



BANCA D'ITALIA
EUROSISTEMA

Temi di Discussione

(Working Papers)

A tale of fragmentation: corporate funding
in the euro-area bond market

by Andrea Zaghini

February 2017

Number

1104



BANCA D'ITALIA
EUROSISTEMA

Temi di discussione

(Working papers)

A tale of fragmentation: corporate funding
in the euro-area bond market

by Andrea Zaghini

Number 1104 - February 2017

The purpose of the Temi di discussione series is to promote the circulation of working papers prepared within the Bank of Italy or presented in Bank seminars by outside economists with the aim of stimulating comments and suggestions.

The views expressed in the articles are those of the authors and do not involve the responsibility of the Bank.

Editorial Board: INES BUONO, MARCO CASIRAGHI, VALENTINA APRIGLIANO, NICOLA BRANZOLI, FRANCESCO CAPRIOLI, EMANUELE CIANI, VINCENZO CUCINIELLO, DAVIDE DELLE MONACHE, GIUSEPPE ILARDI, ANDREA LINARELLO, JUHO TANELI MAKINEN, VALERIO NISPI LANDI, LUCIA PAOLA MARIA RIZZICA, MASSIMILIANO STACCHINI.

Editorial Assistants: ROBERTO MARANO, NICOLETTA OLIVANTI.

ISSN 1594-7939 (print)

ISSN 2281-3950 (online)

Printed by the Printing and Publishing Division of the Bank of Italy

A TALE OF FRAGMENTATION: CORPORATE FUNDING IN THE EURO-AREA BOND MARKET

by Andrea Zaghini*

Abstract

Corporations of different euro-area countries faced noticeably different costs of funding in the bond market during the prolonged period of financial instability that started in 2007. We identify the determinants of corporate bond yield spreads in order to isolate country-specific effects as indicators of market fragmentation. Our evidence hints at a disorderly process of reassessment of corporate credit risk since 2007, with country-specific spreads vis-à-vis Germany becoming strongly positive for issuers located in other euro-area countries (Ireland, Italy, Portugal and Spain, in particular). After the introduction of the non-conventional monetary policy tool named OMT, the spreads declined considerably, but fragmentation disappeared only in the most recent period characterized by expectations and the actual deployment of ECB quantitative easing.

JEL Classification: G15, G32, G38.

Keywords: credit risk, corporate bonds, market fragmentation, sovereign debt crisis.

Contents

1. Introduction	5
2. Literature review	8
3. Data and sample characterization	11
4. The model.....	16
5. Risk-premium determinants and country-specific effects.....	21
6. Are banks different?	26
7. Robustness analysis.....	29
8. Concluding remarks	34
References	36

* Bank of Italy, DG-Economics, Statistics and Research. E-mail: andrea.zaghini@bancaditalia.it

1 Introduction¹

In the euro area the establishment of the monetary union in 1999 was a milestone on the road to more integrated financial markets, since it eliminated once and for all the exchange rate risk within the new currency area. In addition, legal and institutional reforms, along with the development of new financial instruments and trading platforms, facilitated the integration process leading to a significant increase in capital and trade flows among countries (Hartmann et al. 2003, Baele et al. 2004). Well integrated financial markets are a fundamental pillar of a monetary union, since they are essential in safeguarding that the common monetary policy decisions are transmitted in an effective and equal way to all member countries (ECB 2013). However, the burst of the global financial crisis in 2007 and the unfolding of the euro-area sovereign debt crisis from 2010 called into question the extent to which financial markets in the euro area are actually integrated.

While the empirical literature has extensively focused on analyzing the emergence of price anomalies in the sovereign debt market of both emerging markets (Beirne and Fratzscher 2013, Buraschi et al. 2015, Du and Schreger 2016) and advanced economies (Georgoutsos and Migiakis 2013, Giordano et al. 2013, Dewachter et al. 2015), and on assessing the degree of integration/fragmentation in the interbank market (Angelini et al. 2011, Garcia de Andoain et al. 2015, Mayordomo et al. 2015), the corporate bond market has only recently attracted attention. This is surprising, given its importance as a funding source for both financial and non-financial corporations and its role as a link to the real economy, especially in a period of significantly

¹The author would like to thank Antonio Di Cesare, Giuseppe Grande, Jennifer Itzkowitz, Marcello Pericoli, Taneli Mäkinen, Juri Marcucci, Andrea Silvestrini, Jeff Wooldridge and Gabriele Zinna for helpful discussions and useful suggestions. The views expressed in the paper do not necessarily reflect those of the Bank of Italy.

declining loans from banks (if not a proper credit crunch). The few existing contributions (De Santis 2016, Horny et al. 2016, Zaghini 2016) find that a certain degree of market fragmentation emerged in the euro area during the global financial crisis, increased in the years of the sovereign debt crisis and significantly decreased since 2012, when several non-conventional monetary policy instruments were introduced. However, the quoted works focus only on non-financial corporations and rely on different groups of countries, making a comparison of the results almost impossible. In addition, there is no agreement whether at the end of the time sample (end of 2014/beginning of 2015) there is already a return to perfect market integration. Finally, they do not include (or include only partially) the period characterized by the expanded asset purchasing programme (EAPP), the ECB quantitative easing, which, most likely, is the most important non-conventional monetary policy measure implemented so far in the euro area.

Adding to this scarce literature, the aim of this paper is threefold: i) to investigate the causes of the different yields paid by euro-area corporations over the subsequent phases of the global financial crisis, including the most recent period of ECB quantitative easing; ii) to precisely assess the degree of market fragmentation for an enlarged group of euro-area countries; iii) to evaluate the differences in the cost of funding via bonds between banks and non-financial corporations.

In particular, we build on the traditional model proposed by Morgan and Stiroh (2001) and Sironi (2003) on the determinants of bond spreads at origination. We conveniently add to the standard set of exogenous variables (i.e. those tracking bond, issuer and market characteristics) the interactions of country and time dummies. In this way, it is possible to identify and follow over time the role of purely country-specific factors. Whenever country-specific effects are statistically significant we have a violation of the law of one price, which is at the base of the definition of perfect market integration, and thus we can claim that the market is fragmented.

We find that in the tranquil period before the burst of the global financial crisis (2005Q1-2007Q3) the euro-area corporate bond market was well integrated. Instead, the two waves of the global financial crisis (the crash of the US sub-prime mortgage market and the default of Lehman Brothers, 2007Q4-2010Q2) significantly affected the market by breaking the integration and determining a deterioration of the funding ability of corporations in several countries. However, it is during the sovereign debt crisis (2010Q3-2012Q2) that corporate fragmentation became a pressing policy issue, with corporations from almost all countries experiencing a significant disadvantage with respect to Germany, which we set as the reference country. After the *whatever-it-takes* speech of the ECB President Mario Draghi and the introduction of the new OMT (outright monetary transactions) tool, market tensions started to ease, even though market fragmentation was still evident in the bond market (2012Q3-2014Q2). It is only in the most recent period, characterized by the expectations and the actual implementation of the ECB quantitative easing (2014Q3-2015Q4), that the market returned to a level playing field with country-specific effects *vis-à-vis* Germany disappearing also in the most troubled countries.

Finally, as concerns the different cost of funding across sectors, we find that, with the exception of Finland and Italy, banks in the euro area suffered more than firms the fragmentation in the bond market, paying, *coeteris paribus*, a higher spread. Again, it is only in the latest period of quantitative easing that banks and firms were able to face the same funding cost in the corporate bond market.

