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External imbalances and fiscal fragility in the euro area

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Abstract

This paper presents two views of the European sovereign debt crisis. The first is that the South in the euro zone has been fiscally irresponsible and failed to implement pro-competitive supply side policies. The second view holds that the crisis reflects a deep divide between the external surpluses of the North and external deficits of the South. Basic stylized facts cast considerable doubt on the explanation based only on the first thesis. A relatively simple model shows how poor fundamentals can create a debt problem independently of fiscal responsibility. The empirical analysis of the determinants of government bond yield spreads relative to Germany suggests that both views in fact provide useful insights into the roots of the current sovereign crisis. However, differences in labor productivity growth and competitiveness between North and South have assumed a much more dominant role since the Greek crisis erupted in 2010.

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1. Introduction

This paper tries to answer three inter-related questions: Why is the speculative attack (sell off) against sovereign debt taking place in the euro area (EA) in the aftermath of the financial crisis of 2008-2009? Why is that attack primarily focused on the South, and not on the North of the EA? Why is such a crisis not occurring outside the EA?

The current policy debate in the EA is predominantly centered on whether the ongoing fiscal austerity should be continued during depressed economic times. We can identify three different views in this debate: fiscal austerity in the South of the EA (simply the South) is necessary to resolve the debt crisis; fiscal austerity can make the debt crisis worse rather than better; and, an intermediate position, that the austerity measures need to be timed rather carefully.

The first view is the "German" view: fiscal austerity is essential to reduce the yield spreads of government debt in the South relative to that on "safe" German government debt, to restore credibility in the South's ability to honor its debt, and to lessen the risk of the South exiting the euro. The alternative of inflating away the problem by transforming the European Central Bank (ECB) into a lender of last resort to governments is not only unacceptable to the North, but violates the Treaty of the European Union (Neumann 2012). The second, Keynesian view is that fiscal austerity is counter-productive, given the size of the fiscal multipliers, marginal tax rates and expected long-term growth rates. Fiscal austerity may actually exacerbate market doubts about government solvency by lowering expected tax revenues (DeLong and Summers 2012). The third accepts the necessity of fiscal austerity but not under bad economic times; in other words the implementation of fiscal correction must take place when conditions warrant it (Corsetti 2012; IMF 2012a).

Until recently, relatively little has been said about the euro-area crisis being as much the result of external imbalances as of fiscal profligacy.[1] In a sovereign country, inter-regional imbalances would pose no problem to the stability of the monetary union. But in the euro area they do. There are two reasons for this.

The first is that a monetary union needs the support of a significant centralized budget to absorb transitory, idiosyncratic shocks to individual member economies; in other words a fiscal union (Kenen 1969). In a monetary union, monetary policy can

[1]An exception is Wihlborg et al (2010). An implication of this view is the endogenous optimal currency area hypothesis may have misled policymakers into thinking there was no need to adjust.

only stabilize aggregate shocks if they affect all members of the union equally. The alternative, real exchange-rate adjustments to idiosyncratic shocks must operate through changes to regional prices and wages. The fact that prices and wages are sluggish makes this adjustment process slow and leads to excessively long disequilibria in the output and labor markets. Therefore, it falls to fiscal policy to fill in the gap; to play the role of equilibrating regional differences in the fluctuations of output and employment (Fratianni and von Hagen 1992, ch. 8). Inadequate centralized fiscal instruments expose a monetary union to prolonged spells of regional economic disparities and, as a result, undermine the proper functioning of the union. Empirical work done in the 1980s and the 1990s has confirmed the importance of this view.[2]

The call for a sizable centralized fiscal budget to stabilize transitory regional shocks in an Economic and Monetary Union (EMU) is an old one. It was pointed out in 1989 by the Delors Report.[3] Earlier, the MacDougall Report (Commission of the EC 1977) had estimated that a budget of about five percent of the Community's GNP would be required for a viable EMU. The same report also indicated that central governments tend to redistribute resources among regions permanently. For example, between 1971 and 1973, poorer regions in the South of Italy received net public finance inflows averaging between 7.8 and 28 percent of their gross regional product. At the same time, their regional current-account deficits varied between 14.8 and 42.3 percent. In contrast, the relatively rich regions in the North had net public finance outflows between 4.4 and 11.1 percent, compared with current account surpluses of 10.9 to 15.3 percent (Commission of the EC 1977: 33).[4]

[2] For example, Sachs and Sala-i-Martin (1989) contend that the U.S. federal fiscal system responds to regional shocks by offsetting about one-third of impact effects through compensating tax and transfer payments. They, like Eichengreen (1990) and Bayoumi and Masson (1995), conclude that an EMU without a sufficiently large fiscal apparatus would not work well.

[3] On page 89, this report states that: "[I]n all federations the different combinations of federal budgetary mechanisms have powerful "shock-absorber" effects, dampening the amplitude either of economic difficulties or of surges in prosperity of individual states. This is both the product of, and the source of the sense of national solidarity which all relevant economic and monetary unions share."

[4] The Italian redistribution of public resources from the North supplemented inadequate capital flows to South. Between 1970-72, private net inflows, intermediated by banks and subsidized by government, accounted for 14.2 percent of the South's GDP against a current-account deficit equal to 23.4 percent of the area's GDP. Such a situation has persisted to the present day. Long-run sustainability of the inter-regional current-account imbalances in the Italian monetary union was guaranteed not only by inter-regional flows of capital (both private and public) but also of labor. From 1951 to 1981, 25 per cent of the population has emigrated from the less developed Italian regions. On these issues see Tamagna and Qualeatti (1978), Alessandrini (1989), Galli (1990), and De Bonis et al. 2010.

The second reason why national imbalances may undermine the EA is that speculative attacks against individual members of the monetary union cannot be ruled out (Garber 1999). By contrast, speculative attacks against regions of a sovereign country can be ruled out. The argument goes as follows. The euro area has a centralized monetary authority, the ECB, and national central banks (NCB). The fixity of the exchange rate among member countries is guaranteed by unlimited credit granted to each NCB through *Target2*, the online real-time payment system through which intra-euro area transactions are settled. These transactions arise from cross-border flows of goods and services, financial transactions or transfer of money (bank deposits) from one country to another. If member countries had fixed exchange rates but different currencies, these cross-border transactions would have to be settled with international reserves. A common currency and the *Target2* mechanism have eliminated the need for such reserves. But an essential condition for the smooth operation of the euro area is that each NCB must have free access to credit through *Target2* to play the role of reserves. If there is "skepticism that a strong currency NCB will provide through *Target2* unlimited credit in euros to the weak NCBs," sparked by "[a] large cross-border capital movement [that] may occur because of misplaced doubt about the continuation of a country in the monetary union, fear of a default on its bonds, or problems in its financial system that cause a bank run", then a precondition exists for a speculative attack (Garber 1999:211-12).

Before the liquidity crisis that erupted in the European interbank market in August of 2007, the *Target2* balances of individual NCBs were small. Since 2007, these balances have grown steadily.[5] Sinn and Wollmershaeuser (2011) and European Economic Advisory Group (2012, ch. 2) claim that these imbalances represent a quasi-fiscal action by creditor NCBs (the North) in favor of debtor NCBs (the South) and are qualitatively not different from the assistance that the South already receives through the European Financial Stability Facility. In Germany, this issue is becoming politicized and gives additional credence to the point raised by Garber: the very fact that a discussion is taking place about ways to curtail or make *Target2* debit balances more costly raises doubts about the availability of unlimited

[5] At the end of 2010, Germany had a credit balance of €326 billion; and Greece, Ireland, Portugal and Spain owed an aggregate €340 billion (Sinn and Wollmershäuser 2011). At the end of 2011, the German credit balance had increased by more than €100 billion to a reported total of nearly €1tn, while Italy had accumulated a deficit position of close to €200 billion (Bornhorst and Mody 2012).

credit in the future and the possibility, remote as it may be, of a speculative currency attack on the euro – or, more likely, on the debt of debtor economies.

In sum, the EA is structurally fragile, a fragility that was exposed by the financial crisis and government actions to rescue their banking systems. Investors' fears about this weak structure have manifested themselves by attacking the euro through the government debt market. While these attacks may reflect genuine concerns about the unsustainability of debt in the South, the deep divide between the external surplus of the North and the deficits of the South cannot be dismissed as a potential trigger mechanism for the debt crisis and its resistance to fiscal therapy. This resistance may well reflect an inadequate transfer mechanism that is normally present in sovereign states, destabilizing real exchange rate movements, and low economic growth. These are old problems (Sargent 2012); but they have not been recognized by the recent literature or policy practice. As a result, the present regime of fiscal austerity appears to be a cure of a symptom rather than of the cause of the euro crisis.

The rest of the paper is organized as follows. In the second section we present some stylized facts of the sovereign debt crisis, facts that cast some doubt on the view that the sovereign debt crisis has been driven by the lack of fiscal discipline in the South. The third lays out the two interpretations of the crisis. Section four provides a general framework for analyzing an excess debt problem. Section five develops and tests an empirical model of the determinants of sovereign yield spreads in the euro area. The critical result is that fiscal fragility and external imbalances explain a significant share of the widening spreads in the euro area since the onset of the global financial crisis. That share now dominates, having risen significantly with differences in labor productivity and growth rates between the North and the South since the Greek crisis erupted in 2010. Conclusions are drawn in the last section.

