Reducing Systemic Risk in Europe: Is the 'Banking Union' a Big Enough Step?

Thierry Warin[1], Associate Professor of International Business (HEC Montreal & Cirano), Visiting Scholar at the Weatherhead Center for International Affairs (Harvard University)

This paper argues that it will take time for the Banking Union to create a credible integrated financial area in Europe. Combining Network Theory and TSCS analysis, this paper highlights that, although a necessary institutional step, the European financial integration framework suffers from the 2008 financial crisis. Indeed, the 2008 financial crisis' damages go beyond the value of tangible assets but touch also one important intangible: the notion of credibility itself. However, new regulations have emerged, with one overarching goal: restoring the credibility in the financial system. From the Dodd-Frank Act in the United States to Basel III, the international financial world has seen relevant changes. In Europe, the 'Banking Union' was passed. Is it a big enough step?

1   Introduction and Research Question

The 2008 crisis started as a financial crisis and evolved into a sovereign crisis. Since 2008, central banks, governments and international organizations have been working on the lessons learned as well as designing options for a new financial framework. From the Dodd-Frank Act (Vasudev 2014) to Basel III, the international financial world has seen relevant changes. In Europe, the 'Banking Union' was passed. In itself, it is already an interesting reform. But beyond the primary objective of the Banking Union, which is to ensure financial stability, there is also a second feature: it deepens the European integration providing a response to the critics of the European project. Now equipped with an economic pillar (an internal market of goods, services, including financial services) (Geeroms and Karbownik 2014), the question is to know whether the EU has fixed its structural issues in terms of governance. If a new crisis were to hit Europe, would the latter be better prepared to respond? Another question is to know whether this new framework would reduce the systemic risk and thus would reduce either the likelihood or the magnitude of a crisis?

It is a very timely question and – as a disciplinary field – is part of International Political Economy, with a financial focus (Helleiner 1994).

---

[1] The author would like to thank Mathilde Mur and William Sanger for the tremendous help they have provided in the completion of the database. The usual caveats apply.

Europe may be slowly recovering, but the question is to know from which crisis is it recovering? Indeed, Europe is still facing serious economic challenges (eg, refinancing debt remains a problem), as well as resolving the issues with European governance. This latter point is at the heart of the research proposed here.

Overall, the first decade of the euro has been positive for the European economy. But the good economic results, in terms of economic convergence for instance, were in fact putting the attention away from the European governance issues. In short, the deepening of European integration should have been done during these relatively good times. The evidence of these governance issues came when Europe was hit by the 2008 financial crisis. Indeed, the crisis has highlighted the structural problems of the European foundations.

If we look at the financial sector in particular, the banking sector in Europe owns a lot of the public debts. For instance, before the crisis in 2007, the amount of sovereign debts owned by the banking sector was US$ 1200 billion, and went to US$1720 billion mid-2013. From a geographical perspective, the banking sector's exposure to sovereign debts between 2007 and 2013 went from 16% to 22% in Italy, from 26% to 33% in Spain, from 10% to 25% in Ireland and from 14% to 18% in Greece. The banks from these specific four countries owned in 2014 around US$ 700 billions of domestic sovereign debts, twice as much as in 2007. This is the "national preference" effect (Geeroms and Karbownik 2014).

As an illustration, German and French banks are the most exposed to Greek sovereign debt in 2000, 2007 and 2013. On the following graph, we can notice that German banks' claims on Greece have more than double during the first seven years, whereas French claims have been multiplied by a factor of seven. But then, between 2007 and 2013, claims have dropped to a very low level. The drop was of 68% between 2007 and 2013 for Greece, 61% for Lithuania and 53% for Ireland (Source: BIS, 2015).

Figure 1. German and French banks' claims on Greek sovereign debt. Source: BIS, 2015.
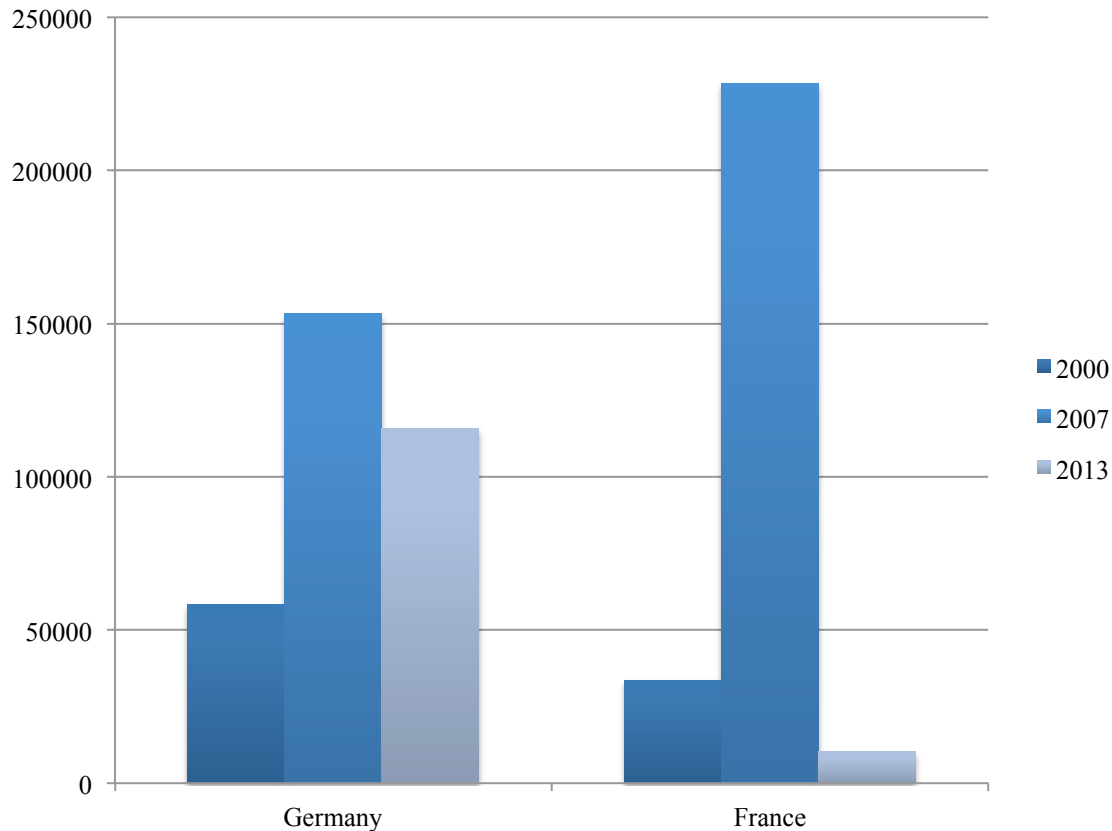
After a phase of deregulations in the late 1990s, suddenly the crisis has triggered a new phase of re-regulations across the world. One of the goals was to avoid systemic risk. This is particularly interesting because it adds a third dimension to financial risk management. Indeed, as we will see in further details later, financial theory highlighted two main risks - not three: (1) the specific risk and (2) the macro risk. In the U.S., in 2010, the Dodd-Frank Act was passed. One of its important contributions is that it proposes a centralized assessment of banks and financial institutions presenting a systemic risk (Noeth, 2011). Moreover, it includes the Volcker amendment creating a "Chinese Wall" between the commercial units and investment units of banks. Basel III is another set of rules that was passed and implemented in a majority of OECD countries. In Europe, the members of the euro area felt the need for another set of rules as they were under the same monetary policy. Indeed, in the spirit of Churchill's famous quote ("Never let a good crisis go to waste") (Boyer, Streeck, and Swedberg 2012), the European Union decided to put together new regulations and new institutions to oversee the European financial industry. This step represents a strong push towards financial integration in Europe. It also adds to the Single European Act of 1986 and the 2006 Services Directive. Known as the Banking Union, this set of rules aims at increasing the protection of depositors while insuring investors of the solidity of the European financial system (Veron 2014).

