

The Microeconomics of Sudden Stop Episodes – An Application to the Euro Area

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Abstract

This study examines the foreign claims of BIS-reporting transnational banks on the euro area economies since the bankruptcy of Lehman Brothers and tries to understand the decline in foreign claims by employing a simple model of multiple equilibria. The underlying reasoning suggests that it was rational for banks to push the euro area periphery to the brink of bankruptcy and that bold economic policy measures effectively stabilized the associated adverse economic consequences. In the model presented here, solidarity among the euro area countries emerges as the most important precondition for integrated financial markets, as it prevents coordination failures among transnational banks and thereby guarantees financial stability.

Keywords: euro area crisis, transnational banks, coordination failure, financial integration

Die Mikroökonomie von Finanzkrisen. Eine Anwendung auf den Euroraum.

Zusammenfassung

Diese Studie untersucht die Auslandsforderungen der an die BIZ meldenden transnationalen Banken gegenüber den Euroraumländern seit dem Bankrott von Lehman Brothers; dabei soll der Rückgang dieser Forderungen in einem einfachen Modell multipler Gleichgewichte erklärt werden. Die Analyse legt den Schluss nahe, dass es für die betreffenden Banken rational war, die Euroraum-Peripherie an den Rand des Bankrotts zu treiben, und dass mutige wirtschaftspolitische Entscheidungen einen wichtigen Beitrag zur Stabilisierung der nachteiligen ökonomischen Konsequenzen geleistet haben. Solidarität zwischen den Euroraumländern erscheint in diesem Modell als wichtigste Voraussetzung für integrierte Finanzmärkte, weil sie das Auftreten von Koordinationsversagen zwischen transnationalen Banken verhindert und damit Finanzstabilität gewährleistet.

Schlagwörter: Eurokrise, transnationale Banken, Koordinationsversagen, integrierte Finanzmärkte

* Oesterreichische Nationalbank (OeNB), Foreign Research Division. The author wishes to thank Helene Schuberth, Paul Ehrlich and an anonymous referee for very helpful comments on an earlier version of this paper and Susanne Steinacher for language advice. The opinions expressed in this paper are those of the author and do not necessarily reflect those of the ECB, the OeNB or the Eurosystem.

1. Introduction

The economic problems prevailing in the euro area periphery¹ since the crisis were aggravated by a sudden stop in private foreign capital flows to these economies following the collapse of Lehman Brothers in September 2008. As a consequence, peripheral banks and sovereigns which had borrowed heavily abroad since the introduction of the euro faced the concrete danger of bankruptcy and had to be bailed out with the help of public funds. The associated consolidation of public finances and the tightening of credit standards in the economies concerned are crucial components of the recession and subsequent rise in unemployment recorded in the euro area periphery.

Transnational banks² played a crucial role here. Figure 1 illustrates the change in transnational banks' claims on the euro area economies between Q2 2008 (right before the Lehman bankruptcy) and Q3 2013 (last available observation). The data include both cross-border claims and lending by local subsidiaries (see

1 The term is used for countries at the periphery of the euro area (especially Greece, Ireland, Italy, Portugal and Spain) whose growth models (until Lehman) were based on domestic demand financed by foreign debt.

