Transfer of Sovereign Credit Risk to Corporate Borrowing Costs, Evidence from the European Debt Crisis

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Rohan Gupte[∞]   Joachim Rogne[*]

Abstract

This paper studies whether a risk transfer relationship exists between sovereigns and domestic firms in developed economies. We provide empirical evidence that increases in a government's perceived credit risk have considerable negative implications on its private sector by increasing firm cost of borrowing. We study the events of the European sovereign debt crisis by analysing CDS data of 15 European sovereigns and 230 firms spanning from 2010-12. Our analysis is furthered by exploiting the announcement of the first Greek bailout on April 23, 2010 in an event study approach with panel data to evaluate the impact of a negative exogenous shock to credit risk. Underlying the analysis is an in-depth study of cross sectional differences in the sovereign to firm transfer relationship between Financial and non-Financial companies, countries inside and outside the Eurozone, and between the PIIGS economies and other European countries. The impact of transmission channels in the form of property rights institutions, and a firm's dependence on external borrowing are evaluated. Our results indicate that a 1% increase in sovereign credit risk results in a 0.12% to 0.14% increase in corporate borrowings costs. Evidence suggests pronounced differences in the transfer relationship between Eurozone and non-Eurozone economies, with the effect strongest for non-financial companies in the PIIGS countries. The transfer is weakened in countries with strong property rights and strengthened amongst Eurozone firms highly dependent on borrowing. Notably, we find no difference in the transfer relationship between financial and non-financial companies. Our paper brings to light some of the real effects of the sovereign debt crisis and the importance of fiscal discipline in a common currency union.

Keywords: Sovereign Credit Risk, Corporate Borrowing Costs, Transfer Risk, Debt Crisis, CDS Spreads.

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1. Introduction

The global financial crisis that began in 2007 and subsequent European sovereign debt crisis highlight the need to better understand the fundamentals of credit risk pricing and how exogenous shocks to the economy transition across markets. In handling the financial crisis several European governments were forced to respond at the national level in the form of bailouts. Invariably these rescue operations, financed through debt issuances, enlarged sovereign debt levels and caused a deterioration of public finances. The rise in sovereign debt levels for certain countries in the Eurozone were at such levels that for the first time there was a real risk of a sovereign default, which had severe negative impacts on European banks that held considerable amounts of sovereign debt on their books. Following write-downs and risk offloads banks faced liquidity shortages, increasing credit risk and borrowing costs (Acharya et al, 2013). A financial system highly interdependent on its sovereign had stark implications for corporates across Europe. Lending dried up and with the reduced access to financing in an already volatile environment many companies faced liquidity and solvency problems, leading to enlarged credit risk and borrowing costs (Acharya et al, 2014). Financially distressed governments cut public spending, rolled back subsidies and guarantees, and raised taxes, adversely impacting private firms (Bedendo and Colla, 2013).

Despite this sovereign-to-firm nexus, current research shows that no evidence of a mechanical relationship between sovereign and corporate credit risk exists in developed economies (Bai and Wei, 2012). However, research has proved that financial turmoil can spread across countries through different transmission channels and create "credit contagion" (Jorion & Zhang, 2007).

In this paper, we study the spill over effect from increased sovereign CDS spreads during the European sovereign debt crisis on corporate borrowing costs in the Eurozone, measured through credit default swaps ("CDS"). Daily sovereign and corporate CDS spreads are used as a proxy for corporate borrowing costs as they allow for an accurate measure of an issuer's credit risk. We analyse the impact of escalating sovereign CDS spreads on firm borrowing costs over a novel sample spanning three years from 2010-12. Furthermore we study a shock to credit risk on April 23, 2010 when Greece officially requested the €110 billion emergency loan package organized by the EU and IMF. We see this as a pivotal point for market reactions to the ensuing sovereign debt crisis.

We recognise that omitted variables could affect the causal relationship we seek to establish and we therefore include a wide range of control variables on the sovereign, firm and market level in order to ameliorate endogeneity bias.

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A majority of the current research focuses on the impact of sovereign credit risk on the financial sector, the determinants of sovereign credit risk and the effects of exogenous shocks on emerging markets. This paper attempts to broaden and extend the understanding of how an increase in sovereign credit risk influence corporate borrowing costs in developed economies, and thereby add to the growing research examining the magnitude of transmission and economic impact on the non-financial sector.

The analysis of the relationship is based on the theoretical arguments used by Augustin et al (2014a) and Bedendo and Colla (2013). This paper is most close to the study by Augustin et al (2014a), and we derive our research questions from their paper. We extend the existing literature through a deeper cross sectional analysis on the effects on the financial and oft overlooked non-financial sectors, and through further insights on differences in the transfer effect between Eurozone and non-Eurozone economies. We depart considerably from existing literature in our choice to study two different samples focussed on the debt crisis Our empirical analysis is extended by several firm and country specific variables. Our main contribution to existing literature is examining the existence of a sovereign to firm risk transfer amongst developed countries bound by the fiscal rules of the European Monetary Union (EMU), as well as analysing the effect of this relationship on the financial and non-financial sectors. Our research approach allows for an analysis of time-varying effects and the magnitude of the Greek bailout.

Similar to previous studies by Bedendo and Colla (2013), and Augustin et al (2014a) we find a causal and economically meaningful relationship between sovereign and firm risk wherein a 1% rise in domestic sovereign risk raises the average European firm's borrowing costs by 0.12% (12bps). This relationship is of a slightly greater magnitude of 0.14% (14bps) after the Greek bailout's exogenous shock to market risk perceptions. Exploiting cross sectional differences between countries we find this effect to be stronger in countries that share the Euro, underscoring the importance of fiscal discipline within a common currency. Interestingly, the domestic sovereign to firm nexus is weakest amongst financial institutions outside of the Eurozone, who are far more reliant on the health of foreign sovereigns. Like Bai and Wei (2012) we observe the importance of property rights institutions in weakening the sovereign to firm transmission, the average increase in firm borrowing costs is 0.15% (15bps) less in countries with strong property rights institutions.

Our findings deviate from Augustin et al (2014a) in the following ways. First, our results exhibit no conclusive evidence to support the view that firm borrowing costs in highly distressed countries i.e. the PIIGS[1] were relatively more affected by escalating sovereign credit risk. This is

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[1] A term used for Portugal, Italy, Ireland, Greece, and Spain.

especially true for financial firms, however we find that the sovereign to firm relationship was relatively more pronounced amongst non-financial firms. Second, we find corporate borrowing dependence to be an important transmission mechanism only within Eurozone economies.

Most notably our findings display no significant difference in the sovereign to firm transfer relationship between the average financial and non-financial firm. We conclude that the negative externalities from escalating sovereign risk, potential private sector expropriation and a credit crunch, are at least as bad for non-financial firms. Our findings indicate that negative spill overs from distressed sovereigns were transmitted into the real economy throughout Europe.

The remainder of the paper is organised as follows: Section 2 reviews the relevant previous research related to our topic. Section 3 establishes the theoretical framework aimed at providing a broader context and understanding. Section 4 identifies and defines the research opportunity through several hypothesises. Section 5 describes and motivates the range of variables used in our dataset. Section 6 explains our methodology and choice of regression set-ups. Section 7 presents our summary statistics. Section 8 our findings and an analysis of our results. Section 9 concludes the paper with remarks on the specific research questions, and makes suggestions for further research directions.

2. Literature Review

The European debt crisis has contributed to the notion that higher sovereign CDS spreads are associated with higher corporate borrowing costs. A number of papers stand out in the current literature on sovereign to corporate spill over effects.

Augustin et al (2014a) use the Greek bailout as an event study to determine the impact of increased sovereign credit risk on corporate borrowing costs as measured by corporate CDS spreads. Their results show a strong relationship between sovereign and corporate credit risk after the Greek bailout, where a 1% increase in sovereign credit risk, on average leads to an increase in corporate borrowing costs of 0.10% after the Greek bailout. Including the domestic equity index return as a control variable the effect is reduced to 0.09%. Differentiating the results further the observed effect is slightly lower for financial companies and companies located outside the Eurozone, whereas for companies located in one of the PIIGS countries borrowing costs are consistently higher. Further, the effect is more distinct for countries that are financially distressed, have weaker property rights, high degree of government ownership, those with a high dependence on bank lending, and firms with dispersed public ownership. In an earlier paper Augustin (2012) also finds cross-sectional evidence suggesting that companies with higher exposure to the Greek economy are more heavily affected.

Similar to Augustin et al (2014a) Bedendo and Colla (2013) show a positive and significant increase in credit risk from sovereign to corporates. The authors identify three transmission channels by which spill over occurs: 1) As sovereign default risks increase, the trust in government debt guarantees issued to government influenced firms decrease, which adversely affects those firms that benefit from such guarantees. 2) Importance of domestic demand, whose effect is greater on the external sector. 3) Domestic credit squeeze caused by banks that hold large amounts of sovereign debt and are consequently forced to de-lever, which negatively affects corporate lending. Their results display that firms with greater exposure to these three transmission channels are more affected by transfer risk. Specifically, a 1% increase in sovereign CDS spreads yields a 0.043% increase in corporate CDS spreads for firms under government influence, a 0.045% increase when sales are concentrated in the domestic market and a 0.045% increase when the firm relies heavily on bank financing.

Bai and Wei (2012) in a paper for the Federal Reserve Bank of New York examine CDS spreads for corporates and sovereign in 30 countries, including both developed and emerging economies. They find an economically and statistically significant transfer of sovereign risk to corporates wherein firm CDS spreads increase by 0.71% for every 1% increase in sovereign risk. The authors also examine the role of state ownership and property rights and institutions as a channel to ameliorate the risk transfer. They find that state owned companies display a greater transmission effect than non-state owned and that stronger property rights weakens the transmission.

2.1. The spill over impact of the European debt crisis on the financial sector:

Acharya et al (2013) use CDS spreads of European sovereigns and banks from 2007-2011 to establish a two-way risk transmission mechanism from the private-to-public sector. First, government bailouts of a distressed financial sector increase sovereign credit risk due to enlarged public debt levels. This in turn weakens the financial sector as the value of government debt guarantees and sovereign bonds decrease.

Adelino & Ferreira (2014) examine how bank lending contracts when their credit ratings are downgraded. Results show that the quantity of new loans decreases whilst rates charged increase.

Longstaff et al (2011) find that sovereign credit risk is primarily driven by financial market variables such as sensitivity to systemic risk and volatility, as captured by the volatility risk premium embedded in the VIX index, rather than by country-specific or macroeconomic fundamentals.

Alter & Beyer (2013) in a paper for the ECB, measure spill over effects from sovereigns to financial companies during the sovereign debt crisis between 2009-2012 by using 5-year CDS

spreads of 11 Eurozone sovereigns and financial companies to create an aggregated contagion index. The authors find proof of increased interdependencies between sovereigns and banks during the crisis. Similarly, Zhang et al. (2012) use a panel data set sample from 2008 -11 consisting of 5-year CDS spreads of ten Eurozone countries and find that increasing risk-neutral default probabilities capture spill overs across countries.

2.2.   The spill over relationship in emerging economies:

Agca and Celasun (2012) analyse the relationship between sovereign debt levels and corporate borrowing costs. The authors find that sovereigns with above average public debt causes significantly higher borrowing costs for corporates since high sovereign debt raises the risk of greater future taxation and expropriation of private property. These results are confirmed by Dailami (2010) who investigates how perceptions of sovereign default risk during volatile market conditions influence corporate borrowing costs. The author finds a unilateral increase in costs of capital for private corporate debt issuers, but a particularly high increase for debt issues with yield spreads above 10%.

Beirne and Fratzscher (2013) examine drivers of sovereign risk and contagion effects for both advanced and emerging economies from 2004 to 2011. The authors find that long-term country-specific variables such as government bond spreads, sovereign CDS spreads and sovereign credit ratings, were less important factors for pricing sovereign risk in the Eurozone prior to the sovereign debt crisis, but became more determining as the crisis unfolded. The effect was particularly pronounced for the PIIGS countries.

Darolles et al. (2012) study 18 emerging markets countries between 2007 and 2011 and focus solely on liquidity as a transmission channel. Using the CDS-bond basis as a proxy for liquidity, the authors' document that contagion effects are due to liquidity problems in the sovereign debt market as increased sovereign to corporate spill over effects correlates with periods of highly illiquid markets.

Alter & Schuler (2012) use CDS spreads to investigate the interdependence of default risk of several Eurozone countries and their domestic banks from 2007 to 2010. Their findings suggest that in the period before the Greek bailout the contagion disperses from credit spreads of financial companies onto the sovereign CDS market.

2.3.   The transmission channels

Bai et al. (2012) analyse the transmission channels through which spill over and contagion effects occurs. By decomposing the credit risk and liquidity components in CDS spreads for 12 Eurozone member states from 2006-12, the authors find that volatility in CDS spreads prior to and at the beginning of the European sovereign debt crisis were mostly due to liquidity

imbalances caused by aggregate and domestic liquidity shocks. Whereas during and after the crisis spreads were driven mainly by changes in perceived credit risk.

Benzoni et al. (2012) propose that uncertainty about the distribution of defaults creates a contagion channel of correlations in CDS spreads, which raises the perceived default intensity of other countries. Subsequently negative credit shock increases market uncertainty about the underlying state of the economy, causing an overestimation of negative outcomes.

Brutti & Saure (2013) show how financial shocks, caused by the Greek bailout, spill over to 11 other member states in the Eurozone. They display that the degree of spill over depends on the financial sector's exposure to sovereign debt of other member states in the Eurozone. The authors find that cross-border financial exposure constitutes an important transmission channels and that for those countries with the highest exposure to Greek debt, a decrease in Greek debt exposure reduces the transmission rate of sovereign risk by 46% more than for those countries with the lowest exposure.

In contrast Caporin et al. (2013) argue that the integration between the different Eurozone countries is stable and reject that sovereign contagion exists between the largest economies in the Eurozone (France, Germany, Greece, Ireland, Italy, Portugal, Spain and the United Kingdom) Their results show that there is no change in the intensity of the transmission of shocks among European countries during the sovereign debt crisis and that the relationships among the different countries are the same during normal and turbulent market conditions. Corzo et al (2012) investigate the role of equity markets, sovereign CDS contracts, and sovereign debt as forward indicators for Eurozone member states between 2008 and 2011. The authors find that equity markets were the market information leader during 2008 to 2009, pointing to a private-to-public risk transfer. However, for 2010 and onwards sovereign CDS markets overtook equity markets as a forward indicator, causing a public-to-private risk transfer during the sovereign debt crisis.

2.4. Determinants of CDS pricing and liquidity

Dieckman & Plank (2011) explore the fundamentals of sovereign CDS pricing on the back of observed market correlation throughout the European sovereign debt crisis. Their findings suggest that CDS pricing is highly affected by the state of a country's domestic financial system, the exposure of the domestic financial system to other EMU[2] economies and the importance of the financial system to the growth of the domestic private sector prior to the crisis.

Meng & Owain (2008) analyse the liquidity dynamics of the CDS market through the change in the width of bid-ask spreads and other factors that commonly influence spreads such

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[2] Economic and Monetary Union of the European Union

as demand and supply pressure, market volatility and credit rating status. The authors find that CDS spreads increase significantly with higher than average market volatility, imbalance in demand and supply and when the corporate is placed on a credit rating downgrade watch list, particularly from investment grade to non-investment grade.

3. Theoretical framework

CDS contracts are an effective tool for management of capital and risk. They allow credit risk to be hedged separately from liquidity risk, thereby changing the risk profile of existing credit portfolios without having to buy or sell securities (Deutsche Bank, 2009). The market for CDSs has grown consistently from the late 90's up until the financial crisis erupted in 2007, and has remained robust despite several market shocks and events such as the 1998 Russian default, the Conseco Finance restructuring in 2000 and the bailout of AIG in 2008 (Augustin et al, 2014b).

3.1. CDS contracts

A CDS is a contract between two parties (referred to as the protection seller and protection buyer) that allows for the transfer of default risk on one or several underlying reference entities from the buyer to the seller. The protection buyer pays a periodic premium to the protection seller, which entitles the buyer to protection on a pre-specified face value, known as the notional amount[3], of the reference entity's debt. The premium paid is referred to as the "CDS spread", calculated as a percentage of the notional amount insured. If the underlying reference entity defaults or triggers a "qualifying" credit event[4], the protection seller is obliged to compensate the buyer for the loss through a specified settlement procedure (ISDA, 2015).

Figure 1: Relationship between contracting parties of a CDS

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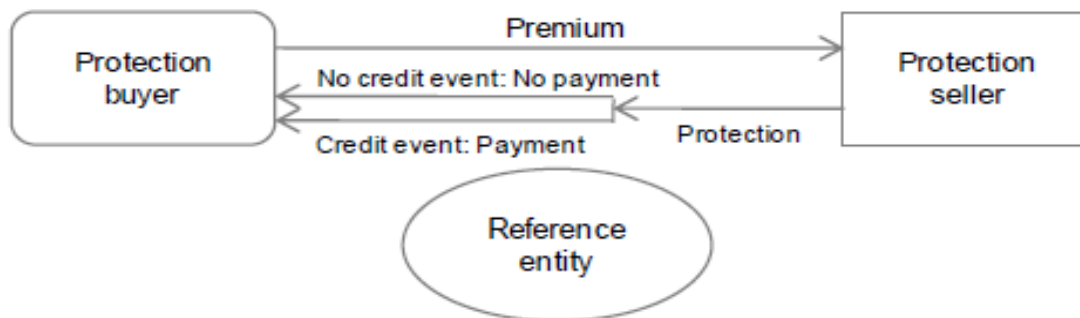
[3] For CDS contracts, notional amount refers to the par amount of credit protection bought or sold, equivalent to debt or bond amounts, and is used to derive the premium payment calculations and the recovery amounts in the event of a default.
[4] A "qualified" credit event constitutes in the context of CDS contracts any failure to meet debt obligations, caused by a bankruptcy, failure to pay, obligation default, default acceleration, repudiation or moratorium or restructuring in various forms.

Figure 2: CDS premium calculation (left) and "Qualifying" Credit Events (right)

The CDS premium is calculated to cover the expected loss of the underlying reference entity. There are two main parameters that determine the expected loss and hence the CDS premium: 1) The probability of default (PD), and 2) The Recovery rate (RR). $$CDS\ premium = PD * (1 - RR)$$ (Deutche Bank, 2009).	**Bankruptcy**: Corporate entities legally declared insolvent because of inability to pay debts **Obligation acceleration**: Obligation becomes due and payable before its normal expiration date. **Obligation default:** A technical default, such as violation of a bond covenant. **Failure to pay:** Failure of the reference entity to make any due payments. **Repudiation/Moratorium**: Provides for compensation after specified actions of a government **Restructuring**: Reduction and renegotiation of debts in order to improve or restore liquidity. (Deutche Bank, 2009).

CDS contracts can be settled in two ways, either through a direct cash settlement or physical delivery. With physical delivery, the protection buyer transfers the obligation referenced in the contractual agreement to the protection seller, and receives the notional amount of the underlying contract as compensation. (Augustin et al, 2014b).

CDS contracts are also characterized by different types of restructuring clauses that state which reference obligations can be used in a physical delivery[5]:

Full Restructuring (CR): Credit event clause that specifies that any obligation with a maturity of up to 30 years can be delivered to settle a triggered CDS commitment.

Modified Restructuring (MR): Under MR contracts, restructuring agreements still count as a qualified credit event, however, the deliverable obligations are limited to those with a maturity of 30 months or less after the termination date of the CDS contract.

Modified-Modified Restructuring (MMR): The MMR clause dictates that the remaining maturity of deliverable assets must be shorter than 60 months for restructured obligations and 30 months for all other obligations.

No Restructuring (XR): Used when the contracting parties agree to exclude restructuring as a credit event from the CDS contract[6] (Augustin et al, 2014b).

3.2. CDS spreads as a proxy for borrowing costs

Using CDS spreads as a proxy for corporate borrowing costs have the advantage of providing a consistent comparison across companies and countries as they are standardized products with constant maturities and are traded with identical contractual agreements, independent of the issuer. Despite taking into account counterparty risk CDS spreads are a much better proxy for corporate borrowing costs than bonds spreads, which are subject to different coupon structures and covenants, declining maturities and legal jurisdiction of the issuing country (Augustin et al, 2014b).

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[5] This is particularly relevant in cases of a restructuring credit event and shows why the restructuring clause is an important element in the pricing of CDS contracts.

[6] The purpose of this contract type is to rule out "soft" credit events, which may encourage opportunistic behaviour, but not constituting a true loss for the protection buyer.

3.3. Sovereign and corporate CDSs

Corporate and sovereign CDS contracts are different in a number of aspects. Qualifying corporate credit events that cause a default commitment are bankruptcies, failure to pay, obligation default, default acceleration or restructurings. For sovereigns bankruptcy is commonly replaced with repudiation or moratorium for sovereign reference entities; when the reference entity rejects or suspends its obligations. Furthermore, the currency denomination is of greater importance for sovereign CDS contracts because of the high risk of currency depreciation or re-denomination in the event of a sovereign reference entity default. For instance, if the UK was to default, a cash payout would be much less attractive in British pounds to the protection holder than a payout denominated in Euros (Augustin et al, 2012).

3.4. The Greek bailout

Under the Maastricht Treaty Eurozone members had pledged to limit debt levels and public deficits and stipulated against member countries assuming the debts of another. Greece's bailout breached this and caused a structural shift in investor perception of sovereign default probabilities. Greece started to test the treaty's limits in the early 2000s. In response future government revenues were securitised to disguise deficits and debt levels (Hope, 2010). In late 2009 Greece's new government suspended this program and released revised debt levels, showing that Greece's debt was 129% of its GDP ratio (IMF, 2013). In an attempt to recover, the Greek government launched a series of austerity measures, but despite these efforts, Fitch downgraded Greek sovereign debt to non-investment grade on April 9, 2010. On April 23 Greece formally requested an emergency aid package. The bailout was intended to calm markets, but instead it led to further concerns about the solvency and fiscal responsibility of other European countries with debt levels because of the strong ties between the Eurozone countries, particularly what was to become known as the PIIGS countries. These concerns caused a unilateral increase in sovereign CDS spreads across Europe[7], particularly for Greece who saw its CDS spreads more than double from 337 bps to 697 bps (Augustin et al, 2014).

3.5. The European Sovereign Debt Crisis

The causes of the European sovereign debt crisis were rooted in uneven growth and productivity performance between Eurozone members, enlarged public budget deficits[8], unsustainably large public debts, as well as imbalances within the monetary union (see Figure 7, Appendix I for a timeline of key events). Greek sovereign debt was immediately downgraded when its deficit was revealed to be 12.7% of GDP (IMF, 2013). The crisis quickly escalated and spilled over to Ireland, Italy, Portugal, and Spain. The EU and the IMF responded promptly by creating a €110

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[7] See Figure 6, Appendix I, for a graph of sovereign CDS spreads before and after the Greek bailout.
[8] Due largely to the effects of the financial crisis (i.e. lower tax income and increased public spending)

billion bailout package for Greece and setting up the European Financial Stability Facility (EFSF), intended to streamline future bailouts. In 2011 the amount required to bailout Greece was revised up and an additional €130 billion package established.