The European Union was hit by the 2008 financial crisis the same way as the United States (Borio 2013). However, the crisis has had a more dramatic impact in Europe due to its institutional architecture. The institutional framework is complex: there is the European Union (EU), which concentrates decision-making power, and the euro zone, which has no decision-making power away from the institutions of the

EU. This dichotomy is fragile and is the result of the history of European integration. The 2008 crisis was exacerbated by this dichotomy. In response to pressure from financial markets, Europe will be equipped with new solutions that strengthen the euro area and reduce this dichotomy. Is that enough to protect the euro area from future crises?

The response to this question finds its roots into the definition of an economic integration: it is both creating a single market for goods and a single market for services. The single market for goods started in 1985 when the European Commission published a comprehensive blueprint to merge the fragmented national markets to create a genuinely frontier-free single market by the end of 1992. In 1986, the EU adopts the Single European Act.

About the single market for services, the Lisbon summit of EU leaders in March 2000 asked for a strategy to remove cross-border barriers to services. Following an in-depth legal and economic analysis and a consultation with Member States, other European institutions and stakeholders, the Commission published a Report on the State of the Internal Market for Services in July 2002.

Following the report and further legal analysis, in January 2004 the Commission made a proposal for a Directive on services in the Internal Market. The Services Directive was finally adopted by the European Parliament and the Council in December 2006 and needed to be transposed by the Member States by the end of 2009 (The Service Directive (Directive 2006/123/EC of 12 December 2006 on services in the internal market) needed to be fully implemented by the Member States by 28 December 2009). This directive is aimed at eliminating obstacles to trade in services.

The Services Directive does not include financial services. It is the crisis of 2008 that pushed towards a new regulatory framework of the financial industry: the Banking Union (Warin & Prasch, 2015). However, there were already discussions about new regulations in 1999: the Financial Services Action Plan (FSAP) was designed to open up a single market for financial services in the EU. But it is really the crisis that made things move forward (Boyer et al., 2012). In November 2008, a group chaired by Jacques de Larosière was mandated to examine possible improvements to supervision and regulation. Reacting to the situation in 2008, the Directive on Deposit Guarantee Schemes (1994/19/EC as amended by 2009/14/EC) and the Capital Requirements Directive (Directive 2006/48/EC) were revised swiftly. A regulation on Credit Rating Agencies (Regulation(EC) No 1060/2009 (OJ L 302, 17.11.2009, p. 1)) was adopted and the Commission has presented two Recommendations on remuneration principles (C(2009) 3159 and C(2009) 3177, both of 30.4.2009). In a number of areas, the EU has shown international leadership by proposing, for example, a macro-prudential risk board for the issuing of risk warnings, retention requirements for securitisation and reform of capital requirements for the trading book.

Also, the 2008 crisis has had an impact on the relaunching the Single Market. Indeed, in October 2009 President Barroso entrusted Mario Monti, President of Bocconi University and former Commissioner for the Internal market, Financial services and Tax policy (1995–1999) and for Competition (1999–2004), with the mission of preparing a report containing options and recommendations for an initiative to relaunch the Single Market as a key strategic objective of the new Commission. On 10 May 2010, Professor Monti submitted his report. The Single Market Act presented by the Commission in April 2011 set out twelve levers to boost growth and strengthen confidence. In October 2012 the Commission proposed a second set of actions (Single Market Act II) to further develop the Single Market and exploit its untapped potential as an engine for growth.

Nowadays, the Banking Union consists of several elements, including for the euro area in particular: the Single Supervisory Mechanism and the Single Resolution Mechanism.

The Single Supervisory Mechanism (SSM) places the European Central Bank (ECB) as the central prudential supervisor of financial institutions in the euro area (including approximately 6000 banks) and in those non-euro EU countries that choose to join the SSM. As of November 2014, the European Central

Bank will directly supervise the largest banks, while the national supervisors will continue to monitor the remaining banks.

The Single Resolution Mechanism (SRM) will apply to banks covered by the SSM. In the cases when banks fail despite stronger supervision, the mechanism will allow bank resolution to be managed effectively through a Single Resolution Board and a Single Resolution Fund, financed by the banking sector. Its purpose is to ensure an orderly resolution of failing banks with minimal costs for taxpayers and to the real economy.

Fourteen years ago, Robert Schuman's vision of a peaceful, integrated Europe, recognizing its common history, was finalized with the implementation of the euro. But the euro area members continue to face the challenges of adjusting to the single monetary policy, abiding by the Stability and Growth Pact on the fiscal side, and implementing structural reforms. Until the 2008 crisis, Europe was closer than ever, but it is clearly still a work in progress. Europe is not yet fully integrated. Europe is plural. One immediately thinks of its two main occurrences: the European Union (EU), and the Economic and Monetary Union (EMU). But there is also the European Free Trade Association (EFTA), the European Economic Area (EEA), and the Europe of Schengen. When one considers this plurality, then Europe's motto seems totally obvious: "United in diversity."

This plurality is at the root of Europe's successes but also its challenges. In the past 60 years, Europe has gone through an unbelievable number of steps to rebuild itself and integrate its economies to become both a new and peaceful Europe. From Robert Schuman's declaration on May 9th, 1950, to the rejection of the European Constitution on June 12, 2008, Europe is definitely not running a sprint, but a hurdle race. It is surely a slower, and more complicated process than was anticipated, but Europe continues to progress in its integration. From an economically motivated integration, Europe is now closer to the supranational entity once dreamt of by Robert Schuman and presented to the world in the "clock lounge" of the Foreign Affairs Ministry Hausmanian building.

But does it make it a better economically integrated Europe? This leads to the next question: what is an economic integration? It is both creating a single market for goods and a single market for services.

This paper studies the implementation of the Banking Union across the euro area in an international perspective. It contributes to the literature firstly by proposing an IPE approach to the implementation of the Banking Union and secondly by proposing an analysis of the impacts of the Banking Union in terms of the improvement of the credibility of the European financial system.

Indeed, now equipped with an internal market of goods, services, including financial services, the question is to know whether the EU has fixed its structural issues in terms of governance and if it helps restoring the credibility of the financial system. If a new crisis were to hit Europe, would the latter be better prepared to respond? Another question is to know whether this new framework would reduce the systemic risk and thus would reduce either the likelihood or the magnitude of a crisis?

All these new rules, and in particular the Banking Union, have thus two goals: (1) to reduce systemic risk and (2) to increase the credibility of the financial system. This paper is about the latter part. Indeed, we want to assess whether credibility - and the lack of - was an issue in Europe and in the euro area in particular.

Our main research question is thus (1) to know whether the Banking Union is a big enough step in order to restore the credibility of the financial system. Another set of questions is thus (2) to know how we can measure the credibility in the financial system and (2) why would it be an issue?

To answer these questions, our approach is twofold. First, in a maybe unconventional way, we will use Network Theory to provide descriptive statistics. Network Theory is very convenient to visualize the

trends and changes in capital flows across the European financial system. In some aspects, we make a contribution to the literature on Economic Geography, and more precisely to the literature on Financial Economic Geography. Second, we use a time-series cross-section analysis of 19 countries based on the foreign claims of banks. We look at bilateral data between European countries (euro and non-euro members) to see whether the crisis has changed the dynamics of capital flows compared to what was the trend before the 2008 financial crisis.

The lay out of the paper is as follows. In the next section, we will review the relevant literature. Then section 3 will present the descriptive statistics based on Network Theory as well as our TSCS estimations and results. Section 4 will conclude.

2   Literature Review

In this literature review, we focus on three dimensions: (1) how the literature defines systemic risk, (2) how the definition of systemic risk leads to the notion of complexity in finance and (3) why financial integration is an important step forward for Europe in light of the Endogenous Optimum Currency Area Theory.

2.1   The definition of systemic risk

In the euro area for instance, the financial industry remains very little diversified. Indeed, 85% of the bank assets are owned by only 120 banks, which may increase systemic risk (Langfield et Pagano, 2015).

