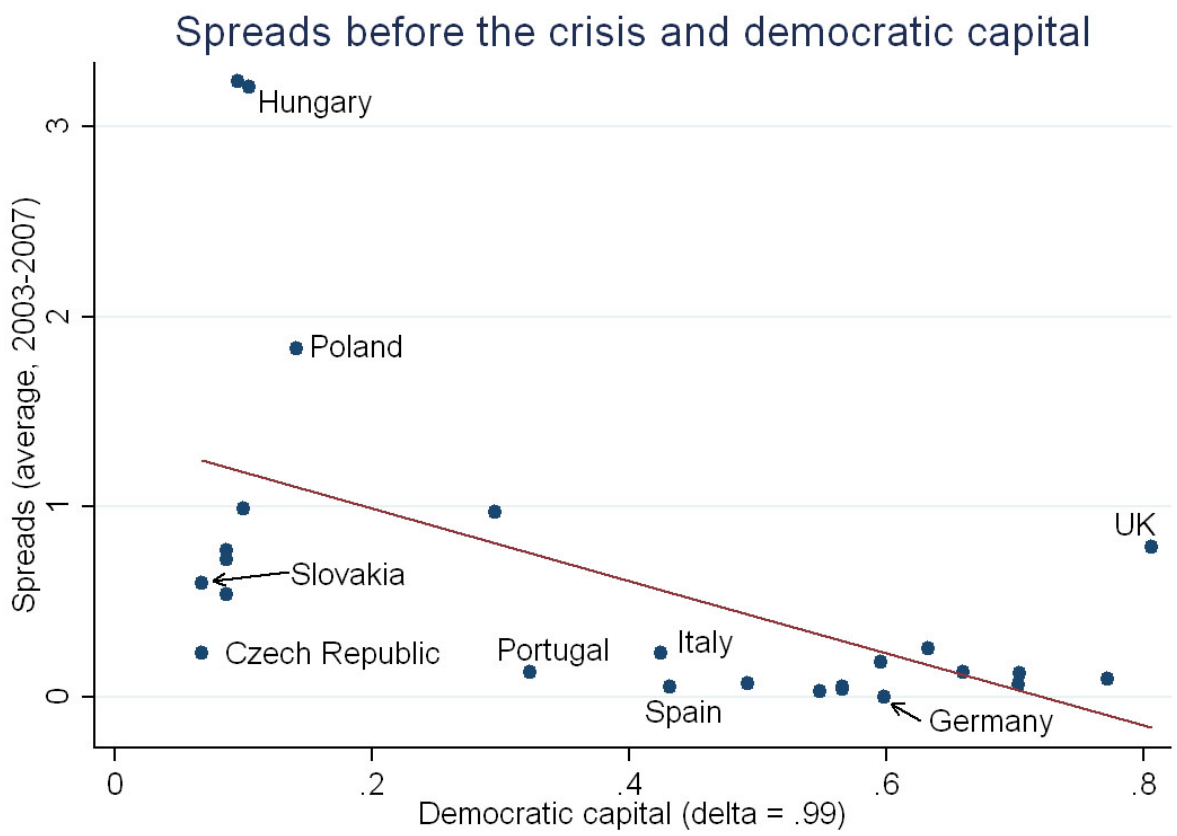
Figure 2