In Ireland, a large real estate bubble burst as a result of an unsustainable price increase. In an attempt to calm the market the Irish government nationalized one of its major banks Anglo Irish Bank, and received a €67.5 billion bailout package from the IMF. Like Ireland, Spain experienced a real estate bubble leading up to the crisis. Facing higher than expected deficits, Spain adopted austerity measures, but failed to decrease their deficit adequately to avoid a downgrade by Fitch and Moody's. Eventually, Spain had to accept a €100 billion bailout package aimed specifically at stabilizing Spanish banks.

In Italy, considerable public debt and slow economic growth, coupled with S&P's downgrade of Italian debt outlook, sparked fears of a growing financial crisis. Unlike Ireland and Greece, Portugal had a strong recovery during the first part of the crisis. However, due to the amounting Greek debt crisis, the country in late 2009 revised up their deficit forecasts and negotiated a €78 billion bailout package, due largely to concerns that the country's economy could not grow sufficiently over the long term.

The EU, with its monetary policy controlled by the ECB, while leaving fiscal policy to individual member states, is inherently problematic in an unstable macro environment, as it denies member states monetary policy levers with which to help their recoveries. This also makes deficit-funded fiscal stimulus harder, as monetary policy could be used to keep borrowing costs low (Riksbank, 2012). The graph below displays the evolution of CDS spreads through the crisis.

Figure 3: CDS Spreads in Basis Points of Select European Economies
Graph (in bps) of daily CDS spreads for major Eurozone economies and PIIGS sovereigns. Time period stretches from Jan 1, 2010 to Dec 31, 2012. Greek CDS spreads reach +37000bps during the time period - graph is scaled back to better capture the movement in the spreads of the other sovereign reference entities.
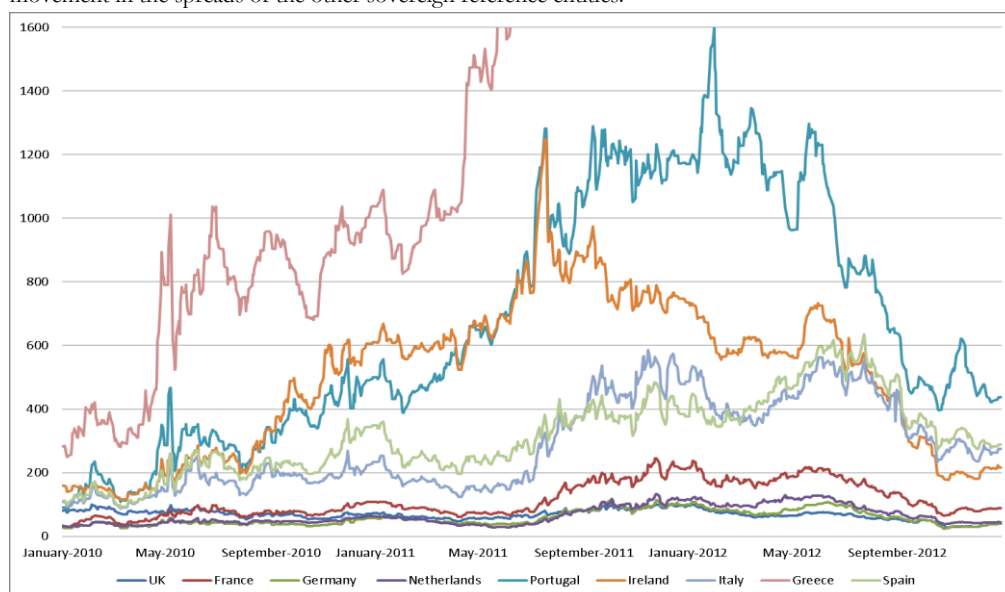
4. Hypotheses

Escalating sovereign credit risk can affect corporate borrowing costs in a number of ways. Distressed sovereigns can shift the burden of public debt to the private sector through increases in current or future corporate taxes, roll backs in subsidies and support programs for domestic firms (Bedendo and Colla, 2013). In extreme cases governments can expropriate private assets triggering a capital flight. Such policies have a direct impact on corporate profits, net worth, and hence borrowing costs from public markets (Augustin et al, 2014a). Moreover, government liquidity problems can quickly cause domestic recessions. Many European economies underwent fiscal tightening programs, deepening recessions and further impacting firm profits. Thus, we expect an economically and statistically significant transfer of sovereign credit risk to the private sector.

H1: Corporate borrowing costs increase as sovereign credit risk rises.

We expect the sovereign to firm transfer to be stronger for the financial sector compared to the non-financial sector. Financial companies have large holdings of sovereign debt on their balance sheets as assets and collateral, and are backed by explicit government guarantees. Enlarged sovereign credit risk impairs these assets and the value of collateral, increasing counterparty default risk and borrowing costs in the money markets. (Acharya et al, 2013). However, the question if financial institutions are more or less impacted than non-financial firms is important when considering the real effects of the debt crisis since the non-financial sector suffers greatly during recessions and credit crunches. Our second hypothesis follows:

H2: Financial sector borrowing costs exhibit a greater increase than the non-financial sector in response to escalating sovereign credit risk.

While the European Economic Area, an economically integrated area, faced significant spillover and contagion from the debt crisis., the impact of increased sovereign credit risk is likely to vary between countries. We expect firms in countries within the common currency to be more harshly affected by the debt crisis due to their inability to use independent monetary policy to maintain external balance and improve competitiveness. Moreover the crisis spread due to the deep integration of Euro area economies, and the strain potential sovereign defaults placed on the future of the common currency. This leads to hypothesis three.

H3: Firms in the Eurozone face a stronger sovereign to firm risk transfer and thus higher borrowing costs as sovereign credit risk increases.

Portugal, Italy, Ireland, Greece, and Spain (PIIGS) were the hardest affected by the crisis, their public finances were amongst the most distressed, and all had severe subsequent recessions. Exposure to these countries and costs of the bailouts they received resulted in strong contagion amongst Europe's stronger economies and spread the crisis. Since these PIIGS countries were at the epicentre of the crisis we believe that the impact of rising sovereign risk was stronger for firms within the PIIGS countries, leading to hypothesis four:

H4: Companies in the PIIGS countries have comparatively higher borrowing costs when sovereign credit risk increases.

Strong economic institutions lead to more competitive and resilient economies (Acemoglu et al, 2004). Property rights institutions play a vital role in this (Bai and Wei, 2012). A state in fiscal trouble can either expropriate the private sector, or less likely, convince the central bank to inflate government debt. Governments can shift the debt burden by changing tax codes and in severe cases apply strict capital controls or seize assets and nationalise firms (Augustin et al, 2014a). Strong property rights restrict a government's ability to expropriate firms (Bai and Wei, 2012). We expect countries with high property rights to more robust to economic shocks and therefore display a weaker connection between sovereign and corporate credit risk (Bai and Wei, 2012). Hypothesis five is:

H5: Stronger property right institutions limit the sovereign to firm transfer, companies in countries with strong property rights should have lower borrowing costs as sovereign risk escalates.

The European debt crisis led to a significant contraction in bank lending and dry up of credit as banks found it increasingly costly to borrow in the money markets (Acharya et al, 2013). New loan volumes fell significantly, especially amongst banks with balance sheet exposure to PIIGS sovereign debt (Popov and Van Horen, 2013). This credit crunch had a substantial impact on firms. Acharya et al (2014) find that firms highly dependent on bank borrowing during the sovereign debt crisis were financially constrained and increased precautionary cash holdings. These firms displayed slower employment, expenditure, and sales growth. Given the punitive impact of the credit crunch we expect firms more dependent on external borrowing, from banks and debt markets, to be more affected by increases in sovereign credit risk.

H6: Firms highly dependent on external borrowing should have comparatively higher borrowing costs in response to escalating sovereign credit risk.

5. Data Usage

In this paper we collected daily trading data on CDS quotes of 230 companies and 15 sovereigns located in Europe, as well as a range of country specific variables, firm-specific variables and market-wide control variables. Out of the 230 companies, 162 are non-financial companies and 68 are financial companies. A financial company constitutes in this context investment companies, investment banks, banks, building societies, insurance companies, and credit unions. Ten sovereigns are Eurozone members (Belgium, Finland, France, Germany, Greece, Italy, Ireland, Netherlands, Portugal and Spain), while the remaining five are outside the Eurozone (UK, Switzerland, Sweden, Denmark, Norway). Our comprehensive data sample forms the basis of our panel data for which the analysis is based on.

For the purpose of our analysis we use two panel data samples. Our first sample stretches from January 1, 2010 to December 31, 2012, capturing several events and trends, and enables us to avoid excess disturbances. The second sample starts on January 1, 2010 and studies Greece's bailout on April 23, 2010 (80 day pre-event period) and runs to August 16, 2010 (80 day post-event period), allowing for a focused analysis of this time period and event.

We calculate the change in the natural logarithm (ΔLn) for all of our time series, except the EUR/USD exchange rate. Firm specific variables are based on annual accounting data and are therefore constant through each respective year. Also constant throughout each year is the Property Rights Score variable.

5.1.   Spill over variables

We measure credit risk with CDS spreads, as they provide a strong measure of default risk. Sovereign CDS quotes were retrieved from Thomson Reuters DataStream and corporate CDS quotes from Bloomberg. Sovereign CDS quotes are denominated in USD, whereas the corporate CDS quotes are denominated in EUR. We use daily average EUR/USD spot exchange rates from Bloomberg to control for this. CDS quotes for both sovereigns and corporates are for CDS contracts of the modified restructuring clause (MR) classification with a maturity of 5 years quoted at mid-prices, providing the most liquid and frequently traded contracts. (Bedendo & Colla, 2013).

5.2.   Firm specific variables

In order to control for firm specific factors we include variables that have an impact on company credit score and subsequently CDS spreads. The variables are solvency (shareholders equity over total assets), leverage (total debt over shareholders equity), borrowing (expressed as total debt over total liabilities), the current ratio, and return on equity. The underlying accounting data used for the firm specific variables were retrieved from the Orbis Bureau van Dijk database. In some instances the corporate CDS belonged to subsidiaries based in other European countries than the

main holding company. In those instances we have chosen to retrieve the accounting data of the main holding company rather than the subsidiary, as it more accurately reflects the effect on the company.

5.3. Country specific control variables

The Property Rights Score control variable assesses the likelihood that the government will expropriate private property and analyses the independence of the judiciary, and corruption within the judiciary (Heritage Foundation, 2015). Data is obtained from the Heritage Foundation and rescaled to be between zero and one by dividing the score by 100.

As in Acharya et al (2013) we control for a country's credit risk exposure to other countries. To do so we constructed a foreign exposure variable for every country in our sample. From the Bank of International Settlements we gathered the claims every country in our sample holds on other European countries and weighted the claim on the country's total foreign claims. These weighted exposures were multiplied with the sovereign CDSs of every other sample country and scaled by the size of the domestic banking sector, obtained from the European Central Bank and Swiss National Bank. The resulting control variable captures changes in sovereign credit risk due to changes in the sovereign credit risk of other countries.

We also control for domestic economic conditions, which according to Augustin (2104) are likely to have an effect on sovereign risk. This is captured through the Domestic Stock Market control variable, which are the MSCI indices for each country in our sample, sourced from Bloomberg.

5.4. Market-wide control variables

In order to gauge and control for European CDS market developments, we use the *iTraxx* Europe Generic Index, which is comprised of the 125 most liquid and traded investment grade CDSs. The *iTraxx* index is also characterized as the best proxy of CDS market wide trends in credit risk. We also include the VSTOXX index or the "Euro VIX" as it is commonly referred to, a market volatility index designed to reflect the market expectations of near-term up to long-term volatility. We use five-year German bond yields (Germany Generic Govt 5 Year Yield) as a control variable for the European risk free rate, as it is the cleanest measure for the Eurozone. As a measure of the global risk free rate we use five-year US Treasury yields (US Generic Govt 5 Year Yield). We also use the 3-month Euribor rate to control for changes in Europe's interbank market.

As Greece was the first sovereign to be affected by the increase in spreads and we include the Greek sovereign CDS spreads as a market-wide control variable in our second sample (Greek bailout). All of the time-series for market-wide control variables were obtained from Bloomberg.

6. Methodology

In this paper we attempt to identify a significant causal relationship between sovereign and corporate credit risk. We do this by testing our hypotheses using over a panel data sample spanning from 2010 to 2012, which captures the events of the sovereign debt crisis. Next, we test if the same hypotheses hold in a shock to credit risk represented by our second sample which studies Greece's bailout in 2010. Comparing the results from both samples ensure that our findings are not driven by the extraordinary events of the European sovereign debt crisis and provide us strong evidence to make our conclusions. The regressions run over both samples follow an Ordinary Least Squares (OLS) approach over panel data. Our methodology is based on methods laid out by past researchers, Acharya et al (2013), Augustin et al (2014a), Bai and Wei (2012), and Bedendo and Colla (2013).

6.1. Panel Data

Panel data sets consist of time-series observations for each cross sectional variable in the data set, allowing for several observations of the same variable over time, allowing us to control for unobserved characteristics in the cross sectional variables (Wooldridge, 2008). Our panels use firms and days as the cross sectional and time dimensions respectively.

6.2. OLS

OLS regressions are used to determine the impact of changes in sovereign credit risk on corporate credit risk. The ordinary least squares regression takes the form:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_k X_{ki} + \varepsilon_i \ (1)$$

Where $X_1, X_2, \ldots, X_k$ are independent variables and Y_i is the dependent variable. In samples of n observations on variables $Y, X_1, X_2, \ldots, X_k$, the OLS is used to fit the equation

$$y = \widehat{\beta_0} + \widehat{\beta_1} X_1 + \widehat{\beta_2} X_2 + \cdots + \widehat{\beta_k} X_k + \mu \ (2)$$

so that $\widehat{\beta_0}, \widehat{\beta_1}, \widehat{\beta_2}, \widehat{\beta_k}$ minimize the sum of squared residuals (Wooldridge, 2008). By taking the change in the natural logarithm of both the dependent and majority of the independent and control variables our regressions take the form:

$$\Delta\log(y) = \widehat{\beta_0} + \widehat{\beta_1}\Delta log(X_1) + \widehat{\beta_2}\Delta\log(X_2) + \cdots + \widehat{\beta_k}\Delta\log(X_k) + \mu \ (3)$$

Where a change 1% change in an explanatory variable X_i results in a $\widehat{\beta_i}$% change in the dependant variable y.

We use robust standard errors and cluster standard errors at the firm level to correct for heteroskedasticity and any correlation of standard errors within firms over time (Bedendo and Colla, 2013). We use a Fixed Effects approach using firm and time Fixed Effects to control for the influence of cross sectional and time factors that we cannot observe and may cause a stronger sovereign to firm transfer and Omitted Variable Bias (Augustin et al, 2014a).

A two-tailed t-test is used to determine the significance of the parameters obtained from our panel regression models. We use the student's t-test to test the null hypothesis that our parameters are equal to zero. The p values obtained indicate the significance of our parameters at the 1%, 5%, 10% level.

$$t = \frac{\bar{X} - \mu}{S/\sqrt{n}} \text{ (4)}$$

The *F*-statistic is computed to determine the overall significance of our models. That is if all the regressors $X_1, X_2, \ldots, X_k$ help to explain y, against the null hypothesis that they do not (Wooldridge, 2008).

6.3. Panel 1, European debt crisis 2010-12

We begin our analysis by running regression over a panel data sample for 230 firms spanning 782 days from beginning 2010 to end 2012. The sample period allows us to capture the extraordinary events of the European debt crisis. Our sample encompasses growing fears of sovereign default starting with Greece's financial irregularities and bailout, and subsequent bailouts in Ireland and Portugal. Sovereign CDS spreads reflect a widening of the crisis to Spain and Italy, concerns of a Greek exit and or default, and breakup of the common currency. We capture the effect of S&P's downgrade of nine European economies[10] on CDS spreads, and the ECB's extraordinary policy response.

6.3.1. Panel 1 – Sovereign to Firm Relationship

We test our first hypothesis (*H1*) by running the following regression on all firms:

$$\Delta cds_{i,j,t}^{F} = \beta_0 + \beta_1 \Delta cds_{j,t}^{S} + \lambda_i X_t + \gamma_i + \delta_t \text{ (5)}$$

$\Delta cds_{i,j,t}^{F}$ is the change in the log of corporate CDS spreads for firm i in country j at time t, $\Delta cds_{j,t}^{S}$ the change in the log of sovereign CDS spreads for country j at time t. β_1 is the parameter of interest and expected to be positive and statistically significant. $\lambda_i X_{j,t}$ represents control variables that account for changes in volatility and the macro economy. γ_i and δ_t represent firm and time fixed effects.

We add the log change of foreign country risk exposure ($\Delta ForExp_{j,t}$) and domestic stock market indices ($\Delta DomStock_{j,t}$) as control variables. Our model now takes the form:

$$\Delta cds_{i,j,t}^{F} = \beta_0 + \beta_1 \Delta cds_{j,t}^{S} + \beta_2 \Delta ForExp_{j,t} + \beta_3 \Delta DomStock_{j,t} + \lambda_i X_t + \gamma_i + \delta_t + \varepsilon_{i,j,t} \text{ (6)}$$

6.3.2. Panel 1 – Financials/Non-Financials

Manipulating cross sectional differences amongst firms tests hypotheses $2 - 4$. The regression in equation 6 is run on financial and non-financial companies to test hypothesis two *(H2)*. Our analysis is extended through a difference in difference regression to estimate the difference in the

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[10] Including the stronger economies of France and the Netherlands.

sovereign spillover relationship for non-financials compared to financials by using a dummy variable $Corp$ that equals one for non-financial firms and zero for financials.

$$\Delta cds^F_{i,j,t} = \beta_0 + \beta_1(\Delta cds^S_{j,t} * Corp) + \beta_2\Delta cds^S_{j,t} + \beta_3\Delta ForExp_{j,t} + \beta_4\Delta DomStock_{j,t} + \lambda_i X_t + \gamma_i + \delta_t + \varepsilon_{i,j,t}$$
(7)

6.3.3. Panel 1 – Eurozone/Non-Eurozone

Hypothesis three (*H3*) is tested by running equation 6 on subsamples of Eurozone firms and non-Eurozone firms and on financial and non-financial companies within these subsamples.

The difference in difference analysis of Equation 7 is adapted and repeated on all firms and on subsamples of financial and non-financial companies. *Corp* is replaced with *Euro*, a dummy variable that takes value one if the firm is headquartered in a Eurozone country and zero otherwise is used. This regression takes the form:

$$\Delta cds^F_{i,j,t} = \beta_0 + \beta_1(\Delta cds^S_{j,t} * Euro) + \beta_2\Delta cds^S_{j,t} + \beta_3\Delta ForExp_{j,t} + \beta_4\Delta DomStock_{j,t} + \lambda_i X_t + \gamma_i + \delta_t + \varepsilon_{i,j,t}$$
(8)

6.3.4. Panel 1 – PIIGS/Non-PIIGS

We test hypothesis four (*H4*) by breaking the Eurozone down further and analysing the impact of increased sovereign CDS spreads on companies headquartered in the PIIGS countries. Equation 6 is repeated on subsamples of PIIGS Countries and Non PIIGS Countries. Regressions are run on all firms, financial and non-financial companies. Equation 7's difference in difference analysis is adapted to determine the differential impact on firms headquartered in a PIIGS country, the relationship is analysed against firms in all other countries in the sample. We use a dummy variable *PIIGS* that equals one for firms in crisis countries and zero otherwise, shown below:

$$\Delta cds^F_{i,j,t} = \beta_0 + \beta_1(\Delta cds^S_{j,t} * PIIGS) + \beta_2\Delta cds^S_{j,t} + \beta_3\Delta ForExp_{j,t} + \beta_4\Delta DomStock_{j,t} + \lambda_i X_t + \gamma_i + \delta_t + \varepsilon_{i,j,t}$$
(9)

6.3.5. Panel 1 – Property Rights

Hypothesis five (*H5)* is tested using a difference in difference analysis to determine the differential impact of high compared to low property rights on sovereign to corporate spill over. High property rights are defined as anything above Heritage Foundation's grade of 70, 0.7 in our sample[11], where "private property is guaranteed by the government. The court system is subject to delays and is lax in enforcing contracts. Corruption is possible but rare, and expropriation is unlikely" (The Heritage Foundation, 2015). A dummy variable, high property rights (*HPR*), is used which takes value one when property rights are greater than 0.7 and zero otherwise. The following regression is run:

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[11] This contrasts with Augustin et al (2014a) who use a score of 90 (0.9), the sample median, for high property rights.

$$\Delta cds_{i,j,t}^{F} = \beta_0 + \beta_1(\Delta cds_{j,t}^{S} * HPR) + \beta_2\Delta cds_{j,t}^{S} + \beta_3\Delta ForExp_{j,t} + \beta_4\Delta DomStock_{j,t} + \beta_5 HPR + \lambda_i X_t + \gamma_i +$$
$$\delta_t + \varepsilon_{i,j,t} \ (10)$$

Property rights, *PropRights*, are added as an explanatory variable to Equation 6 to examine the impact of changes in property rights on changes in corporate CDS spreads:

$$\Delta cds_{i,j,t}^{F} = \beta_0 + \beta_1\Delta cds_{j,t}^{S} + \beta_2 PropRights + \beta_3\Delta ForExp_{j,t} + \beta_4\Delta DomStock_{j,t} + \lambda_i X_t + \gamma_i + \delta_t + \varepsilon_{i,j,t} \ (11)$$

6.3.6. Panel 1 – Borrowing Dependence

To test if hypothesis 6 (*H6*) we categorise non-financial firms into high and low bank dependence based on the sample median level of debt to liabilities. A borrowing dependence dummy variable, high borrowing dependence (*HBD*), is created which takes value one if a firm has a debt to liabilities ratio higher than the sample median and zero otherwise. This variable is used in a difference in difference regression over all firms, and Eurozone and non-Eurozone corporates. Firm specific controls ($\theta_i H_{i,j,t}$) that may impact credit worthiness are added[12]. This equation follows:

$$\Delta cds_{i,j,t}^{F} = \beta_0 + \beta_1(\Delta cds_{j,t}^{S} * HBD) + \beta_2\Delta cds_{j,t}^{S} + \beta_3\Delta ForExp_{j,t} + \beta_4\Delta DomStock_{j,t} + \beta_5 HBD + \lambda_i X_t +$$
$$\theta_i H_{i,j,t} + \gamma_i + \delta_t + \varepsilon_{i,j,t} \ (12)$$

We flush out the role of borrowing[13] (*Borrow*) by adding it as an explanatory variable to examine the impact of a corporate's dependence on external financing, from banks and debt markets, as a transmission mechanism.

$$\Delta cds_{i,j,t}^{F} = \beta_0 + \beta_1\Delta cds_{j,t}^{S} + \beta_2 Borrow + \beta_3\Delta ForExp_{j,t} + \beta_4\Delta DomStock_{j,t} + \lambda_i X_t + \theta_i H_{i,j,t} + \gamma_i + \delta_t +$$
$$\varepsilon_{i,j,t} \ (13)$$

6.4.   Panel 2 – Greek Event

Our hypotheses are further tested on a sample examining Greece' bailout on April 23, 2010 as a pan-European shock to credit risk. This sample enables us to compare our results with Augustin et al (2014a). The time horizon is shortened to 161 days running from January 1, 2010 to August 13, 2010 – 80 days prior to and after the event. Greek firms are removed from the sample as they are most impacted by the bailout. A dummy variable E is created which takes value one after April 23, 2010 and zero before. The other variables remain the same. We test hypothesis one *(H1)* by examining the differential impact of sovereign CDS spreads after the event. We run regressions before and after the event, and over the entire sample period. The change in the log of sovereign CDS spreads is multiplied by the event dummy,E, as shown in equation 14 where β_1 predicts the difference in the sovereign firm relationship after the event.

$$\Delta cds_{i,j,t}^{F} = \beta_0 + \beta_1(\Delta cds_{j,t}^{S} * E_t) + \beta_2\Delta cds_{j,t}^{S} + \beta_3\Delta ForExp_{j,t} + \beta_4\Delta DomStock_{j,t} + \lambda_i X_t + \gamma_i + \delta_t + \varepsilon_{i,j,t}$$
$$(14)$$

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[12] These are leverage, current ratio, return on equity, and equity to assets solvency
[13] Measured by a firm's debt to liabilities ratio.