2. Stylized Facts

In this section we present some stylized facts of the sovereign debt crisis. We start by examining the yields on 10-year government bonds of Greece, Ireland, Portugal, Spain, and Italy (known collectively as GIPSIs) and Germany from 2007 to the end of March 2012. At the time that the European inter-bank liquidity crisis exploded (7

August, 2007), the GIPSI sovereign yields were very close to Germany's.[6] After the Lehman's bankruptcy and, more clearly after the revelation of the Greek crisis, these spreads marched relentlessly upward, apparently immune to the announcements and actions taken by European Union leaders to contain the crisis.[7]

The extraordinary rise in GIPSI's bond yields stands in sharp contrast to the decline of US, UK, and Japanese bond yields, as well as German bonds.[8] These are dramatic contrasts which this paper needs to explain.

Differences in inflation expectations, or an expected exchange rate depreciation of the euro relative to the dollar, are not likely explanations of the phenomenon in question. If they were, one would have observed significant differences between the German yields and US, UK and Japanese yields. In fact, the differences between German yields and UK and US yields are negligible, while the difference with respect to the Japanese yields is less than one percentage point.

High and rising levels of government debt in relation to GDP, and large government budget deficits are another possible explanation. Table 1 shows government gross-debt-to-GDP ratios for 11 EA countries and the three outside countries, the United Kingdom, the Unites States, and Japan. Reported data are for 1999 (start of the euro), 2007 (pre-crisis period), 2011, and the first differences between 2007 and 1999, and 2011 and 2007. By 2007, Austria, Belgium, Finland, Ireland, Italy, the Netherlands, and Spain had reduced their debt ratios relative to 1999 values. By contrast, Japan had increased its debt ratio by 54 percentage points and the United States by one percentage point. Government financed rescue plans of the banking system and the recession following the financial crisis then raised debt ratios significantly. Particularly hard were hit Ireland (whose debt ratio went up by 89 percentage points), Greece (60 percentage points), Portugal (38), and Spain (31). Japanese, US and UK debt ratios also went up sharply, by 45, 38 and 37 percentage points respectively. In contrast, Italian debt ratio was not influenced by the financial

[6] At that point, Ireland and Spain had yield differentials relative to Germany of 9 basis points (bp); Portugal 23 bp; Italy 28 and Greece 30.

[7] When Lehman filed for bankruptcy protection on September 18, 2008, those spreads had risen to 47 bp for Spain (the smallest), and 81 bp for Greece (the largest). When irregularities in Greek government budget accounts were revealed in January of 2010, the Greek spreads moved to 271 bp; Ireland followed with 156 bp; and Spain's were lowest at 71 bp.

[8] The German yield declined steadily from 4.7 percent in the middle of 2008 to 1.2 percent at the end of July, 2012. US and UK yields dropped from around 5 percent in 2007, to around 1.5 percent by July 2012; and Japanese yields from the 2 to 0.85 percent over the same period.

crisis. And as late as the first quarter of 2012, Spain had a debt ratio lower than that of France or Germany.

Next, consider fiscal discipline as measured by the ratio of government primary surpluses to GDP. Table 1 reports the cumulative flow over the period 1999 to 2011 for the 11 EA countries plus the UK, US, and Japan. Three of the Southern economies accumulated smaller primary deficits than in France or Ireland. Italy, on the other hand, accumulated primary surpluses larger than those of Germany, the Netherlands or Austria. And the three outside countries are the least fiscally disciplined. Initial debt conditions also matter. A large debt requires larger primary surpluses to offset interest payments on that debt; this is the case in Belgium and Italy. On the other hand, countries with a more virtuous fiscal past are in a position to run larger primary deficits or the same primary surpluses at lesser cost than countries with a profligate past. This is the case in France, Ireland, Spain, the United Kingdom and the United States. The United States, in particular, benefits from the additional advantage that the US dollar is a dominant world currency which makes borrowing cheaper. The puzzle is Japan, a country with an extremely high initial debt-to-GDP ratio (in 1999), and high budget deficits, but no speculative attacks. The fact that Japan has large net foreign assets, continues to run current account surpluses, and has a central bank that, unlike the ECB, is willing and able to act as lender of last resort to government may explain the puzzle.

The final set of stylized facts refers to external imbalances. Table 2 shows cumulative current-account balances for 11 EA countries as a percent of GDP over the period 1999-2012 (2012 values are IMF forecasts). Note the big divide between the surpluses of the North – Netherlands, Finland, Germany, Belgium, Austria — and the deficits of the South (Italy, Spain, Portugal and Greece) with France acting as median. The table has two additional columns: the cumulative percentage change in unit labor costs for the period 1999-2010 and the cumulative percentage change in the CPI for 1999-2010. With the exception of Ireland, badly affected by the financial crisis, the North has benefited from low unit labor cost growth and below median inflation rates (real exchange rate depreciations relative to the South), whereas the South has suffered from high unit labor cost growth and above median inflation rates[9]

[9] In other words, (cost) inflation in the South cannot be laid at the door of a Balassa-Samuelson effect.

(real exchange rate appreciation relative to the North). These data are consistent with the hypothesis that the asymmetries in the external imbalances of euro area countries were driven by wage and labor productivity differentials which were not compensated by real exchange rate adjustments.

In sum, the stylized facts raise significant doubts about the view that the sovereign debt crisis has been driven primarily by a lack of fiscal discipline in the South. In fact, to select the problem economies by size of deficit or debt ratios is to pick out the wrong set of countries.

3. Two Interpretations

There are at least two interpretations of the sovereign debt crisis in the South of the euro area. The first is a lack of fiscal discipline; the second is external imbalances and inadequate adjustment mechanisms operating in the EA. The two interpretations are not mutually exclusive however.

The first hypothesis takes its cue from the financial crisis of 2008-2009, which instigated a big increase in general risk aversion. It is based on a large literature stressing the adverse role of fiscal deficits and government debt on sovereign bond yields; see Baldacci and Kumar (2010), Maltritz (2012) and references cited therein. Fiscal variables have been found to be statistically significant in explaining the rise in government bond yields in the first phase of the financial crisis (Attinasi et al 2009; von Hagen et al 2011). However, their economic relevance is quite limited (Attinasi et al 2009; Aizenman et al 2011; De Grauwe and Ji 2012). An additional, but smaller role is played by liquidity effects and repricing of risk (announcements of bank rescue packages), while international risk aversion has played the biggest role in explaining the increase in spreads. Significantly, international risk aversion matters most for countries with weaker fiscal positions (Favero and Missale 2012). This parallels the finding that Argentina had, by the time of the collapse of her currency board regime in 2001, swapped default risk for currency risk (Hughes Hallett 2007), which explains a good part of why default risks have acted on the South and not on high-deficit, high-debt countries like Japan, the United States or the United Kingdom.

This argument provides an alternative interpretation of the crisis. The shock of the world financial crisis exposed the fragility of the EA construction which does not permit the South, burdened with external imbalances and rigid economies, to benefit

from the fiscal equalization and bail-out commitments normally available to sub-national governments in a fiscal union. It is quite likely that the South may be too big to bail-out; an issue that does not apply to a country like Japan, for example, whose government is supported by a central bank willing to act as a lender of last resort. Under flexible or adjustable exchange rates, adjustments to a current account deficit occur via a combination of income and exchange rate changes. Under fixed exchange rates, the adjustment occurs by a flow of money from deficit to surplus countries and subsequent price and income adjustments. Should the central bank counteract this money flow with sterilization policies, a speculative attack will induce deficit countries to devalue and surplus countries to revalue their nominal exchange rates. In a monetary union like the EA, NCBs can neither adopt sterilization policies nor adjust their nominal exchange rates. This does not imply, as we have seen, that the monetary union is immune from the risk of a speculative attack induced by persistent external imbalances in some of its member countries. To avoid such a risk, the adjustment to external imbalances must occur through internal revaluation in the surplus countries and internal devaluation in deficit countries. In the EA, this means that the North must have higher incomes, prices and wages; or the South has to have lower incomes, prices and wages; or a combination of the two. This adjustment burden needs to be shared between surplus and deficit countries, with the predominant share of the burden falling on surplus countries when economic activity is slack and on deficit countries in an inflationary environment (Keynes 1943: 20; Mundell 1968, ch. 13). But the North is not willing to reflate. Instead, it has imposed an internal devaluation on the South through a policy of fiscal austerity. Given that internal devaluation is difficult and takes a long time to implement, the market expresses its "fears" on the feasibility and sustainability of this strategy by raising risk premia on Southern government debt. These fears are further reinforced by concerns about the sustainability of the *Target2* balances.

Somewhat belatedly, the literature is beginning to recognize the importance of external imbalances in explaining the euro crisis. The fall in interest rates, following monetary union membership, fueled foreign borrowing by both public and private sectors in the peripheral countries (Waysand et al 2010). However, contrary to the prediction of the Blanchard and Giavazzi (2002) model, "foreign capital was used to support domestic consumption or housing booms rather than productivity enhancing

investments" (Higgins and Klitgaard 2010:1), spreading the seeds of a future sovereign debt crisis (IMF 2012b). This is a point originally made by Ingram (1973), and discussed by Giavazzi and Spaventa (2010) who develop a model to show that the intertemporal budget constraint influences capital allocations even within a monetary union. A boom of foreign financing directed to the non-tradable residential sector, or to consumption, makes growth unsustainable since the solvency conditions cannot be met. According to Merler and Pisani-Ferry (2012:12), "conventional wisdom in research and policy was that among euro-area countries, balance-of-payments would become as irrelevant as among regions within a country". In a CESifo Institute report (Sinn 2012), we read that: "The European Monetary Union is currently experiencing a serious internal balance of payments crisis that is similar, in many important ways, to the crisis of the Bretton Woods System in the years prior to its demise."[10]

In what follows we present a small model showing that these two alternative hypotheses are not mutually exclusive, and then provide some econometric results to show the relative importance of external imbalances and fiscal fragility in explaining the broadening sovereign bond yields in the EA.