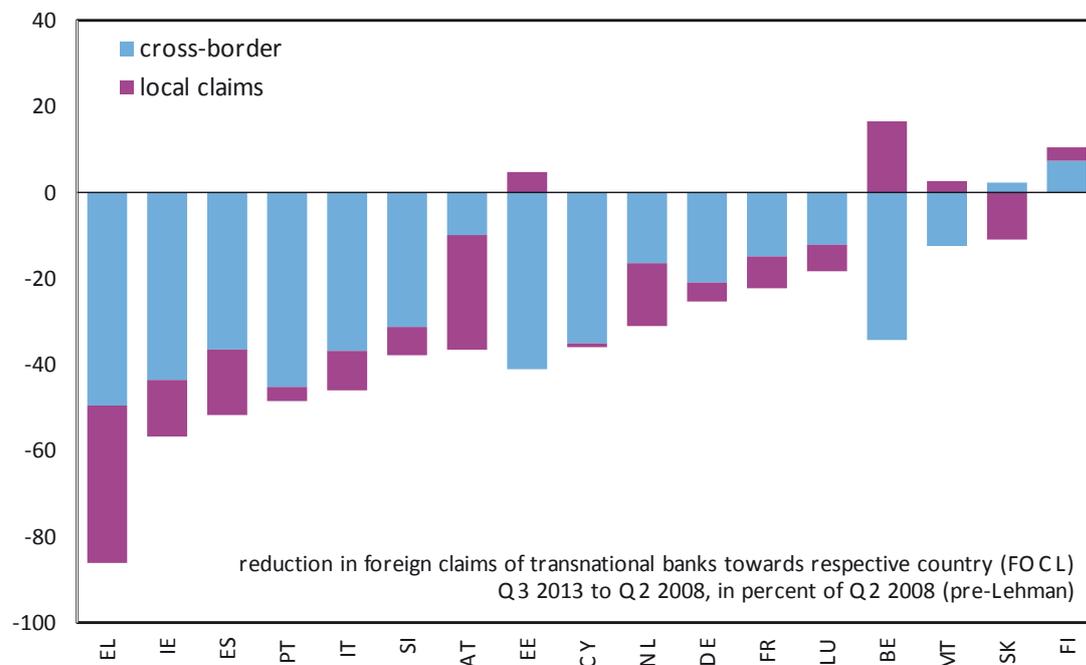
2 Transnational banks are banks that have claims beyond their home country.

annex for details on the data used). As figure 1 shows, claims on (nearly) all euro area economies were lower at the end of the observation period than before the Lehman bankruptcy; this is especially true for claims on the euro area periphery. This sudden stop of capital flows to the euro area periphery is well documented in the literature (Pisani-Ferry/Merler 2012a). This paper aims to provide an explanation for this development.

According to the recent literature, the bulk of the decline in exposures should be attributable to the adverse effects of financial distress on banks' balance sheets (Accominotti/Eichengreen 2013, Lindner 2013, Popov/van Horen 2013, Cerutti 2013, Avdjiev et al. 2012). These effects may have been aggravated by a lack of coordination among national supervisors (Schoemaker 2013). Earlier studies stress the stabilizing role of local subsidiaries (de Haas/van Horen 2011, Hameter et al. 2012). Most of the related studies control for demand effects by including the recipient country's real GDP growth rate as an additional explanatory variable of foreign claims developments.

This study adds another possible channel: the coordination failure among transnational banks. The sudden stop of capital flows to the euro area periphery should be understood as a bank run of transnational banks on these countries. This study develops a simple model of multiple equilibria following the classical

Figure 1: decline in transnational banks' foreign claims on respective country (FOCL)



bank run model of Diamond and Dybvig (1983) and suggests that, after the Lehman bankruptcy, transnational banks' failure to coordinate their actions pushed the periphery into a bad equilibrium. Simple descriptive empirical identification lends some support to this hypothesis. This analysis has three important implications for economic policy in the euro area: First, monetary policy can play an important role in stabilizing the economy even in a zero lower bound situation. Second, integrated financial markets demand a sufficient insurance mechanism that accounts for the possibility of coordination failures. And third, monetary policy shall not be overburdened. A long-term solution to the problem of coordination failures involves both the establishment of a banking union and the reduction of macroeconomic imbalances across Economic and Monetary Union (EMU).

The model presented here is in the tradition of earlier work on multiple equilibria in the euro area sovereign debt crisis (de Grauwe/Ji 2012, Gärtner/Griesbach 2012); it connects to the redefinition of bank runs to include both deposit and wholesale markets (Shin 2009). Because the majority of transnational banks observed here are headquartered in the euro area, the paper is also connected to the intense debate on financial disintegration (ECB 2012).

2. A Simple Model of Multiple Equilibria

In the classical model of bank runs by Diamond and Dybvig (1983), fully rational agents rush to withdraw their deposits in case of an uncertainty shock as they know that banks do not have enough liquidity to repay their liabilities. Their idea is that a coordination failure among private agents can destroy an otherwise sound financial system. The proposed solution is that either the central bank acts as lender of last resort or that there is a deposit insurance that stabilizes depositors' expectations. Both mechanisms should provide the risk-sharing or solidarity necessary to minimize the adverse impact of a coordination failure on the real economy.