The literature on systemic risk assessment can be divided into three broad categories: (1) the first category analyzes how the linkages between banks can amplify shocks, (2) the second category deals with the measure of systemic risk and (3) the third category is about modeling simulations to better understand how specific types of shocks may escalate into more severe systemic events.

About the first category, using aggregate BIS data, Peek and Rosengren (2000b) analyse how foreign banks adjusted to the crises across Latin America in the 1990s crises (Argentina, Brazil, and Mexico), and Kaminsky and Reinhart (2003) studied how reliance on a common lender was a serious issue in the East Asian crisis. Focusing also on Latin America, Martinez-Peria et al. (2005), Kamil and Rai (2010), and McGuire and Tarashev (2008) highlighted the slowdown in international credit to emerging markets. More recently, Cetorelli and Goldberg (2011) and McCauley et al. (2010) illustrate a tightening of credit in emerging markets. Bank-level and individual loan-level data (e.g. data on cross-border syndicated loans) have also been used to study the international propagation of shocks. For example, De Haas and van Lelyveld (2010) and Barba Navaretti et al. (2010) find that banks support their foreign affiliates in distress through internal capital markets. And using bank-level cross-border syndicated loan data, De Haas and van Horen (2011) show that, during the most recent crisis, foreign banks continued to lend to countries that are geographically close and integrated in the network of domestic co-lenders, and to those countries where banks had established relationships. This is of particular interest in the context of our analysis based on Network Theory.

The second category is more about measurements and issues related to measurements. Indeed, according to the literature, prices are contemporaneous measures of market stress rather than being useful to forecast (Borio and Drehmann (2009)). Drehmann and Tarashev (2011) analyze the systemic importance of interconnected banks in the absence of bilateral data.

The third category in the literature conducts simulations and scenario analysis. Arvai et al. (2009), for example, highlight that, when taking into account common lender effects, Western European banks' exposure to Central, Eastern, and Southern European (CESE) countries is far smaller than that of CESE

countries to Western European banks (except for Austria and Sweden). The interaction of funding and credit risk exposures has been analyzed using similar techniques, often using network measures which take into account the distribution of nodes and intensity and complexity of connections.

Schwarcz (2008) provides a general definition of systemic risk, which is the collapse of the whole financial system generated by the bankruptcy of one financial institution. As highlighted by the 2008 financial crisis, it can also go of such a magnitude that it goes beyond the financial sector and translates into the real economy (Warin and Prasch 2015).

Véron (2014) stresses that there exists a toxic combination between national preference and financial integration in Europe without a proper set of European regulations. Indeed, in the absence of common rules, national governments do not want to restructure their banks because they would lose market shares to other foreign banks.

About systemic risk and Network Theory, the links between financial institutions play a key role in systemic risk (Whelan 2009). One way to measure links between banks is to use foreign claims. In such a case, foreign claims can become a proxy for systemic risk (Cerutti, Claessens, and McGuire 2012). Some authors described the evolution of links between banks and the impact on the level of risk in the industry (Allen and Gale 2000; Hattori, Suda, and others 2007; Kubelec and Sá 2010). One conclusion is that densificiation through the multiplication of links is positive for diversification and thus reduction of risk, but accompanied by clustering, it can increase systemic risk.

2.2   The notion of complexity in finance

Assessing systemic risk is very complex. Three reasons van be highlighted: (1) the lack of coordination in institutional mechanisms across the world, (2) the globalization of the financial industry, and (3) the scarcity of data in oder to meaure systemic risk.

The 2008 financial crisis has shown how a shock in one country can propagate to the rest of the world. However, although they do exist, financial linkages are very complex to understand (Cerutti, Claessens, and McGuire 2012). The concept of systemic risk is about complexity. Interdependence of firms and sectors is a critical component of it. To that end, one could characterize systemic risk as a situation where even a boom phase can lead to greater leverage and complexity of the system (Minsky 1986). It follows that a crash is a period of both deleveraging and decomplexification (Mirowski 2013).

Financial markets have evolved dramatically since 1933. Since the 1950s, this evolution has been greatly influenced and informed by the emergence and acceptance of Modern Portfolio Theory (Markowitz 1952).

In the wake of the recent crash, questions have been raised as to whether this framework needs to be modified to account for the implications of too much "financial innovation" for the stability of the financial industry (Prasch & Warin, 2012).

Regulation is the main conclusion when considering the causes and consequences of systemic risk. Some authors explained that financial globalization was premised on achieving a greater degree of convergence in the globalized financial markets (Arestis and Basu 2004). One of the problems they associate with financial globalization is an increase in macroeconomic volatility that has been especially detrimental to developing countries with low levels of physical capital.

Financial regulation has been the subject of a long lasting debate (Peretz and Schroedel 2009) and even more in the wake of the 2008 financial crisis. Some authors called for an immediate reinforcement of the "big three" at the national level: (1) prudential regulation, (2) internal controls and (3) market discipline (Couppey-Soubeyran 2010).

Information can be sufficiently altered by the complexity of the system itself, thereby contributing to the instability of the overall financial system (Minsky 1986). Minsky was famously of the view that a widespread perception of the permanence of stability was not only misleading, but the complacency induced by such a perspective invariably contributed to instability (Warin and Prasch 2015).

2.3   Endogenous Optimum Currency Area Theory

Obviously, the European integration is largely influenced by the Optimum Currency Area Theory (Mundell 1961), and the Banking Union is not different (Geeroms and Karbownik 2014). According to Paul De Grauwe (2011), the loss of control over the monetary policy makes governments more vulnerable to capital flows reversals, which increase the risk and the magnitude of a crisis. The Banking Union in this context can be seen as a deepening of the financial integration that will limit the reversal of capital flows in case of a crisis and thus avoids some asymetric shocks to the euro area. But in fact, this argument can find its roots in another theory, also developped by Robert Mundell: the Endogenous Optimum Currency Area Theory.

Indeed, McKinnon (2004) brings attention to a little-known article by Mundell (1973) that argues that optimal risk-sharing is attained when countries exhibit a wide degree of heterogeneity (Warin, Wunnava, and Janicki 2009). This paper is indeed the major latest refinement, if not a correction of the Optimum Currency Area (OCA) theory, initiated by Mundell (1961) himself. Before this paper, Mundell argued that an economic area has to be optimal before using a common currency or a fixed exchange-rate mechanism. The causality is reversed in 1973 since using a common currency or joining a fixed exchange-rate mechanism may help an economic area become optimal. Thus, there is a chronological anteriority of what is Mundell's intuition in 1973 over what will become known thanks to Frankel and Rose (1998) as the Endogenous Optimum Currency Area theory.

This is particularly interesting since it also leads to the introduction of the nuance in concepts between integration and convergence (Krugman 1993). Countries could integrate and diverge (hopefully) to become an endogenous OCA.

According to Mundell's arguments in his 1973 paper, in the absence of capital controls, credibly fixed exchange rates would encourage international portfolio diversification to share the risks from asymmetric economic shocks (McKinnon 2004). This would, in turn, reduce asynchronous economic shocks helping the creation of an OCA, thus allowing the OCA to arise endogenously. Mundell's intuition in 1973 over the causality of an OCA is based on allocation of capital. Later, Frankel and Rose (1998) and Frankel and Rose (2002) twig the concept of "endogenous" optimum currency area: "The OCA criterion might be satisfied *ex post* even if not *ex ante*". They relate this endogeneity to trade integration and show that trade integration reduces the likelihood of asynchronous economic shocks.

3   Data and Methodology

3.1   Descriptive Statistics and Network Theory

In previous works, we have used FDI as the key variable (Warin, Wunnava, and Janicki 2009). In the literature, authors have been using FDI, but also equity portfolios, private debts and reserves (Kubelec & Sá, 2010). To complement this line of research, we use foreign claims in the financial industry as a way to measure credibility. Indeed, we assume foreign claims and their changes through time are a good proxy of the overall credibility of the financial system in a country, and also that the banking industry has a quick response to the decrease in credibility of the financial sector of a particular country.