The rest of the paper is organized as follows. In Section 2 we discuss the contributions on market fragmentation; in Section 3 we describe the dataset; in Section 4 we introduce the econometric methodology; in Section 5 we analyze the factors determining bonds' risk premium at origination and assess the degree of market fragmentation; in Section 6 we distinguish between banks and firms; in Section 7 we provide several robustness checks;

in Section 8 we draw the conclusions.

2 Literature review

An important consequence of the turmoil in the euro-area sovereign debt market was the transmission of the crisis to the corporate bond market. Eventually, not only banks but also firms were involved in the crisis via the “transfer risk” phenomenon, experiencing a deterioration of their funding abilities (Bedendo and Colla 2015). However, the deterioration was unequal across countries and led to an increasing market fragmentation and segmentation along national borders. Corporate risk premia soon reached unprecedented levels and the heterogeneity across countries increased significantly leading to a worrying widening in the yield spreads between bonds issued by corporations headquartered in the countries most involved in the crisis and those issued by corporations headquartered in countries with sounder public finances. This market evolution, together with diverging banks’ lending rates, was conflicting with the smooth transmission of the common monetary policy. Thus eliminating financial fragmentation was at the base of the interventions of the ECB in 2012, often via non conventional monetary policy measures (Durrè et al. 2013).

However, the empirical literature has almost entirely focused on the fragmentation in the sovereign debt market neglecting the corporate segment of the bond market. In addition, while the role of banks has been extensively investigated as a link in the transmission of fragmentation from the sovereign to the real economy (CGFS 2011, van Rixtel and Gasperini 2013, Angelini et al. 2014) or even as a direct cause of fragmentation, when providing funds at diverging rates to non-financial corporations and households (Giannetti and Laeven 2012, Albertazzi et al. 2014, Popov and Van Horen 2015), it has been overlooked when they were funding themselves on the bond market as any other corporation. All in all, just three very recent contributions have

tackled the issue of estimating the degree of fragmentation across bonds issued by euro-area (non-financial) corporations (De Santis 2016, Horny et al. 2016, Zaghini 2016). In what follows we will examine their approach and discuss their conclusions.

Building on the work for the US bond market by Gilchrist and Zakrajsek (2012), who introduced the concept of excess bond premium (EBP) as the difference between the duration adjusted credit spread and the spread justified by observable credit risk, De Santis (2016) expands the EBP measure to include also market risks slightly and idiosyncratic shocks. Relying on 2,345 bonds issued by non-financial corporations from 9 euro-area countries over the period January 1999 - March 2015 the author proposes as a measure of fragmentation the degree of dispersion across countries of domestic EBP values. He finds that fragmentation (the standard deviation of EBP) was very large till 2003 (especially for high-yield bonds), declining just before the burst of the global financial crisis, and then showing two peaks of almost identical size in the period immediately after the Lehman Brothers default and in the most acute phase of the sovereign debt crisis (2011-2012). While significantly declining after the introduction of the OMT, fragmentation slightly increased at the beginning of 2015.

Again focusing of non-financial corporation bonds (2,434 primary issues from 9 euro-area countries), Zaghini (2016) introduces country dummy variables in a standard model of risk-premium determinants. He refers to the sum of the dummy coefficients as the measure of market fragmentation. In particular, only when the joint coefficient estimate is significantly different from zero the model signals fragmentation. The results suggest that, despite a certain degree of volatility in country-specific effects, the overall integration of the euro-area bond market was not affected by the first wave of the financial crisis (2007-2009). Instead, in the four years from 2010 to 2013 fragmentation was detected and the joint estimate of country coefficient was highly significantly different from zero. Finally, the return to the perfect

market integration happened already in 2014.

In line with Zaghini (2016), also Horny et al. (2016) focus on country dummies to assess the degree of market fragmentation. In particular, their econometric approach is based on dummy regressions for three main drivers: i) the countries' fixed effect, ii) the bond rating, iii) the slope of the term structure. By looking over the period from 2005 to early 2015 at the secondary market pricing of 735 bonds issued by non-financial corporations headquartered in Germany, France, Italy and Spain, they show that the spread to German bonds is hardly ever significantly different from zero for France, it peaks for Italy at the end of 2011 and it peaks for Spain at the end of 2012. Then they rely on the sum of the country coefficients to obtain the measure of market fragmentation. They show that while financial fragmentation remained fairly limited in the post Lehman period (2008-2009), it reached very high levels at the heights of the euro-area sovereign debt crisis in 2011 and 2012. Fragmentation receded gradually after the OMT announcement but it was still detected (50 basis points) at the beginning of 2015.

Among the findings of the three papers there is agreement on the perfect market integration achieved before the burst of the global financial crisis and the high level of fragmentation detected during the most acute phase of the sovereign debt crisis. However, there are also differences, such as the unclear effect of the first wave of the crisis on the market integration and the degree of fragmentation at the end of the time span (2014 or early 2015). In the rest of the paper we will investigate the degree of market integration/fragmentation in the euro-area bond market by taking into account, in addition to non-financial corporations, also the bond placement of banks, by extending the time horizon in order to include also the launch of the ECB quantitative easing, and by including in the analysis all the troubled economies (Ireland, Italy, Portugal and Spain), which were not taken into account all together

by the previous contributions.²

3 Data and sample characterization

Since the aim of this paper is to analyze the determinants of the cost of bond funding for euro-area corporations, we focus on the yield at issuance of bonds. In particular, we look at the asset swap (ASW) spread paid by corporations at origination, namely on the primary market. The ASW spread is a measure of the distance between the bond yield and a risk-free asset (the rate on the asset swap contract with similar characteristics).³ We do not follow the ASW spread on the secondary market since, after the bond launch, it reflects the market assessment of a possible trade in that moment but it does not change the face value of the bond (i.e. it does not change the actual cost for the issuing corporation). Actually, secondary market prices are only an imperfect measure of an hypothetical funding decision for that date (often being based on brokers' indicative prices or dealers' quotes) which are most of the times not coupled with an actual trade. While focusing on a single value for each bond may reduce the full exploitation of the time dimension of the dataset, it leads to a larger selection of bonds and issuing institutions.

The dataset exploited in this paper contains bonds issued over the period 2005Q1-2015Q4 by euro-area listed and non-listed corporations with life to maturity of at least 1 year. In particular, the final sample includes 8,469 bonds issued by 455 corporations (149 banks and 306 non-financial corporations) from 10 countries. Table 1 proposes a snapshot of the issuance activity by country.

²While the paucity of data does not allow to include Greece in any of the quoted analyses, out of the remaining four troubled economies, De Santis (2016) takes into account Ireland, Italy and Spain, Zaghini (2016) includes Italy, Portugal and Spain, Horny et al. (2016) rely on Italy and Spain.

³The ASW spread is the same yield spread used in De Santis (2016) and Zaghini (2016), while Horny et al. (2016) rely on the spread from German Bunds.

Table 1. Bond characteristics by country

Country	Issuers	1-timers	Bonds	Maturity	Tranche Value	ASW
<i>Austria</i>	25	7	171	2,379	424	80
<i>Belgium</i>	18	7	330	2,632	456	95
<i>Finland</i>	14	1	114	2,116	434	119
<i>France</i>	100	22	1,966	2,627	469	90
<i>Germany</i>	95	25	2,787	2,216	296	70
<i>Ireland</i>	15	4	150	2,117	604	252
<i>Italy</i>	69	20	801	2,383	598	164
<i>Netherlands</i>	39	6	1,176	2,360	404	68
<i>Portugal</i>	12	3	112	2,322	609	237
<i>Spain</i>	68	20	862	2,094	604	172
<i>Total</i>	455	115	8,469	2,353	431	101

The number of corporations which have been tapping the bond market over the sample period goes from 100 in France to 12 in Portugal. Several corporations (115) are 1-timers, i.e. they issued only one bond; the share ranges from 7% in Finland to 39% in Belgium.⁴ At the same time the largest number of bonds issued by a single country is 2,787 (Germany), the minimum is 112 (Portugal). The maturity at issue suggests that Belgian and French corporations are used to place bonds with longer redemption horizons (the average being over seven years), whereas Spanish, Irish and Finnish issuers prefer to place bond with shorter maturities (the average being below six years). As for the volume of the initial placement, corporations from just three countries (Spain, Portugal and Ireland) place bond tranches with an average value above 600 million euros, while German corporations exhibit the smallest value (296 million euros). Given the striking heterogeneity even in the bond basic characteristics (maturity and volume), it is not surprising that the ASW spread paid by issuers headquartered in different euro-area countries shows a broad range: from 70 basis points Germany to 252 in

⁴The share of 1-timers is relatively similar for the four top euro-area economies (23% in France, 27% in Germany, 29% in Italy and Spain).