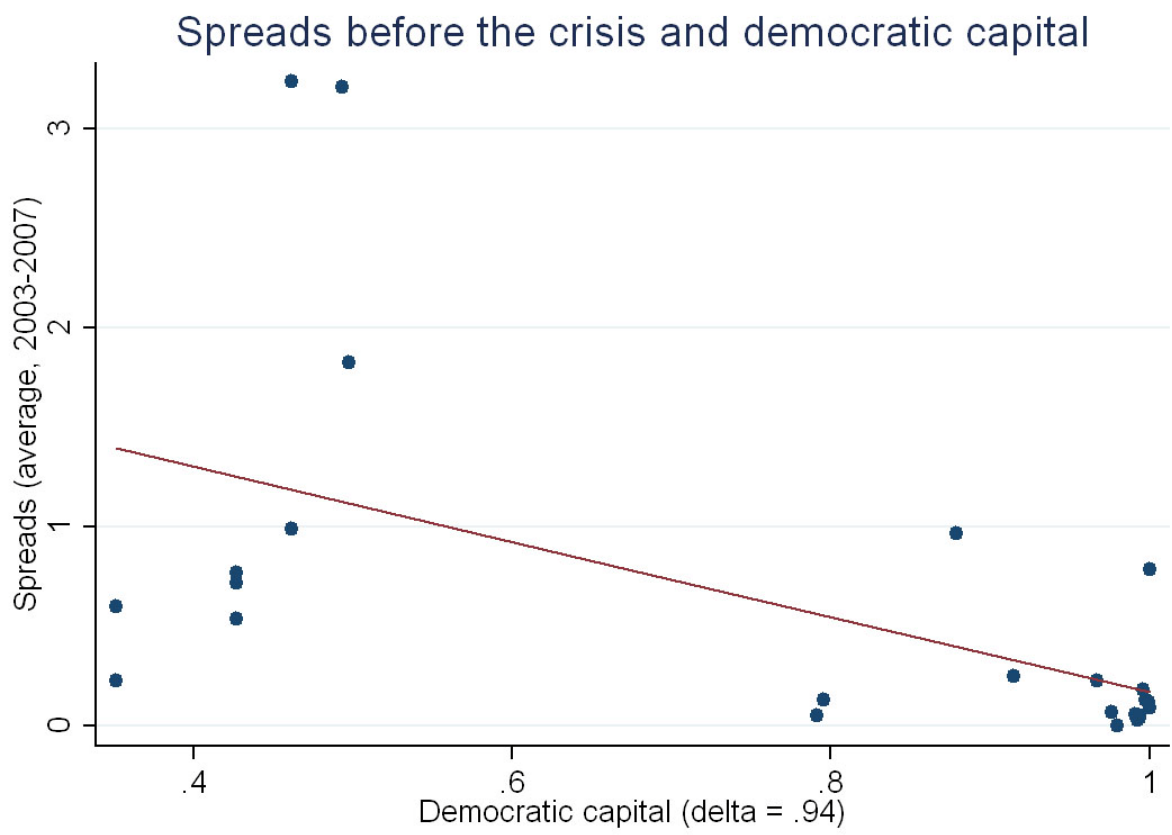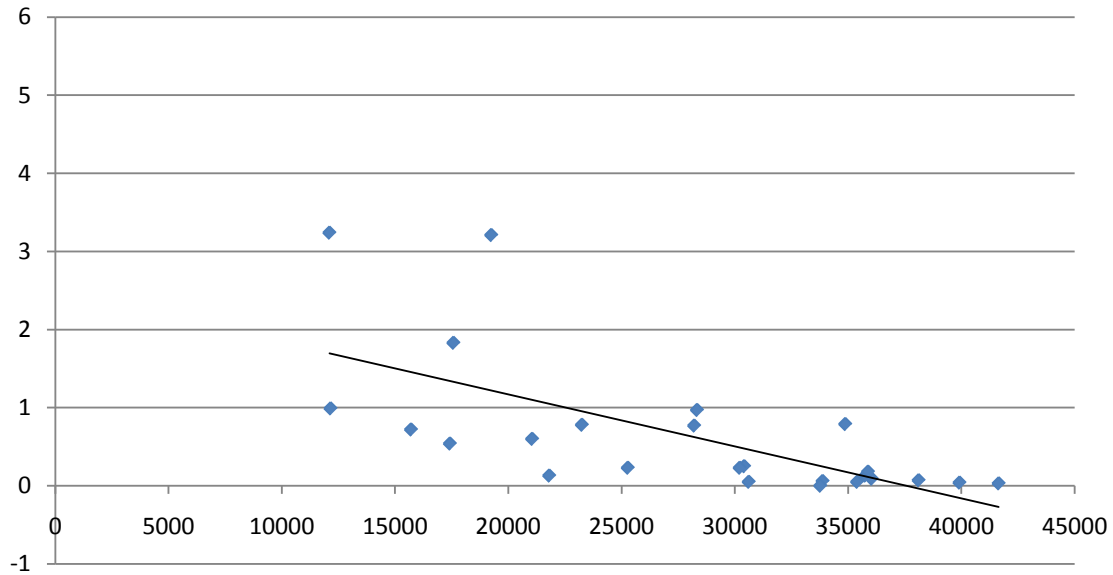
Figure 3