To understand the decline in transnational bank's foreign claims on the euro area periphery, the model presented here considers a simple endowment economy of two transnational banks $B_{i=1,2}$ and one economy. Both banks receive an endowment of EUR 1 each in period $T=0$. Their aim is to maximize profit so they will lend the EUR 1 to the economy that pays interest. Let's assume that in period $T=2$, banks receive 25 percent of

interest on their investment. The borrowing economy, in turn, invests in $T=1$ and receives EUR 1.25 in $T=2$ to settle its debt. (The reader can think of the borrowing economy as a production function that turns EUR 1 into EUR 1.25.) If the banks withdraw their exposure in period $T=1$ (which is assumed to be possible), they suffer a 50 percent haircut on their investment because the money is stuck in the production process. If we consider each bank by itself, these assumptions result in the following set of strategies:

If we consider both banks, it is clear at once that

	$T=0$	$T=1$	$T=2$	
Strategy $S_{i=1}$:		0.00	1.25	→ keep exposure
Strategy $S_{i=2}$:	-1.00	0.50	0.00	→ withdraw exposure

this set of strategies per bank results in an uncooperative game between the two banks. If, for example, bank 1 decides to withdraw its exposure in $T=1$, the country will repay 50 percent of EUR 2, or EUR 1, to this bank, resulting in a total loss for bank 2. In other words, whenever bank 2 believes that bank 1 could withdraw its exposure prematurely, it has an incentive to do that first. In such a setting, an uncertainty shock can push both banks and the economy in question into a bad equilibrium where everybody is worse off. This can be seen from the following matrix of pay-offs³:

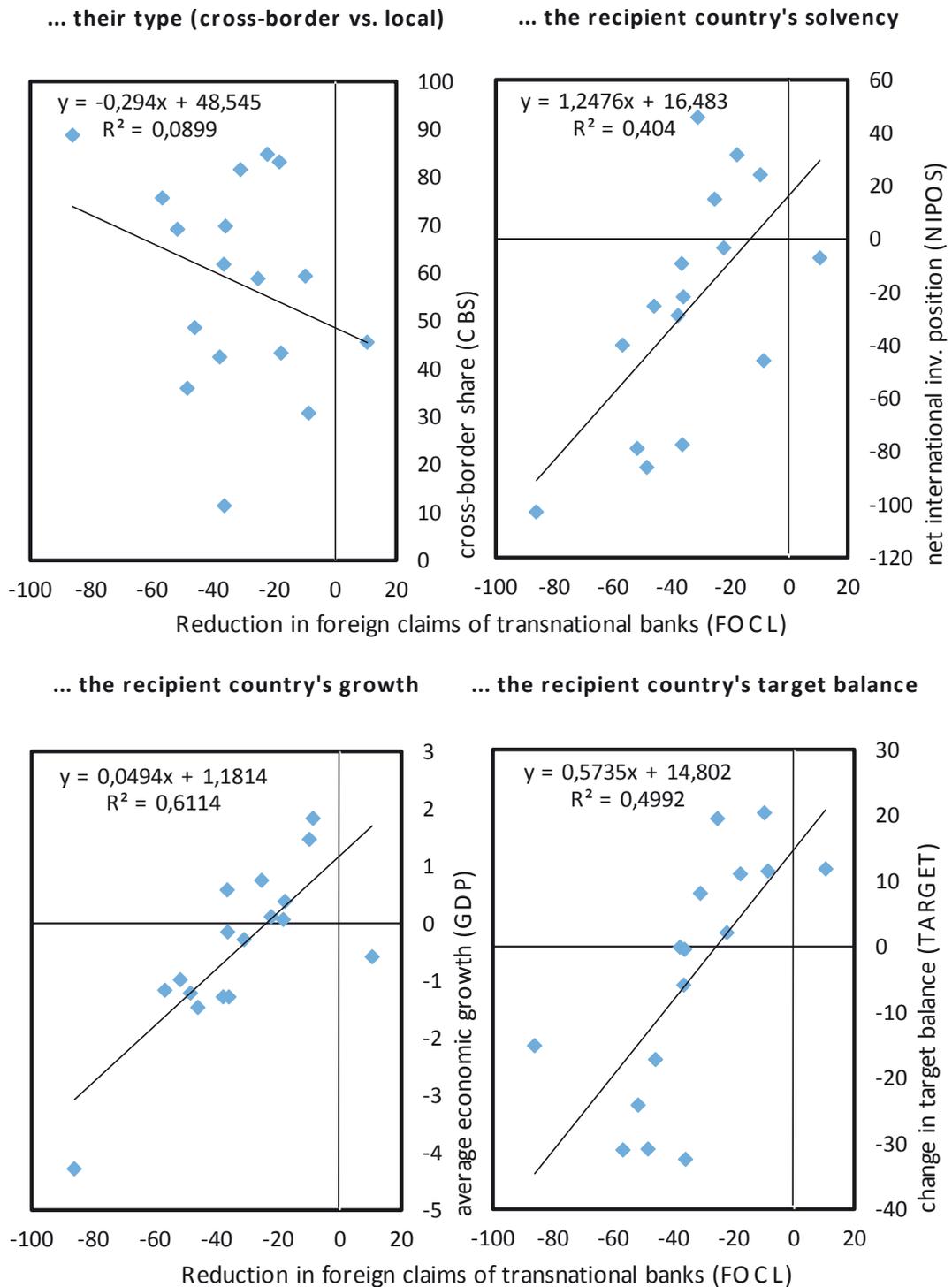
	B^1 : keep	B^1 : withdraw
B^2 : keep	1.25, 1.25	0.00, 1.00
B^2 : withdraw	1.00, 0.00	0.50, 0.50