Ireland.

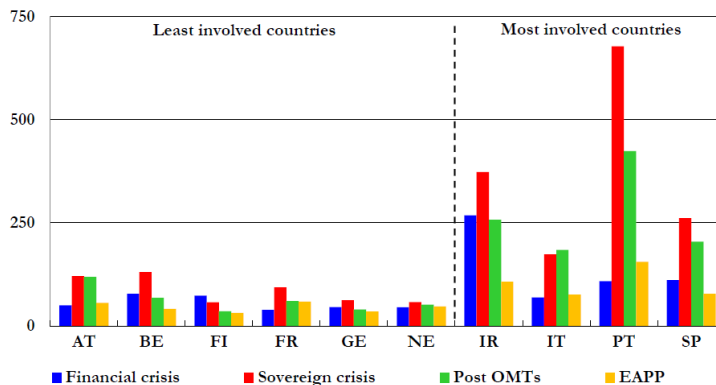
The time span of our dataset allows us to follow all the phases around the global financial crisis. In particular, we refer to five time periods: i) the initial tranquil period which precedes the turmoil in the US subprime mortgage market; ii) the unfolding of global financial crisis ; iii) the spread of the crisis to the sovereign bond market in the euro area; iv) the period of relative easing tensions which follows the OMT launch by the ECB; v) the period characterized first by market expectations of a quantitative easing by the ECB and then by the actual deployment of the expanded assets purchasing programme (EAPP). While providing in Section 7 several robustness checks with respect to the time framing, the initial choice follows the chronology of the most relevant episodes. The tranquil period starts in 2005Q1 and ends in 2007Q3, when BNP Paribas, France’s largest bank, halts redemptions on three investment funds based on US subprime mortgage market, triggering the intervention of FED and ECB. The episode which, instead, characterizes the euro-area sovereign debt market turbulence is the impossibility of Greece to tap the bond market and the request of international financial assistance on April 2010 (namely, the “global crisis” period ends in 2010Q2 and the “sovereign crisis” period starts in 2010Q3). Since the new OMT tool was announced on July 2012 by ECB president Draghi and financial markets immediately reacted positively, with sovereign and corporate spreads starting a new phase of convergence, we select 2012Q3 as our starting quarter for the “post OMT” period. Finally, we select 2014Q3 as a starting point of the “EAPP” period since, from the second half of 2014, it started to be clear across market agents that the inclusion of sovereign bonds in the standard asset purchasing programme was close to be implemented, making the programme a straightforward quantitative easing.

Relying on the above-mentioned time partition, Figure 1 and Figure 2 show the development over time of the ASW by country. The common effect of the global financial crisis is evident: the crisis brought about everywhere

a significant increase in the premia paid by corporations (with the only exception of Finnish banks). Instead, it is also clear that during the sovereign debt crisis the financial turmoil was felt in a very different way across the euro area. The countries most involved in the crisis (Ireland, Italy, Portugal and Spain) saw a further significant increase in the cost of issuance for both banks and firms, whereas the countries less involved faced in many instances just mild adjustments (for firms in Austria, Belgium and Germany the actual cost at issuance even declined). The ASW spread dropped almost everywhere in the OMT period, but it is only in the latest phase, characterized by the ECB quantitative easing, that the tensions in the corporate bond market lessened to the extent of bringing back the ASW spread to levels similar to the pre-crisis period.

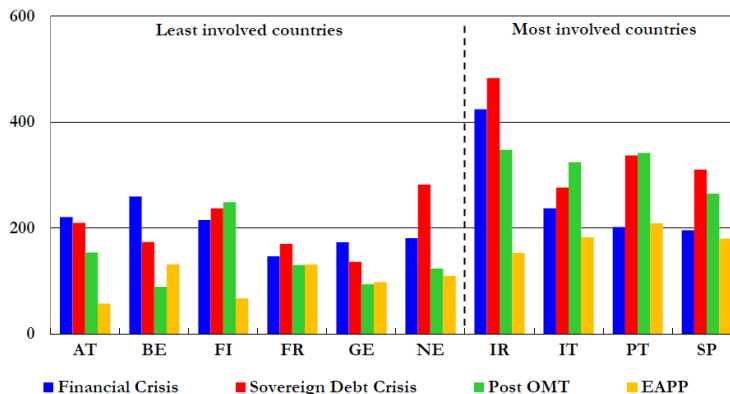
Another relevant aspect that emerges is the remarkably different size of the ASW spread paid by banks and firms. While the ASW spread was generally significantly higher for firms than banks in the tranquil period, the financial and sovereign debt crises made the spreads spike very much in the same fashion. Given that the crisis originated in the financial system and that the sovereign debt crisis was plagued by the vicious loop between sovereigns and domestic banks, it is not surprising that in several countries the banking system suffered larger increases in the cost of bond funding than firms.

Figure 1 Actual ASW spread on bank bonds (basis points)



AT=Austria, BE=Belgium, FI=Finland, FR=France, GE=Germany, NE=the Netherlands, IR=Ireland, IT=Italy, PT=Portugal, SP=Spain. Tranquil period=(2005Q1-2007Q3), Financial crisis=2007Q4-2010Q2, Sovereign crisis=2010Q3-2012Q2, post-OMT's=2012Q3-2014Q2, EAPP=2014Q3-2015Q4.

Figure 2 Actual ASW spread on firm bonds (basis points)



AT=Austria, BE=Belgium, FI=Finland, FR=France, GE=Germany, NE=the Netherlands, IR=Ireland, IT=Italy, PT=Portugal, SP=Spain. Tranquil period=(2005Q1-2007Q3), Financial crisis=2007Q4-2010Q2, Sovereign crisis=2010Q3-2012Q2, post-OMT's=2012Q3-2014Q2, EAPP=2014Q3-2015Q4.

Even though the reported evidence suggests that the corporate bond market was segmented along national borders, we still cannot label this cross-country heterogeneity as market fragmentation. While market heterogeneity is a statistical phenomenon that can be easily measured, market fragmentation is an economic concept, which is more subtle to detect. Actually, financial fragmentation can be conveniently defined as the absence of perfect market integration. In turn, perfect integration envisages a situation in which – due to the law of one price – yield spreads are determined only by differences in the perceived riskiness of assets (related to asset features and issuer creditworthiness) and do not depend on the country of residence of the issuer (Baele et al. 2004). This means that two corporations headquartered in different countries which issue the same type of bond and which are perceived by investors as being completely equivalent in terms of riskiness (the so called *coeteris paribus* condition), should face the same cost of funding. Thus, whenever the *coeteris paribus* condition holds, also the ASW spread should be the same.