GDP per capita and democratic capital (δ = .94)
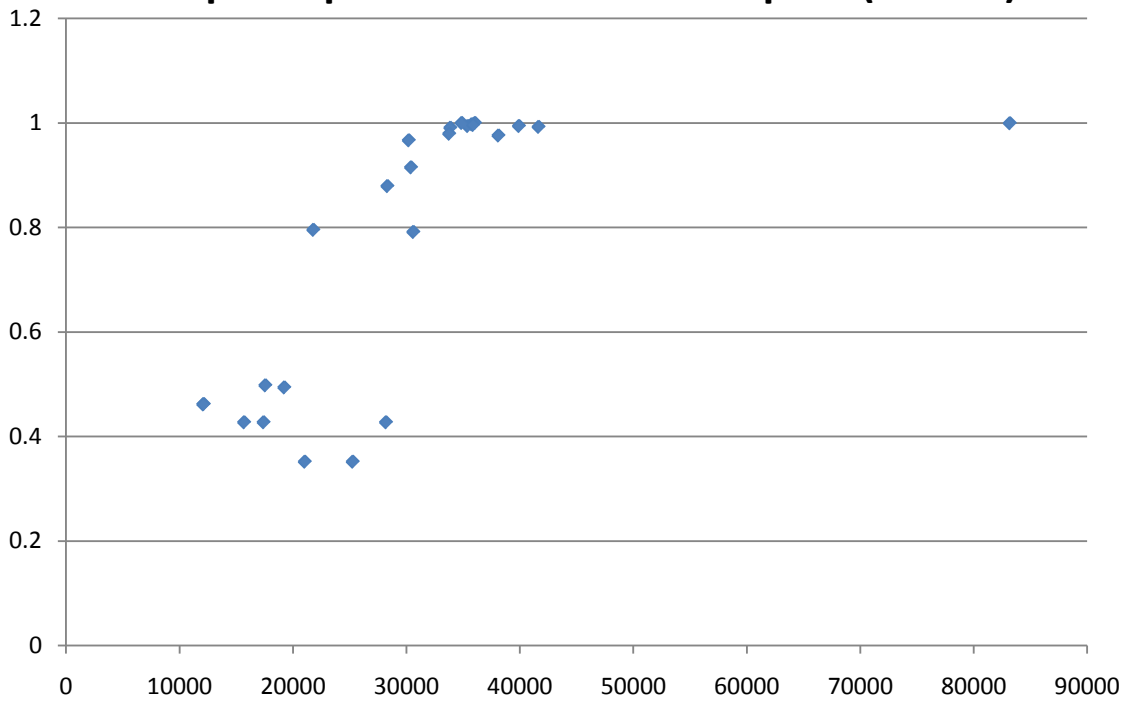
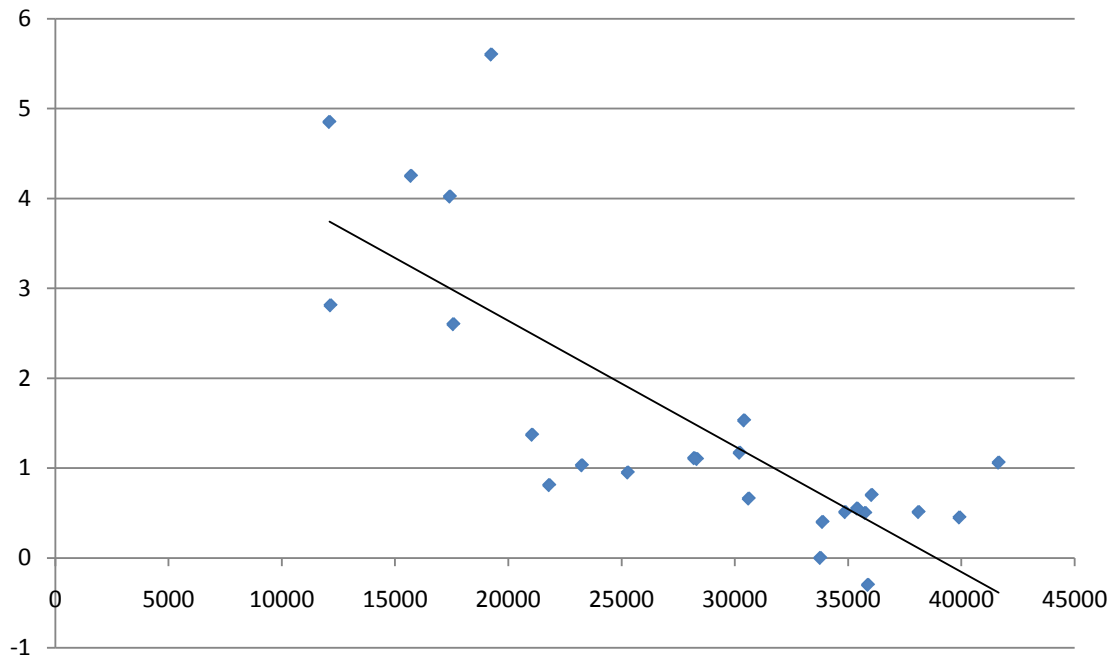GDP per capita and democratic capital (δ = .99)
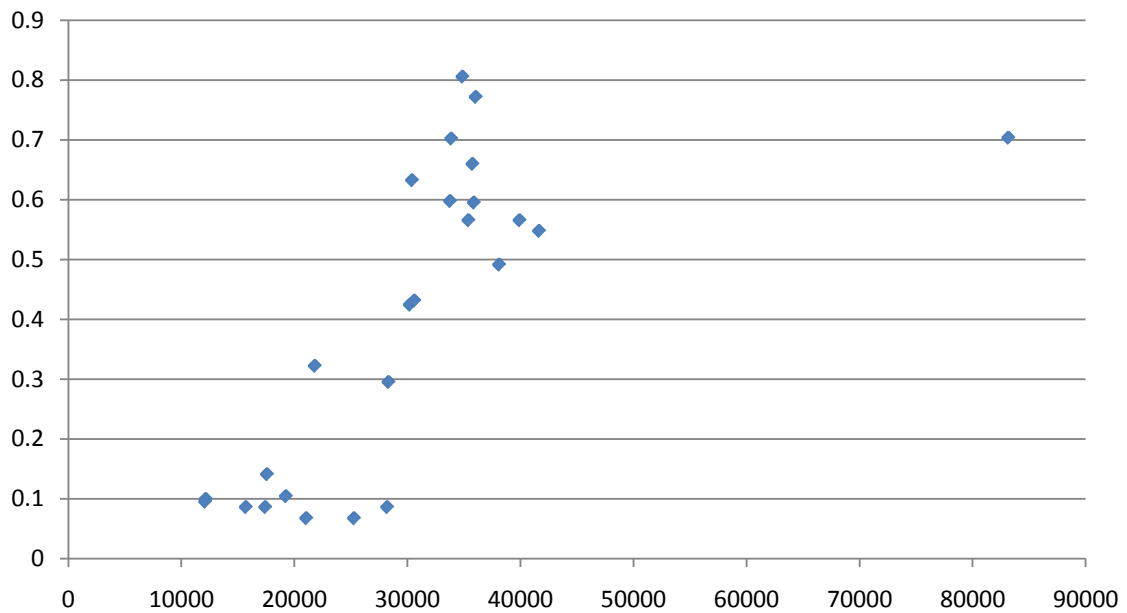
Figures 4 and 5