Between 2007 and 2009, systemic risk is assumed to have quadrupled, and is decreasing since 2012 ("ESRB Risk Dashboard" 2015).

3.1.1 Data Compilation

As in previous works, we make the distinction between core and periphery countries (Hattori, Suda, and others 2007; Reyes and Minoiu 2011). The 12 core countries are: Germany, Austria, Belgium, Spain, Finland, France, Greece, Ireland, Italy, The Netherlands, Portugal, United-Kingdom. They are the creditors. The 8 periphery countries are debtors: Cyprus, Estonia, Latvia, Lithuania, Luxembourg, Malta, Slovakia, and Slovenia.

For our dataset, we compile data from BIS about bank claims in foreign countries (ie outside of the country where a bank has its headquarter).

The data (foreign claims) exclude operations between subsidiaries of the same bank. Central banks centralize the information and we use aggregate data by country (not at the bank level). We collect the date for the 20 countries of interest for our paper (12 core and 8 periphery countries) from 2000 to 2014.[2]

As it can be seen on the next figure, foreign claims have increased until 2008, before decreasing again.

---

[2] Banks' foreign claims are computed using two different parts: (1) cross-border claims (A) are claims on non-residents booked by either a bank's head office or a foreign affiliate (branch or subsidiary) in a third country, (2) local claims are those booked by a foreign affiliate on borrowers residing in the host country of the affiliate. However, to be precise, local claims can be denominated in foreign currencies (B) or in the local currency of the host country (C). Banks report foreign claims (A+B+C) on borrowers in individual countries on both an immediate borrower (IB) basis and an ultimate risk (UR) basis.

Figure 2. Foreign claims for our 20 countries (in billion US$). Source: BIS.
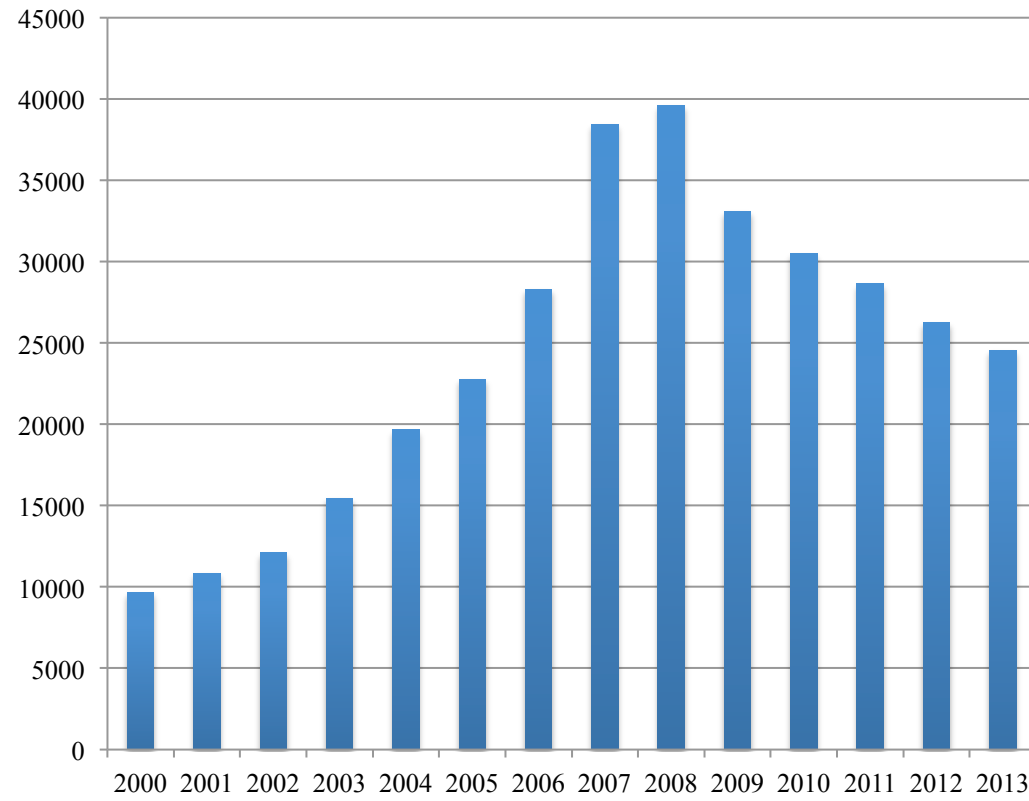
The most exposed countries are Germany, France and the United-Kingdom. International exposures have dramatically decreased for Germany and France (respectively, a 40% and 34% decrease between 2008 and 2013).

3.1.2   Network Analysis

Among the pioneers in Network Theory are Allen & Gale (2000). Their objective is to model the connections in the financial system. They want to highlight the microeconomic foundations of what constitutes a financial contagion in times of a crisis. They focus primarily in the interbank market. According to them, a banking network can either be "complete", where all the banks are connected to each other, or 'incomplete", where there are fewer connections than the number of connections necessitated to connect all the banks in the system. They come to the conclusion that complete banking networks perform better than incomplete banking networks. A complete network propagates a shock to the whole system, but avoids a liquidity crisis that would be generated otherwise by a not-connected bank that would play some free-riding strategies.

Being connected in a complete network may also help in terms of risk sharing and participating to a compensation mechanism (Leitner 2005). At the international level, building a complete network would thus be beneficial. Other studies will explore Network Theory and expand it to finance as some other prior works aforementioned. Some authors build a network of financial capital flows at the global level including 184 countries, spanning from 1978 to 2009 (Reyes and Minoiu 2011; Hattori, Suda, and others 2007; Kubelec and Sá 2010).

Since our dataset has 20 countries, among which 12 are core countries, it is thus called an oriented network. A node within the network represents each country.

The rational is to build indicators to capture the level of diversification within the financial industry and also whether there is a level of concentration around some banks in some countries. The former indicators can highlight a lower specific risk, while the latter can highlight an increase in systemic risk. This would extend the theoretical approach proposed in Warin and Prasch (2015).

Following Hattori et al. (2007), we compute 4 indicators based on Network Theory: (1) the connectivity indice, (2) the average shortest path length between nodes, (3) node's degrees and (4) the node's clustering coefficient (also called transitivity).

1. The betweenness centrality score (shortest-path betweenness) is a measure of accessibility that is the number of times a node is crossed by shortest paths in the graph.
2. The average shortest path length is the average number of stops needed to reach two distant nodes in the graph. The lower the result, the more efficient the network in providing ease of circulation.
3. A node's degree is the number of its attached links and is a measure of nodal importance. We measure in-degree and out-degree.
4. The clustering coefficient is the overall probability for the network to have adjacent nodes interconnected, thus revealing the existence of tightly connected clusters.