Can we say that the *coeteris paribus* condition holds for the bonds issued by the 455 corporations in our sample? Certainly not. Not only the characteristics of the bonds are seldom similar, but also the riskiness of the issuers varies a lot. Thus, the effect (if any) of the residence of the issuer is at best mixed up with the other price determinants. The rest of the paper aims at disentangling the different drivers of the ASW spread, in order to assess whether country-specific effects are indeed at work, whether they change over time and whether they differ between banks and firms.

4 The model

In order to empirically assess the determinants of the risk premium on the primary bond market, we build on the model proposed by Morgan and Stiroh (2001) and Sironi (2003). Their model simply divides the drivers of the bond

spread in three sets of variables: those related to the bond features, (V_l^{bond}), those characterizing the issuing corporation (V_l^{issuer}) and those taking into account the market conditions at the time of issuance (V_z^{market}). Analytically:

$$spread_i = \alpha_0 + \sum_k \alpha_k V_{i,k}^{bond} + \sum_l \alpha_l V_{i,l}^{issuer} + \sum_z \alpha_z V_{i,z}^{market} + \sum_j \alpha_j D_{i,j}^{frag} \quad (1)$$

where $spread_i$ is the ASW spread at origination and $D_{i,j}^{frag}$ is an additional set of variables, which includes country dummies, period dummies and their interactions. The latter group of variable is needed to explicitly allow for country-specific effects and test the assumption of perfect market integration. As already mentioned, when a market is perfectly integrated, risk premia do not depend on the country of residence of the issuer, provided that all the relevant sources of risk are taken into account (*coeteris paribus* condition). If instead there is evidence that the risk premia differences are due to the country in which the issuing corporation is headquartered, we have a fragmented market. In particular, by excluding a reference country from the set $D_{i,j}^{frag}$, the estimated α_j coefficients and their standard errors will show, for each country, the difference with respect to the reference country and the statistical accuracy of the estimates. In this way the null hypothesis of perfect market integration (i.e., absence of fragmentation) can be conveniently set as all country coefficients being equal to zero.⁵

Following Morgan and Stiroh (2001) and Sironi (2003), all exogenous variables belonging to the first three groups are taken at time t (the exact issuance day), with the exception of balance sheet data which are lagged by one year (i.e., they refer to the latest annual balance available at t). Thus the model has a cross-section structure and its estimation can be thought of

⁵From an econometric point of view the procedure is equivalent to run a regression including also the reference country, then compare the coefficients of each country with those of the reference country, and finally test the significance of the differences.

as equivalent to a standard pooled OLS panel estimation.

The initial choice of the regressors is based on the traditional drivers of the risk premium provided by an abundant empirical literature.⁶ In particular, the bond features which are taken into account in $V_{i,k}^{bond}$ are: the time to maturity at origination; the amount issued (single tranche), the currency of denomination, the bond risk category. With regard to the time to maturity of the bond, we expect that issuing corporations may find more difficult to place longer-term bonds, due to the roll-over risk associated to the longer redemption horizon, hinting at a positive relation with the ASW spread. Concerning the volume of the issue, there might be two effects at work going in opposite directions. While issuing corporations may face higher costs to generate a sufficiently large demand for their placements, a larger issuance volume may imply improved liquidity for secondary market trades. It follows that the relation between the bond volume and the ASW spread is ex-ante ambiguous. In addition, in order to better take into account the liquidity of the bond, we use an indicator of the relative size of issue: the ratio of each bond value over the monthly average.⁷ As for the assessment of the ex-ante default risk of the bond, we refer to the broad categorization into “Investment grade” bonds (rating above or equal to BBB-) and “High yield” bonds (rating below BBB-). We expect that investment grade bonds pay a smaller ASW spread than high yield bonds. Finally, among the bond characteristics we also take into account whether the bond is a covered bond or not by introducing an *ad hoc* dummy variable.⁸

⁶In addition to the quoted works by Morgan and Stiroh (2001) and Sironi (2003), the interested reader is referred to the seminal contributions by Elton et al. (2001), Collin-Dufresne et al. (2001), Campbell and Taksler (2003). More recent empirical analyses are instead proposed by Santos (2014), Anginer and Warburton (2014), Ahmed et al. (2015).

⁷Other indicators of liquidity are employed in the robustness section. Note that standard measures of bond-specific liquidity used when analysing secondary market yield spreads (e.g. the number of trades per day or the bid-ask spreads), cannot be used when dealing with the bonds issued on the primary market since just the data concerning the originating trade is available (Bao et al. 2011, Dick-Nielsen et al. 2012, Wang and Wu 2015).

⁸Covered bonds are collateralized bonds typically issued by banks. In the sample there

The set $V_{i,t}^{issuer}$ includes measures of the creditworthiness of the corporations, an indicator of their size and whether issuing corporations are 1-timers or have issued more than one bond in the period under consideration. We also take into account the industry sector.⁹ As for the creditworthiness, we rely on a two-pronged approach. On the one hand, we use the official rating of the issuer, which is a measure of the perceived credit risk of the issuing institution as assessed on a professional basis by rating agencies. In particular, first we average the available ratings provided by Moody's, Fitch and Standard&Poors by linearizing them between 1 (CC/Ca) and 20 (AAA/Aaa), then we create a dummy for each of the 20 categories. On the other hand, we rely on firm specific variables and use the total equity over total liabilities ratio (EL_ratio) and the total debt over total assets ratio (DA_ratio). We expect that a higher leverage (i.e., lower EL_ratio and higher DA_ratio) is associated with a larger ASW spread. On the contrary, the size of the issuing company (log of total assets) is expected to negatively affect the bond spread: given their diversified activities large corporations are better positioned to reduce risk. In addition, their prominence for the domestic economy might entail them to benefit from the too-big-to-fail (TBTF) implicit government support. The idea is that governments would not allow large banks or firms to go bankrupt if their failures were to significantly harm the overall economic activity or even the domestic financial stability. It is thus assumed that, because of the TBTF support, investors expect the government to back the debt of these institutions should they face sustained financial stress (Mishkin 2006).

Finally, as proxy of the euro-area market sentiment we use the CISS Index, which is the financial market stress indicator for the euro area proposed by

are around 1600 such bonds. While they are expected to pay a smaller ASW spread than comparable bonds, their exclusion from the regressions do not change quantitatively or qualitatively the results of the paper on the the degree of market fragmentation.

⁹Corporations are classified into 10 sectors: banks, industrials, consumer goods, consumer services, utilities, telecommunications, technology, basic materials, oil & gas and health care.

Hollo et al. (2012) and regularly updated at the monthly frequency by the ECB statistical data warehouse (SDW). We expect that higher uncertainty is detrimental for investments and thus leads to an increased ASW spread.¹⁰

For the assessment of fragmentation, in the next section we rely on Germany as the reference country for two main reasons: 1) Germany is the largest euro-area economy and it is the only country which has enjoyed a stable rating of triple A over the whole period under analysis; 2) since the bonds issued by German corporations represent a large share of the sample (Table 1), they can serve as a statistically significant benchmark.

As for the data sources, we merged information from several databases in order to have a sample of 8,469 bonds issued by euro-area corporations over the period 2005Q1-2015Q4. In particular, the ASW spread is taken from Thomson Reuters Datastream, balance sheet variables are sourced from Capital IQ, issuance features come from DCM Analytics by Dealogic, the CISS Index from ECB SDW.¹¹

¹⁰The CISS (Composite Indicator of Systemic Stress) comprises 15 market-based financial stress measures concerning five broad market segments (financial intermediation, money market, equity market, bond market, foreign exchange market). The main methodological innovation is the application of standard portfolio theory to the aggregation of the five segment-specific stress measures into a single composite indicator. Given that the cross-correlation between the five sub-indexes is allowed to vary over time, the CISS gives relatively more weight to periods of systemic stress, in which several market segments are impaired at the same time. Other measures of financial market sentiments are used in the robustness checks in Section 7.