The top left quadrant would be the good equilibrium; the bottom left would be the bad equilibrium. Both are Nash equilibriums and therefore reflect the optimal strategies of bank 1 given its expectations of bank 2's optimal strategies and vice versa (see footnote 4). Based on these considerations, it can be argued that the Lehman bankruptcy in September 2008 (and

3 Each bank $B_{i=1,2}$ has a set of strategies $S_{i=1,2}$ from which it chooses a strategy $x_{i=1,2}$ that is optimal given its expectations on the strategy of the other bank. This results in a strategy profile of both banks $x=x_1, x_2$ which then determines the pay-off function $f_i(x)$ of each bank. In other words, the pay-off of each bank depends on its own decision and on the decision of the other bank. A strategy profile is called Nash equilibrium if no bank can improve its own pay-off by changing its decision (given the decision of the respective other bank). The mathematical notation would be: $\forall_i, x_i \in S_i: f_i(x_i^*, x_{-i}^*) \geq f_i(x_i, x_{-i}^*)$, whereby $-i$ is the bank not i .

Figure 2: understanding the decline in transnational banks' foreign claims (FOCL)

The decline in foreign claims in correlation to ...



the Great Recession that followed) acted as an uncertainty shock that resulted in a bank run on the euro area periphery, pushing these economies and the banks themselves into a bad equilibrium. Similarly, the (temporary) agreement signed by German chancellor Angela Merkel and then French president Nicolas Sarkozy in Deauville in October 2010 to impose losses on private creditors in case of a future sovereign bailout from the European Stability Mechanism (ESM) may have aggravated that uncertainty. In the next section, some simple descriptive statistics shall rationalize this hypothesis.

3. Some Basic Empirical Reasoning

In the following, three critical assumptions of the model are tested: i) that exposures can be withdrawn immediately, ii) that it was rational for banks to assume a haircut in case of premature withdrawal of exposures to the euro area periphery, and iii) that banks pushed the periphery and themselves into a bad equilibrium. Preliminary empirical evidence seems to support these assumptions. The annex provides a brief introduction to the data used.

With regard to the first assumption, the data show that cross-border claims (a simple proxy for *hot money*) account for two-thirds of total foreign claims on the euro area periphery. In addition to that, the single currency implies lower costs on financial transactions settled in that currency, making exposures even easier to withdraw (Koo 2011). Although a high share of hot money in total foreign claims is an important precondition for a bank run, figure 2 (top left) shows that a high share of hot money alone does not necessarily lead to a bank run. At just under 0.1, the coefficient of determination, R^2 , is practically 0.