As it can be seen on the following figures, all the European core countries in our dataset are all connected, forming a complete network all by themselves, without the periphery countries.
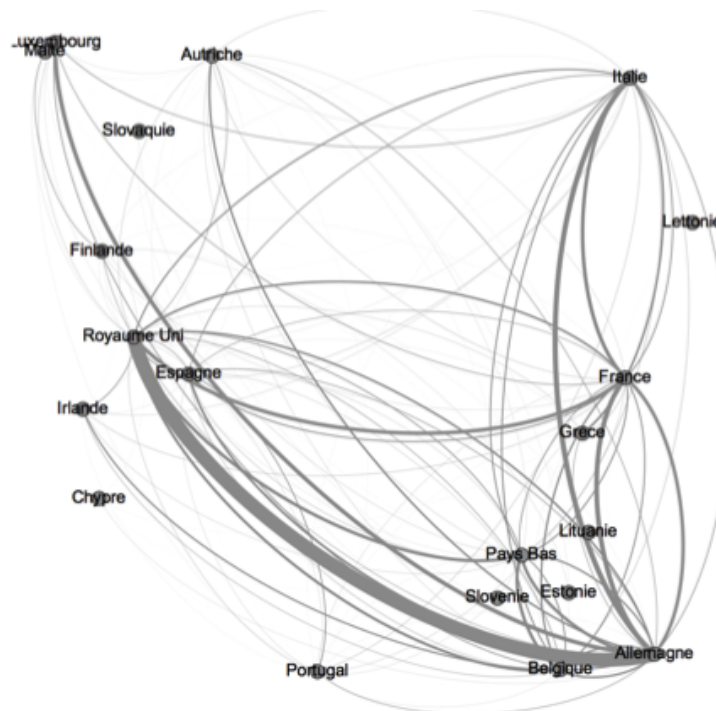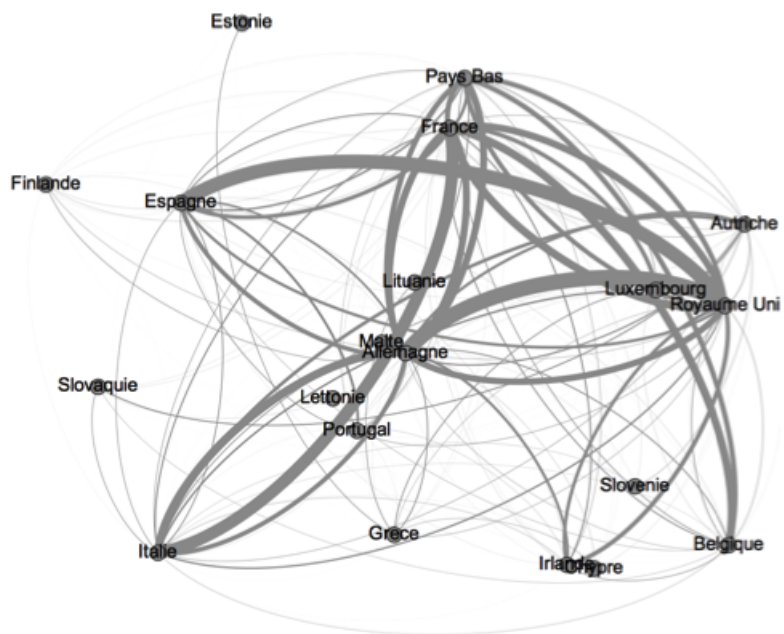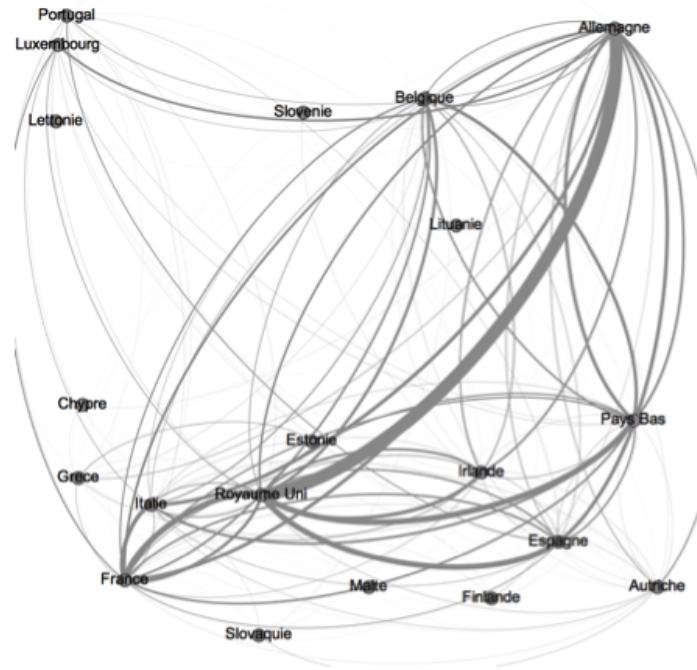
These figures illustrate the fact that euro are members have multiplied bank links. The thickness of the links (the force) has also increased. The European financial network has visibly complexified and augmented. Moreover, we can see that some nodes have become more central: Germany, France, Italy and the United Kingdom.

On the following figures, we graph the number of in-degrees (Hattori, Suda, and others 2007; Reyes and Minoiu 2011).

Figure 3. In-degrees for 2000, 2007, and 2013. Source: BIS.
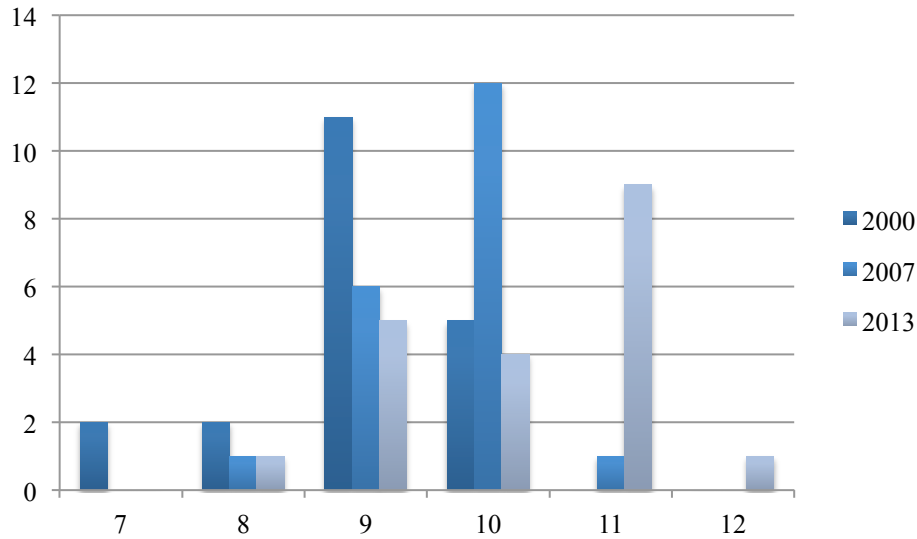
We can observe that in-degrees have increased through time. The in-degree average for our dataset was 8.75 in 2000, 9.65 in 2007, and 10.2 in 2013. The in-degree median was 9 in 2000, 10 in 2007 and 10.5 in 2013.

The core countries are more connected with the periphery countries, which is a different result from the previous literature (Reyes and Minoiu 2011). This may be explained by the entry of Cyprus, Malta, Slovakia and Estonia between 2007 and 2013 into the euro area. This is an interesting preliminary result since the European financial industry seems to integrate more than the rest of the world. Except for Greece, all the euro are members are among the top connected countries in 2006 in the world (Hattori, Suda, and others 2007).

On the next figure, we can see the average node's degree among the countries in our dataset. We can see that it has increased even after the crisis. This is comparable to previous results for the world network (Hattori, Suda, and others 2007).
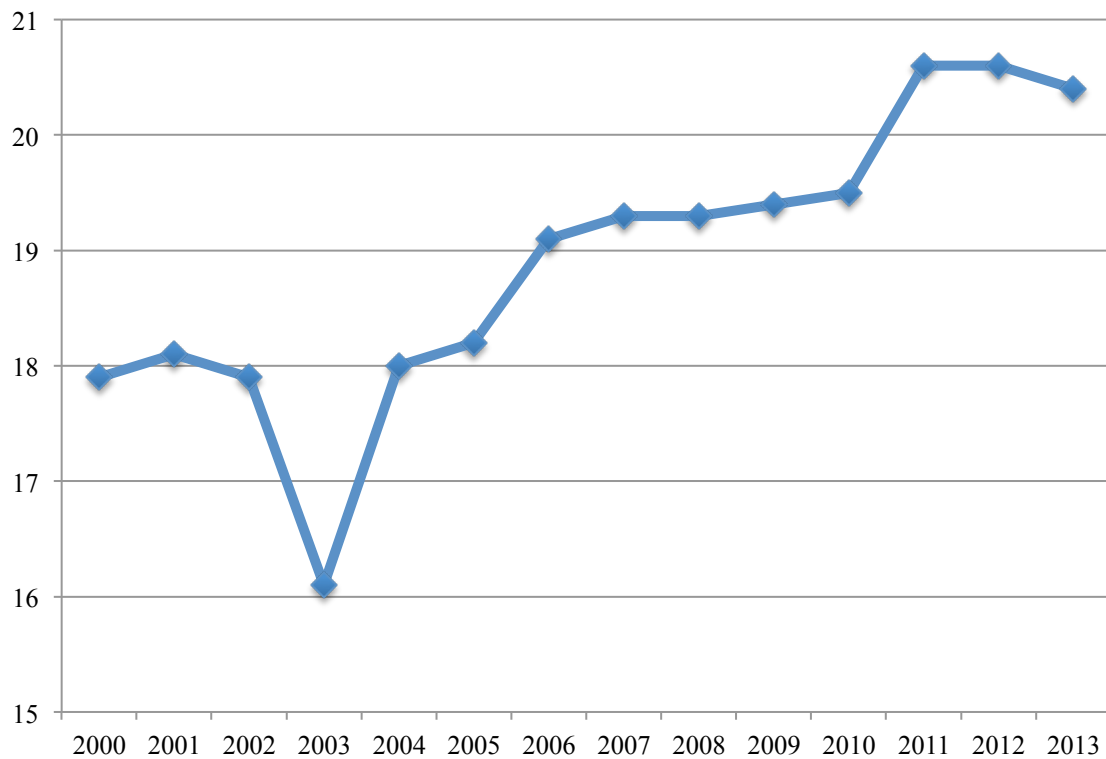
However, although we note an increase of the node's degrees, the volumes of foreign claims have lowered.