4. A General Framework

The objective of this section is to present a simple model that demonstrates how poor fundamentals can create a debt problem with or without fiscal irresponsibility.

The point of departure for this model is the fundamental identity in any open economy: $S - I = (G-T) + CA$, where S = private saving, I = fixed investments, G-T = budget deficit (public spending less revenues) and CA = current account balance. This identity links external imbalances and private financing imbalances to the government's fiscal imbalance. It shows how imbalances on the right hand side can lead to a banking crisis in the private sector; or how an external imbalance, even in the absence of fiscal irresponsibility, can lead to an accumulation of public debt, capital outflows and a financial sector liquidity crisis, in which private debt is replaced by public debt.

For example, if a current-account deficit appears for any reason ($CA < 0$), then either the government has to run a budget deficit ($G-T > 0$), or private savings must fall relative to investment ($S - I < 0$) to restore equilibrium. But private savings tend to rise, and investment to fall in a recession: $S - I > 0$. So the more likely outcome is

[10] A point taken up by Martin Wolf in the *Financial Times* (April 10, 2012).

that the government budget deficit rises. Indeed, if the private sector is carrying too much debt, it will be the first to deleverage in a downturn – creating a banking crisis because savings rise to pay down that debt. This causes a loss of liquidity in the banking system and a potential banking crisis, which leads to even larger fiscal deficits to rebalance economic activity, or to smooth consumption or tax revenues, and to replace the savings in banks. At that point, excess private debt becomes excess public debt. Demand for assets/bonds in problem countries will collapse, especially in a currency union like the EA where asset sales can be sent to low-risk countries (Germany, Finland, the Netherlands) without cost or exchange rate risk. Government bonds in the problem countries are then no longer capital risk free, especially if a bailout looks unlikely or too small. In such cases, the *expected* value of a euro held in one place is not necessarily the same as its value in another – leading to a run on the deposit base in the problem economy and increased borrowing costs.

One can extend this example by asking, how did the private sector get indebted in the first place? If an economy enters an era of historically low interest rates (a global savings glut, or on joining a more disciplined currency zone), then savings will fall with the start of an asset bubble or domestic credit boom (US, UK, Ireland) which turns S-I negative. This is no problem if, and as long as, the credit bubble produces a matching trade deficit (CA<0) as in Portugal or Spain. But if it fails to produce that deficit, or the credit/asset bubble bursts, or if trade financing dries up (so I falls too), or there is a deposit run as above, then there will be a financing stop and fiscal deficits have to increase (G-T>0) to provide liquidity to the banks. Hence the *distribution* of debt matters (Wolf, 2012) and this needs to be recognized in our model.

This sequence of events provides the links by which poor macroeconomic fundamentals and current account deficits can easily translate into fiscal deficits and a crisis in the banking sector, even if there has been no fiscal irresponsibility (Ireland, Spain). Fiscal irresponsibility (Greece) simply adds to the fiscal deficits already implied. It is therefore sufficient to model these links for a given fiscal program, responsible or not. The key point is to show how they can cause unsustainable build-ups in sovereign or private debt, irrespective of the degree of fiscal responsibility.

4.1 Modeling Private Sector Imbalances

Since both current accounts and portfolio balances affect exchange rates and rates of return, and are affected by them, they need to be modeled jointly. This is usually

accomplished by assuming perfectly substitutable assets between countries and instantaneous and complete market adjustments. Uncovered interest rate parity can then be applied. However, given that we are dealing with a case where a country's net debt may become excessive and needs to be curtailed, this approach is not suitable in a world of global imbalances or market distortions caused by sticky prices, fixed exchange rates, sudden stops, and a revealed preference for holding foreign reserves or foreign assets (i.e., where there are safe haven or flight-to-quality effects). A more general approach is provided by Blanchard, Giavazzi and Sa (2005), who build upon earlier models by Masson (1981), Henderson and Rogoff (1983), and Kouri (1983). Blanchard et al. model current account and portfolio balances directly, and the adjustments between them. Their framework therefore permits us to consider imperfect asset substitutability and different asset preferences. It also allows us to examine the stability of the adjustment process in assets/debt under a common currency, sticky relative prices, and sudden stops in capital flows or inter-economy financing. Those extensions are studied by Hughes Hallett and Martinez Oliva (2012) to show the net asset positions of different countries and valuation effects caused by financial flows.

The formal model is presented and analyzed in the Appendix. Here we limit ourselves to a description of its main features and its implications. Our simple model considers two countries, home and foreign, linked to each other by an uncovered interest parity condition, current and expected real exchange rates (defined as the price of home goods relative to foreign goods). In the EA, nominal exchange rates are fixed and changes in real exchange rates occur only through relative prices. A country accumulates net foreign debt through interest payments on the beginning-of-the period debt and a new external imbalance flow, the latter a function of the real exchange rate and trade shocks. Investors' wealth is the difference between domestic assets and net foreign debt; the distribution of wealth between domestic and foreign assets is determined by interest rates and real exchange rates.

In equilibrium, there is a negative relationship between the real exchange rate and net debt in both the portfolio balance and the current account balance relationships. A higher net foreign debt requires a lower exchange rate because the demand for domestic assets has fallen and a larger external surplus is needed to meet interest payments. But to ensure stability in both trade and capital markets, the sensitivity of the real exchange rate (E) to changes in net foreign debt (F) must be higher in the

portfolio balance (*PB=0*) relation than in the current account balance relationship (*CA=0*); see Figure 1.

The same figure could be used to distinguish differences in adjustments between the EA countries and outsiders like the United Kingdom or the United States, which can use their nominal exchange rates and lender-of-last-resort facility to make the current account more sensitive to the real exchange rate. Two specific problems have therefore made the debt crisis in Europe difficult to resolve: fixed nominal exchange rates (a consequence of currency union membership) and sudden stops in financing (especially given excess inflows before the sudden stops). Figure 1 imposes these restrictions with either a fixed real exchange rate $\bar{E}$, or a fixed level of net foreign debt $\bar{F}$ at the left hand vertical line. A fixed real exchange rate shows what will happen with inflexible prices/wages when nominal exchange rates are fixed; and $\bar{F}$ what happens if there is a sudden financing stop.

We start with a fixed exchange rate regime. At a point A, home's current account is in deficit and her net foreign debt is increasing. So the *PB=0* line shifts to the right, and will continue to do so as long as the fixed exchange rate remains in place and relative prices remain sticky. The process of adjustment goes through an early stage of net foreign debt changes before valuation and exchange rate effects lead to a slide down the *PB=0* line. But we never gets as far as A'' in the absence of real exchange rate depreciations. This process is not sustainable because home's debt increases without limit; default will eventually break the real exchange rate when the debt ratio can no longer be serviced, the economy goes into recession and prices fall. When that happens, the economy adjusts down the *PB=0* line until it reaches C. But the longer E is maintained, the further the PB=0 line will have shifted, the greater the debt burden, the bigger the bust. To avoid these outcomes, home or foreign will have to bring a sudden capital stop and provide liquidity support; or they will have to adjust their real exchange rates; or foreign must accept an ever increasing accumulation of claims on home, such as unused foreign assets or *Target2* promissory notes. In sum, debt is the main equilibrating force until countries are forced to adjust the real exchange rate and competitiveness.

Next we move to flexible exchange rates. At B, home's current account is in deficit and her net foreign debt is increasing. A saddle path to a new equilibrium is determined by the interplay of a faster adjusting debt, and hence upward pressure on

the current account deficit; and a slower adjusting trade balance, hence downward pressure on the current-account deficit. If the former dominates, we do not get back to the $CA = 0$ line; instead we move down a parallel line above it until we get close to the *PB = 0* line (*if* the slower moving trade adjustments allow us to catch up with movements in portfolio balances). Eventually, at *PB=0*, *F* will move slower than the trade balance and it becomes possible to slide down the portfolio balance line to the new equilibrium at C. If the trade balance is sensitive to the exchange rate (i.e., the Marshall-Lerner conditions are satisfied), the pressure to move down to the current account line will be large relative to the changes in debt and we will catch up with the shifts in C. However, the Marshall-Lerner conditions are often not satisfied, especially in the short run when J-curve effects are operative. In the long term, the trade deficit may become sufficiently sensitive to real exchange rate depreciations the economy to approach the *CA=0* line. If so, *E* will jump to the saddle path and settle at C where $\dot{F} = 0$ and *PB=0* stops moving. In sum, the danger is that corrections to trade imbalances may never be large enough, rapid enough, or strong enough to balance the current account and stop the debt escalation.

4.2. Implications for a testable empirical model

The model sketched above has several implications for empirical work. First, the two interpretations of the debt crisis – fiscal irresponsibility and external imbalances – are not mutually exclusive and yield compatible implications, especially in the short run.