¹¹We excluded from the sample the top 1% and the lower 1% of bonds according to the reported ASW spread in Datastream. We did not include in the sample bonds from Greece and Luxembourg, since corporations from those countries did not tap regularly the bond market. We also excluded from the sample all bonds issued by financial corporations other than banks.

5 Risk-premium determinants and country-specific effects

Table 2 shows the estimated results from model (1). In particular, the upper panel of Table 2 reports the estimated coefficients on bond, issuer and market characteristics, while the lower panel shows the coefficients on the interaction between country and time dummies from the same regression. In each of the five periods and for each country, the coefficients in the lower panel can be interpreted as the relative advantage/disadvantage in tapping the bond market with respect to German corporations due to the country of residence of the issuer. Only when the estimated values are not significantly different from zero, we can claim that the market is perfectly integrated.

The two basic features of life to maturity and tranche value turn out to positively affect the ASW spread. As expected, bonds with longer maturity show higher spreads to compensate investors for the higher risk that these bonds carry over the extended horizon. Instead, the positive sign of the bond size reflects both a negative assessment of the increased debt burden, and the fact that, in order to place a larger issue, corporations are required to pay a higher spread to generate a sufficient demand. At the same time, the relative size of the bond is not significantly different from zero, euro-denominated bonds and covered bonds have a discount of 21 and 39 basis points, respectively. Finally, being in the “investment grade” class determines a reduction in the ASW spread of around 130 basis points.

As far as the issuer characteristics are concerned, the coefficients on both size and leverage are significant and with the expected sign. Our estimates thus confirm the possibility of a bias in favour of the issuers of larger dimension. As suggested by a broad literature, larger corporations are able to get a discount on their issues, not only because they tap more often the bond market and are able to diversify risks, but also because their absolute and relative dimension make them of (domestic) systemic relevance and benefi-

ciary of the implicit government too-big-to-fail insurance. At the same time, a larger leverage implies higher risk-taking and higher default risk and it is consequently associated with a larger ASW at origination. Finally, 1-timer issuers seem not be penalised with respect to usual issuers.

As expected, the ASW spread is positively correlated with the market sentiment variable: the higher the market stress, the higher the ASW spread paid on new bonds.

Focusing on the assessment of market fragmentation (lower panel of Table 2), the estimated interactions of country dummies and time dummies suggest that in the tranquil period before the eruption of the crisis, characterized by buoyant financial market conditions and accommodative monetary policy, the euro-area bond market was perfectly integrated. Country-specific effects are everywhere not significantly different from zero.¹² Our results thus confirm the findings of the previous literature, which reports that before the financial crisis the process of financial market integration was already achieved not only in the bond market, but also in several other market segments (Hartmann et al. 2003, Baele et al. 2004, Battistini et al. 2014).

The financial crisis period brings about a first significant change in the relative funding cost: in several countries there is an increase in the spread to Germany. The difference is significant but still limited for Belgium, Spain and Portugal (between 28 and 35 basis points) and very large for Ireland (140 basis points), the country most hit by the first wave of the crisis. At the same time, the joint test rejects the null of perfect integration (p -value = 0.086).

¹²Also the test of joint significance of the country-specific coefficients (which can well be interpreted as a direct test for overall market integration) can not reject the null of perfect integration.

Table 2. Regression results¹

	Coefficient	Std. Err.	P-value		Coefficient	Std. Err.	P-value		
Maturity	0.010	0.001	0.000	Issuer size	-4.02	2.018	0.047		
Value	0.007	0.005	0.095	EL_ratio	-45.6	28.058	0.099		
Relative value	0.109	2.029	0.957	DA_ratio	37.0	12.404	0.003		
Issuance in euros	-20.86	4.134	0.000	1-timer	8.29	11.72	0.480		
Covered bond	-39.05	8.493	0.000	Market stress	212.6	17.866	0.000		
Investment grade	-129.4	23.88	0.000						
	Austria	Belgium	Finland	France	Ireland	Italy	Netherlands	Spain	Portugal
Tranquil period	-26.2	10.4	-47.1	-24.1	-20.7	-24.6	-12.0	-11.3	-9.8
Global crisis	-27.5	35.0 *	18.7	-20.0	139.5 ***	3.9	-43.0 **	33.0 ***	27.5 *
Sovereign crisis	57.0 ***	72.3 ***	13.9	18.5 **	162.9 ***	112.2 ***	-14.3	189.6 ***	393.4 ***
Post OMT	38.8 **	21.7 *	8.2	0.2	47.9 *	113.3 ***	-7.2	104.5 ***	162.0 ***
EAPP	-8.6	16.4	7.8	2.2	-11.0	-0.8	-1.9	0.3	12.6

1) Dependent variable: ASW spread; included observations: 8,469; robust standard errors are clustered by issuer; regression includes FE by sector and by issuer rating; Adj R-squared=0.775; symbols ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively. ASW spread is the difference between the bond yield and the fixed-leg rate of a swap contract with the same maturity (basis points); Maturity is the bond maturity at issuance (days); Value is the tranche value of the bond issuance (millions of euros); Issuance in euros is a dummy which takes the value 1 for euro-denominated bonds and 0 otherwise; Covered bond is a dummy which takes 1 for covered bonds and 0 otherwise; Investment grade is a dummy which takes the value 1 for bonds rated BBB- or above and 0 otherwise; Issuer size is the log of the balance sheet value of all assets (millions of euros); 1-timer is a dummy which takes 1 for corporations which issued only one bond over the period 2005Q1-2015Q4 and 0 otherwise, Market stress is the CISS Index proposed by Hollo et al. (2012); EL_ratio is the total equity to total liabilities ratio; DA_ratio is the total debt to total assets ratio.

It is in the period characterized by the sovereign debt crisis that the fragmentation in the corporate bond market becomes a policy issue. The abrupt reassessment of sovereign risk in several countries significantly weights on the funding conditions of domestic corporations, increasing the segmentation along national borders. Starting from the second half of 2010, international rating agencies steadily downgrade to the sovereign rating of Portugal and Spain and soon start to revise also Italian and Belgian creditworthiness. To a more muted extent, the process involves also Austria and France; only Finland and the Netherlands are spared from it. This process spills over to

the corporate market increasing the funding cost of both banks and firms (Bedendo and Colla 2015). The estimated ASW spread differences with respect to German peers attributable to country-specific effects skyrocket to 393 basis points in Portugal, 190 in Spain, 163 in Ireland and 112 in Italy. While the spread peaks in the most hit countries, the relative disadvantage in tapping the bond market is evident also in other countries (Austria, Belgium and France).

Over the most acute phase of the sovereign debt crisis, the dramatic U-turn in the process of financial integration has even challenged the existence of the euro currency. The fear of a euro break-up (the so called redenomination risk) starts to be priced in peripheral euro-area securities, further increasing yield spreads to Germany of both sovereign and corporate bonds (Di Cesare et al. 2012, Klose and Weigert 2014, Dewachter et al. 2015). The ECB deploys a series of non-conventional monetary policy tools, in particular to avoid that a distorted market assessment, plagued by the inconsistent appraisal of tail-risks, could lead to a security pricing which did not reflect countries' fundamentals (Durrè et al. 2013). Among them the OMT scheme (announced by the now renowned *whatever-it-takes* speech by President Draghi) marks a change in the market sentiment and triggers an unwinding of the tensions.