In the years 2011, 2012 and 2013, among the countries that have known the highest growth in terms of out-degrees, we find Sweden, Austria, the United Kingdom, Finland, The Netherlands and Spain.

In 2006, the countries with the highest node's degrees are France (180), the United Kingdom (178) and Germany (173).

Based on their results, Hattori et al. (2007) explain that the connectivity score is very resilient through time and through crises. This is due to the fact that once a bank is part of a network, it does not cut this link very easily. This is one more reason that justifies our use of foreign claims for our data. Indeed, if the bank links do not change, the flow of capital going through these links may well be impacted by a crisis.

3.1.3 Betweenness centrality and clustering coefficient

Betweenness centrality indicates whether going through the network nodes has increased through time. It is a measure of the level of connectivity. Overall, betweenness centrality has increased for our sample.

In 2013, the highest score in terms of between centrality are observed for Austria, Belgium, France, Germany and Spain. It can be a sign of a better risk sharing situation for Europe (Allen, Herring, and others 2001). It can thus be the result of a higher financial integration among European countries.

Figure 4. Betweenness centrality for our sample. Source: BIS (2015).
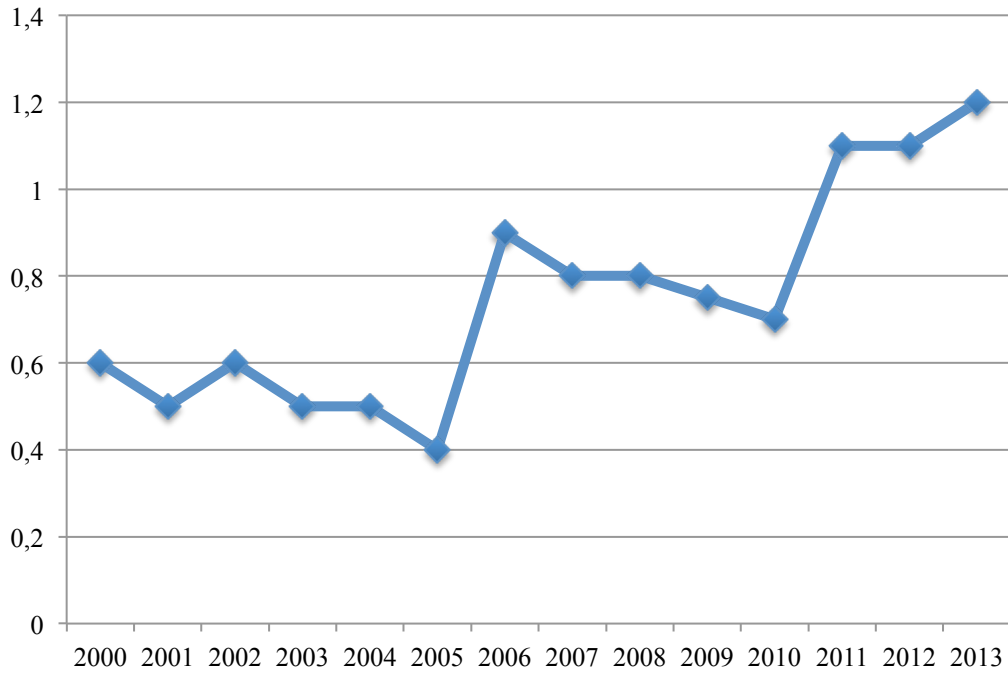
The clustering coefficient has also increased through time (see next figure). It is a little more alarming since this shows that some banks (and some countries) take a greater role in the financial system. This can on the other hand increase systemic risk.

Figure 5. Clustering coefficient for our sample. Source: BIS (2015).
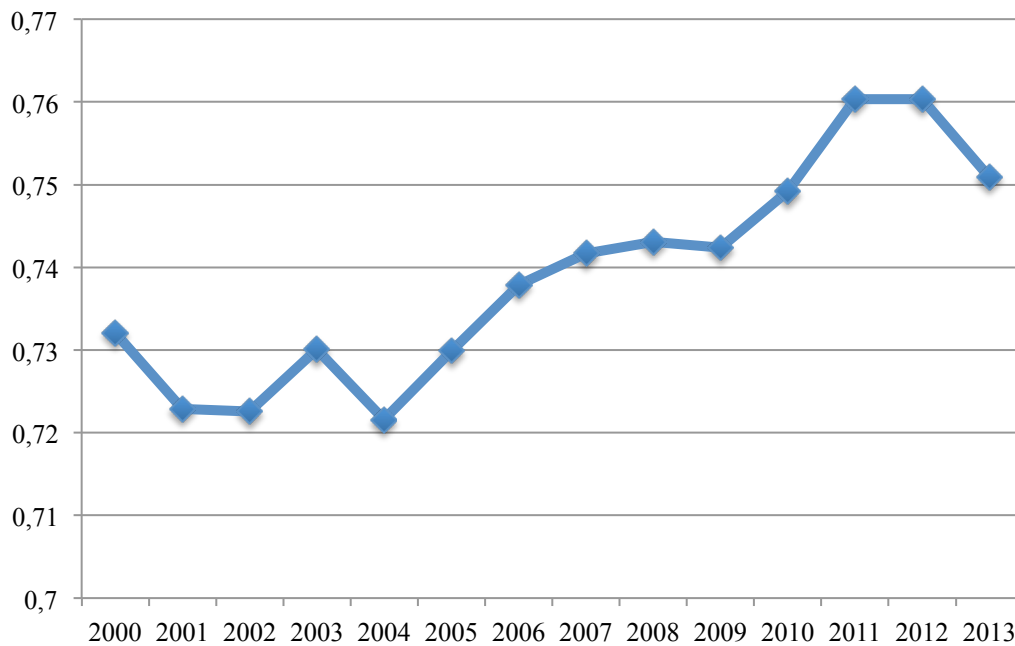
This can capture a Small-World phenomenon.

3.2 TSCS Estimations

3.2.1 Methodology

For this study, we propose an empirical analysis of the e-OCA through the use of a different proxy than the bilateral trade used by Frankel and Rose (1998): the bilateral stock of banks' foreign claims. By doing so, we want to measure Mundell (1973)'s intuition about the better allocation of capital that would result from the use of a common currency.

We will use a gravity model to analyze our dependent variable. This model is commonly employed in the study of international trade.

The data for the banks' foreign claims come from the Bank for International Settlements. GDP are from the OECD or IMF (Bulgaria, Croatia, Cyprus, Latvia, Lithuania, Malta and Romania). Public debts are from the IMF. Interest rates (10 year maturity) and Public deficits are from Eurostat. When data are not in US dollars, the conversion exchange rate was based on the World Bank data.