In the long run, however, the external imbalance interpretation has more explanatory power: factors such as losses of competitiveness, sticky real exchange rates, persistent trade deficits, sudden stops in capital flows, and vanishing liquidity can account for a debt crisis independently of fiscal irresponsibility, whereas poor fiscal policies can be overcome when the fundamentals are strong (e.g., the pre-2005 period). Second, debt sustainability requires higher debt levels to be matched by depreciating real exchange rates; and that the indicators of debt sustainability, such as yields on government securities relative to a safe asset, are more sensitive to portfolio factors and financing flows than to the trade balance.

The relative sensitivity of asset portfolios and trade deficits therefore play a crucial role in a debt crisis: debt reductions need to react to existing debt levels which means current-account deficits and their underlying determinants have to respond too

to prevent those reductions being offset. So whether we reach an equilibrium position with sticky real exchange rates and financing stops is ultimately an empirical matter. It is important that we include the drivers of that interplay in our equation explaining spreads: debt, primary deficits, financing vs. growth, productivity, competitiveness, or trade deficits. Lastly, the loss of market liquidity (a sudden stop in *F*, which manifests itself in larger bid-ask spreads in the securities market) and inflexible real exchange rates render adjustment to a new equilibrium much more difficult, if not impossible.

In the next section, we test the implications of the two interpretations of the debt crisis for their importance.

5. The determinants of EMU sovereign yield spreads

5.1 The empirical model

To assess the relative importance of external imbalances and fiscal variables on the evolution of the 10-year government bond spreads relative to German bunds (*Spread*) to represent fiscal fragility, we follow the recent literature on European sovereign debt crisis (Codogno et al. 2003; Pagano and von Thadden 2004; Barrios et al. 2009; von Hagen et al. 2011; Maltritz 2012; Favero and Missale 2012) and estimate a simple model based on quarterly data for 10 EA countries.[11] To do that, *Spread* is modeled as a function of variables capturing global, regional and country-specific conditions:

$$Spread_{i,t} = \alpha + \beta_0\, Global\ risk\ aversion_t + \beta_1\, Liquidity_{i,t} + \beta_2\, Growth_{i,t} + \sum_{j=2}^{3} \beta_j\, Fiscal_{j,i,t} + \sum_{j=4}^{7} \beta_j\, Imbalances_{j,i,t} + \eta_i + \epsilon_{i,t} \quad (1)$$

where *i* refers to the *i*-th EA country and *t* refers to the quarter. In line with the majority of the recent literature on EA spreads, all country-specific explanatory variables are measured as differences from the benchmark German values (von Hagen et al. 2011; Maltritz 2012; Favero and Missale 2012). In view of the empirical importance of aggregate risk in explaining yield differentials (Codogno et al. 2003; Geyer et al. 2004; Favero et al. 2010), we use a synthetic measure of general risk aversion (*Global Risk Aversion*). We construct this variable from the first principal component of four alternative indicators of global riskiness: the volatility index of the OEX market, the effective long-term yields on AAA- and BBB-corporate bonds and the yields and volatility index on US-euro and euro-yen 3-month exchange rate (as in

[11] As standard in this literature, we drop the other EMU countries from the sample as being too small.

Barrios et al. 2009). The Principal Component Analysis shows that the four indicators are highly correlated. The first component (our *Global Risk Aversion*) explains 62 per cent of the variance in the data and is constructed to give the same weights to each of the four underlying variables. It is interesting to compare the evolution of *Global Risk Aversion* and a synthetic index of our 10 EA *Spreads* (a *Sovereign Risk Factor*), the first principle component of the individual spreads. These two variables turn out to be highly and positively correlated until the first phase of the financial crisis; but they start to diverge in 2010 after Greece's credit rating downgrade in December 2009, which in turn triggered massive capital outflows and sudden-stop episodes in the EA South (Merler and Pisani-Ferry 2012). This steep increase in EA sovereign bond yields in a period of otherwise stable (or moderately declining) global risk aversion is consistent with the hypothesis that the sovereign debt crisis is EA-specific and stems from causes that go far beyond fiscal profligacy (Figure 2).

Our empirical model also includes *Liquidity*, a measure of liquidity risk in the bond markets, and real GDP growth (*Growth*). The effect of liquidity has been recognized by the literature in general (e.g., Amihud and Mendelson 2006; De Nicolò and Ivaschenko 2009) and specifically with respect to EA sovereign spreads (e.g., Attinasi et al. 2009; Barrios et al. 2009).[12] We measure liquidity conditions using bid-ask spreads on the secondary markets for 10-year government bonds. This measure of liquidity reveals a severe liquidity contraction in the Greek market, where the bid-ask spread rose above 700 bp; and, to a lesser extent, in the Irish and Portuguese markets in 2011. Italy and Spain, by contrast, experienced very moderate increases in bid-ask spreads (16 bp and 11 bp, respectively), almost the same as those observed in Austria and Belgium. By contrast, the German market remained deep and liquid throughout the sovereign debt crisis.

The role of fiscal variables in driving *Spreads* is documented, among others, by Attinasi et al. (2009), von Hagen et al. (2011), and De Grauwe and Ji (2012). Our vector *Fiscal* consists of two variables: primary-budget-balance-to-GDP ratio and gross-government-debt-to-GDP ratio, both measured as differences from the German counterparts. These ratios are widely recognized as indicators of fiscal fragility and

[12] Liquidity in EMU bond markets emerged as an issue during the crisis, having been small and inter-twined with fundamental risk during earlier more tranquil periods (Geyer et al. 2004; Pagano and von Thadden 2004; Favero et al. 2010).

have received maximum attention from policy makers.[13] Larger budget deficits are perceived as indicators of a lax fiscal policy, and hence default risk, to the extent that they undermine public debt sustainability. Debt sustainability is also weakened by high values of existing public debt: small changes in interest rates exert large changes in interest payments on debt. Therefore, financial markets start demanding higher risk premia when public debts are perceived to be "too high." The emergence of higher risk premia, in turn, may trigger a vicious cycle of rising interest expenditures and growth-reducing fiscal austerity undertaken during periods of slow or negative economic growth (Perotti 2012).

Table 1 shows that some countries in the South – e.g., Spain – had better fiscal positions than Germany before the onset of the crisis, and we have argued that the roots of the crisis are deeper than fiscal profligacy. Our focus has been on external imbalances instead, and the fragility of the EA in the absence of a smooth adjustment mechanism for resolving those imbalances (Section 3). Vector *Imbalances* in our empirical equation includes explanatory variables that capture the external imbalance issue: changes in the general level of prices (*Inflation*), growth of labor productivity (*Labor productivity*), and a measure of foreign bank lending (*Liabilities to German banks*). *Inflation* and *Labor productivity* are different indicators of competitiveness underlying trade and current account imbalances. *Liabilities to German banks* is computed as the ratio of a country's financial liabilities vis-à-vis German banks to German GDP, as reported in the consolidated banking statistics of the Bank of International Settlements (2012). This variable is a good proxy for the *Target2* mechanism, a key instrument that countries in the South have used to finance their external imbalances at the peak of the crisis. Finally, η_i are country fixed effects and ε_{it} the error term. Table 3 reports variable definitions, data sources and sample means.

5.2 Empirical results

To compare our results with the existing literature, we estimate equation (1) on quarterly data from 2000:q1 to 2011:q2 using a range of possible estimators. Table 4 summarizes the results.

We start by using a panel-corrected standard error (PCSE) estimator and Feasible General Least Squares (FGLS) corrected for heteroskedasticity across panels. The

[13] See the VoxEU debate managed by Corsetti (2012). The two fiscal measures are highly correlated with spreads (Maltritz 2012; Favero and Missale 2012).

PCSE estimator assumes that disturbances are heteroskedastic and contemporaneously correlated across panels and that follow, within panels, an AR(1) process specific to each panel. The PSCE estimates (column 1) suggest that the degree of global risk aversion does not affect EA yield spreads, and that large primary deficits relative to Germany raise the spread. Spreads are, however, more strongly influenced by market liquidity, public debt and growth. These variables are highly significant and have the expected signs. The same is true for the FGLS estimates (column 2).[14]

PCSE and FGLS estimators, while representing the conventional approach in this context (see Attinasi et al 2009; Baldacci et al 2011; Schmitz and von Hagen 2011), assume that observations can be pooled across panels. The validity of this assumption is challenged by the Roy-Zellner test for poolability, which shows that the null hypothesis of equality of the country coefficients is rejected (the value of the Chi-squared test is 534). Therefore, we re-estimate model (1) using a within-group (fixed effect) estimator, assuming an autocorrelation process in the error terms up to order 4 (Newey and West 1987).[15] Adding country fixed effects (column 3) changes the magnitude of the coefficients, but confirms the previous findings, except for the coefficient of the primary balance that becomes positive and statistically significant. At first sight this result seems counterintuitive. It would be correct if enough countries had stronger fiscal positions than Germany. But even if some did, on average, across countries and time, they did not: see Table 3. The explanation is in fact different, and follows because the trade balances term in Table 7 below has a matching sign. This is evidence that external imbalances (when financed by capital flows) offset the need for, and impact of, internal imbalances just as the fundamental identity in Section 4 says it should. A current account imbalance matched by a private financing inflow has little impact on the budget balance. But if those inflows fail, as in the crisis period (2010 on), the impact of the primary deficit on spreads will matter and may switch sign – as we see in Table 6 when we allow the estimated coefficients to vary over time. As proof of this proposition, the flow of finance (here liabilities to German

[14] In this context, the PCSE estimator is preferable to Feasible General Least Squares (FGLS) because the latter generates over-optimistic variance-covariance estimates in panels with a limited time dimension (Beck and Katz 1995).