Starting from July 2012, risk premia slowly but constantly declined. The overall reduction in the spread with respect to the German corporate cost of funding is sizable. However, especially in the most troubled economies, the improvement is not large enough to fully offset the deterioration recorded during the sovereign debt crisis. In the post OMT period, the estimated difference in the ASW spread is still large and significant for Ireland, Italy, Spain and Portugal (between 48 and 162 basis points), it is positive for Austria and Belgium (39 and 22 basis points, respectively) and it is no more significantly different from zero in France.

From the second half of 2014, in the context of a still unequal cost of

corporate and sovereign funding across countries, a weak growth outlook for the euro area and an increasing risk of deflation, agents' expectations of a quantitative easing from the ECB gathered momentum. The possibility of a direct purchase of sovereign bonds started driving domestic yields towards historical minima, well in advance of the official announcement and launch of the programme.¹³

Even though the purchase of bonds is proportional to the sovereign participation in the ECB capital, the most indebted and less creditworthy countries benefited the most from the EAPP, since the programme helped them reducing the sovereign risk. This effect is evident also at the corporate level. For all the countries in the sample, the cost of corporate funding drops to a level comparable to German peers. The joint test of fragmentation suggests that the null hypothesis of perfect market integration can not be rejected (p -value = 0.727).

All in all, our evidence hints at a disorderly process of reassessment of the corporate credit risk over the extended period of the global financial crisis, the great recession and the sovereign debt crisis, which halted the process of financial market integration in the euro area. However, in the most recent period, the progress in restructuring the EU governance, the improved macroeconomic outlook, the launch of the Single Supervisory Mechanism, in addition to the non-conventional monetary policy measures, were able to bring back the market integration to pre-crisis levels.

As a further step of the analysis of market integration, in the next section we will investigate whether the above-mentioned process of risk overhauling has been equal for banks and firms. In other words, we want to check whether in addition to cross-country heterogeneity there is also evidence of sector

¹³The extension of the existing asset purchase programme to bonds issued by euro-area central governments, agencies and European institutions in the secondary market against central bank money was announced on the 22nd January 2015. The public sector purchase programme (PSPP), as part of the expanded asset purchase programme (EAPP), officially started on the 9th March 2015.

heterogeneity.

6 Are banks different?

To investigate the possibility of a different behavior of firms and banks over the sample period, we first regress model (1) with the inclusion of a dummy variable which takes 1 if the issuer is a bank and 0 otherwise. The coefficient on the bank dummy is 29.3 and significantly different from zero (p -value = 0.014).¹⁴ It thus seems *prima facie* that there is a structural difference between euro-area banks and firms in their ability in tapping the bond market, with banks being worse off. Is this true for all countries or just for a subset of economies? Is the additional spread constant or does it change over time? In order to answer these questions we have to adjust model (1). In particular, we include in the set $D_{i,j}^{frag}$ also: i) the interactions of all country dummies with the dummy tracking the banking sector; ii) the interactions of country, period and bank dummies. In this way we are able to assess the sector heterogeneity at the country level and its development over time.

The first line of Table 3 shows the estimates of a regression in which only the interactions of country and bank dummies are included. The results support the view that only for few countries (Belgium, Ireland and Spain) there is a significant “structural” difference in the cost of funding between banks and non-financial corporations, with the former paying an additional spread in the range 25-60 basis points.

To further analyze the issue, the lower panel of Table 3 reports the results of a regression in which all the interactions among country, period and bank dummies are included. When we expand the analysis to the time dimension, different country patterns emerge. Just for Finland and Italy there are no differences in any of the 5 periods. For all other countries, there is a

¹⁴Note that in the baseline regression reported in Table 2 fixed effects by sector were included. Instead, in the regressions in this Section, only the bank dummy is used as a regressor in order to differentiate the financial from the non-financial sector of the economy.

significant difference in the funding cost between banks and firms, at least in one period. In the tranquil period before the global financial crisis, for Belgium and Germany we have that banks were penalised by 48 and 60 basis points, respectively, with respect to non-financial corporations. At the same time in Ireland and Portugal it was exactly the other way around: banks were able to issue on the bond market at a discount with respect to firms. This evidence suggests that the productive structure of the single economies provided a different support to domestic issuers. For instance, in Ireland the financial sector of the economy was more developed than the industrial sector, with banks tapping more regularly the bond market and acting as a sort of “national champions”. In Germany instead, several small Sparkassen with regional demarcation might have been considered more opaque than equivalent industrial peers and thus penalised, *coeteris paribus*, when issuing bonds.

In the period characterized by the global financial crisis and the great recession, the differences between banks and firms diminish somewhat. While in Austria and the Netherlands banks are better positioned to tap the bond market and in Spain firms have an advantage, for the rest of the countries there appear no significant differences in the funding cost on the bond market.

Table 3. Estimated differences between banks and firms¹

	Austria	Belgium	Finland	France	Germany	Ireland	Italy	Netherlands	Spain	Portugal
2005Q1-2015Q4	-4.3	24.7 *	7.8	19.7	7.4	60.0 *	-16.81	-6.1	27.5 **	15.5
Tranquil Period	48.3	47.7	37.3	14.8	59.5 ***	-29.9 *	7.2	-51.8 ***	15.7	-23.7 ***
Global Crisis	-35.8 **	-26.3	-7.86	-22.1	-20.9	67.8	-37.7	-49.6 *	29.4 *	-14.06
Sovereign Crisis	-21.7	109.3 ***	-21.0	23.8	15.0	169.0 ***	10.0	-37.8	92.5 ***	199.0 ***
Post OMT	18.6	38.5	12.2	32.5 *	-0.6	107.0 ***	-33.1	22.3	17.4	-46.8
EAPP	1.3	-4.2	23.2	22.4	19.5	-34.0	-22.0	21.1	-40.2	9.0

(1) The table reports in the top panel the coefficients of the interaction of country dummies with a bank dummy (a dummy taking 1 when the issuing corporation is a bank and zero otherwise) in a regression according to Model (1). The table reports in the lower panel the interaction of countries dummies, period dummies and the bank dummy. Dependent variable: ASW spread; included observations: 8,469; robust standard errors are clustered by issuer; symbols ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively. See footnote on Table 2 for the description of the regressors.

Given that the spill-over of the sovereign financial distress involved banks more than firms (CGFS 2011, Angelini et al. 2014, Ahmed et al. 2015), it is not a surprise that the difference in the funding cost between banks and firms is the largest during the sovereign debt crisis. Banks from countries in which the government had to extensively intervene to support the domestic financial stability suffered the most. The difference ranges from 93 to 200 basis points in Belgium, Ireland, Spain and Portugal. The joint test of significance (the equivalent of the cross-country test for perfect market integration) confirms the rejection of the null of no heterogeneity (p -value < 0.001).

In addition to the reduction of market fragmentation across countries, the change in the market mood, brought about by the non-conventional monetary policy measures and the concomitant implementation of structural reforms in several Member States, has the effect of closing the gap between banks and firms in the post OMT period. However, a positive difference in the funding cost between banks and firms still prevails across euro-area countries, and the joint test of coefficients' significance still rejects the null of no heterogeneity (p -value = 0.054).

The outlook improves even further in the last period characterized by the expectations and the actual implementation of the EAPP (but also by the negotiations for the third bailout of the Greek sovereign debt). For the first time since 2005Q1 the estimated differences are not significantly different from zero in any country. The joint test confirms the absence of a significant discrepancy for the whole market (p -value = 0.851), thus suggesting a level playing field in the funding conditions between euro-area banks and firms.

7 Robustness analysis

In this section we examine how the main results concerning the degree of market fragmentation are affected by the choice of the regressors. In particular, we check whether results are robust to changes in the issuer creditworthiness, the bond grade and the variable assessing the market sentiments.