According to the convergence criteria, the European integration process is focused on inflation, budgetary, exchange rate, and interest rate convergence. These criteria account for every aspect necessary for monetary, fiscal, and structural stability, yet the effect of these measures on bilateral foreign investment – largely a microeconomic phenomenon – has not been the focus of past empirical research. The following section presents the model used in this empirical analysis and application of the convergence criteria into an econometric framework.

The empirical analysis is based on a variant of the gravity model, commonly used to analyse bilateral trade flows. The dataset is composed of aggregate annual bilateral stocks of banks' foreign claims for 28 countries, from 2000 to 2014. Since the dataset includes missing observations, the actual dataset is unbalanced.

The model is estimated using the following gravity equation and includes Hecksher-Ohlin variables (market size, income similarity, factor endowments, and distance) as well as proxies for capturing the European convergence (interest rate difference, budget difference, and debt difference) (Warin, Wunnava, and Janicki 2009):

$$
\begin{aligned}
\ln\left(FC_{ij,t}\right) = {}& \alpha_s + \beta_1 G_{ij,t} + \beta_2 S_{ij,t} + \beta_3 R_{ij,t} \\
& + \beta_4 D_{ij,t} + \beta_5 IRDIF_{ij,t} + \beta_6 BGTDIF_{ij,t} \\
& + \beta_7 DBTDIF_{ij,t} + \lambda_0 EMU_t + \lambda_1 \left(G*EMU\right)_{ij,t} \\
& + \lambda_2 \left(S*EMU\right)_{ij,t} + \lambda_3 \left(R*EMU\right)_{ij,t} + \lambda_4 \left(D*EMU\right)_{ij,t} \\
& + \lambda_5 \left(IRDIF*EMU\right)_{ij,t} + \lambda_6 \left(BGTDIF*EMU\right)_{ij,t} \\
& + \lambda_7 \left(DBTDIF*EMU\right)_{ij,t} + \varepsilon_{ij,t}
\end{aligned}
\tag{1}
$$

EMU is a dummy variable that takes a value of zero for every year when both countries in a pair are not EMU members, and one from when both countries in the pair are EMU members. For pairs with

countries that are not yet EMU members the value will be zero for the whole sample. This approach will make us able to use these pairs as a *de facto* control group, an approach that will be reinforced by the interaction variables. Indeed, moreover we interact this dummy variable with the variables representing market size, market similarity, factor endowments, distance, interest rate, differences in budget deficits, and differences in public debts. This helps us isolate whether being an EMU member matters or not compared to not being a member, while using the exogenous variables we specified.

Both the Heckscher-Ohlin and convergence variables (the explanatory variables) take the following forms:

$$G_{ij,t} = \ln\left(Y_{it} + Y_{jt}\right)$$

$$S_{ij,t} = \ln\left(1 - \left(\frac{Y_{it}}{Y_{it} + Y_j}\right)^2 - \left(\frac{Y_{jt}}{Y_{it} + Y_j}\right)^2\right)$$

$$R_{ij,t} = \left|\ln\left(\frac{gcf_{it}}{N_{it}}\right) - \ln\left(\frac{gcf_{jt}}{N_{jt}}\right)\right| \tag{2}$$

$$IRDIF_{ij,t} = \left|interest_{it} - interest_{jt}\right|$$

$$BGTDIF_{ij,t} = \left|budget_{it} - budget_{jt}\right|$$

$$DBTDIF_{ij,t} = \left|debt_{it} - debt_{jt}\right|$$

Fixed effects are denoted α_s, and recognize country-specific (symmetric) heterogeneity, but homogeneity when $i = j$ (i.e. when i = Austria or j = Austria, then the dummy variable takes a value of 1, and zero otherwise). Therefore, heterogeneity models country-specific participation or investment intensity instead of modeling heterogeneity between source and host countries. The error term, ε_{ijt}, represents all unobserved bilateral effects.

The four Hecksher-Ohlin variables (G, S, R, D) resemble the Helpman (1987) specification: G is the measure of "market size" (see table 1) or overall "economic space", S is an index that captures the relative size of the two economies that is bounded between absolute divergence in size and equality in country size, called "market similarity", R measures the relative difference between the two countries in terms of relative "factor endowments", and D denotes the log of the "distance" between the economic centers of the two countries (Warin, Wunnava, and Janicki 2009).

The three European convergence variables are: IRDIF is the difference in "interest rates" between country i and j, BGTDIF represents the difference in the government "budget surplus or deficit" as a percentage of GDP between the source and host country, and DBTDIF is the difference of the "debt-to-GDP ratio" between each country pair.

To select the right set of estimators, we have checked for fixed-effects, both section and time fixed effects. We validated time fixed-effects. WE also checked for contemporenous correlation. According to Baltagi, cross-sectional dependence is a problem in macro panels with long time series (over 20-30 years). We checked for heteroskedasticity as well. To correct for contemporenous correlation as found by our Pesaran test, we could use the Parks-Kmenta estimator. However, the Parks-Kmenta method is typically inappropriate for use with medium- and large-scale micro econometric panels due to at least two reasons: (1) this method is infeasible if the panel's time dimension T is smaller than its cross-sectional dimension N which is the here, and (2) Beck and Katz (1995) show that the Parks-Kmenta method tends to produce unacceptably small standard error estimates.

We checked for the use of Beck and Katz' estimator. However, Driscoll and Kraay (1998) demonstrate that the standard nonparametric time series covariance matrix estimator can be modified such that it is robust to very general forms of cross-sectional as well as temporal dependence.

But instead of using Driscoll and Kraay's estimator, we chose Bruno (2005)'s estimator. It is an augmented version of Andersen-Hsiao, Arelano-Bond and Blundell-Bond estimators. We calibrated the model for the upper limit of the coefficients and the lower limit of the coefficients with respectiviely a simple OLS and a TSCS fixed-effects panel estimation.

The econometric analysis and discussion of the results are presented in the next section.

3.2.2 Econometric results

In the following table, we present the overall results from our estimators. They cover the whole sample of 28 countries, from 2000 to 2014.

Table 1. Results from Bruno (2005)'s estimators.

Dependent Variable:
ln(foreign claims), Mean: , Std. Dev.:

Models Variables	AH	AB	BB
1.ln(foreign claims)	0.7706145***	0.7680939***	0.7890003***
	(0.0210321)	(0.0154851)	(0.0158765)
Heckscher-Ohlin Variables			
G (Market Size)	0.5982242**	0.6212411*	0.6935756***
	(0.2504998)	(0.2474445)	(0.2515827)
S (Market Similarity)	0.5479701***	0.5693662***	0.5672798***
	(0.1190458)	(0.1164924)	(0.1153057)
R (Factor Endowment)	–0.0064353	–0.0063036	–0.0065768
	(0.007879)	(0.0078376)	(0.0078778)
D (Distance)	–0.1394205*	–0.1406167*	–0.1450627*
	(0.0696173)	(0.0697554)	(0.0679347)
European Convergence Variables			
IRDIF (Interest Rate)	–0.7804493	–0.7373451	–0.6987228
	(0.7116379)	(0.7158669)	(0.7215123)
BGTDIF (Budget)	0.2593074	0.2636486*	0.2885406*
	(0.5362314)	(0.5346335)	(0.5356301)
DBTDIF(Debt)	0.2512312*	0.2556992	0.2189133
	(0.1101264)	(0.1082702)	(0.1055234)
EMU Dummy	1.390462	1.455797	1.568206
	(1.798418)	(1.779619)	(1.796618)
Interaction Variables			
G*EMU	–0.031061	–0.0332862	–0.0404435
	(0.0688905)	(0.0679542)	(0.0678508)
S*EMU	–0.098033	–0.0955701	–0.1009391
	(0.0704668)	(0.0699222)	(0.0684049)
R*EMU	–0.0803473	–0.0829788	–0.0187047
	(0.0687577)	(0.0682502)	(0.0698228)
D*EMU	–0.1204984*	–0.1194073	–0.1215676
	(0.0611793)	(0.0612674)	(0.0625275)
IRDIF*EMU	1.565743	1.502569	1.363008
	(1.078594)	(1.082133)	(1.081059)
BGTDIF*EMU	0.2491585	0.2526658	0.1824601
	(0.6993925)	(0.6994265)	(0.6946765)
DBTDIF*EMU	–0.2328053	–0.2358581	–0.1990059
	(0.1365852)	(0.1365596)	(0.1360336)

Time Fixed-Effects

n= 3821, Adj. R-Sq: 0.88, St. Dev. into parentheses

* <0.1 significance
** <0.5 significance
*** <0.01 significance

When we compare these results to the two sub-periods (2000-2007 and 2008-2014), we observe that there is an overall positive impact of belonging to the EMU, even after the 2008 financial crisis. However, we also observe a slight negative impact of the crisis, which tends to force core countries to repatriate capital within their borders. This would confirm the descriptive statistics aforementioned, using an analysis based on Network Theory.