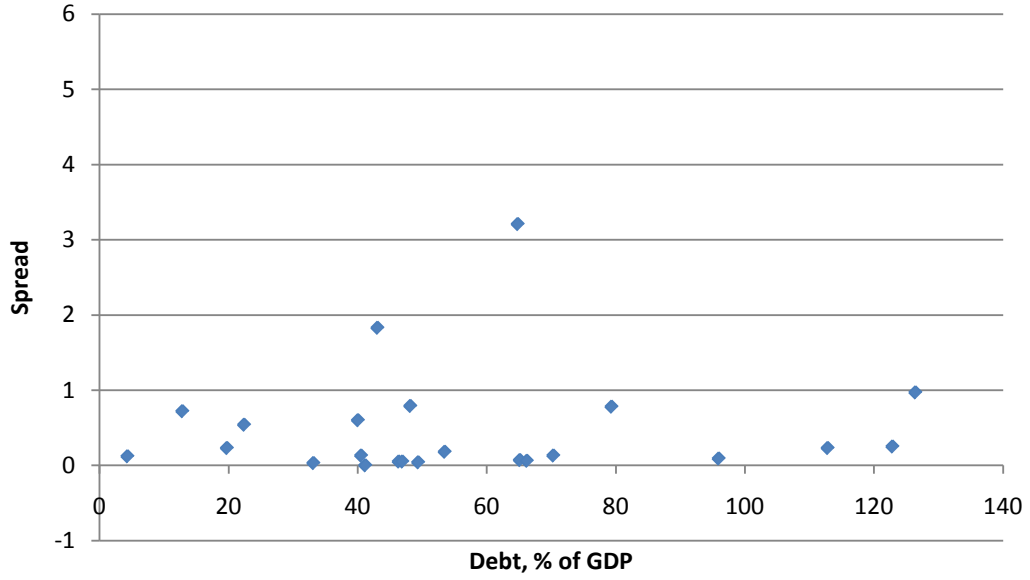# GDP per capita and average pre-crisis spreads (2003-07)