6.4.1. Panel 2 – Cross Sectional: Financials/Non-Financials, Eurozone, PIIGS/Non-PIIGS

To test hypothesis 2 – 4 we re-run Equation 14 on a subsamples of financial and non-financial firms, Eurozone and non-Eurozone firms, and PIIGS and non-PIIGS firms before and after the event, and over the whole sample period.

A difference in difference regression is also used to compliment the analysis and determine the impact of the Greek bailout. We use the regression below (equation 15) over the whole sample period and are most interested in the coefficient of β_1 which predicts the difference in the sovereign to firm relationship after the event. The variable D_j is a dummy that takes value one and zero otherwise for non-financial companies, firms headquartered in the Eurozone, and firms headquartered in PIIGS countries for each respective regression.

$$\Delta cds10_{i,j,t}^F = \beta_0 + \beta_1\big(\Delta cds_{j,t}^S * E_t * D_j\big) + \beta_2\big(\Delta cds_{j,t}^S * D_j\big) + \beta_3\big(E_t * D_j\big) + \beta_4\big(\Delta cds_{j,t}^S * E_t\big) + \beta_5\Delta cds_{j,t}^S +$$
$$\beta_6\Delta ForExp_{j,t} + \beta_7\Delta DomStock_{j,t} + \lambda_i X_t + \gamma_i + \delta_t + \varepsilon_{i,j,t} \ (15)$$

6.4.2. Panel 2 – Property Rights

A difference in difference regression is used to examine the importance of high property rights, as per hypothesis five (*H5*) before and after the event. This follows the same method of equation 15, the dummy variable D_j is replaced with an indicator HPR that takes value one if property rights are greater than 0.7[14]. The following regressions are run over all firms, financials, and non-financials before and after the event and over the whole sample period. β_1 predicts the difference in the sovereign to firm relationship after the event for countries with high versus low property rights.

$$\Delta cds_{i,j,t}^F = \beta_0 + \beta_1\big(\Delta cds_{j,t}^S * E_t * HPR\big) + \beta_2\big(\Delta cds_{j,t}^S * HPR\big) + \beta_3\big(E_t * HPR\big) + \beta_4\big(\Delta cds_{j,t}^S * E_t\big) +$$
$$\beta_5\Delta cds_{j,t}^S + \beta_6\Delta ForExp_{j,t} + \beta_7\Delta DomStock_{j,t} + \beta_8 HPR + \lambda_i X_t + \gamma_i + \delta_t + \varepsilon_{i,j,t} \ (16)$$

To flush out the role of property rights we re-run equation 11, before and after the event, and add two interaction variables, first between the event dummy and sovereign CDS, second between the event dummy and property rights. We only control for time fixed effects, as property rights are common to groups of firms and constant over the sample. The coefficients β_1 and β_2 predict the difference in the sovereign to firm relationship for countries with high compared to low property rights and the importance of property rights respectively.

$$\Delta cds_{i,j,t}^F = \beta_0 + \beta_1\big(\Delta cds_{j,t}^S * E_t\big) + \beta_2(PropRights * E_t) + \beta_3\Delta cds_{j,t}^S + \beta_4 PropRights + \beta_5\Delta ForExp_{j,t} +$$
$$\beta_6\Delta DomStock_{j,t} + \lambda_i X_t + \delta_t + \varepsilon_{i,j,t} \ (17)$$

6.4.3. Panel 2 – Borrowing Dependence

Hypothesis six (*H6*) examines the importance of high borrowing as a means of transmitting sovereign credit risk. This is done through a difference in difference regression. We analyse this effect over a subsample of non-financial corporates using a similar to method to equation 16,

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[14] Our threshold for high property rights.

however *HPR* is replaced with a dummy variable *HBD* that takes value one of a firm's debt to liabilities ratio is greater than the sample median. β_1 predicts the difference in the sovereign to firm relationship after the event for firms with high compared to low borrowing dependence.

$$\Delta cds_{i,j,t}^F = \beta_0 + \beta_1\big(\Delta cds_{j,t}^S * E_t * HBD\big) + \beta_2\big(\Delta cds_{j,t}^S * HBD\big) + \beta_3\big(E_t * HBR\big) + \beta_4\big(\Delta cds_{j,t}^S * E_t\big) +$$
$$\beta_5\Delta cds_{j,t}^S + \beta_6\Delta ForExp_{j,t} + \beta_7\Delta DomStock_{j,t} + \beta_8 HBD + \lambda_i X_t + \theta_i H_{i,j,t} + \gamma_i + \delta_t + \varepsilon_{i,j,t} \ (18)$$

The explicit role of borrowing in explaining changes in corporate CDS spreads is examined by an analysis similar to equation 13 with two interaction variables added – first between the event dummy and sovereign CDS, second between borrowing and the event dummy. We control for time fixed effects as a firm's borrowing dependence is constant over the sample period.

$$\Delta cds_{i,j,t}^F = \beta_0 + \beta_1\big(\Delta cds_{j,t}^S * E_t\big) + \beta_2\big(Borrowing * E_t\big) + \beta_3\Delta cds_{j,t}^S + \beta_4 Borrow + \beta_5\Delta ForExp_{j,t} +$$
$$\beta_6\Delta DomStock_{j,t} + \lambda_i X_t + \theta_i H_{i,j,t} + \delta_t + \varepsilon_{i,j,t} \ (19)$$

7. Summary statistics

In Table I (Table 16, Appendix II) we provide summary statistics for corporate and sovereign CDS spreads for our whole panel data set and the event study data set on a pre- and post-event basis. For Switzerland there are no sovereign CDS spreads to be reported in the event study data sample because of the incomplete time series. The statistics shows considerable heterogeneity across companies, countries and time. In panel A we see from the event study sample that average corporate CDS spreads increase from 121 bps to 159 bps from the pre-bailout to the post-bailout period. We also observe an increase in average volatility, both observations being consistent with overall market turbulence resulting from the Greek bailout. The whole panel data set shows considerably higher average and volatility in corporate CDS spreads, due to the longer time series and market developments that take place.[15] For panel B and the sovereign CDS spreads the increase in average spreads and volatility is most prominent for the PIIGS countries, particularly Greece.

In Table II (Table 16, Appendix II) we provide further cross-sectional statistics on the subgroups of our samples[16]. Panel C shows change across time in average spreads and volatility consistent with those of panel A, however, the effect is more pronounced for corporates located in countries with low property rights and high exposure to bank lending. For the whole panel the average spreads are comparatively higher for financial companies, companies located in the Eurozone, especially within the PIIGS countries, which coincides with those countries that have lower property rights.

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[15] Norwegian statistics are impacted by an outlier as Norske Skog gets downgraded from investment grade to junk and gets very close to breaching its loan covenants, resulting in a huge spike in CDS spreads to 4880 bps.
[16] We separate the statistics for Financial and non-Financial companies, countries inside and outside the Eurozone, for PIIGS and non-PIIGS, firms in countries with high property rights against firms in countries with low property rights, and corporations with an above median borrowing dependence against those with a below-median exposure borrowing dependence.

8. Results & Discussion

Having outlined the previous literature, data collection, and methodology, we present in this section the results of the 2010-12 European debt crisis and Greek bailout samples and provide an analysis of the same. Our reference specification controls for firm fixed effects, controlling for time and firm and time fixed effects provide robustness checks.

8.1. Sovereign to Firm Transfer

We find the transfer of sovereign credit risk to the private sector to be large and highly statistically significant throughout the European Debt Crisis. As displayed in Table 1 column 1, a 1% increase in domestic sovereign risk results in a 0.12% rise in private sector borrowing costs, significant at the 1% level. Robustness tests controlling for time fixed effects, exposure to other sovereigns, and domestic stock markets are qualitatively similar. Domestic economic conditions captured by the domestic stock index have an important effect on corporate CDS spreads; a 1% increase leads to a 0.22% reduction in borrowing costs robust and significant at the 1% level. Exposure to other European countries also plays a role, however it is not as important as exposure to the domestic sovereign.

Table 1: Sovereign to Firm Relationship controlling for Foreign Exposure & Domestic Market Index
This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads. We control for exposure to other sovereigns (Foreign Exposure) and the influence of the domestic stock market (Domestic Stock Index). Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to December 31, 2012

Variables	(1)	(2)	(3)
Dependent variable: ΔLn(Corporate CDS)			
Sovereign CDS	0.1212***	0.0679***	0.0673***
	0.0088	*0.0105*	*0.0106*
Foreign Exposure	0.0285**	0.0018	0.0002
	0.0134	*0.0066*	*0.0169*
Domestic Stock Index	-0.2198***	-0.2540***	-0.2513***
	0.0169	*0.0468*	*0.0466*
Observations	162 423	162 423	162 423
R - Squared	0.3083	0.3870	0.3870
Firm FE	YES	NO	YES
Time FE	NO	YES	YES
Cluster Firm	YES	YES	YES

Standard Errors in Italics
*** $p<0.01$ (1%), ** $p<0.05$ (5%), * $p<0.10$ (10%)

Our analysis is furthered by considering the impact of the Greek bailout, an exogenous shock to sovereign credit risk, on private sector borrowing costs. Table 2 columns 1 & 3 report the relationship between sovereign and corporate risk before and after April 23 2010's announcement. The interaction coefficient SovCDS * Event in column 5 reports the expected

difference in the sovereign to firm relationship after the event. Columns 2,4&6 provide our robust estimates. In contrast to Augustin et al (2014a), who use April 11 2010 as the event date, we find a highly significant link between sovereign and corporate CDSs prior to the event. A 1% increase in sovereign credit risk increases the average European firm's borrowing costs by 0.08% before the bailout and 0.14% after. Column 5's difference in difference estimate predicts that the bailout results in a 0.04% increase in firm borrowing costs for every 1% increase in sovereign risk, significant at the 1% level. Results are robust when factoring in time fixed effects. Firms become more reliant on the health of domestic sovereigns since the foreign exposure coefficient becomes insignificant after the bailout.

Table 2: Sovereign to Firm Relationship Before & After Greek Bailout

This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads. We control for exposure to other sovereigns (Foreign Exposure) and the influence of the domestic stock market (Domestic Stock Index). *Event is a dummy variable that equals 1 after the event date (April 23 2010), zero otherwise.* . Columns 1&2 only include observation before the event date, columns 3&4 include observations after the event date. Columns 5&6 include all observations and report the difference estimator. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to August 13, 2010

Variables	(1) Pre-Bailout	(2) Pre-Bailout	(3) Post-Bailout	(4) Post-Bailout	(5) Difference	(6) Difference
Dependent variable: ΔLn(Corporate CDS)						
SovCDS * Event					0.0387***	0.0384**
					0.0113	*0.0164*
Sovereign CDS	0.0777***	0.0485***	0.1352***	0.0851***	0.0826***	0.0467***
	0.0088	*0.0145*	*0.0157*	*0.0196*	*0.0098*	*0.0145*
Domestic Stock Index	-0.0618	-0.5212***	-0.3867***	-0.5352***	-0.2841***	-0.5448***
	0.0468	*0.1068*	*0.0504*	*0.1472*	*0.0412*	*0.1220*
Foreign Exposure	0.0653***	0.0400	0.0220	-0.0042	0.0282	0.0097
	0.0217	*0.0277*	*0.0284*	*0.0344*	*0.0246*	*0.0309*
Observations	15 794	15 794	16 120	16 120	31 914	31 914
R - Squared	0.2923	0.3846	0.4681	0.5317	0.4125	0.4887
Firm FE	YES	YES	YES	YES	YES	YES
Time FE	NO	YES	NO	YES	NO	YES
Cluster Firm	YES	YES	YES	YES	YES	YES

Standard Errors in Italics
*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

8.2. Financials / Non Financials

Our second hypothesis *(H2)* that financial firms should have higher borrowing costs as sovereign credit risk increases is examined. Our initial test over the 2010-2012 panel seems to confirm this, Table 3 panels A and B column 1. A 1% increase in domestic sovereign CDS leads to a 0.11%[17] increase in borrowing costs for non-financials and 0.15% rise for financials, significant at the 1% level. However, robustness tests in columns 2 and 3 show very little pronounced difference

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[17] The magnitude of this result is higher than Bedendo & Colla (2013), who find a 0.046% increase in corporate (non-financial) credit risk and hence borrowing costs for every 1% increase in sovereign CDS spreads.

between the effect on financial and non-financial firms, supported by column 2 which suggests that the average financial firm's borrowing costs are only 0.01% higher than their non-financial counterpart in response to a 1% increase in sovereign risk. This result is corroborated by Table 4's difference in difference regression where the coefficient Corp * SovCDS, capturing the difference in borrowing costs for non-financials compared to financials, is not statistically different from zero. The evidence suggests no real difference in transfer risk between the two sectors over the debt crisis. Interestingly Table 3 reveals that the domestic stock market has a greater impact on non-financial compared to financial CDSs, suggesting that the state of the domestic economy is more important for non-financials.

Table 3: Sovereign to Firm Relationship for Financial & Non-Financial Firms

This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads. Panel A reports the results for non-financial firms, Panel B the results for financial firms. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from

Panel A NON FINANCIAL FIRMS	(1)	(2)	(3)
Dependent variable: ΔLn(Corporate CDS)			
Sovereign CDS	0.1066***	0.0635***	0.0626***
	0.0091	*0.0124*	*0.0126*
Domestic Stock Index	-0.2655***	-0.2931***	-0.2890***
	0.0170	*0.0566*	*0.0565*
Foreign Exposure	0.0160	-0.0005	-0.0070
	0.0125	*0.0058*	*0.0157*
Observations	113 755	113 755	113 755
R - Squared	0.3333	0.4354	0.4354
Firm FE	YES	NO	YES
Time FE	NO	YES	YES
Cluster Firm	YES	YES	YES
Panel B FINANCIAL FIRMS	(1)	(2)	(3)
Dependent variable: ΔLn(Corporate CDS)			
Sovereign CDS	0.1522***	0.0754***	0.0750***
	0.0195	*0.0192*	*0.0193*
Domestic Stock Index	-0.1272***	-0.1739**	-0.1724**
	0.0304	*0.0715*	*0.0713*
Foreign Exposure	0.0572	0.0047	0.0102
	0.0351	*0.0245*	*0.0468*
Observations	48 668	48 668	48 668
R - Squared	0.2683	0.3591	0.3591
Firm FE	YES	NO	YES
Time FE	NO	YES	YES
Cluster Firm	YES	YES	YES

Standard Errors in Italics

*** $p<0.01$ (1%), ** $p<0.05$ (5%), * $p<0.10$ (10%)

Table 4: Difference in Difference Regression Financials vs. Non-Financials, 2010-12

This table reports the results of a difference-in-difference regression that tests whether borrowing costs of financial companies are more adversely impacted than borrowing costs of non-financial companies. *Corp* is a dummy variable that takes value 1 for non-financial firms, and zero otherwise. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to December

Variables	(1)	(2)	(3)
Dependent variable: ΔLn(Corporate CDS)			
Corp * SovCDS	-0.0301	-0.0351	-0.0352
	0.0319	*0.0319*	*0.0321*
SovCDS	0.1418***	0.0905***	0.0900***
	0.0256	*0.0243*	*0.0243*
Domestic Stock Index	-0.2840***	-0.2491***	-0.2463***
	0.0167	*0.0465*	*0.0462*
Foreign Exposure	0.0275**	0.0014	-0.0016
	0.0134	*0.0067*	*0.0170*
Corp	0.0000	-0.0004***	0.0000
	0.0000	*0.0001*	*0.0000*
Observations	162 423	162 423	162 423
R - Squared	0.3087	0.3875	0.3875
Firm FE	YES	NO	YES
Time FE	NO	YES	YES
Cluster Firm	YES	YES	YES

Standard Errors in Italics

*** $p<0.01$ (1%), ** $p<0.05$ (5%), * $p<0.10$ (10%)

Testing hypothesis 2 over the Greek bailout sample provides results that add to our analysis. We compare financials and non-financials prior to and after the bailout and test for differential sensitivity to the event, captured by SovCDS * Event. Panels A & B in Table 5 report the results for non-financials and financials respectively. Controlling for robustness we find no significant difference between the sectors after the event[18] [19]. However, the jump in borrowing costs after the event is higher for non-financials, robust over all specifications. A 1% rise in domestic sovereign credit risk after the bailout raises borrowing costs by 0.05% and 0.02% for non-financial and financial firms respectively. However this effect is statistically insignificant for financial firms. (Columns 7,8&9 in panel B). Non-financial firms are more sensitive to changes in the domestic stock market index after the bailout when compared to financials.

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[18] Controlling for time fixed effects we find a 1% rise in sovereign CDS increases non-financial and financial corporate CDSs by 0.0840% and 0.0902% respectively, a difference of just 0.00602%.

[19] Supported by the coefficient of triple interaction, Corp*Event*SovCDS in Table 23 in Appendix II, which shows the predicted impact of the bailout for non-financial borrowing costs and is statistically insignificant.

Table 5: Greek Bailout Differential Effects for Financial & Non Financial Firms

This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads. Panel A reports the results for non-financial firms, Panel B the results for financial firms. *Event* is a dummy variable that equals 1 after the event date (April 23 2010), zero otherwise. Columns 1-3 only include observation before the event date, columns 4-6 include observations after the event date. Columns 7-9 include all observations and report the difference estimator. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to August 13, 2010

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
NON FINANCIAL FIRMS	Pre-Bailout	Pre-Bailout	Pre-Bailout	Post-Bailout	Post-Bailout	Post-Bailout	Difference	Difference	Difference
Dependent variable: ΔLn(Corporate CDS)									
SovCDS * Event							0.0455***	0.0508***	0.0512***
							0.0118	*0.0165*	*0.0163*
Sovereign CDS	0.0669***	0.0391**	0.0392**	0.1197***	0.0840***	0.0844***	0.0612***	0.0346**	0.0345**
	0.0095	*0.0155*	*0.0155*	*0.0157*	*0.0215*	*0.0217*	*0.0099*	*0.0147*	*0.0151*
Domestic Stock Index	0.0206	-0.3995**	-0.3709***	-0.4865***	-0.6071***	-0.6053***	-0.3275***	-0.5468***	-0.5414***
	0.0496	*0.1307*	*0.1290*	*0.0477*	*0.1648*	*0.1623*	*0.0401*	*0.1454*	*0.1456*
Foreign Exposure	0.0278	0.0059	0.0074	-0.0003	-0.0136	-0.0154	-0.0007	-0.0085	-0.0089
	0.0214	*0.0250*	*0.0278*	*0.0286*	*0.0328*	*0.0352*	*0.0249*	*0.0290*	*0.0315*
Observations	11 054	11 054	11 054	11 259	11 259	11 259	22 313	22 313	22 313
R - Squared	0.3279	0.4361	0.4361	0.5106	0.5960	0.5960	0.4541	0.5531	0.5531
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
FINANCIAL FIRMS	Pre-Bailout	Pre-Bailout	Pre-Bailout	Post-Bailout	Post-Bailout	Post-Bailout	Difference	Difference	Difference
Dependent variable: ΔLn(Corporate CDS)									
SovCDS * Event							0.0215	0.0091	0.0155
							0.0227	*0.0339*	*0.0329*
Sovereign CDS	0.0987***	0.0742**	0.0633**	0.1693***	0.0902**	0.0900**	0.1288***	0.0756**	0.0696**
	0.0183	*0.0302*	*0.0294*	*0.0342*	*0.0378*	*0.0377*	*0.0217*	*0.0302*	*0.0297*
Domestic Stock Index	-0.2119**	-0.7812***	-0.6897***	-0.1819*	-0.3676	-0.3667	-0.1865**	-0.4943**	-0.4816**
	0.0921	*0.1611*	*0.1573*	*0.1048*	*0.2690*	*0.2688*	*0.0872*	*0.2134*	*0.2145*
Foreign Exposure	0.1292***	0.0664	0.0838	0.0656	0.0095	0.0173	0.0812	0.0292	0.0390
	0.0456	*0.0471*	*0.0599*	*0.0664*	*0.0687*	*0.0825*	*0.0555*	*0.0597*	*0.0729*
Observations	4 740	4 740	4 740	4 861	4 861	4 861	9 601	9 601	9 601
R - Squared	0.2593	0.3811	0.3807	0.4053	0.4701	0.4701	0.3551	0.4403	0.4402
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

8.3.   Discussion – Sovereign Risk Transmission & Financials / Non Financials

Our results over all firms, and sectors (financial/non-financial) in both panels reveal a robust and highly economically significant relationship between sovereign and private sector credit risk. Financially distressed governments can shift the debt burden by increasing corporate taxes, reducing subsidies, and in extreme cases expropriating private investment (Bedendo and Colla, 2013). European governments responded to the debt crisis with austerity programs, fiscal tightening that reduced aggregate demand causing deep recessions. The state of the domestic economy is important for non-financial firms and has a meaningful impact on firm borrowing costs. The non-financial sector faced declining profitability, which impacted net worth and led to tighter credit and higher borrowing costs. European financial firms were exposed to their governments through large holdings of domestic sovereign debt[20] (Acharya et al, 2013). Losses on sovereign debt impaired assets and resulted in write-downs that lowered profitability and weakened collateral, resulting in higher borrowing costs.