Starting from the firm rating, instead of using the full set of dummy variables (one for each rating category), we rely directly on the average values of the ratings assigned by Moody's, Fitch and Standard&Poors by linearizing them between 1 (CC/Ca) and 20 (AAA/Aaa), so that a larger value of the variable is associated to a better rating. The joint test of market integration is reported in the first column of Table 4 for each period. In a second check we use the proximity of bond and firm ratings. Bond ratings are assigned by rating agencies to the single issue at the time of issuance and as such, they reflect both the issuer default risk and the facility seniority and security structure. Since they are assigned at the moment of the bond placement, the agencies' evaluation might reflect an even more updated assessment of the firm than the firm's rating itself. As a matter of fact, firm ratings and the bond ratings are positively correlated (0.649), but far from being coincident (the two ratings are different for slightly more than half of the bonds). We thus use the bond rating (both linearized between 1 and 20 and as a set of dummy variables) as a proxy of the firm rating (column 2 and column 3,

respectively).

Table 4. Robustness of regressors: Test of market integration¹

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tranquil period	-125.0	-95.1	-83.3	-95.2	-69.8	-108.9	-91.1
Global crisis	171.4 **	208.6 **	319.8 ***	316.3 ***	177.6 *	199.2 **	192.8 **
Sovereign crisis	1,016 ***	999.2 ***	1,112 ***	1,106 ***	912.2 ***	960.9 ***	985.0 ***
Post OMTs	457.8 ***	425.8 ***	602.5 ***	399.2 ***	435.6 ***	325.8 ***	457.3 ***
EAPP	-42.0	44.2	56.6	-11.2	-22.9	-37.1	-51.6
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Tranquil period	-112.2	-102.1	-99.0	-174.7	-173.4	-139.1	-145.6
Global crisis	146.5 **	196.3 ***	220.0 ***	165.3 *	267.6 **	233.1 **	203.5 ***
Sovereign crisis	1,023 ***	1,034 ***	1,001 ***	1,023 ***	879.1 ***	945.5 ***	972.1 ***
Post OMTs	467.2 ***	512.0 ***	598.7 ***	483.3 ***	399.4 ***	308.8 **	418.3 ***
EAPP	-8.2	7.0	33.0	26.9	-18.0	-57.7	-67.9

(1) The table reports the test of joint significance of the country-specific effects for 14 different regressions. Columns (1) to (3) are robustness regressions for the firm rating; columns (4) to (7) are robustness regressions for the bond rating; columns (8) to (11) are robustness regressions for the market sentiments; columns (12) to (14) are robustness regressions for business cycle conditions. Dependent variable: ASW spread; included observations: 8,469; robust standard errors are clustered by issuer; all regressions include FE by sector; symbols ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.

In a further set of checks we change the variable identifying the ex-ante default risk of the bond by using directly the bond rating instead of the investment grade dummy. We first rely on the linearized version of the bond rating (maintaining also the firm rating as a linearized variable), in a second regression we employ the bond rating as a linearized variable but we use the firm rating as a set of dummies; in a third regression we proceed the other way around and in a fourth regression both bond rating and firm rating are employed as set of dummies (Table 4, columns 4-7).

As concerns the variable used to proxy the market sentiments, we use

three different indicators: i) the VSTOXX Index, which is a measure of equity market volatility in the euro area (computed relying on both call- and put-implied volatilities from the DJ Euro STOXX 50 index); ii) the VIX Index, which is the equivalent of the VSTOXX for the US stock market; iii) the index proposed by Gilchrist and Mojon (2014) which is a synthetic measure of the cost of market funding for both banks and non-financial corporations (columns 8-10). In addition, we also check for the market liquidity (column 11): we use as a regressor the average of the corporate CDS bid-ask spread for the four countries most involved in the sovereign debt crisis (Ireland, Italy, Spain and Portugal).¹⁵ Finally, to assess whether business cycle conditions influence the results of the paper, we introduce in model (1), as separate regressors, also the unemployment rate, the industrial production and the HICP inflation rate at the monthly frequency (columns 12-14).¹⁶

The robustness checks confirm the main results of the paper. The test of joint significance of the country-specific effects supports the interpretation provided in Section 5 for each period. The euro-area corporate bond market already achieved a comfortable degree of financial integration before the global financial crisis, which however started to become fragmented immediately after its burst. The sovereign debt crisis determined a sizable increase in the market fragmentation, which called for a decisive intervention of the ECB. The period of easing tensions in financial markets started in the summer 2012 led to a reduction of the market fragmentation, but country-specific effects continued to be priced in the bond yields of banks and firms headquartered in the most troubled economies. Eventually, the drop in the interest rates caused by the expectation and the actual implementation of the euro-area quantitative easing was able to bring back the corporate bond

¹⁵Since Bao et al. (2011) showed that the indices of equity market volatility comove in an important way with the aggregate market (i)liquidity, the VIX Index and the VSTOXX Index already used in regressions 8 and 9 may be interpreted also as a proxy of the market (i)liquidity.

¹⁶Note that also all the possible combinations of the three variables have been tested with no effects on the results of the paper. Data are sourced from ECB SDW.

market to a level playing field across countries.

A second group of checks concerns the robustness of the choice of the time framing of the five periods in which the dataset has been divided. Taken as given the initial and the final quarters (2005Q1 and 2015Q4), we adjust the other ending and starting quarters of each period by \pm one quarter. All in all there are 80 possible combinations of the time framing of the five periods in addition to the one chosen for the baseline regression.

Table 5. Robustness of time framing: Test of market integration¹

	Baseline	Average	Max	Min	1%	5%	10%
Tranquil period	-165.5	-62.0	39.2	-173.1	0	0	0
Global crisis	167.1 *	201.3	239.3	133.6	28	49	3
Sovereign crisis	1,005 ***	1,137	1,262	911.3	80	0	0
Post OMT	489.3 ***	480.0	719.2	334.8	79	1	0
EAPP	17.1	27.8	82.8	-22.3	0	0	2

(1) The table reports the test of joint significance of the country-specific effects for the baseline regression reported in Table 2 (column 1) and the descriptive statistics of the same test for the 80 robustness regressions concerning the time framing. Dependent variable: ASW spread; included observations: 8,469; robust standard errors are clustered by issuer; all regressions include FE by sector; symbols ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.

For each of the 80 regressions and for each period we run the test of joint significance of the country-specific effects (test of market integration). Results are shown in Table 5 according to the p -value of test (significance at 1%, 5% and 10%). The perfect market integration in the tranquil period is confirmed in any of the 80 regressions: the test is never significantly different from zero. The start of the fragmentation in the euro-area corporate bond market is confirmed in the global financial crisis period. Even though with different degrees of significance, in none of the 80 regressions is the null hypothesis of perfect market integration accepted. The same happens for the sovereign crisis period and the post OMT period in which the existence

of fragmentation is always verified at 1%, with just one exception at 5%. Finally, in the EAPP period, the null of perfect integration is rejected in just in two cases (at the 10% significance), thus confirming that the market has returned to a pricing of bonds at issuance which is not influenced by country-specific effects.

Table 6. Robustness of country sampling: Test of market integration¹

	Baseline	WO IE	WO PT	WO PT & IR
Tranquil period	-165.5	-81.2	-66.2	-48.8
Global crisis	167.1 *	79.1	197.6 **	33.3
Sovereign crisis	1,005 ***	887.2 ***	713 ***	421.4 ***
Post OMT	489.3 ***	507.1 ***	377.5 ***	303.3 **
EAPP	17.1	32.0	15.9	20.3

(1) The table reports the test of joint significance of the country-specific effects for the baseline regression reported in Table 2 (column 1) and the regressions excluding Ireland (column 2), excluding Portugal (column 3) and excluding Ireland and Portugal (column 4). Dependent variable: ASW spread; included observations: 8469, 8319, 8357 and 8207, respectively; robust standard errors are clustered by issuer; all regressions include FE by sector; symbols ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.