[15] Results are similar using different autocorrelation lags in the error term. We performed Hausman's (1978) specification test to compare the random and fixed effect models. The results strongly reject the random effect model. In addition, the small number of observations and the limited number of countries prevents us from using a more complete dynamic specification and GMM estimates (Arellano and Bond 1991), which are in any case unsuited to samples like ours (Bond 2002).

banks, a proxy for *Target2*) should become more important with a more negative impact after 2010; and it does, see Table 6. Thus, to the extent private financing falls short, primary deficits will proxy for external deficits. Otherwise they are expansionary. A second complication is that the positive coefficient on primary balances also depends on the individual country effects. Remove the fixed effect dummies and the coefficient turns negative as we might have expected from first principles. In other words, the primary deficit's impact on a country's spread depends on its initial position. The absolute effect of an increased primary deficit is to increase borrowing costs, and hence spread vs. the benchmark (Germany). But if that country starts from a weak position (a large primary deficit relative to Germany), and if private financing is easily available, then spreads (the relative, if not absolute borrowing costs) fall as long as private finance is available and the relative deficits do not become so large as to cause a financing stop or capital reversal. Such financing makes it safer to live with divergence.

For the rest, deteriorations in public debt, contractions in market liquidity, or a growth slowdown relative to Germany, spill over into higher spreads. These findings are all consistent with the hypothesis that fiscal fundamentals contribute to explaining the crisis, but in a far more complicated way than we usually suppose.

In column 4 we add time dummies; the fit of the model significantly increases, but *only* in pre-crisis years if competitiveness and financing variables are included. A lack of competitiveness and financing difficulties therefore contribute to explaining the increase in spreads since 2008. Put differently, risks will be mispriced if the wider macroeconomic fundamentals beyond fiscal indiscipline are ignored. Hence there may have been risk mispricing independent of the fundamentals, but in this case the effects are limited (contrast De Grauwe and Ji 2012) if risk aversion is modeled explicitly.

So far we have ignored the role of external imbalances and capital flows within the EA. We noted that an interpretation of the European debt crisis in terms of foreign borrowing and lending imbalances has gained currency recently (Higgins and Klitgaard 2010; Sinn 2010; Giavazzi and Spaventa 2010; Merler and Pisani-Ferry 2012; EEAG 2012). The specific arguments are that large foreign bank lending from the North to the South before the crisis, sudden capital reversals in the wake of the crisis, and mounting NCB *Target2* balances offer a more accurate picture of diverging external imbalances than current-account imbalances (Buiter et al 2011). For instance,

foreign lending by German banks to EA countries shows steep increases in lending to Spain, Ireland and Portugal up to the first months of 2008. In Ireland, Portugal, and Spain, foreign capital was mainly channeled to non-tradable sectors like housing, making the intertemporal budget constraint unsustainable (Giavazzi and Spaventa 2010, Lane and Pels 2012). But once the Greek crisis started, solvency fears and uncertainty about liquidity provisions by the ECB triggered a crisis of confidence and sudden capital reversals in the Southern countries (Merler and Pisani-Ferry 2012).

For these reasons, in column 5 we augment the model by including country-specific measures of external imbalances: inflation, relative unit labor costs and credit extended by the German banks. The explanatory power of the model rises (the R-squared is 0.87) and this represents our preferred specification. While results on macroeconomic fundamentals are confirmed, we find that spreads also rise when there is a capital reversal (i.e. a reduction in lending by German banks), and when labor productivity declines and inflation rises relative to Germany. Also the time dummies are no longer significant; the unexplained time factor is no longer associated with the increase in spreads. These findings support the hypothesis that external imbalances, misaligned real exchange rates and capital reversals contributed to the crisis.

5.3 Fiscal fragility, external imbalances, or both?

The results reported in Table 4 justify the attention given to fiscal adjustment to heal the Eurozone debt problems. But the same results also point to a decisive role played by differences in competitiveness and economic growth between North and South. To assess which of the two competing (but not necessarily alternative) explanations of the Eurozone crisis matters more, we calculate the contribution of each determinant in explaining the change in *Spread* using the regression coefficients of columns 5 of Table 4 and actual changes in the determinants between 2011:q2 and 2008:q3, or between 2011:q2 and 2010:q1; see Table 5.

The statistically significant macroeconomic variables in Table 4 explain 77 (76) percent of the movements in the *Spread* between the third quarter of 2008 (first quarter of 2010) and second quarter of 2011. Taking the periods of global financial crisis and sovereign debt crisis together, the bid-ask spread and public debt are the two main drivers of *Spread*, accounting for 41% and 26%, respectively, of an average 290 bp increase in spreads across EA countries. If, instead, we focus only on the sovereign debt crisis period (2010 onward), the role of public debt becomes negligible

(accounting for only 4.7% of the increase in *Spread* in that period), while labor productivity becomes the relevant factor (29% of that increase), together with market liquidity (48.5%), in explaining the widening spreads between the Southern countries and Germany. The other factors remain fairly small, with global risk aversion and inflation losing what relevance they had before the crisis.

In sum, the results point to a) the greater importance of market liquidity in times of uncertainty (as in Beber et al. 2009); and b) a shift from a fiscal crisis to a balance-of-payment crisis which is grounded in labor productivity differences and growth differentials between North and South.

Thus, the fiscal imbalances and excess debt we observe are not only a matter of fiscal irresponsibility. Indeed, they are not even predominantly a fiscal indiscipline matter in the debt crisis period itself. Other macro-imbalances, in particular external and financing imbalances, matter even in a currency union. Relative to Germany, to run the euro system safely and smoothly requires symmetric adjustment.

5.4 Testing for structural breaks

The empirical results so far assume that the coefficient estimates remain the same over time. It is reasonable to assume, however, that the marginal effects of the macro variables would change as the EA crisis intensifies. Hence, as a next step, we test for the presence of a structural break in December 2010.[16] Table 5 shows the results for our baseline model. The Chow test confirms that there is a very significant structural break in the wake of the EA crisis. Moreover, the effect on the explanatory variables is significantly different across the pre-2010 and post-2010 samples, as shown by the t-tests for the equality of coefficients.

First, it is worth stressing that the role of external imbalances is magnified during the crisis. Differences in growth, growth of labor productivity and foreign borrowing turn out to be significant in the crisis period only, providing supporting evidence in favor of an external imbalance interpretation of the sovereign debt crisis. Inflation, by contrast, switches sign and becomes insignificant, implying that the austerity program, in causing falling prices (deflation) relative to Germany, may now be creating currency risk for the euro as a whole or an exit risk (devaluation risk) for the problem countries.

[16] We choose 2010 as breakpoint because the bunching of the national spreads broke down in 2010 as the Greek data problems become public. Additional tests confirm that date: see figure 2.

As regards the other variables, *Global Risk Aversion* has the standard positive coefficient in the pre-crisis period, but turns negative in the midst of the EA crisis, further confirming the regional dimension of the crisis (Figure 2). Finally, the effect of budget balance is not significant in either sub-period. But public debt has a much larger coefficient in post-2010 than before, while the coefficients on market liquidity are not statistically different across the two sub-samples.

5.5 Robustness

We tested the robustness of the main results, first for potential endogeneity of the bid-ask spread, second to more controls; see Table 7.

We address the potential endogeneity of liquidity effects using a two stage least squares (2SLS) estimator. In this case the bid-ask spread of country *i* at time *t* is instrumented using its own lagged value and the average of the other 10 EA countries at time *t*. The results for the baseline specification, reported in column 1 of Table 7, confirm our previous findings. The diagnostics of the 2SLS estimates show that the model is not misspecified. The exclusion restriction is satisfied since the Sargan-Hansen test of overidentifying restrictions (OIR) does not reject the null hypothesis that the instruments are uncorrelated with the error term. The Kleibergen-Paap rk LM statistic rejects the null hypothesis that the excluded instruments are not correlated with the endogenous regressors (i.e., the equation is underidentified). We are thus confident that our instruments satisfy the rank condition. Finally, the Kleibergen-Paap F-statistic for weak identification is well above the Staiger-Stock (1997) rule of thumb value of 10, and above the Stock-Yogo (2005) 5 percent critical values for 10 percent maximum bias. This is strong evidence for the validity of the instruments. Moreover the coefficient on the bid-ask spread is similar in size and significance to our preferred specification (col. 5, Table 4), and to the estimates in this table once political risk and trade imbalances are accounted for. This suggests simultaneity biases are minimal in a properly specified model. That said, none of our inferences are affected; there are no sign or size changes, or losses in significance, in the other coefficients. However, the 2SLS estimates do not allow for the serial or cross equation error correlations found in the FE-NW estimates. We therefore opt to remain with our preferred estimates from Tables 4 and 7: choosing efficiency which might affect the interpretation of our results, over consistency/endogeneity which evidently does not.