In contrast to hypothesis two (*H2*) we find no real difference between the transfer of sovereign credit risk to the non-financial and financial sectors during the debt crisis (2010-12 panel). Additionally, results indicate that the transmission channel to non-financials is more affected by the bailout. A possible interpretation follows. Given its high holdings of both domestic and European sovereign debt the financial sector has better information and is faster to react to changes in sovereign debt markets and creditworthiness. Thus its CDS spreads have already priced in high sovereign risk and are not affected greatly by the Greek bailout. In contrast, the non-financial sector does not have much direct exposure to the sovereign prior to the event, markets update their beliefs of corporate credit risk after the Greek bailout causing a significant increase in sovereign risk perceptions, evidenced by a larger change in spreads of non-financial compared to financial CDSs in response to the bailout. Furthermore, when sovereign credit risk and or default is high the real impact, expropriation, and transfer to the private sector is the same regardless of which sector of the economy a firm belongs to. The ensuing credit crunch during the European debt crisis was at least as bad for the non-financial sector, with risk averse investors and banks reluctant to lend to firms in or with economic linkages to distressed countries (see Acharya et al, 2014 ; Stracca, 2013).

To conclude, we find enough evidence to accept hypothesis one (*H1*) that increased sovereign credit risk leads to higher corporate borrowing costs. However we find no real

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[20] For example in August 2011, the Italian banks UniCredit and Intesa's exposure to Italian bonds was 121% and 175% of their core capital ratio respectively. The same ratio for Spain's BBVA and Santander exposure to Spanish bonds was 193% and 76% respectively. See "Europe's Banks Struggle With Weak Bonds" by Landon Thomas Jr., *NYTimes.com*, August 3, 2011.

difference in borrowing costs of financial compared to non-financial firms when sovereign credit risk rises. Hence we reject hypothesis two (*H2*).

8.4.   Eurozone versus Non Eurozone

Hypothesis (*H3*) stipulating that increased sovereign credit risk raises borrowing costs more for firms in the common currency is tested. Table 6 reports the results from regressions over our 2010-12 sample. Panel A displays the effect on firms in the Eurozone, Panel B firms outside the Eurozone, columns 1-3 present the results over all firms, 4-6 financials, 7-9 non-financials. We find the sovereign to corporate-nexus is significantly stronger within the Eurozone and appears to be strongest for the financial sector, however controlling for robustness we find no significant difference between financials and non-financials. Intriguingly amongst firms in countries outside of the Eurozone the domestic sovereign to corporate relationship is much stronger for non-financial firms compared to their financial counterparts. Borrowing costs for financial companies outside of the Eurozone are more reliant on exposure to foreign sovereigns, a 1% rise in foreign government CDS spreads results in a 0.16% increase borrowing costs. This is robust and significant at the 1% level (Panel B Columns 5 & 6).

Table 7's difference in difference regression provides evidence for a stronger sovereign to firm nexus is stronger for Eurozone firms. The coefficient of Euro*SovCDS, the predicted difference in borrowing costs for Eurozone compared to non-Eurozone firms, is positive and highly significant. The difference in borrowing costs is most pronounced for financials, 0.14% higher than their non-Eurozone counterparts (Column 4). Narrowing the sample to the days around the Greek bailout finds a similar result. Table 8 reports the results of a difference in difference regression over the Greek bailout sample. The coefficient of EUR*SovCDS suggests that Eurozone firms face higher borrowing costs over the sample period, significant and robust. However, the coefficient of triple interaction EUR* Event*SovCDS is statistically insignificant, indicating no difference in borrowing costs between firms inside and outside of the Eurozone after the bailout. Comparing the results of Tables 24 & 25[21] (Appendix II) support this. Robust estimates find minor differences between Eurozone and non-Eurozone firms after the bailout. Euro area firms see a larger increase in borrowing costs than their counterparts in countries outside the common currency.

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[21] Tables 24 & 25 report the results before, after, and the predicted difference around the Greek bailout for Eurozone and non-Eurozone firms respectively. Panels A.B & C show the results over all firms, non-financials, and financials respectively.

Table 6: Eurozone vs. Non Eurozone firms, 2010-12

This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads. Panel A reports the results for firms headquartered in Eurozone countries, Panel B the results for firms outside the Eurozone. Columns 1-3 report the results for all firms, 4-6 financial firms, 7-9 non-financial firms. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to December 31, 2012

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7) Non	(8) Non	(9) Non
EUROZONE	All Firms	All Firms	All Firms	Financial	Financial	Financial	Finaancial	Finaancial	Finaancial

Dependent variable: ΔLn(Corporate CDS)

Sovereign CDS	0.1311***	0.0743***	0.0746***	0.1708***	0.0753***	0.0751***	0.1113***	0.0753***	0.0759***
	0.0121	0.0127	0.0127	0.0208	0.0222	0.0224	0.0111	0.0157	0.0158
Domestic Stock Index	-0.2214***	-0.2716***	-0.2688***	-0.1286***	-0.1527**	-0.1502**	-0.2728***	-0.3465***	-0.3445***
	0.0184	0.0555	0.0555	0.0296	0.0683	0.0683	0.0188	0.0766	0.0771
Foreign Exposure	0.0407**	0.0080	0.0228	0.0391	-0.0047	-0.0039	0.0390**	0.0084	0.0255
	0.0171	0.0075	0.0217	0.0409	0.0263	0.0529	0.0176	0.0070	0.0230
Observations	103 435	103 435	103 435	33 433	33 433	33 433	70 002	70 002	70 002
R - Squared	0.3319	0.4137	0.4134	0.2933	0.3967	0.3967	0.3596	0.4651	0.4646
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7) Non	(8) Non	(9) Non
NON EUROZONE	All Firms	All Firms	All Firms	Financial	Financial	Financial	Finaancial	Finaancial	Finaancial

Dependent variable: ΔLn(Corporate CDS)

Sovereign CDS	0.0633***	0.0041	0.0031	0.0401**	-0.0414*	-0.0524**	0.0745***	0.0241***	0.0242***
	0.0089	0.0081	0.0086	0.0180	0.0218	0.0225	0.0086	0.0070	0.0070
Domestic Stock Index	-0.1321***	0.1596***	0.1575***	-0.0058	0.2963**	0.2260**	-0.1834***	0.0796	0.0790
	0.0201	0.0615	0.0608	0.0309	0.1152	0.0946	0.0195	0.0560	0.0560
Foreign Exposure	0.0670***	0.0312	0.0409	0.1554***	0.0995***	0.1879***	0.0297*	-0.0254	-0.0257
	0.0188	0.0252	0.0358	0.0438	0.0354	0.0684	0.0170	0.0300	0.0312
Observations	58 988	58 988	58 988	15 235	15 235	15 235	43 753	43 753	43 753
R - Squared	0.2610	0.3512	0.3511	0.2120	0.3169	0.3126	0.2837	0.3994	0.3994
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 7: Difference in Difference Eurozone vs. Non Eurozone firms, 2010-12

This table reports the results of a difference-in-difference regression that tests whether borrowing costs of firms situated in the Eurozone countries are more adversely impacted than the borrowing costs of firms outside the Eurozone. *Euro* is a dummy variable that takes value 1 if the country is in the Eurozone, and zero otherwise. Columns 1-3 report the results for all firms, 4-6 financial firms, 7-9 non-financial firms. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to December 31, 2012.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
							Non	Non	Non
Variables	All Firms	All Firms	All Firms	Financial	Financial	Financial	Finaancial	Finaancial	Finaancial
Dependent variable: ΔLn(Corporate CDS)									
Euro * SovCDS	0.0923***	0.1003***	0.1040***	0.1360**	0.1471**	0.1501**	0.0692***	0.0786***	0.0806***
	0.0232	*0.0234*	*0.0237*	*0.0561*	*0.0593*	*0.0585*	*0.0236*	*0.0230*	*0.0239*
SovCDS	0.0500***	-0.0132	-0.0156	0.0411	-0.0497	-0.0517	0.0547***	0.0021	0.0008
	0.0144	*0.0152*	*0.0151*	*0.0392*	*0.0434*	*0.0427*	*0.0134*	*0.0137*	*0.0127*
Domestic Stock Index	-0.2048***	-0.2096***	-0.2088***	-0.1065***	-0.1256***	-0.1254**	-0.2542****	-0.2520***	-0.2511***
	0.0150	*0.0398*	*0.0399*	*0.0257*	*0.0574*	*0.0574*	*0.0151*	*0.0497*	*0.0500*
Foreign Exposure	0.0438***	0.0081	0.0193	0.0718**	0.0126	0.0274	0.0293**	0.0052	0.0105
	0.0130	*0.0069*	*0.0167*	*0.0331*	*0.0239*	*0.0447*	*0.0125*	*0.0062*	*0.0161*
Euro	.	0.0003**	.	.	0.0008***	.	.	0.0002	.
	.	*0.0002*	.	.	*0.0002*	.	.	*0.0002*	.
Observations	162 423	162 423	162 423	48 668	48 668	48 668	113 755	113 755	113 755
R - Squared	0.3100	0.3898	0.3896	0.2719	0.3638	0.3635	0.3343	0.4372	0.4372
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				Non Financial	Non Financial	Non Financial			
Variables	All Firms	All Firms	All Firms	Financial	Financial	Financial	Financial	Financial	Financial
Dependent variable: ΔLn(Corporate CDS)									
EUR * Event * SovCDS	-0.0141	-0.0068	-0.0064	-0.0260	-0.0190	-0.0194	0.0245	0.0382	0.0400
	0.0220	*0.0221*	*0.0221*	*0.0232*	*0.0235*	*0.0236*	*0.0468*	*0.0471*	*0.0480*
EUR * SovCDS	0.0827***	0.0910***	0.0941***	0.0482**	0.0642**	0.0652**	0.1286***	0.1280***	0.1337***
	0.0212	*0.0230*	*0.0237*	*0.0237*	*0.0267*	*0.0273*	*0.0419*	*0.0484*	*0.0485*
EUR* Event	-0.0011**	-0.0013**	-0.0014**	0.0004	-0.0004	-0.0004	-0.0040***	-0.0028**	-0.0029**
	0.0005	*0.0006*	*0.0006*	*0.0005*	*0.0006*	*0.0006*	*0.0011*	*0.0012*	*0.0012*
Event * SovCDS	0.0491***	0.0454**	0.0468**	0.0642***	0.0688***	0.0699**	0.0000	-0.0223	-0.0201
	0.0158	*0.0218*	*0.0218*	*0.0161*	*0.0229*	*0.0229*	*0.0370*	*0.0490*	*0.0490*
SovCDS	0.0153	-0.0301*	-0.0335**	0.0242	-0.0181	-0.0193	0.0158	-0.0414	-0.0492
	0.0156	*0.0163*	*0.0164*	*0.0172*	*0.0160*	*0.0162*	*0.0322*	*0.0405*	*0.0398*
Domestic Stock Index	-0.2618***	-0.4854***	-0.4749***	-0.3193***	-0.5099***	-0.5035***	-0.1404*	-0.3811*	-0.3659*
	0.0369	*0.1126*	*0.1129*	*0.0354*	*0.1339*	*0.1336*	*0.0787*	*0.1992*	*0.2002*
Foreign Exposure	0.0495*	0.0307	0.0366	0.0098	0.0096	0.0101	0.1122**	0.0567	0.0726
	0.0257	*0.0289*	*0.0330*	*0.0284*	*0.0341*	*0.0370*	*0.0521*	*0.0577*	*0.0703*
EUR	.	0.0009**	.	.	0.0000	.	.	0.0031***	.
	.	*0.0004*	.	.	*0.0004*	.	.	*0.0010*	.
R - Squared	0.4139	0.4905	0.4904	0.4544	0.5538	0.5538	0.3582	0.4450	0.4438
Observations	31 914	31 914	31 914	22 313	22 313	22 313	9 601	9 601	9 601
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

8.4.1. Discussion

As expected the sovereign to firm relationship is higher for firms within the Eurozone. The events of the debt crisis put the future of the common currency at risk as a sovereign default could have led to costly exists from common currency and placed the Euro payments system at risk (Roch and Uhlig, 2013). Stronger Euro area countries were impacted as the shared costs of bailouts led to increased CDS spreads on sovereign debt (Acharya et al, 2013). Economies contracted due to falls in trade and aggregate demand, austerity programs to restore competitiveness aggravated downturns. Euro area countries suffered from an inability to use independent monetary policy as response mechanism. Firm borrowing costs rose across the deeply interlinked Eurozone, borrowing costs rose for both the financial and non-financial sectors increased in a similar manner.

We find the spread between Eurozone and non-Eurozone borrowing costs highest in the financial sector. Eurozone financials, especially German and French banks, had considerable exposure to both domestic and PIIGS sovereign debt, leading to significant contagion. As sovereign debt declined in quality so did the assets and collateral (Popov and Van Horen, 2013). Eurozone financials also suffered from the risk of a breakup of the common currency. Throughout this period European banks increased their holdings of domestic sovereign debt, becoming more exposed to the sovereign's credit worthiness[22].

Foreign exposure was found to be more important than the domestic sovereign's health in explaining changes in CDS spreads amongst non-Eurozone financials. Financials outside of the common currency were highly exposed to Eurozone sovereigns, banks, firms, and households (Stracca, 2013). UK banks had large holdings of Irish and Spanish debt (Deutsche Bank, 2010). Contagion was high. Thus a significant portion of the rise in borrowing costs was explained by the credit worthiness of Eurozone economies rather than the domestic sovereign's. We find evidence for this in our results, the foreign exposure coefficient is of a larger magnitude and significant at the 1% level (Table 6, Panel B, Columns 4-6).

Table 7 suggests that non-Eurozone firms faced a larger jump in borrowing costs since the predicted difference in Eurozone and non-Eurozone borrowing costs are statistically insignificant in this post bailout period. Tables 24 and 25 (Appendix II) provide evidence for this[23]. We believe that the differential response relates to the view of the bailout as an exogenous shock to credit risk. CDS spreads of corporates within the Eurozone already reflected the damage a potential Greek default would do to the common currency. Spreads rose as the bailout did not have the expected calming effect. In contrast, the bailout dramatically changed market perceptions of credit risk in countries with ties to Eurozone countries (Augustin et al, 2014a). Hence non-Eurozone firms' CDS spreads increased considerably to reflect changed risks and became more dependent on their sovereign's health.

Our findings indicate that firms headquartered within Eurozone countries faced higher borrowing costs when sovereign credit risk escalated compared to firms in countries outside the common currency. We also find that Eurozone firms had higher borrowing costs before the bailout. After the bailout these firms still faced higher borrowing but experienced a smaller increase change in these costs compared to their counterparts in non-Eurozone firms. Thus we find sufficient evidence to accept hypothesis three (*H3*).

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[22] See "Europe's banks overexposed to domestic debt" by Christopher Thompson, *Financial Times*, December 23, 2013.
[23] However, non-Eurozone firm borrowing costs were lower than their Eurozone counterparts in the post bailout period.

8.5.   PIIGS versus Non-PIIGS

Hypothesis four (*H4*) postulates that firms in PIIGS countries have comparatively higher borrowing costs when sovereign credit risk increases. Table 9 reports the results from regressions over our 2010-12 sample. The average PIIGS firms have substantially higher borrowing costs, a 1% rise in sovereign credit risk would result in a 0.18% compared to 0.09% increase in borrowing costs for the average PIIGS and non-PIIGS firm. The difference between PIIGS and non-PIIGS holds for financials and is most stark for non-financials, robust and significant at the 1% level. Borrowing costs for PIIGS firms are marginally higher in the non-financial sector. A 1% increase in sovereign credit risk would increase borrowing costs for the average PIIGS non-financial and financial firm by 0.19% and 0.17% respectively, robust and significant at the 1% level. The opposite holds in non-PIIGS firms where the sovereign to firm relationship is higher in the financial sector.

Table 10 provides further support for higher borrowing costs in PIIGS firms, the difference in the sovereign to firm nexus between PIIGS and non-PIIGS companies is highest for the non-financial sector. A 1% increase in sovereign risk increases the average PIIGS firm's borrowing costs by 0.10% more than firm outside the PIIGS countries. This effect is stronger amongst non-financial firms. However, we cannot conclude any difference in borrowing costs for the financial sector since the coefficients are statistically insignificant, this finding departs notably from Augustin et al (2014a).

Table 11 displays the differential response to the Greek bailout for PIIGS firms excluding Greece. The coefficient, PIIGS*Event*SovCDS, is negative suggesting that the average PIIGS firm's borrowing cost is lower than average non-PIIGS firm in the post bailout period. However, in contrast to Augustin et al (2014a), this test is inconclusive since the predicted difference is statistically insignificant when the sample is broken down by sector. Tables 26 & 27[24] in Appendix II reveal that the expected difference in the sovereign to firm nexus after the event is negative and statistically insignificant for PIIGS firms and positive and statistically significant for non-PIIGS firms.

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[24] Tables 26&27 display the impact of the Greek bailout for PIIGS and non-PIIGS firms respectively.

Table 9:PIIGS vs. Non PIIGS firms, 2010-12

This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads. Panel A reports the results for firms headquartered in PIIGS countries, Panel B the results for firms outside the PIIGS countries. Columns 1-3 report the results for all firms, 4-6 financial firms, 7-9 non-financial firms. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to December 31, 2012

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7) Non	(8) Non	(9) Non
PIIGS	All Firms	All Firms	All Firms	Financial	Financial	Financial	Finaancial	Finaancial	Finaancial
Dependent variable: ΔLn(Corporate CDS)									
Sovereign CDS	0.1813***	0.1215***	0.1190***	0.1717***	0.1143***	0.1136***	0.1933***	0.1311***	0.1247***
	0.0230	*0.0208*	*0.0212*	*0.0324*	*0.0278*	*0.0280*	*0.0315*	*0.0343*	*0.0361*
Domestic Stock Index	-0.2017***	-0.2064***	-0.1992***	-0.1325***	-0.1379**	-0.1355**	-0.2842***	-0.2986***	-0.2830***
	0.0264	*0.0498*	*0.0471*	*0.0317*	*0.0562*	*0.0544*	*0.0367*	*0.0870*	*0.0804*
Foreign Exposure	0.0315	-0.0719	-0.0943	0.0857*	-0.0003	-0.0067	-0.0293	-0.1530**	-0.1984**
	0.0368	*0.0497*	*0.0624*	*0.0520*	*0.0692*	*0.0836*	*0.0489*	*0.0647*	*0.0889*
Observations	40 446	40 446	40 446	20 156	20 156	20 156	20 290	20 290	20 290
R - Squared	0.3413	0.4286	0.4284	0.2944	0.4118	0.4118	0.3970	0.5073	0.5069
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7) Non	(8) Non	(9) Non
NON PIIGS	All Firms	All Firms	All Firms	Financial	Financial	Financial	Finaancial	Finaancial	Finaancial
Dependent variable: ΔLn(Corporate CDS)									
Sovereign CDS	0.0942***	0.0283***	0.0264***	0.1293***	0.0402**	0.0389**	0.0835***	0.0256***	0.0233***
	0.0067	*0.0065*	*0.0060*	*0.0226*	*0.0194*	*0.0180*	*0.0052*	*0.0054*	*0.0051*
Domestic Stock Index	-0.2012***	-0.1109**	-0.0988**	-0.1001**	-0.0878	-0.0802	-0.2314***	-0.1158**	-0.1027**
	0.0163	*0.0533*	*0.0478*	*0.0430*	*0.1704*	*0.1484*	*0.0159*	*0.0476*	*0.0442*
Foreign Exposure	0.0125	-0.0018	-0.0167	0.0307	-0.0058	-0.0093	0.0067	-0.0028	-0.0201
	0.0129	*0.0057*	*0.0153*	*0.0436*	*0.0241*	*0.0532*	*0.0107*	*0.0048*	*0.0127*
Observations	121 977	121 977	121 977	28 512	28 512	28 512	93 465	93 465	93 465
R - Squared	0.2979	0.3888	0.3884	0.2500	0.3461	0.3461	0.3190	0.4349	0.4343
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** $p<0.01$ (1%), ** $p<0.05$ (5%), * $p<0.10$ (10%)

Table 10: Difference in Difference PIIGS vs. Non PIIGS firms, 2010-12

This table reports the results of a difference-in-difference regression that tests whether borrowing costs of firms situated in the PIIGS countries are more adversely impacted than firms outside the PIIGS countries. *PIIGS* is a dummy variable that takes value 1 if the country is one of the PIIGS, and zero otherwise. Columns 1-3 report the results for all firms, 4-6 financial firms, 7-9 non-financial firms. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to December 31, 2012.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
							Non Finaancial	Non Finaancial	Non Finaancial
Variables	All Firms	All Firms	All Firms	Financial	Financial	Financial			
Dependent variable: ΔLn(Corporate CDS)									
PIIGS * SovCDS	0.0984***	0.1206***	0.1254***	0.0441	0.0736	0.0754	0.1327***	0.1506***	0.1568***
	0.0310	*0.0308*	*0.0306*	*0.0562*	*0.0564*	*0.0555*	*0.0401*	*0.0405*	*0.0400*
SovCDS	0.0916***	0.0192**	0.0158*	0.1309***	0.0324	0.0308	0.0781***	0.0182**	0.0141**
	0.0085	*0.0087*	*0.0082*	*0.0301*	*0.0269*	*0.0256*	*0.0066*	*0.0075*	*0.0071*
Domestic Stock Index	-0.2019***	-0.1950***	-0.1873***	-0.1173***	-0.1372**	-0.1345**	-0.2469***	-0.2275***	-0.2163***
	0.0142	*0.0355*	*0.0333*	*0.0255*	*0.0545*	*0.0511*	*0.0146*	*0.0425*	*0.0403*
Foreign Exposure	0.0176	-0.0042	-0.0213	0.0512	0.0005	-0.0061	0.0042	-0.0065	-0.2850**
	0.0127	*0.0064*	*0.0154*	*0.0335*	*0.0239*	*0.0433*	*0.0115*	*0.0056*	*0.0132*
PIIGS	.	0.0006***	.	.	0.0009**	.	.	0.0004*	.
	.	*0.0002*	.	.	*0.0004*	.	.	*0.0002*	.
Observations	162 423	162 423	162 423	48 668	48 668	48 668	113 755	113 755	113 755
R - Squared	0.3120	0.3917	0.3913	0.2693	0.3611	0.3609	0.3386	0.4416	0.4408
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 11: Greek Bailout Difference in Difference PIIGS vs. Non PIIGS firms

This table reports the results of a difference-in-difference regression that tests whether borrowing costs of firms situated in the PIIGS countries are more adversely impacted than the borrowing costs of firms outside the PIIGS countries. *PIIGS* is a dummy variable that takes value 1 if the country is in amongst the PIIGS, and zero otherwise. *Event* is a dummy variable that equals 1 after the event date (April 23 2010), zero otherwise. Columns 1-3 report the results for all firms, Columns 4-6 non-financial firms, Columns 7-9 financial firms Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to August 13, 2010.