Second, and related to that, the model presented here suggests that it was rational for banks to assume that a haircut would take place in case banks withdrew their claims prematurely. Is this plausible? Yes, it is. The peripheral economies had accumulated large current account deficits since the introduction of the euro (on top of international investment positions [NIPs] that were already negative in 1999). This accumulation resulted in a net indebtedness of their total economy vis-à-vis the rest of the world in Q2 2008. NIPs across the euro area countries are highly correlated with the decline of transnational banks' total foreign claims observed since the collapse of Lehman Brothers (figure 2, top right). The scatterplot suggests that if a country's

NIP improves by 10 percent before an uncertainty shock, the decline in foreign claims will be 12 percent lower thereafter. According to the coefficient of determination, R^2 , the NIP explains around 40 percent of the total decline in foreign claims since the Lehman bankruptcy. In other words, macroeconomic imbalances are crucial to understand the so-called euro crisis (Vernengo/Pérez-Caldentey 2012). The vulnerability of the euro area periphery was amplified by the well-known doom loop between the solvency of banks and that of their sovereigns (Pisani-Ferry/Merler 2012b)⁴ and the widespread political uncertainty about the future composition of the euro area up to the first half of 2012 (ECB 2013).

With regard to the third assumption, this paper looks at the average real GDP growth rate of euro area economies between 2008 and 2013 to measure whether transnational banks pushed the euro area periphery into a bad equilibrium (figure 2, bottom left). The scatterplot suggests that a decline in foreign claims by 10 percent goes along with a decrease in the real GDP growth rate by 0.5 percent. That said, this close correlation could result from both supply and demand effects. Notwithstanding the importance of demand (Krugman/Eggertson 2012), two crucially important supply factors should be highlighted. Remember that before the crisis, the funding markets for sovereigns and for banks were the most strongly globalized financial markets in the euro area (ECB 2009). This means that any impact of changes in foreign claims on real GDP growth in the recipient countries should work via these two funding markets. First, the sudden stop episode was a major driver of the sovereign debt crisis in peripheral economies (Pisani-Ferry/Merler 2012c). The associated rise in risk premia in several euro area economies resulted in *simultaneous* fiscal consolidation across all euro area economies, which had a significant negative effect on economic activity in the euro area (in 't Veld 2013). Second, due to both the sudden stop episode (direct effect) and the sovereign debt crisis (indirect effect), the majority of banks in the euro area periphery faced severe funding troubles in recent years (van Rixtel/Gasperini 2013). This again resulted in a substantial tightening of bank lending standards, espe-

4 Pisani-Ferry and Merler (2012b) show that adverse refinancing conditions for banks express themselves in adverse refinancing conditions for their sovereigns, and vice versa. This widely discussed problem became known as doom loop between sovereigns and banks.

cially for SMEs, which constrained economic activity even further (ECB 2012). Clearly, the complex interconnectedness of all these factors with domestic and global demand issues makes it complicated to identify the causal effect of the decline in foreign claims on real GDP growth in the euro area. However, existing evidence suggests that the influence of factors related to the supply of foreign capital should have been sizeable.

4. Economic Policy Considerations

The advantage of the simple model presented here is that it allows a consistent discussion of economic policy measures taken since the beginning of the crisis. It implies that a sudden stop episode results from a coordination failure of transnational banks. In principle, the model suggests two ways for banks to prevent such coordination failures (see matrix below): i) reduce the number of strategies, e.g. via capital controls, credible contracts (i.e. banks reassuring one another that they will not withdraw their exposures prematurely). ii) change the pay-offs for banks; e.g. via insurance mechanisms (for the funding of peripheral sovereigns and banks). In case i) banks will be forced to keep their exposures until $T=2$ (below left); in case ii) banks will be keen to keep their exposures (below right). In this second setting, keeping their exposures is the dominant strategy of transnational banks (they will follow it irrespective of what they believe that the other banks will do). Credibility is important for every solution considered.

In the following, we will provide two practical examples for these theoretical options.

The “reduce the number of strategies” solution: the European Bank Coordination “Vienna” Initiative (VI). The VI is a framework for safeguarding financial stability in emerging Europe. It was launched at the height of the first wave of the global financial crisis in January 2009 and brought together all the relevant public and private sector stakeholders of EU-based transnational banks active in emerging Europe which, together, own a large share of the bank-ing sectors in that region and also a significant percentage of government securities.

The VI participants agreed on the coordinated deleveraging of transnational banks aimed to safeguard financial stability and minimize the negative effects on the real economy. By reaching a credible agreement, the VI has helped prevent a systemic banking crisis in emerging Europe⁵ at relatively low cost (de Haas et al. 2012). In this respect, the VI has a similar effect as the following example.