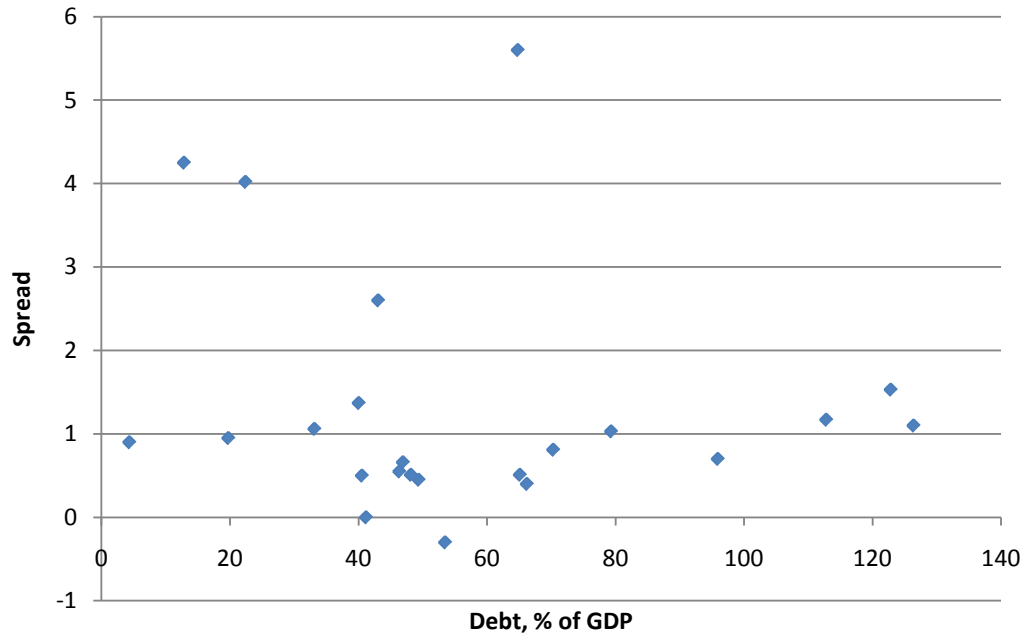# GDP per capita and average spreads in 2008Q4