Variables	(1) All Firms	(2) All Firms	(3) All Firms	(4) Non Financial	(5) Non Financial	(6) Non Financial	(7) Financial	(8) Financial	(9) Financial
Dependent variable: ΔLn(Corporate CDS)									
PIIGS * Event * SovCDS	-0.0456*	-0.0584**	-0.0528**	-0.0339	-0.0422	-0.0388	-0.0502	-0.0644	-0.0591
	0.0249	*0.0254*	*0.0249*	*0.0324*	*0.0316*	*0.0316*	*0.0422*	*0.0434*	*0.0424*
PIIGS * SovCDS	0.1370***	0.1733***	0.1690***	0.1447***	0.1703***	0.1684***	0.1033**	0.1538***	0.1485***
	0.0273	*0.0281*	*0.0278*	*0.0358*	*0.0370*	*0.0367*	*0.0448*	*0.0455*	*0.0455*
PIIGS * Event	-0.0022***	-0.0004	-0.0023***	-0.0010*	-0.0003	-0.0015***	-0.0026**	0.0001	-0.0015
	0.0007	*0.0004*	*0.0007*	*0.0006*	*0.0004*	*0.0006*	*0.0011*	*0.0009*	*0.0013*
Event * SovCDS	0.0384***	0.0376***	0.0389***	0.0376***	0.0382***	0.0391***	0.0379	0.0332	0.0363
	0.0094	*0.0144*	*0.0144*	*0.0101*	*0.0140*	*0.0140*	*0.0234*	*0.0352*	*0.0351*
SovCDS	0.0456***	-0.0155	-0.0166	0.0341***	-0.0100	-0.0113	0.0820***	-0.0108	-0.0124
	0.0079	*0.0107*	*0.0109*	*0.0073*	*0.0103*	*0.0105*	*0.0229*	*0.0250*	*0.0260*
Domestic Stock Index	-0.2373***	-0.3870***	-0.3764***	-0.2839***	-0.3867***	-0.3777***	-0.1513**	-0.3557**	-0.3449**
	0.0290	*0.0886*	*0.0883*	*0.0269*	*0.0998*	*0.0991*	*0.0650*	*0.1669*	*0.1659*
Foreign Exposure	0.0107	-0.0246	-0.0266	-0.0168	-0.0378	-0.0410	0.0688	0.0038	0.0069
	0.0238	*0.0264*	*0.0297*	*0.0232*	*0.0271*	*0.0991*	*0.0551*	*0.0595*	*0.0726*
PIIGS	.	0.0006*	.	.	0.0002	.	.	0.0015***	.
	.	*0.0003*	.	.	*0.0004*	.	.	*0.0006*	.
R - Squared	0.4168	0.4946	0.4943	0.4591	0.559	0.5588	0.3568	0.4447	0.4441
Observations	31 914	31 914	31 914	22 313	22 313	22 313	9 601	9 601	9 601
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

8.5.1. Discussion

The PIIGS countries were the worst affected by the European debt crisis, hence the impact of rising sovereign CDS spreads was strongest. PIIGS firms faced the highest borrowing costs over the debt crisis and faced the strongest sovereign to firm spillover relationship. Interestingly, the non-financial sector was the most impacted and had the highest differential in borrowing costs. Plausible given that the deepest recessions were in PIIGS countries. Unlike the financial sector that can respond to severe contractions by reducing lending, the non-financial sector faces costs and expenditure programs that are harder to reduce (Arteta and Hale, 2006). The effect of the downturn was most amplified for highly leveraged firms. Given the unprecedented contraction in aggregate demand in the PIIGS countries, the negative effects of rising sovereign CDS spreads were the largest for the non-financial sector.

In contrast the financial sector in non-PIIGS countries had the strongest sovereign to firm relationship. Sovereign risk increased in stronger diversified non-PIIGS economies due to the costs of rescue arrangements and the stress placed on the common currency. Financial firms outside of the PIIGS countries were highly exposed to PIIGS sovereign, corporate, and household debt[25]. As a result they received low interest ECB loans when these assets declined. However, these loans were used to purchase higher yielding domestic sovereign bonds[26]. Thus many European banks increased their holdings of domestic sovereign debt throughout the sample period and grew more interconnected with their sovereign (Acharya et al, 2013). While these institutions saw increasing CDS spreads as credit risk rose in the PIIGS countries, declining sovereign health had a stronger effect on enlarging CDS spreads. Growing credit risk throughout this period had similar effects on all financial companies, thus we find the differential in borrowing costs between PIIGS and non-PIIGS financials to be statistically insignificant.

Narrowing our analysis around the Greek bailout we find a large rise in non-PIIGS borrowing costs, lending support to the view of Greece's bailout as a shock to global credit risk. Market perceptions of sovereign risk were updated and investors required higher returns to lend to countries with strong linkages to Greece (Augustin et al, 2014a). In contrast PIIGS countries experienced higher credit risk prior to the bailout due to poor fiscal balances marked with high budget deficits and debt to GDP ratios (see Figure 4, Appendix I).

Our findings indicate that non-financial firms in PIIGS countries faced higher borrowing costs than their counterparts outside of the PIIGS countries. However, our tests of this difference in borrowing costs amongst financial institutions are inconclusive. Therefore we do not find sufficient evidence to accept hypothesis four (*H4*) and thus depart notably from Augustin et al (2014a)'s findings.

8.6. Property Rights

According to hypothesis 5 *(H5)* we expect corporate borrowing costs to be lower in countries with better property rights. Table 12 presents the results of regressions run over the 2010-12 sample. High PropRight*SovCDS predicts the difference in sovereign to corporate spillover for firms in countries with high compared to low property rights. The increase in firm borrowing costs is 0.15% lower in countries with high property rights[27] versus countries with low property rights[28] for every 1% increase in sovereign risk. Continuing this analysis to financial and non-

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[25] At the end of 2010 French banks had claims of $56.7 billion from Greek creditors. German and French lenders held $22.7 billion and $15 billion of Greek debt respectively, as well as a considerable amount of Portugal's debt. British banks had claims of $112.4 billion on Irish lenders, close a quarter of the $462.3 billion overall foreign claims on Ireland. See German Banks Top French on $23 Billion Greek Debt, BIS Says" by Boris Groendahl , *Bloomberg.com*, June 6, 2011

[26] See "Europe's banks overexposed to domestic debt" by Christopher Thompson, *Financial Times*, December 23, 2013.

[27] High Property Rights Countries: Belgium, Denmark, Finland, France, Germany, Ireland, Netherlands, Norway, Sweden, Switzerland, UK.

[28] Low Property Rights Countries: Greece, Italy, Portugal, Spain.

financial companies (columns 4-9) provides noticeable results. The magnitude of the coefficient drops notably for financial firms and is statistically insignificant in our reference specification. In contrast the relationship for the non-financial sector is highly significant, the increase in borrowing costs for non-financial firms is 0.21% smaller in countries with high property rights.

In a departure from Augustin et al (2014), property rights do not seem to be an important transmission mechanism in the days after Greece's bailout, Table 13. The difference in the sovereign to firm relationship after the bailout for firms in countries with high compared to low property rights, HPR * Event * SovCDS, is statistically insignificant. However property rights have an impact over the whole sample as the coefficient of HPR * SovCDS, the difference in borrowing costs between firms in countries with high and low properties over the whole sample, is statistically significant and has a similar magnitude to Table 12's comparable estimate.

Table 12: Difference in Difference High vs. Low Property Rights, 2010-12

This table reports the results of a difference-in-difference regression that tests whether the borrowing costs of firms in countries with low property rights are more adversely impacted than firms in countries with high property rights. *HighPropRight* is a dummy variable that takes value 1 if the country has property rights above 0.7, and zero otherwise. Columns 1-3 report the results for all firms, 4-6 financial firms, 7-9 non-financial firms. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to December 31, 2012.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
							Non	Non	Non
Variables	All Firms	All Firms	All Firms	Financial	Financial	Financial	Finaancial	Finaancial	Finaancial
Dependent variable: ΔLn(Corporate CDS)									
HighPropRight*SovCDS	-0.1484***	-0.1788***	-0.1809***	-0.0875	-0.1197**	-0.1204**	-0.2078***	-0.2369***	-0.2395***
	0.0374	*0.0368*	*0.0366*	*0.0592*	*0.0589*	*0.0583*	*0.0497*	*0.0494*	*0.0490*
SovCDS	0.2368***	0.1910***	0.1915***	0.2058***	0.1379***	0.1380***	0.2844***	0.2495***	0.2499***
	0.0342	*0.0335*	*0.0335*	*0.0460*	*0.0463*	*0.0463*	*0.0474*	*0.0470*	*0.0468*
Domestic Stock Index	-0.1909***	-0.1559***	-0.1518***	-0.1049***	-0.1046**	-0.1044**	-0.2348***	-0.1782***	-0.1712***
	0.0130	*0.0295*	*0.0276*	*0.0234*	*0.0463*	*0.0435*	*0.0135*	*0.0351*	*0.0335*
Foreign Exposure	0.0229**	-0.0017	-0.0136	0.0531	0.0019	-0.0013	0.0112	-0.0036	-0.0195
	0.0126	*0.0063*	*0.0153*	*0.0344*	*0.0239*	*0.0444*	*0.0112*	*0.0053*	*0.0134*
High Property Rights	.	-0.0009***	.	.	-0.0012***	.	.	-0.0006***	.
	.	*0.0002*	.	.	*0.0003*	.	.	*0.0002*	.
Observations	162 423	162 423	162 423	48 668	48 668	48 668	113 755	113 755	113 755
R - Squared	0.3151	0.3952	0.3949	0.2718	0.3637	0.3634	0.3427	0.4464	0.4459
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 13: Greek Bailout Difference in Difference High vs. Low Property Rights

This table reports the results of a difference-in-difference regression that tests whether the borrowing costs of firms in countries with low property rights are more adversely impacted than firms in countries with high property rights. *High Prop Rights* is a dummy variable that takes value 1 if the country has property rights above 0.7, and zero otherwise. *Event* is a dummy variable that equals 1 after the event date (April 23 2010), zero otherwise. Columns 1-3 report the results for all firms, Columns 4-6 non-financial firms, Columns 7-9 financial firms. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to August 13, 2010.

Variables	(1) All Firms	(2) All Firms	(3) All Firms	(4) Non Financial	(5) Non Financial	(6) Non Financial	(7) Financial	(8) Financial	(9) Financial
Dependent variable: ΔLn(Corporate CDS)									
HPR * Event * SovCDS	0.0263	0.0437	0.0432	-0.0069	0.0071	0.0070	0.0436	0.0678	0.0677
	0.0326	*0.0329*	*0.0328*	*0.0441*	*0.0451*	*0.0451*	*0.0476*	*0.0480*	*0.0478*
HPR * SovCDS	-0.1826***	-0.2191***	-0.2192***	-0.1997***	-0.2319***	-0.2323***	-0.1489***	-0.1938***	-0.1938***
	0.0300	*0.0298*	*0.0298*	*0.0403*	*0.0402*	*0.0402*	*0.0453*	*0.0449*	*0.0446*
HPR * Event	0.0017***	0.0038***	0.0039***	0.0020***	0.0020***	0.0020****	0.0003	0.0039***	0.0039***
	0.0005	*0.0009*	*0.0009*	*0.0005*	*0.0007*	*0.0008*	*0.0011*	*0.0013*	*0.0013*
Event * SovCDS	0.0048	-0.0028	-0.0002	0.0371	0.0303	0.0317	-0.0140	-0.0234	-0.0193
	0.0309	*0.0325*	*0.0323*	*0.0426*	*0.0438*	*0.0437*	*0.0424*	*0.0471*	*0.0468*
SovCDS	0.2263***	0.1985***	0.1965***	0.2334***	0.2185***	0.2176***	0.2214***	0.1708***	0.1671***
	0.0287	*0.0296*	*0.0296*	*0.0391*	*0.0396*	*0.0395*	*0.0404*	*0.0443*	*0.0442*
Domestic Stock Index	-0.2130***	-0.3053***	-0.3019***	-0.2587***	-0.2901***	-0.2864***	-0.1238**	-0.2858*	-0.2830*
	0.0272	*0.0841*	*0.0839*	*0.0250*	*0.0940*	*0.0939*	*0.0622*	*0.1622*	*0.1615*
Foreign Exposure	0.0171	-0.0151	-0.0170	-0.0090	-0.0283	-0.0310	0.0727	0.0120	0.0150
	0.0232	*0.0253*	*0.0285*	*0.0219*	*0.0249*	*0.0269*	*0.0546*	*0.0583*	*0.0709*
HPR	.	-0.0041***	.	.	-0.0025***	.	.	-0.0049***	.
	.	*0.0007*	.	.	*0.0005*	.	.	*0.0011*	.
R - Squared	0.4213	0.4997	0.5001	0.4647	0.5649	0.5646	0.3608	0.4492	0.4467
Observations	31 914	31 914	31 914	22 313	22 313	22 313	9 601	9 601	9 601
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

8.6.1. Discussion

Similar to Bai and Wei (2012) and Augustin et al (2014a) we find an economically and statistically significant role of property rights. The impact of a distressed sovereign on firm borrowing costs is pointedly lower in countries with high property rights, highlighting the economic significance of such institutions as they limit a government's ability to shift the debt burden and expropriate private investment. Property rights institutions weaken the sovereign to firm transfer risk. (Bai and Wei, 2012).

The importance of property rights is most pronounced for the non-financial sector where the magnitude of the coefficient HighPropRight * SovCDS is significantly higher than in the non-financial sector. Our evidence suggests that the risk of government expropriation is higher for non-financial corporates (Augustin et al, 2014a).

The role of strong property rights in the sovereign to firm transfer relationship is statistically insignificant after the Greek bailout[29]. An explanation to reconcile this with our findings above follows. Greee's bailout caused a sizeable increase in the market perception of European sovereign credit risk in way that CDS contracts had not priced in before (Augustin et al, 2014a). Sovereign risk increased in all countries, even those with high property rights. Ireland, a country with high property rights[30], was the next to suffer from escalating bond yields and received a bailout a few months after Greece. It is plausible that the subsequent market reaction in the days following the bailout outweighed the importance of property rights. As the crisis matured beliefs of sovereign default were updated such that the market came to understand the importance of property rights in mitigating the transmission of sovereign credit risk and hence escalating corporate borrowing costs.

Our findings indicate that escalating sovereign credit risk does increase corporate borrowing costs by a larger amount in countries with weaker property rights. While this relationship is statistically insignificant in the 80 day post Greek bailout period, we believe that this is due to market overreaction in this limited period. However, the relationship is significant and of a similar magnitude to Table 12 over all 161 days in the Greek bailout sample. Hence we accept hypothesis five (*H5*).

8.7.   Borrowing

Hypothesis 6 (*H6*) postulates that corporates highly dependent on external borrowing have comparatively greater costs of borrowing when sovereign risk increases. A firm has a high borrowing dependence if its debt to liability ratio is above the sample median, 0.462 in the 2010-12 Sample and 0.4191 in the Greek bailout Sample.[31] It is important to note that our study of a firm's dependence on all sources of external borrowing departs from previous studies that examine a firm's reliance on bank borrowing as means of transmitting sovereign credit risk.

Table 14 displays the results of regressions run over the 2010-12 sample. The coefficient of interest High Borrowing * SovCDS predicts the difference in sovereign to corporate spillover for firms with a high compared to low borrowing. The coefficient is statistically insignificant except amongst Eurozone corporates. For every 1% increase in domestic sovereign CDS spreads the average increase in corporate borrowing costs is 0.06% higher for a firm highly dependent on borrowing (Column 4). This is a robust and statistically and economically significant relationship.

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[29] However it is of a similar magnitude and statistically significant throughout the sample period, see the coefficient HPR * Event.
[30] Ireland's Heritage Foundation property rights score in 2010 was 90 out of a maximum of 100 (0.9 in our sample), amongst the highest in Europe.
[31] High borrowing dependence is a dummy variable, which takes value one if a firm's debt to liabilities ratio is above the sample median.

Narrowing the analysis to the period around the Greek bailout, Table 15, finds no evidence for borrowing dependence as a transmission mechanism in the days immediately after the emergency loan. Departing considerably from Augustin et al (2014a). The coefficient HBD * Event * SovCDS, the difference in the sovereign to firm transfer relationship after the event for firms with high compared to low borrowing dependence, is statistically insignificant. In contrast HBD * SovCDS, the difference in sovereign transfer for firms with high compared to low borrowing over the entire sample, is statistically significant and has a similar magnitude to the results in Table 14. Again the sovereign to firm nexus is more pronounced and most significant amongst Eurozone companies.

Table 14: Difference in Difference High vs. Low Borrowing, 2010-12

This table reports the results of a difference-in-difference regression that tests whether the borrowing costs of firms highly dependent on external borrowing are more adversely impacted. *High Borrowing* is a dummy variable that takes value 1 if a firm's debt to liabilities ratio is above the sample median of 0.4280, and zero otherwise. Columns 1-3 report the results for all firms, 4-6 financial firms, 7-9 non-financial firms. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to December 31, 2012.

Variables	(1) All Firms	(2) All Firms	(3) All Firms	(4) Eurozone	(5) Eurozone	(6) Eurozone	(7) Non-Eurozone	(8) Non-Eurozone	(9) Non-Eurozone
Dependent variable: $\Delta Ln(Corporate\ CDS)$									
High Borrowing * SovCDS	0.0279	0.0322	0.0332	0.0589**	0.0638**	0.0629**	-0.0337	-0.0231	-0.0230
	0.0249	0.0249	0.0249	0.0325	0.0323	0.0320	0.0304	0.0290	0.0290
SovCDS	0.0922***	0.0446***	0.0443***	0.0826***	0.0408***	0.0418***	0.0944***	0.0386*	0.0386*
	0.0102	0.0108	0.0109	0.0118	0.0135	0.0135	0.0219	0.0207	0.0207
High Borrowing	0.0003	-0.0001	0.0006**	0.0001	-0.0003	0.0007	0.0002	0.0000	0.0001
	0.0003	0.0001	0.0003	0.0005	0.0002	0.0004	0.0003	0.0001	0.0024
Domestic Stock Index	-0.2647***	-0.2901***	-0.2853***	-0.2696***	-0.3318***	-0.3302***	-0.1840***	0.0786	0.0780
	0.0166	0.0551	0.0547	0.0182	0.0731	0.0734	0.0197	0.0566	0.0565
Foreign Exposure	0.0143	-0.0012	-0.0099	0.0377**	0.0090	0.0227	0.0318**	-0.0220	-0.0222
	0.0125	0.0058	0.0156	0.0175	0.0071	0.0227	0.0161	0.0289	0.0299
Observations	113 755	113 755	113 755	70 002	70 002	70 002	43 753	43 753	43 753
R - Squared	0.3333	0.4358	0.4353	0.3613	0.467	0.4663	0.2838	0.3996	0.3991
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 15: Greek Bailout Difference in Difference High vs. Low Borrowing

This table reports the results of a difference-in-difference regression that tests whether the borrowing costs of firms highly dependent on external borrowing are more adversely impacted. *High Borrowing* is a dummy variable that takes value 1 if a firm's debt to liabilities ratio is above the sample median of 0.4191, and zero otherwise. *Event* is a dummy variable that equals 1 after the event date (April 23 2010), zero otherwise. Columns 1-3 report the results for all firms, 4-6 financial firms, 7-9 non-financial firms. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to August 13, 2010.

Variables	(1) All Firms	(2) All Firms	(3) All Firms	(4) Eurozone	(5) Eurozone	(6) Eurozone	(7) Non-Eurozone	(8) Non-Eurozone	(9) Non-Eurozone
Dependent variable: ΔLn(Corporate CDS)									
HBD * Event * SovCDS	-0.0160	-0.0151	-0.0139	-0.0032	-0.0022	-0.0012	-0.0551	-0.0517	-0.0517
	0.0237	*0.0227*	*0.0226*	*0.0308*	*0.0297*	*0.0296*	*0.0338*	*0.0337*	*0.0338*
HBD * SovCDS	0.0497**	0.0525**	0.0515**	0.0795***	0.0816***	0.0807***	-0.0277	-0.0289	-0.0286
	0.0227	*0.0230*	*0.0229*	*0.0275*	*0.0277*	*0.0275*	*0.0272*	*0.0276*	*0.0276*
HBD * Event	-0.0002	-0.0009*	-0.0009*	-0.0012**	-0.0015**	-0.0015**	0.0014	0.0000	0.0000
	0.0005	*0.0005*	*0.0005*	*0.0006*	*0.0006*	*0.0006*	*0.0095*	*0.0011*	*0.0011*
Event * SovCDS	0.0521***	0.0563***	0.0546***	0.0256	0.0408**	0.0403**	0.1137***	0.0844*	0.0917*
	0.0135	*0.0152*	*0.0159*	*0.0157*	*0.0198*	*0.0198*	*0.0241*	*0.0512*	*0.0511*
SovCDS	0.0377***	0.0086	0.0087	0.0209*	-0.0007	0.0000	0.0658***	0.0498	0.0427
	0.0105	*0.0140*	*0.0146*	*0.0124*	*0.0179*	*0.0181*	*0.0213*	*0.0338*	*0.0337*
Domestic Stock Index	-0.3237***	-0.5316***	-0.5260***	-0.3086***	-0.6163***	-0.6104***	-0.2556***	-0.0918	-0.0755
	0.0373	*0.1368*	*0.1368*	*0.0421*	*0.1800*	*0.1795*	*0.0384*	*0.1364*	*0.1363*
Foreign Exposure	-0.0047	-0.0138	-0.0148	0.0631	0.0396	0.0423	-0.0082	-0.0053	-0.0064
	0.0245	*0.0285*	*0.0307*	*0.0531*	*0.0522*	*0.0576*	*0.0245*	*0.0409*	*0.0410*
HBD	.	0.0004	.	.	0.0012**	.	.	-0.0007	.
	.	*0.0004*	.	.	*0.0005*	.	.	*0.0006*	.
R - Squared	0.4549	0.554	0.554	0.4878	0.5864	0.5861	0.4061	0.5155	0.5154
Observations	22 313	22 313	22 313	13 504	13 504	13 504	8 809	8 809	8 809
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

8.7.1. Discussion

We find the sovereign to firm nexus most pronounced and significant amongst Eurozone corporates. This departs from Augustin et al (2014a) who find a statistically significant relationship of a similar magnitude for all firms after the Greek bailout. We believe our finding is rooted in the deep credit crunch in the Euro area, particularly in the PIIGS countries. While countries outside of the Eurozone also experienced credit crunches the dry up of funds and its consequences were not as strong as that experienced in the Eurozone.