In columns 2-5 of Table 7 we expand the preferred specification by including the stock of private debt (as a share of GDP), trade balances (as a share of GDP), and an indicator of political risk proxied by the International Country Risk Guide (ICRG). We find that private debt does not add explanatory power to our model. By contrast, trade imbalances not privately financed (Table 3, with a positive coefficient in Table 7, shows they were mostly privately financed in this period) and greater political risk raise bond yields.[17] Factors such as government stability, corruption, bureaucratic quality and vetoes by special interests do have an influence on *Spreads*, once macro-economic fundamentals have been controlled for (Baldacci et al 2011).

6. Conclusions

This paper has presented two views of Europe's sovereign debt crisis. The first is that the South of the euro zone has been fiscally irresponsible, and has failed to implement necessary supply-side policies such as liberalizing labor markets and the market for services. This interpretation has won official recognition and represents the prevailing wisdom in the EA. It has led to an austerity program aimed at reducing government budget deficits and debt-to-GDP ratios in the South, haircuts on holders of government debt should member countries receive financial assistance from the European Union, measures to restructure public debt, and the new Fiscal Compact to reinforce budgetary discipline.

The second view is that Germany and the northern economies have failed to understand the nature of a sovereign debt crisis and that trade finance plays a central role. Within the EA, the North has enjoyed large current-account surpluses while the South accumulated current-account deficits, suggesting that the real exchange rate of the euro is too weak for the North and too strong for the South. Since nominal exchange rates are fixed in the Euro, and given that economic activity is historically low in the South, the burden of adjusting external imbalances should fall primarily on the North through an expansion of aggregate demand rather than forcing the South to curtail demand. An austerity program in the South implies the opposite: a reduction of income that is bound to undermine the effects of austerity on budget

[17] This coefficient on trade balances is subject to exactly the same interpretation as that for the positive coefficient on primary balances in Section 5.2; it switches to an insignificant negative coefficient in the crisis period as public finance replaces private, and turns negative if country fixed effects are taken out.

deficits and debt ratios. In addition, the South cannot benefit from the insurance mechanism that operates in other fiscal unions, by redirecting public funds from above-average income regions to below-average income regions.

These two views are not inconsistent. The first stresses the need for fiscal correction, although not necessarily in the short term. The second recognizes the importance of long-run fiscal adjustment, but identifies the source of the sovereign debt crisis as inadequate adjustments in competitiveness between surplus and deficit countries. As presently constituted, the euro area lacks two important safety valves: a transfer union and a guarantee that national central banks have unlimited access to credit in the settlement of intra-EA payments.

The stylized facts in Section 2, and model in Section 4, raise doubts about an interpretation that says debt crises are driven only, or even primarily, by fiscal irresponsibility in the South. The comparison of the correlation between debt levels, primary balances and yield spreads in southern Europe and in the United Kingdom, United States and Japan imply that fiscal fundamentals are not enough to explain sovereign risk. Even within the EA, some Southern countries had sounder fiscal positions than Germany before the onset of the crisis. By contrast, there is a clear divide between external surpluses of the North and deficits in the South. The North has benefited from low unit labor cost growth and real exchange rate depreciations relative to the South. This trend is mirrored by capital outflows from the North–especially from German banks–to the South. These flows were used to finance domestic consumption and a boom in the residential sector rather than productive investments, spreading the seeds of a sovereign debt crisis. The empirical results in this paper confirm that hypothesis: the Euro-zone sovereign debt crisis has been as much a matter of external imbalances and consequent financing stops, as of fiscal irresponsibility. In fact in the crisis period, it has been pre-dominantly a question of misaligned fundamentals, external imbalances and financing. No-one would argue that austerity is not necessary in the long term; but mismatches in the timing of its effects can mean that a misdirected cure kills some patients before they recover.

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APPENDIX: A Model of Current Account and Portfolio Balances

Consider a home country, say Spain, and foreign country, say Germany (denoted with a "*"), which are linked by the uncovered interest parity condition,

$$(1+r) = (1+r^*)E / E^e_{+1} \tag{1}$$

where r and r^* are the home and foreign rates of interest respectively, E is the *real* exchange rate (defined as the price of home goods relative to foreign goods), and E^e_{+1} is the real exchange rate expected next period. Thus

$$E = P/(eP^*) \tag{2}$$

where e is the nominal exchange rate defined as the domestic currency price of foreign currency (e.g., dollars per euro if the US is the home country). In the specific case of Spain and Germany, $e = 1$. The home country accumulates net foreign debt according to:

$$F_{+1} = (1+r)F + D(E_{+1}, z_{+1}), \qquad (3)$$

where F is the net debt denominated in the home currency (the amount of domestic currency needed to pay them off)[18]. *D(E,z)* is the trade deficit, which is a positive function of the real exchange rate. z is a shift variable describing the impact of a trade shock, a change in preference for home goods, or other changes in spending or the pattern of spending on those goods.

To allow for imperfect substitutability between national assets, let W be the total wealth of home investors, X the *total* stock of home's assets, and F net debt position of the home economy (all in real terms). Thus:

$$W = X - F, \quad \text{where } F \geq 0 \text{ implies net debt/liabilities} \qquad (4)$$

Wealth of foreign investors, in home's currency, is

$$W^*/E = X^*/E + F. \qquad (5)$$

The expected real rate of return from holding home's assets relative to foreign's is

$$R^e = [(1+r)/(1+r^*)].E^e_{+1}/E. \qquad (6)$$

Home investors place a share α in home securities and *1-*α in foreign assets; and α^* and *1-*α^* are the corresponding shares of foreign investors. We assume that α is increasing in the relative rates of return on home assets, R^e, and in s, defined as the preference for holding domestic assets including any home bias, and safe haven effects. Symmetrically, α^* is decreasing in those two factors. If home biases dominate the asset market, then $\alpha + \alpha^* > 1$. Equilibrium in the market for home's assets, and hence foreign's assets, is given by the following portfolio balance (PB) equation:

$$X = \alpha W + (1-\alpha^*)W^*/E = \alpha(X-F) + (1-\alpha^*)(X^*/E + F). \qquad (7)$$

Unlike in perfect substitutability, the distribution of wealth between home and foreign is independent of shifts in the trade or current account balances (i.e. z). Instead the real exchange rate E, relative rates of return R^e, and asset preferences *s,* all of which affect α, determine and are determined by the distribution of wealth holdings. Nevertheless, trade and current account balances do lead to changes in F, and hence to changes in the real exchange rate:

$$\frac{dE}{dF} = -\frac{\alpha + \alpha^* - 1}{(1-\alpha^*)X^*/E^2} < 0 \quad \text{iff} \quad \alpha + \alpha^* > 1. \qquad (8)[19]$$

The portfolio balance relation is nonlinear in E-F space and is downward sloping as long as home biases persist $\alpha + \alpha^* > 1$. Under these conditions, higher debt at home requires a lower exchange rate (because the demand for home assets has fallen, a larger trade surplus is needed to meet interest payments); and real exchange rates respond less to current-account imbalances than to changes in portfolio preferences and the distribution of wealth.

[18] We do not distinguish home's foreign and domestic held debt since no Eurozone country can use monetary policy to inflate its debt away. In that sense, all debt is "foreign".

[19] Both (8) and (11) are derived assuming that variations in α and α^* are small and may be ignored. This is correct up to a first-order approximation. Moreover $\alpha+\alpha^*>1$ is a natural condition given transactions costs and foreign risks, and that $\alpha,\alpha^*=½$ implies indifference between X and X^* as assets.

If home and foreign goods are imperfect substitutes, and the trade balance D behaves as in (3), then home's net debt in the next period will be:

$$\Delta F_{+1} = (1-\alpha^*)(1+r)W^*/E - (1-\alpha)(1+r^*)W.E/E^e_{+1} + D(E_{+1}, z_{+1}). \qquad (9)$$

That is foreign ownership of home assets (plus interest), less the value of home owned foreign assets plus interest, plus the next trade deficit. Rewriting with (4), (5) and (6):

$$F_{+1} = (1+r)F + (1-\alpha)(1+r)(1-1/R^e)(X-F) + D_{+1}. \qquad (10)$$

This is the current-account balance (CA) relation since $CA_{+1} = D_{+1} - rF$. The middle term reflects the changing evaluation of home-owned foreign assets due to differing rates of return (including risk premia). Equation (10) contains, not only the CA balance, but also the cumulative effect of "discretionary" trade-balance choices. Policymakers have little control over F except by providing liquidity or loans in the face of sudden stops in capital or financing flows (i.e. when F is held constant), except through future trade balances and growth. The slope of the CA relation, in E-F space in the current period, is:

$$\frac{dE}{dF} = \frac{-E_{+1}}{(1-\alpha)(1+r^*)(X-F)} < 0, \qquad (11)$$

which depends on the size of the domestic asset base: a large asset base, $X > F$, means a shallow slope, a small asset base a steep slope. This is the normal state of affairs since, if F rises, it requires E to fall to create a move towards a trade surplus at home in order to generate sufficient extra revenues to pay for the higher net debt – the more so the smaller is the asset base relative to foreign ownership of domestic assets. That implies (11) will have to be negative.

The following condition, that the portfolio balance line is steeper than the CA relation, must be satisfied to ensure stability in both the trade and capital markets:

$$\frac{(1-\alpha)(1-\alpha^*)}{\alpha+\alpha^*-1} > \frac{E_{+1}E^2}{(1+r^*)X^*(X-F)}. \qquad (12)$$

Equation (12) is satisfied if:

- $X >> F$ or $F < 0$. This represents an economy with a large domestic asset base and is self-sufficient in investment and funding; on the contrary, stability is at risk if the economy is heavily dependent on foreign debt for funding.
- If E is low and expected to remain low; or X^* is large. This is generally a matter of policy stance; as in Germany in the EA, or China.
- If $\alpha + \alpha^* \approx 1$, i.e. if assets are largely substitutable, but $\alpha\alpha^*$ is large.