These results are not as strong as the ones found in 2009 when FDI were used as the dependent variable (Warin, Wunnava, and Janicki 2009), but there is a somewhat similar narrative with the stock of foreign claims.

4   Conclusion

Even with improved aggregate banking statistics and better bank-level data, other dimensions of systemic risk will likely remain inadequately covered. While better coverage of banks is a top priority, non-banks, including pension funds, insurance companies, and large multinational corporations, can also be systemically important. This suggests, going forward, including not only such non-bank institutions in the counterparty sector breakdown of banks' exposures, but also bringing large non-bank firms under the data gathering umbrella (Cerutti et al., 2012).

To borrow a now famous phrase, "the sick man of Europe", it is Europe itself. Progress had been made before 2008, but too slowly. On the front of progress, we can note a control of public finances practically in the canons of European rules. However, the financial crisis has forced countries to use their fiscal policies to help their ailing economies. All the efforts that had been made before the crisis were swept by the latter. The crisis of 2008 had the effect of bringing to light the fragile foundations of Europe and the implicit assumptions that were made and on which the success of European integration was based.

In terms of limitations and further research, now equipped with an internal market of goods, services, including financial services, the question is to know whether the EU has fixed its structural issues in terms of governance. If a new crisis were to hit Europe, would the latter be better prepared to respond? Another question is to know whether this new framework would reduce the systemic risk and thus would reduce either the likelihood or the magnitude of a crisis?

5   References

Allen, Franklin, and Douglas Gale. 2000. "Financial Contagion." *Journal of Political Economy* 108 (1): 1. doi:10.1086/262109.

Allen, Franklin, Richard Herring, and others. 2001. "Banking Regulation versus Securities Market Regulation." *The Wharton School–University of Pennsylvania* 1: 1–58.

Arestis, Philip, and Santonu Basu. 2004. "Financial Globalisation and Regulation." *Research in International Business and Finance* 18 (2): 129–40. doi:10.1016/j.ribaf.2003.11.001.

Borio, Claudio. 2013. "The Great Financial Crisis: Setting Priorities for New Statistics." *Journal of Banking Regulation* 14 (3): 306–17. doi:10.1057/jbr.2013.9.

Boyer, Robert, Wolfgang Streeck, and Richard Swedberg. 2012. "Greta R. Krippner Capitalizing on Crisis: The Political Origins of the Rise of Finance. Cambridge, MA, Harvard University Press, 2011." *Socio-Economic Review* 10 (2): 403–18. doi:10.1093/ser/mwr037.

Bruno, Giovanni S. F. 2005. "Approximating the Bias of the LSDV Estimator for Dynamic Unbalanced Panel Data Models." *Economics Letters* 87 (3): 361–66.

Cerutti, Eugenio, Stijn Claessens, and Patrick McGuire. 2012. "Systemic Risk in Global Banking: What Can Available Data Tell Us and What More Data Are Needed?" http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2038212.

Couppey-Soubeyran, Jezabel. 2010. "Financial Regulation in the Crisis Regulation, Market Discipline, Internal Control: The Big Three in Turmoil." Economie Internationale 2010-3. CEPII research center. http://www.cepii.fr/anglaisgraph/publications/economieinter/rev123/ei123b.htm.

Geeroms, Hans, and Pawel Karbownik. 2014. "A Monetary Union Requires a Banking Union. Bruges European Economic Policy (BEEP) Briefing 33/2014." http://aei.pitt.edu/57213.

Hattori, Masazumi, Yuko Suda, and others. 2007. "Developments in a Cross-Border Bank Exposure 'network.'" In *Proceedings of a CGFS Workshop Held at the Bank for International Settlements*. http://210.174.171.233/en/research/wps_rev/wps_2007/data/wp07e21.pdf.

Helleiner, Eric. 1994. "The World of Money: The Political Economy of International Capital Mobility." *Policy Sciences* 27 (4): 295–98. doi:10.1007/BF01000061.

Krugman, Paul. 1993. "Integration, Specialization and Regional Growth: Notes on 1992." In *Adjustment and Growth in the European Monetary Union*, edited by F Torres and Francesco Giavazzi. Cambridge: Cambridge University Press.

Kubelec, Chris, and Filipa Sá. 2010. "The Geographical Composition of National External Balance Sheets: 1980-2005." http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1577143.

Leitner, Yaron. 2005. "Financial Networks: Contagion, Commitment, and Private Sector Bailouts." *The Journal of Finance* 60 (6): 2925–53. doi:10.1111/j.1540-6261.2005.00821.x.

Markowitz, Harry. 1952. "Portfolio Selection." *The Journal of Finance* 7 (1): 77–91. doi:10.1111/j.1540-6261.1952.tb01525.x.

McKinnon, Ronald. 2004. "Optimum Currency Areas and Key Currencies: Mundell I versus Mundell II." *Journal of Common Market Studies* 42: 689–715.

Minsky, Hyman P. 1986. *Stabilizing an Unstable Economy*. New Haven, CT: Yale University Press.

Mirowski, Philip. 2013. "Market Complexity and the Nature of Crises in Financial Markets." In *Social Fairness and Economics: Economic Essays in the Spirit of Duncan Foley. - London [u.a.]: Routledge, ISBN 978-0-415-53819-0. - 2013, P. 374-393.*

Mundell, Robert A. 1961. "A Theory of Optimum Currency Areas." *The American Economic Review* 51: 657–65.

Peretz, Paul, and Jean Reith Schroedel. 2009. "Financial Regulation in the United States: Lessons from History." *Public Administration Review* 69 (4): 603–12.

Reyes, Javier A., and Camelia Minoiu. 2011. "A Network Analysis of Global Banking:1978-2009." IMF Working Paper 11/74. International Monetary Fund. https://ideas.repec.org/p/imf/imfwpa/11-74.html.

Schwarcz, Steven L. 2008. "Systemic Risk." In *American Law & Economics Association Annual Meetings*, 20. bepress. http://law.bepress.com/cgi/viewcontent.cgi?article=2663&context=alea.

Vasudev, P. M. 2014. "Credit Derivatives and the Dodd–Frank Act: Is the Regulatory Response Appropriate?" *Journal of Banking Regulation* 15 (1): 56–74. doi:10.1057/jbr.2012.19.

Veron, Nicolas. 2014. "L'Union Bancaire, Un Succès Européen." 56. EN TEMPS RÉEL. http://entempsreel.com/wp-content/uploads/2014/09/140915_Nicolas-Veron_Lunion-bancaire.pdf.

Warin, Thierry, and Robert Prasch. 2015. "Systemic Risk in the Financial Industry: Mimetism for the Best and for the Worst." *Journal of Banking Regulation* forthcoming. http://works.bepress.com/warin/89.

Warin, Thierry, Phanindra V. Wunnava, and Hubert P. Janicki. 2009. "Testing Mundell's Intuition of Endogenous OCA Theory." *Review of International Economics* 17 (1): 74–86.

Whelan, Karl. 2009. "Containing Systemic Risk." Working Paper 200927. School Of Economics, University College Dublin. http://ideas.repec.org/p/ucn/wpaper/200927.html.