Euro area banks found it increasingly costly to borrow in the money markets as their balance sheet exposure holdings of sovereign debt were impaired (Ivashina et al, 2012 ; De Marco, 2013: Acharya et al, 2013). Lending growth slowed and the ensuing credit crunch was most severe in the PIIGS countries (Popov and Van Horen, 2013). New lending volumes in Ireland, Spain, Portugal, and Italy fell 82%, 66%, 45%, and 21% respectively from 2008-13, while

SMEs in the same countries borrowed at rates 4%-6% higher than similar firms in Germany. Stronger economies in the Eurozone also saw significant reductions in lending, as new lending volumes fell 37% and 32% in France and the Netherlands respectively from 2008-13.[32]

The credit crunch may have been enlarged as domestic and European banks bought sovereign bonds in lieu of lending to the credit starved private sector, reallocating credit from the private to public sector, thereby crowding out private lending and raising corporate borrowing costs (Becker and Ivashina, 2014b ; Broner et al, 2013).

This substantial decline in credit had significant real effects on Euro area businesses as bank liquidity problems turned into corporate solvency issues[33]. Firms dependent on banks affected by the sovereign debt crisis were financially constrained and increased precautionary cash holdings[34] (Acharya et al, 2014). Without external credit to finance their continuing operations, firms become less liquid and more attuned to the state of the domestic economy and health of their sovereign. As a result firms highly dependent on external borrowing faced larger increases in borrowing costs and credit risk as sovereign risk increased. SMEs were the worst affected as liquidity shortages grew into solvency problems leading to increased bankruptcies[35].

Intriguingly we find the importance of high borrowing dependence in the sovereign to firm relationship to be statistically insignificant after the Greek bailout, suggesting a similar increase in borrowing costs for the average high and low borrower in response to escalating sovereign risk. It is plausible that borrowing dependence was not important in the eighty days after the bailout, as money markets had just begun to react to bank exposure to distressed countries. Thus banks were yet to reduce credit to the degree seen when the debt crisis intensified, reconciling this finding with our discussion above.

We do not find sufficient evidence to accept hypothesis 6. Our results establish the role of external borrowing dependence amongst Eurozone firms but are inconclusive for firms outside of the common currency.

8.8. Robustness & Limitations

8.8.1. Robustness

To ensure the strength of our model we test the robustness of our findings, the specifications of our panel regression models are important to the results obtained. Our reference specification controls for firm fixed effects to account for unobserved firm specific characteristics. To confirm robustness the specification is changed to control for time fixed effects, which account for

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[32] See "SMEs in peripheral eurozone face far steeper borrowing rates" by Patrick Jenkins, *Financial Times*, October 10, 2013
[33] See "Eurozone banks hit by return of credit crunch" by Victor Mallet and Peter Wise, *Financial Times*, November 30, 2010
[34] Especially since these firms were uncertain about their continuing ability to borrow from banks. Hence they held cash to maintain their ability to make payments in the wake of falling market demand.
[35] See "Italian Banks' Woes Hurt Small Firms" by Giovanni Legorano, *Wall Street Journal*, December 1, 2013.

unobserved macroeconomic factors, as well as time and firm fixed effects[36]. Estimates in our robust specifications are mostly of a qualitatively similar magnitude to our reference regressions. Differences include changes in significance levels and a change in magnitude of the sovereign CDS coefficient from positive to negative[37] for a small number of measures. Importantly, all main conclusions from our study are supported.

As a second robustness test we add country stock market returns and foreign exposure as control variables since they directly impact both sovereign and firm credit risk and CDS spreads. This should reduce Omitted Variable Bias. The coefficients and statistical significance of sovereign CDS remains the same (Tables 18&19, Appendix II)

Finally, we analyse our models on two complimentary samples, one spanning from 2010-12 capturing three extraordinary years of the European sovereign debt crisis, and a second narrower sample around the Greek bailout in 2010 and its impact on sovereign credit risk. Despite minor differences the results from both samples support our main conclusions.

8.8.2. Limitations

Our samples use firms with continuous and liquid CDS data over the period examined. CDSs are traded on the debt of firms that issue publicly traded and rated bonds. These companies are larger with a greater international presence than the average European firms, SMEs and local banks, which were the most harshly affected by the crisis[38]. Furthermore, our sample companies are likely to be less dependent on bank borrowing and less financially constrained than the average European firm (Bedendo and Colla, 2013). The firms we examine were probably not as affected by the credit crunch as they could substitute bank financing with funding from bond markets (Becker and Ivashina, 2014a). In contrast the bond and credit markets were closed for SMEs[39]. We likely underestimate the importance of borrowing dependence as a means of transmitting sovereign credit risk and increasing corporate borrowing costs.

Our samples include firms whose CDSs are currently traded in the market and therefore contain a survivorship bias that may skew our estimates downwards. Moreover, it is likely that some of our difference in difference estimates are biased due the substantially larger number of non-financial firms compared to financial, firms headquartered in non-PIIGS countries compared to those in PIIGS countries, and firms in countries with high compared to low property rights[40].

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[36] See Augustin et al (2014), Bedendo and Colla (2013).
[37] Notably in Table 6 Panel B Columns 5&6
[38] See "SMEs in peripheral eurozone face far steeper borrowing rates" by Patrick Jenkins, *Financial Times*, October 10, 2013
[39] See "Eurozone banks hit by return of credit crunch" by Victor Mallet and Peter Wise, *Financial Times*, November 30, 2010
[40] See Table 16 - Summary Statistics

There may be instances of reverse causality as described by Acharya et al (2013), where developments within particular sectors of the economy, the financial sector for example, have a direct effect on the sovereign credit risk. Other factors such as increasing unemployment, lower government tax income and corporate bankruptcies would lead to lower economic growth and may therefore intensify the effect of reverse causality. We attempt to negate this effect by studying a time period of 2010 onwards during which sovereign distress had substantial negative externalities on domestic economies. A majority of the effects of financial sector distress on sovereigns via bailout programs is captured in the years before our period of analysis.

9. Conclusion

In this paper we attempt to determine whether a risk transfer relationship exists between sovereigns and domestic firms. We provide empirical evidence that increases in a government's perceived credit risk have considerable negative implications on its private sector by increasing firm cost of borrowing. We study the events of the European sovereign debt crisis to identify a causal relationship. Our analysis compares the effects of escalating sovereign credit risks through the debt crisis, and the impact of a negative exogenous shock to credit perceptions of European governments, through the Greece's bailout which changed investor opinions of the likelihood of sovereign defaults.

We contribute to existing research by examining the impacts of credit shocks on the sovereign to firm transfer relationship in developed economies bound by strict fiscal rules. Moreover, in contrast to the literature focussed on the effects of the sovereign debt crisis on the European financial sector (for example Acharya et al, (2013), Adelino and Ferreira (2014)) our paper examines the impact on both the financial and often overlooked non-financial sector. We expand on similar analysis by Bedendo and Colla (2013) and Augustin et al (2014a) by using two separate panel data samples to ascertain the impact of increased sovereign risk on firms, in and cross-sectional differences between countries, and evaluate transmission mechanisms.

Similar to Bedendo and Colla (2013) and Augustin et al (2014a) we find a strong, causal, and economically meaningful transfer of sovereign credit risk to firm borrowing costs, a 1% increase in sovereign risk results in a rise in corporate borrowing costs between 0.12% (12bps) and 0.14% (14bps). We find this effect to be stronger in countries within the Eurozone compared to those outside of it. Additionally we find this transfer relationship to be weakest in countries with strong property rights institutions as such institutions limit a government's ability to expropriate the private sector.

Most notably we find the impact of increased sovereign credit risk on borrowing costs to be at least as large for non-financial compared to financial firms. We attribute this to the real

impact on and expropriation of the private sector being the same during periods of sovereign distress same regardless of which sector of the economy a firm belongs to. While financial firms were impacted through their holdings of sovereign debt, the ensuing credit crunch had a harsh impact for the non-financial sector, with risk adverse investors reluctant to lend to firms.

Our results depart substantially from findings in existing literature in two ways. First, they suggest that borrowing costs for non-financial firms in the PIIGS countries have comparatively higher borrowing costs when sovereign credit risk increases, though no such relationship holds for financial firms. The PIIGs countries had the deepest recessions and credit crunches, which harshly impacted non-financial firms who faced the largest negative externalities from rising sovereign credit risk. In contrast the financial sector was closely interconnected and the negative externalities from rising sovereign risk were the same within and outside the PIIGS countries. Second, we find borrowing dependence to be an important transmission only within Eurozone economies. We attribute this to the deep credit crunch in the common currency area that left firms financially constrained and illiquid and or insolvent and more affected by the health of their sovereign.

Our findings underscore the importance of public debt management and fiscal discipline within a common currency. Our paper highlights the rapid spread of contagion amongst integrated economies and importance of institutions in building a strong and resilient economy. We show the perils of a financial system deeply connected with the sovereign and add to the debate on the effects of bailouts. This paper brings light to some of the real effects of the sovereign debt crisis and contributes that growing field of research.

Possible extensions to our paper could examine whether the sovereign to firm relationship holds amongst firms of different capital structures, strongly capitalised firms may be more resilient to sovereign risk shocks. Does the relationship differ amongst industries? Some industries like utilities and telecoms benefit from explicit and implicit government guarantees. Is the spill over relationship stronger as firm credit ratings decrease, especially between investment grade and non-investment grade firms? Transmission channels of sovereign risk to the equity markets could be examined. Further analysis on the real effects of the European debt crisis could study the influence of the risk relationship on firm investment and capital structure decisions. We leave these questions to future researchers.

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11.   Appendix I

Figure 4: Debt to GDP Ratios of Sample Sovereign Governments (%)

Country	Sovereign Debt/GDP(%)		
	2010	2011	2012
Belgium	100.9%	104.1%	106.4%
Denmark	53.1%	59.9%	59.3%
Finland	57.9%	58.2%	64.0%
France	95.7%	99.3%	109.3%
Germany	86.2%	85.8%	88.5%
Greece	157.3%	179.9%	167.5%
Ireland	88.5%	103.9%	127.8%
Italy	131.1%	124.0%	142.2%
Netherlands	71.9%	76.1%	82.7%
Norway	49.3%	33.9%	34.7%
Portugal	104.0%	118.4%	134.6%
Spain	68.4%	78.8%	92.6%
Sweden	47.3%	47.6%	46.7%
Switzerland	46.2%	46.3%	46.5%
United Kingdom	81.7%	97.1%	101.6%

Source: OECD (2014)

Figure 5: PIIGS Sovereign Debt Exposure of Europe's 10 Largest Banks
Table showing PIIGS sovereign debt holding (USD bn) as a % of Total Assets (USD bn)

Bank	Total Assets	PIIGS Sovereign Debt Holdings	PIIGS debt as a % of Total Assets
BNP Paribas	2668	43.1	1.62%
Deutche Bank	2545	16.2	0.64%
HSBC	2468	6.7	0.27%
Barclays	2328	29.2	1.26%
RBS	2266	3.5	0.15%
Credit Agricole	2131	19.1	0.89%
Banco Santander	1610	69.6	4.32%
Lloyds	1546	0.1	0.01%
Societe General	1512	9.7	0.64%
Unicredit	1232	54.3	4.41%

Source: Forbes (2015)

Figure 6: Evolution of Sovereign CDS Spreads in Bps over both samples - 2010-12 & Greek Bailout

Graph (in basis points) of daily CDS spreads for PIIGS sovereigns. On the left hand side the time series is our "whole panel" data set, stretching from Jan 1, 2010 to Dec 31, 2012. On the right hand side the time series is our "event study" data set. The pre-bailout period stretches from the start of the sample on January 1, 2010 to the Greek bailout on April 23rd, 2010. The post-bailout period refers to the time after the event, up to the end of the sample period on August 16, 2010.
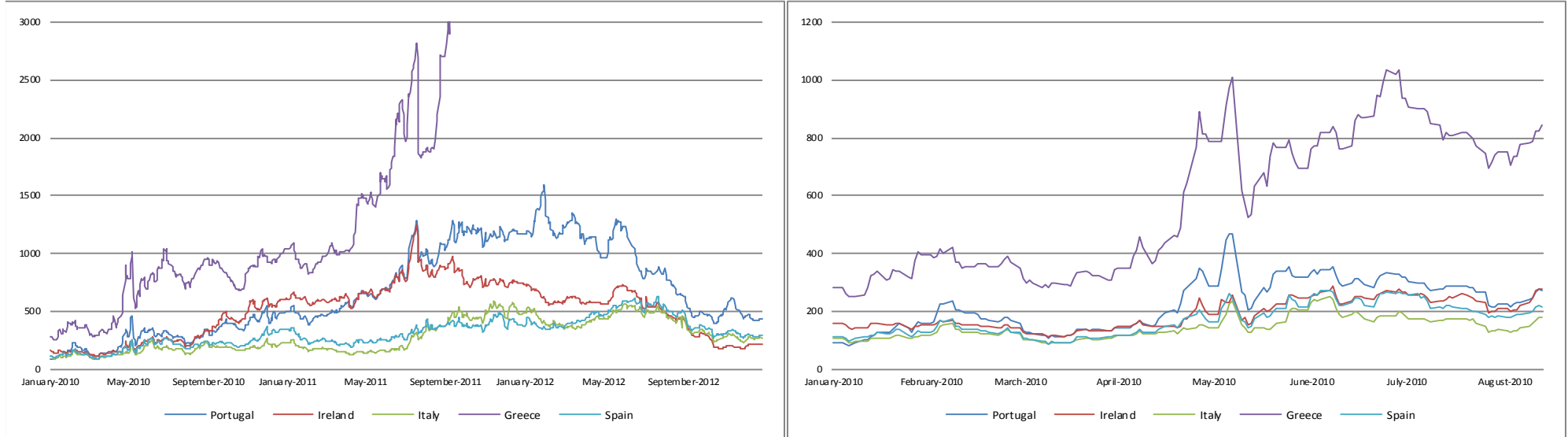
Graph (in basis points) of daily CDS spreads for non-PIIGS sovereigns. On the left hand side the time series is our "whole panel" data set, stretching from Jan 1, 2010 to Dec 31, 2012. On the right hand side the time series is our "event study" data set. The pre-bailout period stretches from the start of the sample on January 1, 2010 to the Greek bailout on April 23rd, 2010. The post-bailout period refers to the time after the event, up to the end of the sample period on August 16, 2010.

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Figure 7: Timeline of the key events during the European sovereign debt crisis

Fitch downgrades Spain's sovereign rating
25-05-2010

Spain announces austerity measures
29-01-2010

EU members agree on plan to resolve crisis. Important provisions include: asking holders of Greek debt to accept haircut by 50%; increasing the tier 1 capital of European banks and leveraging the capacity of the EFSF.
27-10-2011

The IMF approves a new €920 million tranche for Ireland
06-09-2012

S&P cuts Greece's credit rating from BBB+ to BBB-
27-04-2010

Italy sells €12bn of sovereign debt at 2.735% down from 5.952%
12-01-2012

S&P cuts the sovereign debt rating of Ireland to AA-
24-07-2010

S&P downgrades Italy's sovereign debt rating from A+ to A-, outlook negative
19-09-2011

Greece announces budget deficit 12.7% of GDP – twice the previously announced figure
05-11-2009

EMU leaders agree to Greek bailout
11-04-2010

Greek sovereign CDS spreads soar to 1038 bps
30-06-2014

Ireland agrees with EU and IMF to a €85 billion bailout package
28-11-2010

Portugal agrees with the other Eurozone members and the IMF to a €78 billion bailout package
17-05-2011

S&P places the debt of 15 of the 17 Eurozone nations on credit watch: negative.
05-12-2011

EU and IMF agree to a second bailout program for Greece of €130 billion
14-03-2012

Unemployment in the Eurozone reaches an all-time high
01-11-2012

2009 Q4 | Q1 2010 | Q2 | Q3 | Q4 | Q1 2011 | Q2 | Q3 | Q4 | Q1 2012 | Q2 | Q3 | Q4 **2012**

S&P cuts Greece's sovereign credit rating from A- to BBB+
16-12-2009

Greece requests emergency bailout from the EU and IMF
23-04-2010

Anxiety about Irish sovereign debt sends Irish sovereign CDS spreads to 652 bps
13-11-2010

EU members agree to enlarge the size of the EFSF's capital guarantees to €780 billion
21-06-2011

German sovereign bond auction severely undersubscribed
23-11-2011

Greece closes a €200 billion restructuring deal with its creditors.
09-03-2012

EU finance ministers announce that they have reached an agreement to form a banking union. Authority is granted to force troubled banks to close their doors and for bank capital ratios to be raised.
13-12-2012

Greece puts in place first austerity package
09-02-2010

Italy agrees to €25bn austerity package
25-05-2010

Bank of Greece, announces a reduction in the nation's deficit of 41.8%
05-07-2010

Franco-Belgian bank Dexia is nationalized
10-11-2011

S&P cuts the rating of nine Eurozone nations, including France, the Netherlands, and Austria.
13-01-2012

Spain nationalizes its 3rd largest bank Bankia
28-05-2012

Source: CFA Institute (2011)

Summary statistics (in basis points) of daily CDS spreads for corporate and sovereign reference entities in Panels A and B, respectively, broken down by country for the whole panel data sample and the event study data sample. We report: mean, standard deviation (sd), minimum (min), maximum (max) and the number of observations (obs). The first column, with the header N, reports the number of companies in Panel A and number of countries in Panel B. The whole panel data sample stretches from January 1, 2010 to December 31, 2012 The pre-bailout period stretches from the start of the sample on January 1, 2010 to the Greek bailout on April 23, 2010 (80 days). The post-bailout period refers to the time after the event, up to the end of the sample period on August 16, 2010 (80 days).

Panel A:		Whole Panel					Event Study: Pre - Bailout					Event Study: Post - Bailout				
Corporate CDS Spreads	N	obs	mean	sd	min	max	obs	mean	sd	min	max	obs	mean	sd	min	max
Belgium	2	1564	1310	55	53	340	160	65	9	53	87	160	98	25	54	153
Denmark	5	3892	148	77	56	438	400	123	69	56	274	400	139	70	60	307
Finland	7	5454	274	239	42	1230	560	251	253	42	1033	560	225	189	49	757
France	40	31279	200	209	35	1806	3200	143	167	35	1656	3200	191	219	44	1652
Germany	34	26539	171	154	32	1634	2720	148	158	32	965	2720	177	164	43	916
Greece	3	2190	1182	645	83	3269	240	451	291	83	909	240	673	262	154	1003
Italy	15	11703	270	186	38	1157	1200	100	63	38	425	1200	160	84	51	540
Ireland	2	1559	516	401	47	1806	160	245	44	173	358	160	296	37	200	392
Netherlands	18	14073	180	196	36	1680	1440	112	112	36	609	1440	142	136	52	746
Norway	4	3128	424	687	48	4880	320	307	428	49	1307	320	345	479	49	1440
Portugal	4	3128	632	341	60	1739	320	149	48	60	329	320	360	106	154	639
Spain	10	7820	332	214	58	1342	800	151	117	58	618	800	256	160	96	835
Sweden	19	14858	163	240	41	1948	1520	124	159	41	885	1520	137	161	51	896
Switzerland	12	9384	106	65	26	436	960	77	33	36	173	960	102	47	38	227
United Kingdom	55	43007	153	127	27	1257	4400	121	99	29	710	4400	159	120	37	703
Total	230	179578	212	255	26	4880	18400	139	155	29	1656	18630	181	180	37	1652

Panel B:		Whole Panel					Event Study: Pre - Bailout					Event Study: Post - Bailout				
Sovereign CDS Spreads	N	obs	mean	sd	min	max	obs	mean	sd	min	max	obs	mean	sd	min	max
Belgium	1	782	170	78	47	399	80	60	8	47	80	80	109	18	76	145
Denmark	1	782	66	39	27	157	80	35	4	29	43	80	41	4	33	53
Finland	1	782	45	20	20	87	80	28	4	20	36	80	30	3	24	35
France	1	782	116	54	30	245	80	48	10	30	66	80	76	10	60	99
Germany	1	782	58	24	23	118	80	34	6	25	46	80	43	5	35	59
Greece	1	782	12105	15695	249	37081	80	350	61	249	613	80	803	105	524	1038
Italy	1	782	288	141	87	587	80	114	16	87	157	80	173	31	128	252
Ireland	1	782	503	239	115	1249	80	145	14	115	173	80	232	30	155	285
Netherlands	1	782	66	30	28	134	80	36	4	29	46	80	47	4	38	57
Norway	1	782	26	9	15	52	80	17	1	15	20	80	23	2	19	30
Portugal	1	782	675	379	83	1601	80	151	38	83	270	80	296	50	206	467
Spain	1	782	316	122	89	634	80	123	19	89	173	80	217	33	143	270
Sweden	1	782	42	15	17	84	80	42	8	32	55	80	40	3	33	45
Switzerland	1	782	43	2	38	47	-	-	-	-	-	-	-	-	-	-
United Kingdom	1	782	68	16	28	102	80	81	7	68	100	80	76	10	53	99
Total	15	171676	278	2306	15	37081	1120	66	48	15	613	1134	91	103	19	1038

Summary statistics (in basis points) of daily CDS spreads for corporate reference entities, categorized according to the cross-sectional tests we conduct in this paper. We report: mean, standard deviation (sd), minimum (min), maximum (max) and the number of observations (obs). The first column, with the header N, reports the number of companies in Panel C. The first two rows report summary statistics for financial and non-financial companies. The third and fourth rows separate the statistics for countries inside and outside the Eurozone. The fifth and sixth rows separate the statistics for the PIIGS and non-PIIGS countries inside the Eurozone. The seventh and eigth rows report sample statistics for those corporations headquartered in a country whose property rights score is above 0.70 against those in countries with a below 0.70 property rights score. The last two rows report sample statistics for those corporations with a high exposure to borrowing above the median value against those in countries with a below-median exposure to borrowing. The whole panel data sample stretches from January 1, 2010 to December 31, 2012 The pre-bailout period stretches from the start of the sample on January 1, 2010