These stability conditions are not met if

- $\alpha + \alpha^* < 1$;
- $X > F$ is sufficiently small even if $\alpha + \alpha^* > 1$. This is likely in Greece, Ireland or Portugal whose assets are widely held by other EA countries. Italy, whose assets are predominantly held at home, may be relatively safe because α^* will be large, even if $\alpha \approx ½$ for the rest of the Eurozone.

Figure 1: A Model of Current Account and Portfolio Balances

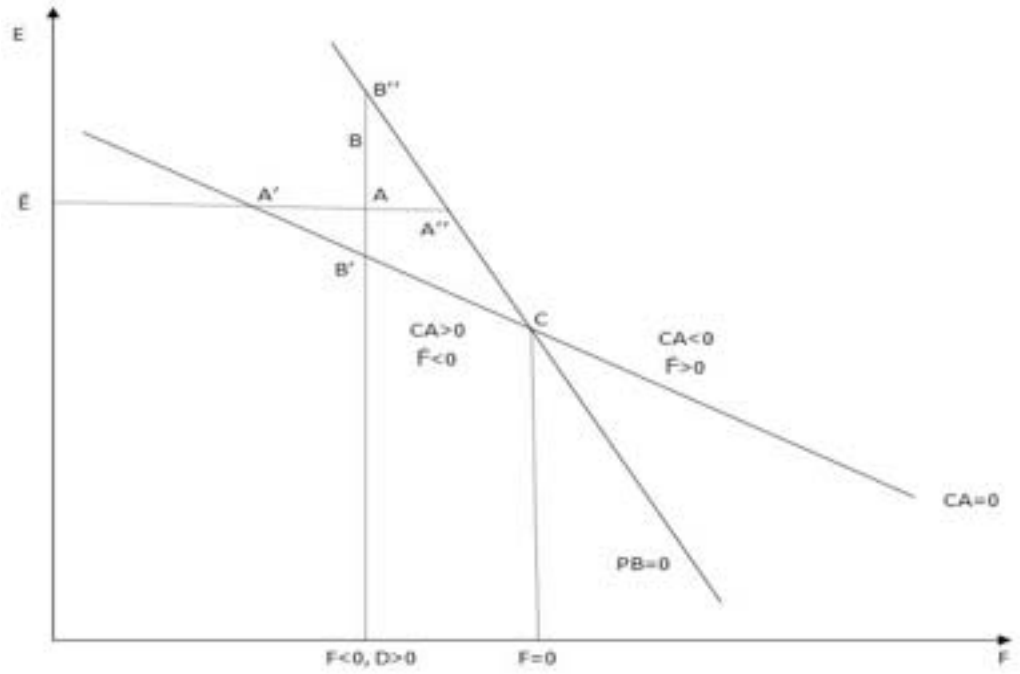
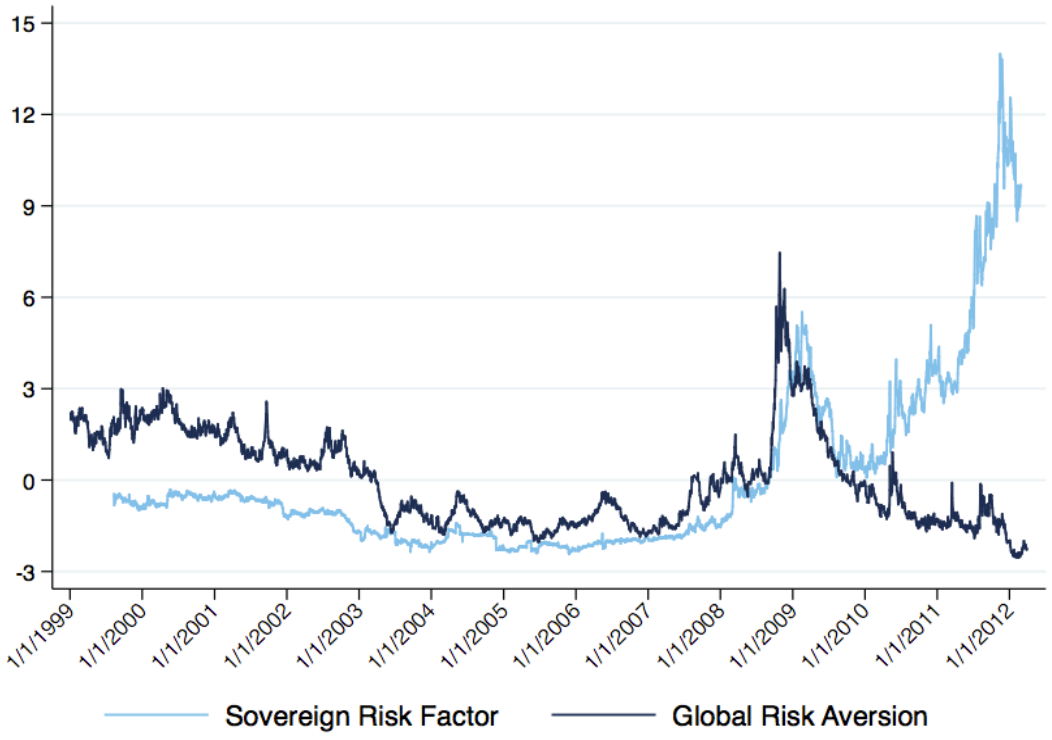


Figure 2. Global risk aversion and sovereign risk in the euro area



Notes: The *Sovereign Risk Factor* is the first principal component of the sovereign yield spreads to 10-years German bunds of EMU countries. The *Global Risk aversion* is calculated as the first principal components of the volatility index of the OEX market, the effective long-term yields on AAA- and BBB-corporate bonds and on US, and the volatility of the euro-yen 3-months exchange rate. Daily data. See Table 4 for sources.

Table 1: Government gross debt and cumulative primary surplus in the EA, UK, US, and Japan, 1999-2011 (percent of GDP)

Country	Debt to GDP			Change		Cumulative primary surpluses to GDP
	1999	2007	2011	1999-2007	2011-2007	1999-2011
Austria	67	61	72	-7	12	1.3
Belgium	114	84	95	-30	10	40.0
Finland	46	35	50	-11	15	29.8
France	59	64	87	5	23	-14.9
Germany	61	65	83	4	18	4.5
Greece	103	105	166	3	60	-17.7
Ireland	48	25	109	-23	84	-28.6
Italy	114	104	121	-10	17	23.6
Netherlands	61	45	66	-16	20	7.8
Portugal	50	68	106	19	38	-5.7
Spain	62	36	67	-26	31	-5.0
United Kingdom	44	44	81	0	37	-25.2
United States	61	62	100	1	38	-38.9
Japan	134	188	233	54	45	-75.4

Source: International Monetary Fund, World Economic Outlook Database, September 2011 (forecast values for 2011).

Table 2. Current-account balances, unit labor costs and inflation rates, 11 EA countries, 1999-2012

Country	Cumulative		
	(CAB/Y)*100 1999-2012	ULC % change 1999-2010	CPI inflation 1999-2012
Netherlands	79.6	4.2	30.3
Finland	66	-19.9	26.4
Germany	52	1.4	21.8
Belgium	32.5	8	29.9
Austria	28.1	-1.5	26.4
France	-3.4	2.4	24.5
Ireland	-19.1	-22.5	32.1
Italy	-24.4	28.5	30.9
Spain	-75.5	24.8	38.4
Greece	-123.2	54.9	43.1
Portugal	-132.2	11.1	35.1

Notes: CAB = current-account balance, Y = GDP, ULC = unit labor cost, CPI = Consumer Price Index, 2012 values are forecast. Source: International Monetary Fund, World Economic Outlook Database, September 2011 for CAB, Y and CPI inflation; OECD, Main Economic Indicators for ULC.

Table 3: Variables: description, sources and descriptive statistics

Variable	Definition	Source	Mean 2005q1 - 2011q2 (248 obs.)
Spread	Difference in yields to maturity of 10-year government bonds: euro member countries less the German value.	Global Insight	70.142
Global risk aversion	General risk aversion, as the 1st component of the PCA of 4 measures of risk: OEX market volatility index, US corporate AAA and BBB yields and Euro-Yen 3-months exchange rate volatility. Quarterly averages from daily data.	Global Insight and FRED	-0.391
Bid-Ask	Bid-ask spread in 10-year government bond market less the German values, per cent. Quarterly averages from daily data.	Bloomberg	1.045
Primary balance	Primary balance over GDP less the German values, per cent. Quarterly data. Since data are not seasonally adjusted, the variable is a (2 1 2) moving average.	Eurostat	-1.934
Public debt	Gross government debt over GDP less the German values, per cent. Quarterly.	Eurostat	2.806
Growth	Quarterly GDP growth less the German values, percentage change with respect to corresponding quarter of previous year.	Eurostat	-0.319
Inflation	Quarterly inflation less the German values of the monthly HICP index number (2005 = 100)	Eurostat	0.733
Labor productivity	Quarterly real labor productivity per employee less the German values, percentage change on previous period (seasonally adjusted and adjusted by working days).	Eurostat	0.052
Liabilities to German banks	Financial liabilities vis-a-vis German banks over GDP, per cent.	BIS and Eurostat	18.188
Private debt	Private debt over GDP less the German value, per cent. Quarterly. No data on the Netherlands.	Eurostat	54.418
Debt service	Quarterly interest payments on government debt over GDP less the German values, per cent.	Eurostat	0.152
Political risk	Political Risk Rating (0-100): one of the ICRG indices, based on several political risk components. Data are taken as the home value less the German value. Low figures mean high risk.	PRS Group	-2.439
Trade Balance	Trade balance over GDP relative to German values, per cent. Quarterly. Since data are not seasonally adjusted, the variable is a (2 1 2) moving average.	Eurostat	-5.366

Table 4: Determinants of 10-year government bond spreads relative to German Bunds in the EA, 2005q1 to 2011q2.