The “change the pay-offs” solution: Outright Monetary Transactions (OMTs). The OMT program aims to guarantee the functioning of the monetary policy transmission mechanism (transmission of ECB policy rates to bank rates) in the euro area as a whole. The transmission mechanism was impaired by the substantial tightening of bank lending standards in the peripheral economies (see above). This was partly caused by the mispricing of sovereign risk as investors and banks speculated on a possible break-up of the euro area (de Grauwe/Ji 2012). In early August 2012, the ECB explicitly addressed this type of coordination failure by announcing that it would stand ready to intervene in the secondary sovereign bond markets if necessary (and if certain conditions were met). This announcement was credible (as the ECB obviously had the firepower for an unlimited intervention), and it led to a change in the pay-off matrix. Investors and banks no longer expected a further decrease in the value of their sovereign assets (irrespective of what they expected the others would do). Hence, they stopped selling bonds, and the situation stabilized. Although the ECB’s decision raised severe criticism among several economists, the ECB’s new role as a backstop for sovereign stress in the euro area is now well established (de Grauwe 2011, Buiters/Rahbari 2012).

The ECB’s liquidity operations aim to provide the private banking sector with euro liquidity on a regular basis. In the course of the crisis, these operations turned into a leading insurance mechanism (Boeckx 2012). As many banks in peripheral economies lost access to funding by transnational banks, the ECB’s liquidity

5 Especially Bosnia and Herzegovina, Hungary, Latvia, Romania, and Serbia.

	<i>B1: keep</i>	<i>B1: withdraw</i>		<i>B1: keep</i>	<i>B1: withdraw</i>
<i>B2: keep</i>	1.25, 1.25	-	<i>B2: keep</i>	1.25, 1.25	1.00, 1.25
<i>B2: withdraw</i>	-	-	<i>B2: withdraw</i>	1.25, 1.00	1.00, 1.00
"reduce the number of strategies" solution			"change the pay-offs" solution		

operations provided sufficient liquidity to bridge the-se funding gaps. In other words, the ECB took over large parts of the interbank market. The associated growth in the ECB's balance sheet had a strong regional aspect in that peripheral economies borrowed relatively more than core economies. This paper measures these borrowing volumes by the respective country's TARGET balance with the ECB (see annex, table 1, column 5).

A simple scatterplot that relates the change in the TARGET balances of euro area economies between Q2 2008 and Q3 2013 (in percent of 2008 nominal GDP) to the reduction in transnational banks' foreign claims suggests that the ECB's liquidity operations stabilized around 55 percent of the reduction in foreign claims. The coefficient of identification, R^2 , is 0.5 and thereby rather high. It seems that the commonly backed balance sheet of the ECB, again, acted as a powerful insurance mechanism that insured the euro area periphery against a sudden stop in foreign capital flows. Given the fact that the ECB's balance sheet is backed by all Member States of the European Union (EU), the liquidity operations represent some form of risk-sharing or solidarity among Member States (just like the OMTs). While many economists still think that the interest rate is central banks' most powerful monetary policy instrument (Krugman/Eggertson 2012), the crisis has shown that it is indeed their balance sheet (i.e. their control over the monetary base). The monetary base (like the interest rate), however, should remain a tool for achieving short- to medium-term stabilization and should not become a tool for maintaining long-term stability (Boeckx 2012).

In the long run, the euro area needs to tackle the preconditions and reasons for the bank run that was observed in the euro area periphery. The analysis presented here suggests that policy-makers should work on two issues: i) They will have to change the form of transnational banking and promote local instead of cross-border claims (a "reduce the number of strategies" solution), and ii) they will have to reduce macroeconomic imbalances within EMU in a sustainable manner (a "change the pay-offs" solution). On top of that, they will need to un-burden monetary policy by setting up democratically accountable insurance mechanisms. The European Stability Mechanism (ESM), an insurance mechanism involving strong and weak sovereigns, was the first step in this direction, while the Single Resolution Mechanism (SRM) and the Single Resolution Fund (SRF) will need to follow suit. The SRF is the most important element of the future

banking union. It aims to relieve sovereigns from rescuing banks head-quartered in their country that are too big to fail and too big to rescue. Funds will be provided by banks themselves (via bank levies), while the bail-in of banks' creditors will reduce the SRF's costs upfront. In the end, the SRF will serve as an insurance mechanism between strong and weak banks. It is designed to break the doom loop between the solvency of banks and that of their sovereigns and will play an important part in providing a long-term solution that will guarantee financial stability in EMU. Similarly to the ECB's balance sheet, both the ESM and the SRF represent mechanisms of risk-sharing or solidarity among euro area countries.