Panel C:		Whole Panel					Event Study: Pre - Bailout					Event Study: Post - Bailout				
	N	obs	mean	sd	min	max	obs	mean	sd	min	max	obs	mean	sd	min	max
Non-Financial	162	126581	193	242	26	4880	12960	141	161	29	1307	12960	174	176	37	1440
Financial	68	52997	258	279	32	2652	5440	133	141	32	1656	5440	198	192	50	1652
Eurozone	135	105309	248	276	32	3269	10800	149	162	32	1656	10800	200	192	43	1652
Non-Eurozone	95	74269	160	212	26	4880	7600	124	143	29	1307	7600	154	160	37	1440
PIIGS	52	40473	337	355	36	3269	4160	144	141	36	909	4160	222	188	51	1003
Non-PIIGS	178	139105	176	203	26	4880	14240	137	159	29	1656	14240	169	177	37	1652
High Property rights (> 0.70)	198	154736	179	208	26	4880	15839	136	155	29	1656	15839	168	174	37	1652
Low Property rights (< = 0.70)	32	24842	415	390	38	3269	2561	155	155	38	909	2561	263	203	51	1003
High Borrowing (> median)	149	116523	243	278	32	4880	11920	152	166	32	1656	11920	203	197	38	1652
Low Borrowing (< median)	81	63055	155	193	26	1948	6480	113	128	29	965	6480	139	139	37	916

Median = 0.4280   Median = 0.4195   Median = 0.4195

SOLVAY SA	BRITISH AIRWAYS PLC	ALSTOM S.A.	SNS BANK NV
BNP PARIBAS FORTIS SA	BRITISH AMERICAN TOBACCO P.L.C.	BOUYGUES SA	NORSKE SKOGINDUSTRIER ASA
ABB LTD	BT GROUP PLC	CAP GEMINI	STATOIL ASA
ADECCO SA	CENTRICA PLC	CARREFOUR SA	TELENOR ASA
CLARIANT AG	COMPASS GROUP PLC	CASINO GUICHARD-PERRACHON SA	DNB BANK ASA
HOLCIM LTD.	DIAGEO PLC	COMPAGNIE DE SAINT GOBAIN SA	EDP - ENERGIAS DE PORTUGAL, S.A.
NESTLE S.A.	DIXONS RETAIL PLC	CEGM SA	BANCO COMERCIAL PORTUGUES SA
NOVARTIS AG	EXPERIAN PLC	DANONE	CAIXA GERAL DE DEPOSITOS SA
ROCHE HOLDING AG	FGP TOPCO LIMITED	ELECTRICITE DE FRANCE SA	NOVO BANCO SA
SYNGENTA AG	GKN PLC	GDF SUEZ	AB ELECTROLUX
CREDIT SUISSE GROUP AG	GLAXOSMITHKLINE PLC	GROUPE AUCHAN	AB VOLVO
SWISS REINSURANCE CO LTD	GLENCORE PLC	KERING	ASSA ABLOY AB
UBS AG	IMPERIAL TOBACCO GROUP PLC	LAFARGE	ATLAS COPCO AB
ZURICH INSURANCE CO LTD	INVENSYS LIMITED	L'AIR LIQUIDE	INVESTOR AB
BAYER AG	ITV PLC	LVMH MOET HENNESSY - LOUIS VUITTON SE	NORDEA BANK AB
BAYERISCHE MOTOREN WERKE AG	J SAINSBURY PLC	ORANGE	SEB AB
BERTELSMANN SE & CO. KGAA	KINGFISHER PLC	PERNOD RICARD SA	SVENSKA HANDELSBANKEN AB
CONTINENTAL AG	LADBROKES PLC	PEUGEOT SA	ENI SPA
DAIMLER AG	LIBERTY GLOBAL PLC	PUBLICIS GROUPE SA	FIAT S.P.A.
DEUTSCHE BAHN AKTIENGESELLSCHAFT	MARKS AND SPENCER P.L.C.	RALLYE SA	FINMECCANICA S.P.A.
DEUTSCHE LUFTHANSA AG	MELROSE INDUSTRIES PLC	RENAULT	TELECOM ITALIA S.P.A.
DEUTSCHE POST AG	NATIONAL GRID PLC	SANOFI	ASSICURAZIONI GENERALI SPA
DEUTSCHE TELEKOM AG	NEXT PLC	SCHNEIDER ELECTRIC SE	BANCA MONTE DEI PASCHI DI SIENA SPA
E.ON SE	PEARSON PLC	TECHNIP	BANCA NAZIONALE DEL LAVORO SPA
ENBW ENERGIE BADEN-WURTTEMBERG AG	RENTOKIL INITIAL PLC	THALES SA	BANCA POPOLARE DI MILANO SCARL
FRESENIUS SE & CO. KGAA	REXAM PLC	TOTAL S.A.	INTESA SANPAOLO SPA
HEIDELBERGCEMENT AG	SABMILLER PLC	VALEO SA	MEDIOBANCA SPA
HENKEL AG & CO. KGAA	SKY PLC	VEOLIA ENVIRONNEMENT	UNICREDIT SPA
LANXESS AG	SMITHS GROUP PLC	VIVENDI	UNIONE DI BANCHE ITALIANE SCPA
LINDE AG	TATE & LYLE PUBLIC LIMITED COMPANY	WENDEL	VIMPELCOM LTD.
MERCK KGAA	TESCO PLC	AXA SA	SVENSKA CELLULOSA AB SCA
METRO AG	UBM PLC	BNP PARIBAS SA	SWEDISH MATCH AB
PORSCHE AUTOMOBIL HOLDING SE	UNILEVER PLC	CREDIT AGRICOLE SA	TELEFONAKTIEBOLAGET LM ERICSSON
PROSIEBENSATNON MEDIA AG	UNITED UTILITIES PLC	DEXIA CREDIT LOCAL SA	TELIASONERA AB
RWE AG	VODAFONE GROUP PUBLIC LIMITED COMPANY	GECINA SA	VATTENFALL AB
SIEMENS AG	WM MORRISON SUPERMARKETS PLC	NATIXIS SA	BANCO DE SABADELL SA
THYSSENKRUPP AG	WPP PLC	SCOR SE	BANCO POPOLARE SC
TUI AG	3I GROUP	SOCIETE GENERALE SA	BANCO SANTANDER SA
VOITH GMBH	AVIVA PLC	ANGLO AMERICAN PLC	FUNDACION BANCARIA CAIXA D'ESTALVIS
VOLKSWAGEN AG	BARCLAYS BANK PLC	ASTRAZENECA PLC	ELISA OYJ
ALLIANZ SE	BRITISH LAND CO PLC/THE	BAE SYSTEMS PLC	FORTUM OYJ
BAYERISCHE LANDESBANK	HAMMERSON PLC	BP P.L.C.	METSA BOARD OYJ
COMMERZBANK AG	HBOS PLC	UNIBAIL-RODAMCO SE	METSO OYJ
DEUTSCHE BANK AG	HSBC BANK PLC	AIRBUS GROUP N.V.	NOKIA OYJ
HANNOVER RUECK SE	LEGAL & GENERAL GROUP PLC	AKZO NOBEL NV	STORA ENSO OYJ
IKB DEUTSCHE INDUSTRIEBANK AG	LLOYDS BANK PLC	HEINEKEN NV	UPM-KYMMENE OYJ
LBBW	PRUDENTIAL PLC	KONINKLIJKE AHOLD NV	ACCOR SA
MUENCHENER RUECKVERSICHERUNGS-GESELLSCHAFT AG	ROYAL BANK OF SCOTLAND PLC/THE	KONINKLIJKE DSM N.V.	ALCATEL-LUCENT S.A.
COOPERATIEVE CENTRALE RAIFFEISEN-BOERENLEENBANK BA	STANDARD CHARTERED PLC	KONINKLIJKE KPN NV	SAS AB
DONG ENERGY A/S	ALLIANCE & LEICESTER LTD	KONINKLIJKE PHILIPS N.V.	SCANIA AB
ISS A/S	NATIONWIDE BUILDING SOCIETY	POSTNL N.V.	SECURITAS AB
TDC A/S	HELLENIC TELECOMMUNICATIONS S.A.	STMICROELECTRONICS N.V.	SKF AB
DANSKE BANK A/S	ALPHA BANK AE	WOLTERS KLUWER NV	STENA AKTIEBOLAG
GAS NATURAL SDG, S.A.	NATIONAL BANK OF GREECE SA	ABN AMRO BANK NV	
IBERDROLA SA	SMURFIT KAPPA GROUP PLC	AEGON NV	
MELIA HOTELS INTERNATIONAL, S.A.	BANK OF IRELAND	ING BANK NV	
REPSOL S.A.	ATLANTIA S.P.A.	KBC BANK NV	
TELEFONICA SA	EDISON S.P.A.	NIBC BANK NV	
BANCO BILBAO VIZCAYA ARGENTARIA SA	ENEL SPA	CARLSBERG BREWERIES A/S	

12.   Appendix II, Additional Regressions

Table 17: Relationship between Sovereign and Firm CDS, 2010-12

This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to December 31, 2012

	(1)	(2)	(3)
Variables			
Dependent variable: ΔLn(Corporate CDS)			
Sovereign CDS	0.1287***	0.0724***	0.0718***
	0.0088	*0.0113*	*0.0113*
Observations	171 295	171 295	171 295
R - Squared	0.2952	0.3746	0.3746
Firm FE	YES	NO	YES
Time FE	NO	YES	YES
Cluster Firm	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 18: Relationship between Sovereign and Firm CDS including Foreign Exposure, 2010-12

This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads. We control for exposure to other sovereigns (Foreign Exposure). Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to December

	(1)	(2)	(3)
Variables			
Dependent variable: ΔLn(Corporate CDS)			
Sovereign CDS	0.1283***	0.0760***	0.0750***
	0.0094	*0.0118*	*0.0118*
Foreign Exposure	0.0259	0.0001	-0.0047
	0.0135	*0.0067*	*0.0172*
Observations	162 453	162 453	162 453
R - Squared	0.3036	0.3845	0.3845
Firm FE	YES	NO	YES
Time FE	NO	YES	YES
Cluster Firm	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 19: Relationship between Sovereign and Firm CDS including Domestic Stock Market Index, 2010-12

Variables	(1)	(2)	(3)
Dependent variable: ΔLn(Corporate CDS)			
Sovereign CDS	0.1223***	0.0648***	0.0644***
	0.0083	*0.0101*	*0.0101*
Domestic Stock Index	-0.2191***	-0.2478***	-0.2458***
	0.0169	*0.0435*	*0.0436*
	171 265	171 265	171 265
	0.3001	0.3771	0.3771
Firm FE	YES	NO	YES
Time FE	NO	YES	YES
Cluster Firm	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 20: Relationship between Sovereign and Firm CDS including Greek CDS, Greek Bailout Sample

This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads and log changes in Greek CDS spreads. We control for the influence of the domestic stock market (Domestic Stock Index). Event is a dummy variable that equals 1 after the event date (April 23 2010), zero otherwise. Columns 1&3 only include observation before the event date, columns 2&4 include observations after the event date. Columns 5&6 include all observations and report the difference estimator. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to August 13, 2010

	ALL FIRMS		FINANCIAL		NON FINANCIAL	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Pre-Bailout	Post-Bailout	Pre-Bailout	Post-Bailout	Pre-Bailout	Post-Bailout
Dependent variable: ΔLn(Corporate CDS)						
Sovereign CDS	0.0801***	0.1290***	0.1078***	0.1772***	0.0676***	0.1091***
	0.0086	*0.0152*	*0.0185*	*0.0315*	*0.0090*	*0.0154*
Greek CDS	0.0095*	0.0183***	0.0321**	0.0143	0.0003	0.0193***
	0.0053	*0.0043*	*0.0144*	*0.0101*	*0.0046*	*0.0045*
Domestic Stock Index	-0.0537	-0.3836***	-0.2104**	-0.1763	0.0175	-0.4762***
	0.0424	*0.0485*	*0.0088*	*0.1079*	*0.0410*	*0.0448*
Observations	17 069	17 416	4 898	5 023	12 171	12 393
R - Squared	0.2836	0.4558	0.2359	0.3999	0.3155	0.4911
Firm FE	YES	YES	YES	YES	YES	YES
Time FE	NO	NO	NO	NO	NO	NO
Cluster Firm	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

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Table 21: Relationship between Sovereign CDS and Greek CDS, Greek Bailout Sample

This table reports the result from regressing the log change in sovereign CDS spreads on long changes in the Greek CDS spread. It provides an estimate of how much of a sovereign's CDS spread is explained by the Greek spread. The residuals from this analysis are used in our next regression.

Variable	
Dependent variable: ΔLn(Sovereign CDS)	
Greek CDS	0.4183***
	0.0063
Observations	34 616
R - Squared	0.3351

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 22: Orthogonal Regression using Greek CDS and Abnormal Spreads

This table reports the results of orthogonal regressions. We regress the log change in corporate CDS spreads on log changes in the Greek CDS spreads, and Abnormal domestic sovereign CDS spreads - the residual from the previous regression. Event is a dummy variable that equals 1 after the event date, April 23 2010. Columns 1&2 include observations for all firms, 3&4 financial firms, 5&6 non-financial firms. Columns 1,3&5 include observation before the event date, columns 2,4&6 include observations after the event date. Firm fixed effects are used and standard errors are clustrered by firm. The sample period goes from January 1, 2010 to August 13, 2010

	ALL FIRMS		FINANCIAL		NON - FINANCIAL	
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Before Bailout	After Bailout	Before Bailout	After Bailout	Before Bailout	After Bailout
Dependent variable: ΔLn(Corporate CDS)						
Abnormal Sov CDS	0.0801***	0.1290***	0.1078***	0.1772***	0.0676***	0.1091***
	0.0086	*0.0152*	*0.0185*	*0.0315*	*0.0090*	*0.0156*
Greek CDS	0.0423***	0.0722***	0.0772***	0.0884***	0.0286***	0.0649***
	0.0059	*0.0068*	*0.0149*	*0.0140*	*0.0054*	*0.0071*
Domestic Stock Index	-0.0537	-0.3836***	-0.2104**	-0.1763	0.0175	-0.4762***
	0.0424	*0.0485*	*0.0884*	*0.1079*	*0.0441*	*0.0448*
Observations	17 069	17 416	4 898	5 023	12 171	12 393
R - Squared	0.2836	0.4558	0.2539	0.3999	0.3155	0.4911
Firm FE	YES	YES	YES	YES	YES	YES
Time FE	NO	NO	NO	NO	NO	NO
Cluster Firm	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 23: Greek Bailout Difference in Difference Financial vs. Non Financial Companies

This table reports the results of a difference-in-difference regression that tests whether borrowing costs of financial companies are more adversely impacted than borrowing costs of non-financial companies. *Corp* is a dummy variable that takes value 1 for non-financial firms, and zero otherwise. *Event* is a dummy variable that equals 1 after the event date (April 23 2010), zero otherwise. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to August 13, 2010

Variables	(1)	(2)	(3)
Dependent variable: ΔLn(Corporate CDS)			
Corp * Event * SovCDS	0.0312	0.0355	0.0335
	0.0271	*0.0276*	*0.0272*
Corp * SovCDS	-0.0654**	-0.0717**	-0.0696**
	0.0271	*0.0285*	*0.0284*
Corp * Event	0.0023***	0.0038***	0.0038***
	0.0005	*0.0007*	*0.0007*
Event * SovCDS	0.0155	0.0120	0.0157
	0.0235	*0.0268*	*0.0262*
SovCDS	0.1275***	0.0948***	0.0915***
	0.0231	*0.0252*	*0.0250*
Domestic Stock Index	-0.2788***	-0.5348***	-0.5266***
	0.0402	*0.1208*	*0.1222*
Foreign Exposure	0.0247	0.0029	0.0045
	0.0246	*0.0276*	*0.0045*
Corp	.	-0.0023***	.
	.	*0.0005*	.
Observations	31 914	31 914	31 914
R - Squared	0.4135	0.4903	0.4895
Firm FE	YES	NO	YES
Time FE	NO	YES	YES
Cluster Firm	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 24: Greek Bailout Eurozone Firms by Sector

This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads. Panel A reports the results for all firms in Eurozone countries, Panel B the results for non-financial firms in Eurozone countries, Panel C the results for financial firms in Eurozone countries. *Event* is a dummy variable that equals 1 after the event date (April 23 2010), zero otherwise. Columns 1-3 only include observation before the event date, columns 4-6 include observations after the event date. Columns 7-9 include all observations and report the difference estimator. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to August 13, 2010

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Pre-	Pre-	Pre-	Post-	Post-	Post-			
EUROZONE - ALL FIRMS	Bailout	Bailout	Bailout	Bailout	Bailout	Bailout	Difference	Difference	Difference
Dependent variable: ΔLn(Corporate CDS)									
SovCDS * Event							0.0217	0.0300	0.0315
							0.0140	*0.0204*	*0.0198*
Sovereign CDS	0.0714***	0.0426**	0.0407**	0.1161***	0.0726***	0.0725***	0.0792***	0.0400*	0.0391**
	0.0096	*0.0174*	*0.0167*	*0.0177*	*0.0227*	*0.0227*	*0.0107*	*0.0173*	*0.0170*
Domestic Stock Index	-0.0765	-0.7139***	-0.6379***	-0.3533***	-0.5446***	-0.5422***	-0.2618***	-0.5908***	-0.5778***
	0.0546	*0.1412*	*0.1380*	*0.0611*	*0.1871*	*0.1879*	*0.0488*	*0.1547*	*0.1553*
Foreign Exposure	0.1666***	0.1125***	0.1301***	0.0661	0.0288	0.0324	0.0957**	0.0548	0.0630
	0.0400	*0.0382*	*0.0442*	*0.0499*	*0.0477*	*0.0549*	*0.0440*	*0.0426*	*0.0491*
Observations	9 939	9 939	9 939	10 126	10 126	10 126	20 065	20 065	20 065
R - Squared	0.3169	0.4116	0.4114	0.4975	0.5623	0.5623	0.4398	0.5167	0.5167
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
EUROZONE - NON	Pre-	Pre-	Pre-	Post-	Post-	Post-			
FINANCIALS	Bailout	Bailout	Bailout	Bailout	Bailout	Bailout	Difference	Difference	Difference
Dependent variable: ΔLn(Corporate CDS)									
SovCDS * Event							0.0273*	0.0428**	0.0424**
							0.0148	*0.0207*	*0.0205*
Sovereign CDS	0.0619***	0.0458**	0.0476**	0.0982***	0.0818***	0.0819***	0.0567***	0.0405**	0.0414**
	0.0104	*0.0198*	*0.0191*	*0.0178*	*0.0250*	*0.0251*	*0.0108*	*0.0196*	*0.0196*
Domestic Stock Index	0.0124	-0.5207***	-0.4772**	-0.4788***	-0.7248***	-0.7253***	-0.3218***	-0.6648***	-0.6573***
	0.0614	*0.1903*	*0.1891*	*0.0554*	*0.2123*	*0.2121*	*0.0478*	*0.1957*	*0.1951*
Foreign Exposure	0.1146**	0.0754*	0.0909*	0.0535	0.0306	0.0312	0.0701	0.0447	0.0510
	0.0478	*0.0451*	*0.0520*	*0.0633*	*0.0600*	*0.0683*	*0.0561*	*0.0529*	*0.0606*
Observations	6 700	6 700	6 700	6 804	6 804	6 804	13 504	13 504	13 504
R - Squared	0.3513	0.4574	0.4573	0.546	0.6315	0.6315	0.4847	0.5829	0.5829
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Panel C	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Pre-	Pre-	Pre-	Post-	Post-	Post-			
EUROZONE - FINANCIALS	Bailout	Bailout	Bailout	Bailout	Bailout	Bailout	Difference	Difference	Difference

Dependent variable: ΔLn(Corporate CDS)

SovCDS * Event							0.0082	0.0126	0.0186
							0.0267	*0.0388*	*0.0375*
Sovereign CDS	0.0894***	0.0400	0.0311	0.1554***	0.0688	0.0685	0.1275***	0.0461	0.0415
	0.0206	*0.0332*	*0.0323*	*0.0370*	*0.0432*	*0.0431*	*0.0236*	*0.0339*	*0.0332*
Domestic Stock Index	-0.2252**	-0.8405***	-0.7454***	-0.1186	-0.2068	-0.2029	-0.1440	-0.3886	-0.3724
	0.0993	*0.1791*	*0.1771*	*0.1242*	*0.3260*	*0.3269*	*0.0989*	*0.2555*	*0.2568*
Foreign Exposure	0.2087***	0.1222*	0.1380*	0.0706	0.0028	0.0069	0.1125	0.0403	0.0470
	0.0632	*0.0681*	*0.0797*	*0.0923*	*0.0903*	*0.1078*	*0.0768*	*0.0798*	*0.0948*
Observations	3 239	3 239	3 239	3 322	3 322	3 322	6 561	6 561	6 561
R - Squared	0.2914	0.4317	0.4314	0.4385	0.5169	0.5179	0.3880	0.4874	0.4874
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 25: Greek Bailout Non Eurozone Firms by Sector

This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads. Panel A reports the results for all firms in non-Eurozone countries, Panel B the results for non-financial firms in non-Eurozone countries, Panel C the results for financial firms in non-Eurozone countries. *Event* is a dummy variable that equals 1 after the event date (April 23 2010), zero otherwise. Columns 1-3 only include observation before the event date, columns 4-6 include observations after the event date. Columns 7-9 include all observations and report the difference estimator. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to August 13, 2010

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
NON EUROZONE - ALL	Pre-	Pre-	Pre-	Post-	Post-	Post-			
FIRMS	Bailout	Bailout	Bailout	Bailout	Bailout	Bailout	Difference	Difference	Difference

Dependent variable: ΔLn(Corporate CDS)

SovCDS * Event							0.0742***	0.0732*	0.0830**
							0.0138	*0.0400*	*0.0409*
Sovereign CDS	0.0452***	0.0264	0.0172	0.1408***	0.0915***	0.0895***	0.0490***	0.0201	0.0083
	0.0107	*0.0226*	*0.0234*	*0.0174*	*0.0313*	*0.0309*	*0.0115*	*0.0242*	*0.0249*
Domestic Stock Index	0.1277**	-0.1176	-0.0796	-0.3241***	0.0947	0.1130	-0.1819***	0.0279	0.0564
	0.0513	*0.1144*	*0.1186*	*0.0520*	*0.1544*	*0.1548*	*0.0361*	*0.1161*	*0.1188*
Foreign Exposure	0.0465**	0.0240	0.0282	0.0371	0.0284	0.0409	0.0281	0.0277	0.0377
	0.0203	*0.0243*	*0.0282*	*0.0332*	*0.0444*	*0.0519*	*0.0260*	*0.0358*	*0.0419*
Observations	5 855	5 855	5 855	5 994	5 994	5 994	11 849	11 849	11 849
R - Squared	0.2577	0.3497	0.3597	0.4116	0.4831	0.4831	0.3633	0.4494	0.4493
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
NON EUROZONE - NON FINANCIALS	Pre-Bailout	Pre-Bailout	Pre-Bailout	Post-Bailout	Post-Bailout	Post-Bailout	Difference	Difference	Difference