Dep. Var.: Spread	(1) PCSE	(2) FGLS	(3) FE - NW	(4) FE - NW	(5) FE - NW
Global risk aversion	4.087	4.238**	13.357***	12.930***	9.692***
	[4.380]	[2.066]	[3.397]	[3.702]	[2.851]
Primary balance	-8.261***	-5.537***	6.583*	7.418**	5.284**
	[1.320]	[1.027]	[3.577]	[3.275]	[2.043]
Public debt	1.167**	0.415***	7.574***	6.823***	7.419***
	[0.482]	[0.156]	[1.660]	[1.446]	[1.245]
Growth	-7.440**	-9.732***	-22.524***	-21.083***	-19.218***
	[3.654]	[1.928]	[6.392]	[7.209]	[5.111]
Bid-Ask	8.345***	13.942***	10.402***	9.974***	9.395***
	[1.600]	[1.182]	[1.393]	[1.247]	[1.290]
Inflation					15.716***
					[4.140]
Labor productivity					-19.193***
					[4.845]
Liabilities to German banks					-2.973**
					[1.285]
Year 2006				-26.435*	-38.277***
				[14.594]	[12.939]
Year 2007				-11.196	-44.477***
				[14.311]	[16.414]
Year 2008				-15.407	-30.918
				[19.164]	[19.885]
Year 2009				30.517**	-3.118
				[13.945]	[15.033]
Year 2010				37.123*	2.833
				[19.120]	[21.137]
Year 2011				47.492**	-12.920
				[24.100]	[28.774]
Observations	248	248	248	248	248
R-squared	0.701		0.802	0.826	0.868
Number of Countries	10	10	10	10	10
Country dummies	NO	NO	YES	YES	YES
Time dummies	NO	NO	NO	YES	YES
Time dummies (p-value)				0.060	0.892

Notes: The table reports the regression coefficients of the estimation of model (1) using the following estimator: Panel-Corrected Standard Error (PCSE), Feasible General Least Square (FGLS) corrected for heteroskedasticity across panels, and Fixed Effects with Newey and West (1987) standard errors with autocorrelation up to order 4 (FE - NW). The associated standard errors are reported in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. A constant is included but not showed. The bottom row of the table reports the: 1) p-value of the F-test for the joint significance of the time dummies.

Table 5: Contributions of explanatory variables to EA sovereign yield spreads

Variable	Beta	Values			Delta		Contribution to the spread			
		2008q3	2010q1	2011q2	2011q2-2010q1	2011q2-2008q3	2011q2-2010q1		2011q2-2008q3	
							Face values	%	Face values	%
Spread		*39.97*	*86.82*	*329.66*	*242.83*	*289.68*				
Global risk aversion	9.69	0.63	-0.63	-1.46	-0.83	-2.09	-8.01	-3.3	-20.22	-7.0
Primary balance	5.28	-3.57	-3.42	-6.47	-3.05	-2.89	-16.08	-6.6	-15.27	-5.3
Public debt	7.42	-0.62	8.01	9.55	1.54	10.17	11.42	4.7	75.49	26.1
Growth	-19.22	-0.30	-2.13	-1.37	0.76	-1.07	-14.67	-6.0	20.50	7.1
Bid-Ask	9.40	0.76	0.83	13.36	12.53	12.59	117.75	48.5	118.39	40.9
Inflation	15.72	0.48	1.45	2.35	0.90	1.87	14.09	5.8	29.38	10.1
Labor productivity	-19.19	-0.77	2.81	-0.82	-3.63	-0.05	69.66	28.7	0.96	0.3
Liabilities to German banks	-2.97	20.89	19.64	16.00	-3.64	-4.89	10.81	4.5	14.52	5.0
Total							184.96	76.17	223.76	77.24

Notes: The table reports the estimated contribution of each explanatory variable to the 10-years government bond spreads to German bunds, based on actual changes of explanatory variables over different sample periods. Calculations are based on the coefficients reported in Table 4 (column 5).

Table 6: Testing for structural breaks

	Baseline model (Table 1, col. 5)		
	pre-2010	post-2010	t-test
Global risk aversion	12.340***	-140.763***	35.01
	(2.069)	(25.200)	0.00
Primary balance	1.053	-2.299	1.77
	(1.785)	(2.009)	0.19
Public debt	3.164***	7.871***	8.44
	(0.674)	(1.685)	0.00
Growth	-4.821*	-25.825***	23.07
	(2.655)	(4.173)	0.00
Bid-Ask	6.017**	2.644**	1.23
	(2.640)	(1.195)	0.27
Inflation	7.285**	-10.429	5.84
	(2.982)	(7.019)	0.02
Labor productivity	-3.465	-27.957***	9.98
	(2.695)	(6.997)	0.00
Liabilities to German banks	0.186	-11.694***	60.52
	(0.471)	(1.534)	0.00
Chow test		27.02	
(p-value)		0.00	
Observations		248	
R-squared		0.978	

Notes: The table reports the regression coefficients of Fixed Effects estimation of model (1). Each regressor is interacted with a pre-2010 and a post-2010 dummies, in order to have separate coefficients for the pre- and the post-2010 periods, reported in columns 1 and 2. The associated Newey and West standard errors with autocorrelation up to order 4 are reported in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. The base model refers to the specification reported in column 5 of Table 4. The t-tests and the associated p-values for equality of coefficients across the two sub-periods are reported in columns 3. The Chow tests for the presence of a structural break between pre- and post-2010 are reported at the bottom of the Table. A constant, the *Post 2010* dummy, yearly dummies, and nine country dummies (each one interacted with the *pre-2010 and with the post-2010* dummies) are included in both specifications but not showed.

Table 7: Testing for robustness

	(1)	(2)	(3)	(4)	(5)
Dep. Var.: Spread	2SLS	FE - NW	FE - NW	FE - NW	FE - NW
Global risk aversion	10.257***	10.555***	8.917***	9.480***	8.911***
	[2.506]	[3.415]	[3.322]	[3.020]	[2.589]
Primary balance	5.118***	6.703*	6.419*	6.830***	5.875***
	[1.738]	[3.414]	[3.635]	[2.151]	[2.041]
Public debt	7.246***	8.020***	7.803***	6.403***	6.344***
	[0.946]	[1.566]	[1.534]	[1.197]	[1.163]
Growth	-19.445***	-20.877***	-20.544***	-16.476***	-18.298***
	[3.921]	[6.079]	[6.215]	[5.119]	[4.995]
Bid-Ask	10.044***	26.687***	26.468***	9.378***	9.329***
	[1.288]	[9.069]	[9.047]	[1.270]	[1.270]
Inflation	15.933***	15.228**	15.056***	11.288***	15.971***
	[3.693]	[6.823]	[5.622]	[4.180]	[4.005]
Labor productivity	-19.998***	-22.060***	-20.834***	-20.422***	-19.976***
	[4.398]	[5.605]	[5.403]	[4.604]	[5.012]
Liabilities to German banks	-2.613**	-2.570*	-2.781**	-2.826**	-2.696*
	[1.019]	[1.346]	[1.324]	[1.343]	[1.420]
Private debt		-0.186			
		[0.554]			
Debt service			1.226		
			[1.550]		
Political risk				-9.762***	
				[1.896]	
Trade Balance					8.158***
					[3.062]
Observations	244	203	229	248	248
R-squared	0.880	0.803	0.798	0.857	0.874
Year dummies	YES	YES	YES	YES	YES
Number of Countries	10	9	10	10	10
OIR (Hansen J-statistic)	0.374				
Under-identification test	0.009				
Weak-identification (F-test)	35.181				

Notes: The table reports the regression coefficients of the estimation of model (1) using the following estimator: Two Stage Least Squares (2SLS) with robust standard errors and Fixed Effects with Newey and West (1987) standard errors with autocorrelation up to order 4 (FE - NW). The associated standard errors are reported in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. A constant and yearly dummies are included but not showed. In the 2SLS estimates, the bid-ask spread of country *i* at time *t* is instrumented using its own lagged value and the average of the other 10 countries at time *t*. The bottom rows of the table reports the: 1) the p-value of the Sargan-Hansen test of over-identifying restrictions (OIR) testing the null hypothesis that the instruments are uncorrelated with the error term; 2) the p-value of the Kleibergen–Paap rk LM-statistic testing the null hypothesis that the excluded instruments are not correlated with the endogenous regressor; and 3) the Kleibergen–Paap rk Wald F-statistic testing for weak identification.