Figures 6 and 7 (Luxembourg excluded in both graphs above)

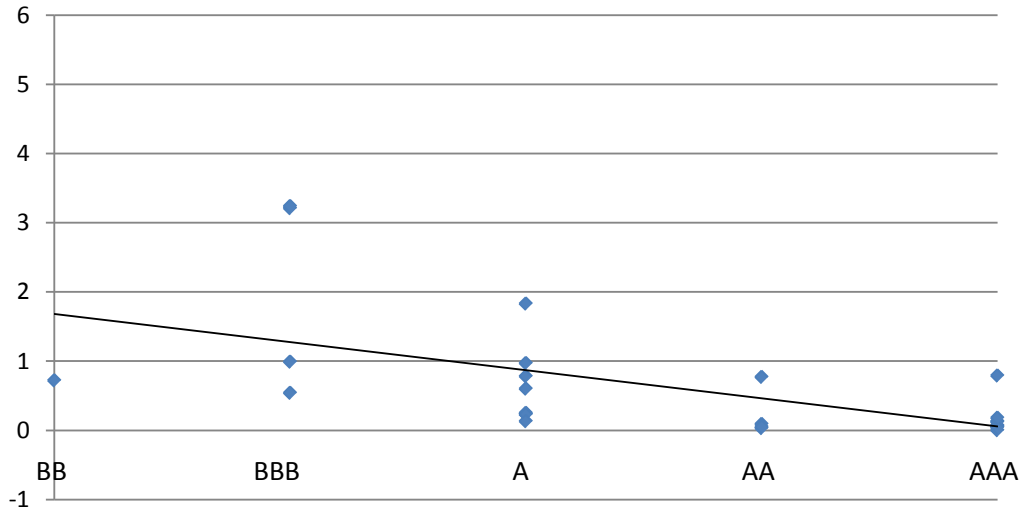# Debt and average pre-crisis spreads
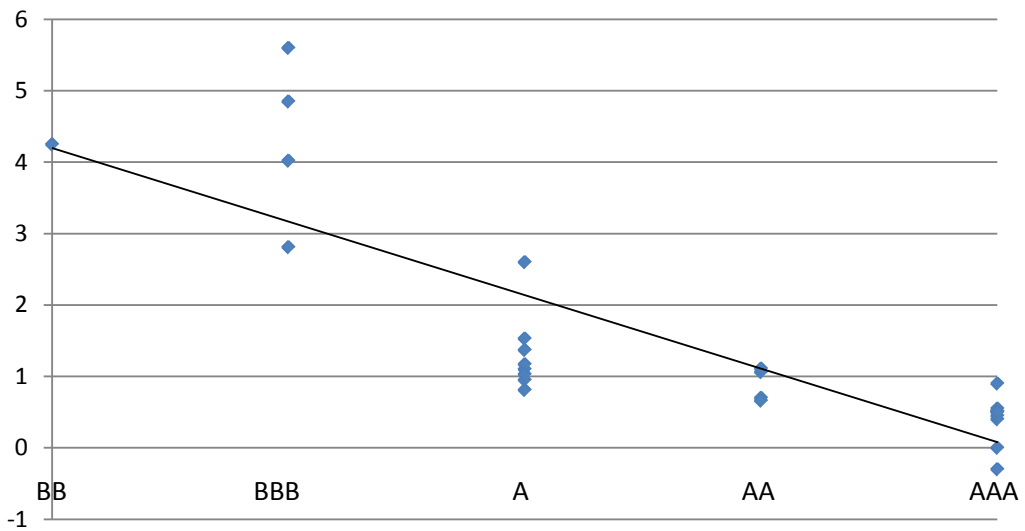## (2003-07)

Debt and average spreads in 2008Q4

Figures 8, 9

Credit rating in 2009 and average pre-crisis spreads (2003-2007)
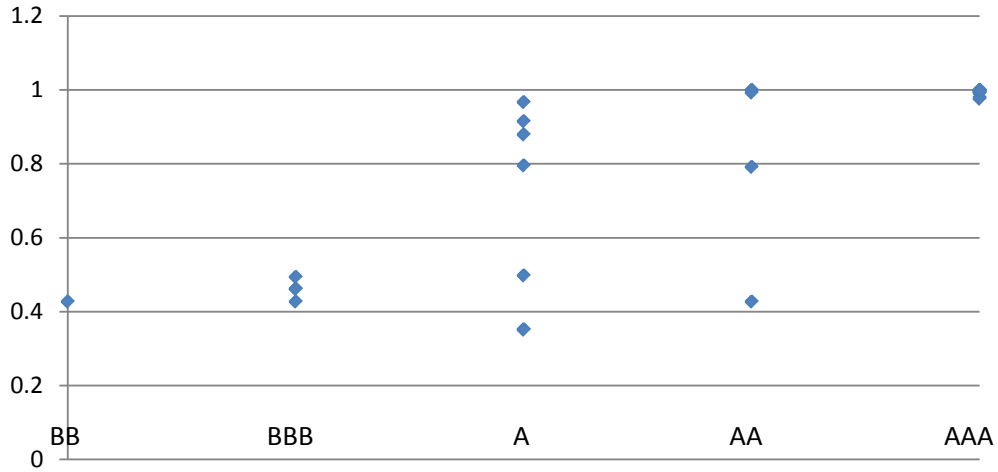