Dependent variable: ΔLn(Corporate CDS)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SovCDS * Event							0.0826***	0.0524	0.0619
							0.0147	*0.0448*	*0.0450*
Sovereign CDS	0.0456***	0.0369	0.0295	0.1553***	0.0879***	0.0883***	0.0528***	0.0350	0.0259
	0.0124	*0.0280*	*0.0284*	*0.0191*	*0.0321*	*0.0321*	*0.0132*	*0.0307*	*0.0306*
Domestic Stock Index	0.1483***	-0.1612	-0.1343	-0.4326***	-0.0501	-0.0335	-0.2568***	-0.0910	-0.0696
	0.0457	*0.1429*	*0.1437*	*0.0538*	*0.1740*	*0.1708*	*0.0386*	*0.1362*	*0.1353*
Foreign Exposure	0.0270	0.0038	0.0016	-0.0163	-0.0266	-0.0276	-0.0140	-0.0161	-0.0175
	0.0201	*0.0302*	*0.0303*	*0.0337*	*0.0524*	*0.0525*	*0.0261*	*0.0433*	*0.0433*
Observations	4 354	4 354	4 354	4 455	4 455	4 455	8 809	8 809	8 809
R - Squared	0.2961	0.4182	0.4182	0.4522	0.5455	0.5455	0.4047	0.5139	0.5139
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Panel C	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
NON EUROZONE - FINANCIALS	Pre-Bailout	Pre-Bailout	Pre-Bailout	Post-Bailout	Post-Bailout	Post-Bailout	Difference	Difference	Difference

Dependent variable: ΔLn(Corporate CDS)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SovCDS * Event							0.0370	0.0689	0.0771
							0.0279	*0.0528*	*0.0539*
Sovereign CDS	0.0481**	0.0128	-0.0072	0.0894***	0.0732	0.0456	0.0441***	0.0187	-0.0146
	0.0197	*0.0394*	*0.0386*	*0.0247*	*0.0652*	*0.0565*	*0.0128*	*0.0384*	*0.0315*
Domestic Stock Index	0.0718	-0.0577	0.0935	-0.0385	0.2972	0.3017	0.0208	0.2297	0.2982*
	0.1524	*0.1752*	*0.1882*	*0.0958*	*0.2184*	*0.2192*	*0.0609*	*0.1518*	*0.1676*
Foreign Exposure	0.0981**	0.0549	0.0985	0.1736***	0.1414**	0.2043**	0.1372**	0.1110**	0.1695**
	0.0496	*0.0475*	*0.0605*	*0.0574*	*0.0581*	*0.0813*	*0.0492*	*0.0514*	*0.0685*
Observations	1 501	1 501	1 501	1 539	1 539	1 539	3 040	3 040	3 040
R - Squared	0.1919	0.3069	0.3057	0.3286	0.3955	0.3934	0.2778	0.3645	0.3627
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 26: Greek Bailout PIIGS Firms by Sector

This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads in PIIGS countries. Panel A reports the results for all firms, Panel B the results for non-financial firms, Panel C the results for financial firms. *Event* is a dummy variable that equals 1 after the event date (April 23 2010), zero otherwise. Columns 1-3 only include observation before the event date, columns 4-6 include observations after the event date. Columns 7-9 include all observations and report the difference estimator. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to August 13, 2010

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Pre-Bailout	Pre-Bailout	Pre-Bailout	Post-Bailout	Post-Bailout	Post-Bailout			
PIIGS - ALL FIRMS	Pre-Bailout	Pre-Bailout	Pre-Bailout	Post-Bailout	Post-Bailout	Post-Bailout	Difference	Difference	Difference

Dependent variable: ΔLn(Corporate CDS)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SovCDS * Event							-0.0197	-0.0264	-0.0155
							0.0204	*0.0359*	*0.0349*
Sovereign CDS	0.1368***	0.1374***	0.1213***	0.1577***	0.1126**	0.1122**	0.1639***	0.1361***	0.1258***
	0.0232	*0.0405*	*0.0405*	*0.0310*	*0.0430*	*0.0432*	*0.0268*	*0.0423*	*0.0428*
Domestic Stock Index	-0.3199***	-0.7291***	-0.6234***	-0.2267***	-0.2300**	-0.2249**	-0.2651***	-0.3976***	-0.3700***
	0.0727	*0.1365*	*0.1438*	*0.0618*	*0.1080*	*0.1071*	*0.0557*	*0.0958*	*0.0941*
Foreign Exposure	0.0952**	0.0068	-0.0254	-0.0030	-0.1408	-0.1476	0.0222	-0.0885	-0.1037
	0.0387	*0.0671*	*0.0727*	*0.0712*	*0.1176*	*0.1220*	*0.0545*	*0.0963*	*0.1013*
Observations	3 876	3 876	3 876	3 970	3 970	3 970	7 846	7 846	7 846
R - Squared	0.3448	0.4654	0.465	0.500	0.5624	0.5624	0.4478	0.5303	0.5303
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Pre-Bailout	Pre-Bailout	Pre-Bailout	Post-Bailout	Post-Bailout	Post-Bailout			
PIIGS - NON FINANCIALS	Pre-Bailout	Pre-Bailout	Pre-Bailout	Post-Bailout	Post-Bailout	Post-Bailout	Difference	Difference	Difference

Dependent variable: ΔLn(Corporate CDS)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SovCDS * Event							-0.0210	-0.0125	-0.0044
							0.0288	*0.0428*	*0.0424*
Sovereign CDS	0.1705***	0.1599***	0.1498**	0.1517***	0.1230*	0.1215*	0.1676***	0.1421**	0.1332**
	0.0354	*0.0585*	*0.0588*	*0.0361*	*0.0635*	*0.0643*	*0.0361*	*0.0633*	*0.0652*
Domestic Stock Index	-0.2491***	-0.4875**	-0.4019**	-0.3326***	-0.4612***	-0.4542***	-0.3207***	-0.4806***	-0.4510***
	0.0821	*0.1907*	*0.2009*	*0.0720*	*0.1323*	*0.1297*	*0.0599*	*0.1330*	*0.1307*
Foreign Exposure	0.0075	-0.0885	-0.1178	-0.1028	-0.2127	-0.2270	-0.0707	-0.1717	-0.1910
	0.0476	*0.1030*	*0.1224*	*0.0797*	*0.1439*	*0.1522*	*0.0640*	*0.1275*	*0.1381*
Observations	1 980	1 980	1 980	2 025	2 025	2 025	4 005	4 005	4 005
R - Squared	0.3956	0.5188	0.5185	0.5769	0.6500	0.6499	0.5214	0.6123	0.6122
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Panel C	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Pre-Bailout	Pre-Bailout	Pre-Bailout	Post-Bailout	Post-Bailout	Post-Bailout			
PIIGS - FINANCIALS	Pre-Bailout	Pre-Bailout	Pre-Bailout	Post-Bailout	Post-Bailout	Post-Bailout	Difference	Difference	Difference
Dependent variable: ΔLn(Corporate CDS)									
SovCDS * Event							-0.0151	-0.0255	-0.0116
							0.0290	*0.0548*	*0.0534*
Sovereign CDS	0.0970***	0.1059*	0.0848	0.1659***	0.10578*	0.1060*	0.1566***	0.1203**	0.1083*
	0.0288	*0.0569*	*0.0562*	*0.0520*	*0.0617*	*0.0618*	*0.0392*	*0.0587*	*0.0590*
Domestic Stock Index	-0.3858***	-0.8692***	-0.7469***	-0.1162	0.0055	0.0100	-0.2044**	-0.2751*	-0.2495
	0.1180	*0.1544*	*0.1637*	*0.1018*	*0.1837*	*0.1819*	*0.0929*	*0.1573*	*0.1551*
Foreign Exposure	0.1944***	0.0935	0.0594	0.0976	-0.0566	-0.0566	0.1196	-0.0010	-0.0125
	0.0571	*0.0866*	*0.0929*	*0.1152*	*0.1824*	*0.1868*	*0.0858*	*0.1436*	*0.1490*
Observations	1 896	1 896	1 896	1 945	1 945	1 945	3 841	3 841	3 841
R - Squared	0.3198	0.491	0.4905	0.4433	0.5318	0.5318	0.3965	0.5152	0.5152
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 27: Greek Bailout Non PIIGS Firms by Sector

This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads in non-PIIGS countries. Panel A reports the results for all firms, Panel B the results for non-financial firms, Panel C the results for financial firms. *Event* is a dummy variable that equals 1 after the event date (April 23 2010), zero otherwise. Columns 1-3 only include observation before the event date, columns 4-6 include observations after the event date. Columns 7-9 include all observations and report the difference estimator. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to August 13, 2010

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Pre-Bailout	Pre-Bailout	Pre-Bailout	Post-Bailout	Post-Bailout	Post-Bailout			
NON PIIGS - ALL FIRMS	Pre-Bailout	Pre-Bailout	Pre-Bailout	Post-Bailout	Post-Bailout	Post-Bailout	Difference	Difference	Difference
Dependent variable: ΔLn(Corporate CDS)									
SovCDS * Event							0.0455***	0.0319**	0.0333**
							0.0089	*0.0154*	*0.0154*
Sovereign CDS	0.0573***	0.0158	0.0136	0.1176***	0.0453***	0.0456***	0.0543***	0.0141	0.0125
	0.0072	*0.0100*	*0.0099*	*0.0113*	*0.0156*	*0.0159*	*0.0074*	*0.0095*	*0.0098*
Domestic Stock Index	0.1495***	-0.1019	-0.0931	-0.3867***	-0.2046	-0.1982	-0.2090***	-0.1783	-0.1703
	0.0326	*0.0775*	*0.0780*	*0.0383*	*0.1509*	*0.1508*	*0.0267*	*0.1092*	*0.1093*
Foreign Exposure	0.0139	-0.0122	-0.0174	0.0037	-0.0281	-0.0291	-0.0225	-0.0237	-0.0263
	0.0209	*0.0208*	*0.0245*	*0.0306*	*0.0305*	*0.0352*	*0.0262*	*0.0266*	*0.0309*
Observations	11 918	11 918	11 918	12 150	12 150	12 150	24 068	24 068	24 068
R - Squared	0.2851	0.3835	0.3835	0.4574	0.5332	0.5332	0.4034	0.4918	0.4918
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Panel B	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
NON PIIGS - NON	Pre-	Pre-	Pre-	Post-	Post-	Post-			
FINANCIALS	Bailout	Bailout	Bailout	Bailout	Bailout	Bailout	Difference	Difference	Difference

Dependent variable: ΔLn(Corporate CDS)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SovCDS * Event							0.0445***	0.0327**	0.0338**
							0.0098	*0.0141*	*0.0141*
Sovereign CDS	0.0476***	0.0051	0.0049	0.1034***	0.0369**	0.0367**	0.0406***	0.0051	0.0037
	0.0069	*0.0096*	*0.0098*	*0.0109*	*0.0148*	*0.0150*	*0.0068*	*0.0092*	*0.0096*
Domestic Stock Index	0.1741***	-0.0920	-0.0864	-0.4493***	-0.1179	-0.1061	-0.2477***	-0.1148	-0.1061
	0.0328	*0.0859*	*0.0859*	*0.0388*	*0.1430*	*0.1437*	*0.0268*	*0.1065*	*0.1073*
Foreign Exposure	0.0027	-0.0239	-0.0255	-0.0060	-0.0339	-0.0380	-0.0135	-0.0308	-0.0339
	0.0194	*0.0205*	*0.0227*	*0.0286*	*0.0300*	*0.0327*	*0.0242*	*0.0259*	*0.0283*
Observations	9 074	9 074	9 074	9 234	9 234	9 234	18 308	18 308	18 308
R - Squared	0.3219	0.4402	0.4402	0.4944	0.5954	0.5954	0.4400	0.5548	0.5548
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Panel C	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Pre-	Pre-	Pre-	Post-	Post-	Post-			
NON PIIGS - FINANCIALS	Bailout	Bailout	Bailout	Bailout	Bailout	Bailout	Difference	Difference	Difference

Dependent variable: ΔLn(Corporate CDS)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SovCDS * Event							0.0476**	0.0267	0.0294
							0.0201	*0.0408*	*0.0408*
Sovereign CDS	0.0888***	0.0507**	0.0429*	0.1635***	0.0749*	0.0752*	0.0991***	0.0473**	0.0441*
	0.0204	*0.0235*	*0.0246*	*0.0322*	*0.0418*	*0.0418*	*0.0207*	*0.0237*	*0.0248*
Domestic Stock Index	0.0702	-0.1384	-0.1067	-0.1806*	-0.4640	-0.4652	-0.0820	-0.3577	-0.3503
	0.0877	*0.1529*	*0.1604*	*0.0971*	*0.4539*	*0.4487*	*0.0711*	*0.3158*	*0.3132*
Foreign Exposure	0.0446	-0.0009	0.0022	0.0261	-0.0084	-0.0059	0.0259	-0.0082	-0.0075
	0.0570	*0.0502*	*0.0688*	*0.0841*	*0.0756*	*0.0971*	*0.0721*	*0.0664*	*0.0868*
Observations	2 844	2 844	2 844	2 916	2 916	2 916	5 760	5 760	5 760
R - Squared	0.2196	0.3296	0.3295	0.3742	0.4364	0.4364	0.3237	0.4032	0.4032
Firm FE	YES	NO	YES	YES	NO	YES	YES	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 28: Importance of Property Rights in Explaining Changes in Firm CDS Spreads, 2010-12

This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads and a country's property rights score. Property rights scores are obtained from the Heritage Foundation. Columns 1-3 report the results for all firms, 4-6 financial firms, 7-9 non-financial firms. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to December 31, 2012

Variables	(1) All Firms	(2) All Firms	(3) All Firms	(4) Financial	(5) Financial	(6) Financial	(7) Non Financial	(8) Non Financial	(9) Non Financial
Dependent variable: ΔLn(Corporate CDS)									
Sovereign CDS	0.1234***	0.0675***	0.0673***	0.1560***	0.0748***	0.0751***	0.1076***	0.0633***	0.0626***
	0.0086	*0.0105*	*0.0106*	*0.0186*	*0.0192*	*0.0193*	*0.0090*	*0.0124*	*0.0126*
Property Rights	-0.0031***	-0.0030***	0.0119***	-0.0040***	-0.0039***	0.0070	-0.0023***	-0.0021***	0.0103**
	0.0004	*0.0004*	*0.0034*	*0.0009*	*0.0009*	*0.0054*	*0.0005*	*0.0006*	*0.0044*
Domestic Stock Index	-0.2186***	-0.2523***	-0.2510***	-0.1257***	-0.1717**	-0.1723**	-0.2649***	-0.2920***	-0.2888***
	0.0170	*0.0468*	*0.0466*	*0.0307*	*0.0716*	*0.0713*	*0.0171*	*0.0566*	*0.0565*
Foreign Exposure	0.0142**	0.0022	0.0006	0.0360	0.0068	0.0104	0.0083	-0.0004	-0.0066
	0.0063	*0.0067*	*0.0169*	*0.0234*	*0.0253*	*0.0468*	*0.0053*	*0.0058*	*0.0158*
Observations	162 423	162 423	162 423	48 668	48 668	48 668	113 755	113 755	113 755
R-Squared	0.3088	0.3872	0.3843	0.2690	0.3594	0.3574	0.3355	0.4354	0.4355
Firm FE	NO	NO	YES	NO	NO	YES	NO	NO	YES
Time FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Cluster Firm	YES	YES	YES	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 29: Importance of Property in Explaining Changes in Firm CDS Spreads, Greek Bailout

This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads and a country's property rights score (*PropRights*). Property rights scores are obtained from the Heritage Foundation. Panel A reports the results for all firms, Panel B the results for non-financial firms, Panel C the results for financial firms. *Event* is a dummy variable that equals 1 after the event date (April 23 2010), zero otherwise. Columns 1-2 only include observation before the event date, columns 3-4 include observations after the event date. Columns 5-6 include all observations and report the difference estimator. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to August 13, 2010

Panel A	(1)	(2)	(3)	(4)	(5)	(6)
ALL FIRMS	Pre-Bailout	Pre-Bailout	Post-Bailout	Post-Bailout	Difference	Difference
Dependent variable: ΔLn(Corporate CDS)						
SovCDS * Event					0.0385***	0.0398**
					0.0115	0.0166
PropRights * Event					0.0002	0.0091***
					0.0006	0.0026
Sovereign CDS	0.0787***	0.0490***	0.1354***	0.0847***	0.0829***	0.0451***
	0.0088	0.0146	0.0157	0.0195	0.0098	0.0142
Property Rights	-0.0139***	-0.0123***	-0.0032**	-0.0031**	-0.0081***	-0.0122***
	0.0021	0.0020	0.0014	0.0014	0.0012	0.0022
Domestic Stock Index	-0.0699	-0.5451***	-0.3864***	-0.5353***	-0.2840***	-0.5429***
	0.0474	0.1079	0.0504	0.1471	0.0412	0.1219
Foreign Exposure	0.0613***	0.0381	0.0182	-0.0058	0.0251	0.0080
	0.0197	0.0242	0.0260	0.0308	0.0225	0.0275
Observations	15 794	15 794	16 120	16 120	31 914	31 914
R - Squared	0.2944	0.3863	0.4681	0.5317	0.4129	0.4892
Firm FE	NO	NO	NO	NO	NO	NO
Time FE	NO	YES	NO	YES	NO	YES
Cluster Firm	YES	YES	YES	YES	YES	YES

Panel B	(1)	(2)	(3)	(4)	(5)	(6)
NON FINANCIALS	Pre-Bailout	Pre-Bailout	Post-Bailout	After Bailout	Difference	Difference
Dependent variable: ΔLn(Corporate CDS)						
SovCDS * Event					0.0453***	0.0527***
					0.0119	0.0164
PropRights * Event					0.0017***	0.0031
					0.0063	0.0025
Sovereign CDS	0.0664***	0.0371**	0.1193***	0.0840***	0.0606***	0.0327**
	0.0096	0.0154	0.0157	0.0215	0.0099	0.0146
Property Rights	-0.0083***	-0.0074***	-0.0037**	-0.0038**	-0.0064***	-0.0069***
	0.0022	0.0020	0.0017	0.0018	0.0014	0.0020
Domestic Stock Index	0.0171	-0.3817***	-0.4863***	-0.6051***	-0.3275***	-0.5402***
	0.0503	0.1301	0.0478	0.1651	0.0402	0.1456
Foreign Exposure	0.0248	0.0040	-0.0002	-0.0141	-0.0018	-0.0095
	0.0201	0.0253	0.0271	0.0329	0.0236	0.0292
Observations	11 054	11 054	11 259	11 259	22 313	22 313
R - Squared	0.3286	0.4367	0.5106	0.5961	0.4544	0.5532
Firm FE	NO	NO	NO	NO	NO	NO
Time FE	NO	YES	NO	YES	NO	YES
Cluster Firm	YES	YES	YES	YES	YES	YES

Panel C	(1)	(2)	(3)	(4)	(5)	(6)
FINANCIALS	Pre-Bailout	Pre-Bailout	Post-Bailout	After Bailout	Difference	Difference

Dependent variable: ΔLn(Corporate CDS)

	(1)	(2)	(3)	(4)	(5)	(6)
SovCDS * Event					0.0210	0.0139
					0.0231	*0.0333*
PropRights * Event					-0.0036***	0.0106**
					0.0012	*0.0045*
Sovereign CDS	0.1060***	0.0711**	0.1713***	0.0900**	0.1325***	0.0710**
	0.0181	*0.0296*	*0.0336*	*0.0377*	*0.0211*	*0.0295*
Property Rights	-0.0191***	-0.0164***	-0.0063**	-0.0053*	-0.0103***	-0.0163***
	0.0038	*0.0037*	*0.0029*	*0.0030*	*0.0025*	*0.0041*
Domestic Stock Index	-0.2284**	-0.7330***	-0.1816*	-0.3672	-0.1866**	-0.4812**
	0.0924	*0.1584*	*0.1050*	*0.2690*	*0.0872*	*0.2144*
Foreign Exposure	0.1155***	0.0786	0.0535	0.0114	0.0715	0.0343
	0.0392	*0.0491*	*0.0579*	*0.0696*	*0.0485*	*0.0611*
Observations	4 740	4 740	4 861	4 861	9 601	9 601
R - Squared	0.2638	0.3841	0.4056	0.4703	0.3566	0.4414
Firm FE	NO	NO	NO	NO	NO	NO
Time FE	NO	YES	NO	YES	NO	YES
Cluster Firm	YES	YES	YES	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 30: Importance of Borrowing Dependence in Explaining Changes in Firm CDS Spreads, 2010-12

This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads and a firm's debt to liabilities ratio (*Borrowing*). Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to December 31, 2012

Variables	(1)	(2)	(3)

Dependent variable: ΔLn(Corporate CDS)

	(1)	(2)	(3)
Sovereign CDS	0.1065***	0.0063***	0.0626***
	0.0091	*0.0124*	*0.0126*
Borrowing	0.0013	-0.0002	0.0016
	0.0015	*0.0003*	*0.0013*
Domestic Stock Index	-0.2655***	-0.2930***	-0.2890***
	0.0170	*0.0566*	*0.0565*
Foreign Exposure	0.0162	-0.0003	-0.0067
	0.0126	*0.0058*	*0.0158*
Observations	113 755	113 755	113 755
R - Squared	0.3329	0.4354	0.4350
Firm FE	YES	NO	YES
Time FE	NO	YES	YES
Cluster Firm	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)

Table 31: Importance of Borrowing Dependence before and after Greek Bailout

This table reports the results from regressing the log change in corporate CDS spreads on log changes in the domestic sovereign CDS spreads and a firm's debt to liabilities ratio (Borrowing). *Event* is a dummy variable that equals 1 after the event date (April 23 2010), zero otherwise. Columns 1-3 only include observation before the event date, columns 4-6 include observations after the event date. Columns 7-9 include all observations and report the difference estimator. Standard errors are clustered by firm and each column indicates whether Firm or Time Fixed Effects are used. The sample period goes from January 1, 2010 to August 13, 2010

Variables	(1) Pre-Bailout	(2) Post-Bailout	(3) Difference
Dependent variable: ΔLn(Corporate CDS)			
SovCDS * Event			0.0507***
			0.0165
Borrowing * Event			-0.0018
			0.0022
Sovereign CDS	0.0392**	0.0841***	0.0348**
	0.0154	*0.0215*	*0.0147*
Borrowing	0.0007	-0.0008	0.0009
	0.0015	*0.0015*	*0.0015*
Domestic Stock Index	-0.3977***	-0.6069***	-0.5467***
	0.1305	*0.1648*	*0.1454*
Foreign Exposure	0.0072	-0.0140	-0.0083
	0.0253	*0.0330*	*0.0293*
Observations	11 054	11 259	22 313
R - Squared	0.4363	0.5961	0.5531
Firm FE	NO	NO	NO
Time FE	YES	YES	YES
Cluster Firm	YES	YES	YES

Standard Errors in Italics

*** p<0.01 (1%), ** p<0.05 (5%), * p<0.10 (10%)