5. Conclusions

This paper analysed the development of foreign claims of BIS-reporting transnational banks on the euro area economies since the bankruptcy of Lehman Brothers. The idea was to understand the decline of foreign claims by employing a simple model of multiple equilibria following Diamond and Dybvig (1983). The reasoning presented here suggests that it was rational for transnational banks to push the euro area periphery into a bad equilibrium after the Lehman bankruptcy and that monetary policy effectively stabilized the adverse economic consequences. Moreover, integrated financial markets seem to need appropriate insurance mechanisms that prevent future coordination failures and guarantee financial stability in the long run.

In particular, the present analysis suggests three preconditions for achieving financial integration and financial stability in EMU: i) the ECB should continue to be a credible lender of last resort for both banks and sovereigns, ii) macroeconomic imbalances within the euro area need to be reduced sustainably, and financial integration should be based on local instead of foreign claims, and iii) Europe needs a fully functional banking union, better now than later.

The most important conclusion of this paper, however, is that solidarity among euro area countries is a fundamental ingredient in overcoming crises (Winkler 2012). If policymakers do not manage to implement the insurance mechanisms necessary to stabilize banks' expectations, EMU will not be able to benefit from transnational banking or integrated economies without suffering from repeated financial crises. This paper provides a simple framework for considering these issues.

Annex: Data Base

The consolidated banking statistics of the Bank for International Settlements (BIS) capture foreign claims of banks headquartered in the BIS-reporting countries⁶ on all countries world-wide on a bilateral basis, including claims of their own foreign affiliates but excluding positions between related offices. Data are on an ultimate risk-basis.

Foreign claims are reported in USD million. A reduction in their value between two points in time is not necessarily due to an outflow. They could decline because the lender's ownership changes, because the denominating currency (mostly euro in this case) depreciates against the U.S. dollar, because of market price changes or because of write-downs.

Table 1: descriptive statistics on the data used for this paper

	<i>FOCL</i>	<i>CBS</i>	<i>NIPOS</i>	<i>GDP</i>	<i>TARGET</i>
AT	-36,54	61,72	-9,30	0,58	-5,87
BE	-17,77	43,23	31,70	0,38	11,03
CY	-35,97	69,70	-21,85	-1,28	-32,40
EE	-36,34	11,30	-77,50	-0,15	-0,46
FI	10,51	45,46	-7,20	-0,58	11,77
FR	-22,26	84,69	-3,40	0,12	2,07
DE	-25,36	58,71	15,00	0,75	19,45
EL	-86,12	88,71	-102,80	-4,28	-15,10
IE	-56,73	75,59	-40,00	-1,17	-30,99
IT	-46,02	48,52	-25,30	-1,47	-17,21
LU	-18,33	83,09	n.V.	0,07	n.V.
MT	-9,80	59,28	24,10	1,47	20,33
NL	-31,07	81,49	45,80	-0,28	8,07
PT	-48,49	35,86	-86,00	-1,22	-30,84
SK	-8,66	30,64	-45,80	1,83	11,46
SI	-37,84	42,40	-28,80	-1,28	-0,14
ES	-51,74	69,06	-78,90	-0,98	-24,16

Notes: *FOCL* are total foreign claims of all BIS-reporting banks on the respective economy (consolidated banking statistics, ultimate risk-basis), cumulated change between Q3 2013 and Q2 2008 in percent of Q2 2008 (BIS). *CBS* is the share of cross-border claims in total foreign claims of all BIS-reporting banks on the respective economy (consolidated banking statistics, ultimate risk-basis), Q2 2008 in percent (BIS). *NIPOS* is the respective economy's assets minus its liabilities vis-à-vis the rest of the world in percent of GDP, Q2 2008 (Eurostat). *GDP* is the average of annual real GDP growth rates from 2009 to 2013 (Eurostat). *TARGET* is the change in the respective economy's *TARGET* balance from Q2 2008 to Q3 2013, in percent of 2008 GDP (CES ifo).

⁶ Australia, Austria, Belgium, Canada, Chile, Chinese Taipei, Finland, France, Germany, Greece, India, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States.

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