Slope of the trend line is -0.41.
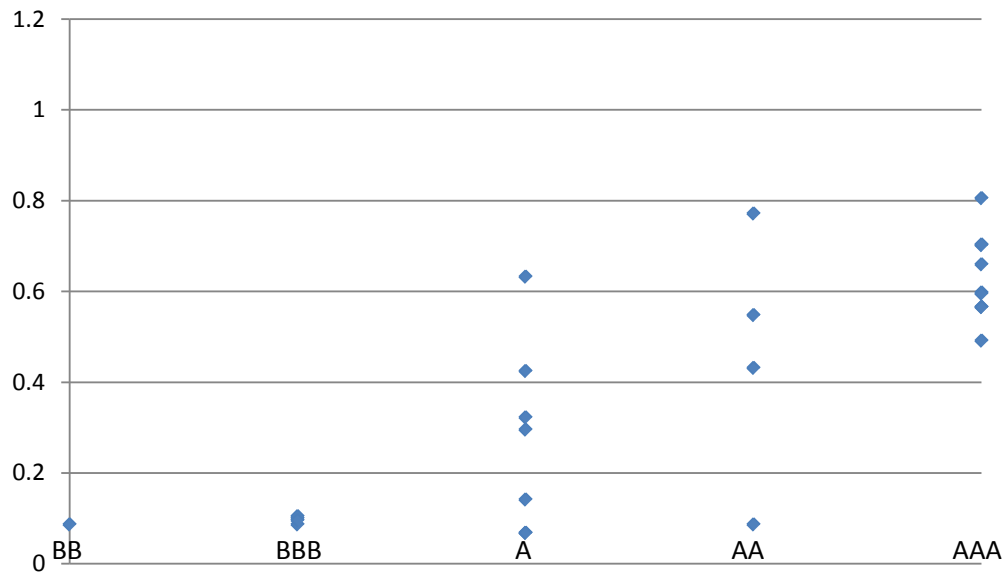
Credit rating in 2009 and average spreads in 2008Q4

Slope of the trend line is -1.03.

Figures 10, 11

Credit rating in 2009 and democratic capital (δ=.94)

Credit rating in 2009 and democratic capital (δ=.99)

Figures 12, 13

APPENDIX

A What can countries do to lower their spreads?

A.1 Making tax collection more efficient

A simplification of the tax laws, for example through the introduction of a flat tax (which has, in recent years, been popular among policymakers in Eastern Europe) could, if designed well, lead to higher revenues which could be used to reduce deficits or even to decrease debt levels. Such steps would be particularly helpful for some Western European countries.

Paulus and Peichl (2009) find that, although an introduction of a flat tax will generally increase efficiency and decrease equity, in countries such as Spain, Portugal and Greece, both of these phenomena are likely to increase, should a tax reform of this kind be introduced.[35] However, Fuest, Peichl, and Schaefer (2008), who simulate the effects of flat tax introduction on Germany, conclude that it is unlikely to spill over from Eastern Europe.

A.2 Unpopular reforms

According to Alesina and Giavazzi (2006) deregulation of labor and product markets in the EU would lead to higher growth rates. More recently, Rogoff (2009) wrote that "if Europe continues to make its labor markets more flexible, its financial market regulation more genuinely pan-European, and remains open to trade, trend growth can pick up again in the wake of the crisis."

Other useful reforms include creation of favorable conditions for immigration of skilled workers, decreasing the costs of having children or shrinking the size of the shadow economy by making it easier and less costly to run businesses.

A.3 Credible fiscal outlook and more discipline

In an environment where few sanctions are associated with excessive spending, trust cannot be maintained. (See a brief discussion of Horvath and Odor (2009) in footnote 34 on page 20.)

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[35]In countries where income inequalities are less severe and a middle class is solidly established, distributional effects of a flat tax may be less favorable.