As a final check of robustness and as a way to ease the comparison with previous empirical works, we report the test of market integration when excluding Ireland and/or Portugal from the baseline regression (Table 6). Since De Santis (2016), Zaghini (2016) and Horny et al. (2016) rely on different euro-area samples of countries, we check whether their results are driven by the missing inclusion of one (or more) of the troubled economies. The most relevant evidence concerns the exclusion of Ireland from the sample (column 2). Given that Ireland was one of the most strongly hit countries in the first wave of the financial crisis, it is not surprising that the perceived creditworthiness of Irish corporations deteriorated sooner than elsewhere in the euro area. In fact, a large country-specific effect is already estimated in

the global financial crisis period (140 basis points; Table 2). When excluding Ireland from the regression, the value of test of market integration drops from 166 to just 81 basis points and the test loses its statistical significance. Thus, if we were to analyze the euro-area sample made out of the remaining nine countries, we would find that the market integration was not significantly affected by the global financial crisis. Instead, the exclusion of Portugal alone is not enough to change the significance of the test, which is still signalling a break of the market integration (column 3). Given the evidence reported in Table 6, it is not surprising that both Zaghini (2016), which does not include Ireland, and Horny et al. (2016), which do not include Ireland and Portugal, find that there is not a break in the market integration in the period 2007-2009, whereas De Santis (2016) suggests the opposite, given that his sample excludes Portugal but includes Ireland. The sensitivity of the results on financial market integration in all the other time periods is instead not affected by the exclusion of Ireland and/or Portugal.

8 Concluding remarks

In the paper we provide an assessment of the fragmentation of the euro-area corporate bond market by disentangling the different sources of risk which are priced in bond yield spreads at issuance. Starting from the assumption that in an integrated market the country of issuance of a bond should not influence the yield at origination (law of one price), we use the estimated country-specific effects as a measure of fragmentation.

Our analysis starts from the model by Morgan and Stiroh (2001) and Sironi (2003) of the determinants of yield spread on bonds at issuance. We adapt the model in two ways: 1) we take into account the possibility that also the country in which the issuer is headquartered has a bearing on the yield spread; 2) we use Germany as a benchmark in order to have a direct estimate of the differences across countries, which we use as a measure of

market fragmentation.

In particular, referring to five distinct periods, we find that in the years before the burst of the global financial crisis there is no evidence of market fragmentation, i.e. the corporate bond market was well integrated. During the financial crisis, instead, the difference in the cost of funding with respect to German corporations became positive in several countries, signalling that financial agents started to include in the pricing of bonds also country-specific effects.

Fragmentation reached a worrying level during the sovereign bond crisis. The estimated difference in the cost of funding attributable to the residence of the issuer is around 400 basis points in Portugal, is in the range 160-190 basis points in Ireland and Spain and is 112 basis points in Italy. Given the perverse consequences on the monetary policy transmission and the distortions in the allocation of capital, the ECB implemented a series of non conventional measures which were able to change the market mood. Starting from the summer 2012, yield spreads on both corporate and sovereign bonds started a steady descent. Yet, a significant difference in the cost of funding remained for the four countries most hit by the sovereign debt crisis (Ireland, Italy, Portugal and Spain). Only in the latest period, characterized by the preparation and actual deploying of a quantitative easing by the ECB, the market returned to a level playing field in which country-specific effects do not influence the corporate cost of funding on the common bond market.

Another finding of the paper stems from the analysis of the heterogeneity in the cost of funding between banks and firms. We find that with the exception of Finland and Italy, banks suffered more than firms the fragmentation of the euro-area bond market, by often paying higher risk premia. However, as market fragmentation faded, banks and firms were finally able to face a level playing field.

References

- [1] Ahmed, J.I., Anderson C., Zarutskie R. (2015), “Are the Borrowing Costs of Large Financial Firms Unusual?”, Finance and Economics Discussion Series Paper 24, Board of Governors of the Federal Reserve System.
- [2] Albertazzi, U., Ropele T., Sene G., Signoretti F.M. (2014), “The impact of the sovereign debt crisis on the activity of Italian banks, Journal of Banking and Finance, Vol.46, pp.387-402.
- [3] Angelini, P., Nobili A., Picillo C. (2011), “The Interbank Market After August 2007: What Has Changed, and Why?”, Journal of Money, Credit and Banking, Vol. 43, pp.923-958.
- [4] Angelini, P., Grande G., Panetta F. (2014). “The negative feedback loop between banks and sovereigns”, Bank of Italy Occasional Paper 213
- [5] Anginer, D., Warburton A.J. (2014), “The Chrysler Effect: The Impact of Government Intervention on Borrowing Costs”, Journal of Banking and Finance, Vol.40, pp.62-79.
- [6] Baele, L., Ferrando A., Hördal P., Krylova E., Monnet C. (2004). “Measuring Financial Integration in the Euro Area”, Oxford Review of Economic Policy, Vol.20, pp.509-530.
- [7] Bao, J., Pan J., Wang J. (2011), “The illiquidity of corporate bonds”. Journal of Finance, Vol.66, pp.911-946.
- [8] Battistini, N., Pagano, M., Simonelli, S. (2014). “Systemic risk, sovereign yields and bank exposure in the euro crisis”. Economic Policy, Vol.2014, pp.203-251

- [9] Bedendo, M. and P. Colla (2015), “Sovereign and Corporate credit risk: Evidence from the Eurozone”, *Journal of Corporate Finance*, Vol.33, pp.34-52.
- [10] Beirne, J. and M. Fratzscher (2013), “The pricing of sovereign risk and contagion during the European sovereign debt crisis”, *Journal of International Money and Finance*, Vol.34, pp.60-82
- [11] Buraschi, A., M. Menguturk and E. Sener (2015), “The Geography of Funding Markets and Limits to Arbitrage”, *Review of Financial Studies*. Vol.28, pp.1103-1152.
- [12] Campbell, J.Y. and Taksler G.B. (2003), “Equity Volatility and Corporate Bond Yields”, *Journal of Finance*, Vol.58, pp.2321-2350.
- [13] CGFS, (2011). The impact of sovereign credit risk on bank funding conditions, Committee on the Global Financial System Paper 43.
- [14] Collin-Dufresne, P., Goldstein R.S., Spencer Martin J. (2001), “The Determinants of Credit Spread Changes ”, *Journal of Finance*, Vol.56, pp.2177-2207.
- [15] De Santis, R. (2016), “Credit Spreads, Economic Activity and Fragmentation”, ECB Working Paper 1930.
- [16] Dewachter H., Iania L., Lyrio M., de Sola Perea M. (2015), “A macro-financial analysis of the euro area sovereign bond market”, *Journal of Banking and Finance*, Vol.50, pp.308-325.
- [17] Di Cesare, A., Grande, G., Manna, M., Taboga, M. (2012), “Recent estimates of sovereign risk premia for euro-area countries”, Bank of Italy Occasional Paper 128

- [18] Dick-Nielsen, J., Feldhutter P., Lando D. (2012), “Corporate bond liquidity before and after the onset of the subprime crisis”, *Journal of Financial Economics*, Vol.103, pp.471-492.
- [19] Du, W. and J. Schreger (2016), “Local Currency Sovereign Risk”, *Journal of Finance*, Vol. 71, pp.1027-1070.
- [20] Durré, A, Maddaloni A., Mongelli F. (2013), “The ECB’s Experience of Monetary Policy in a Financially Fragmented Euro Area”, *Comparative Economic Studies*, Vol.56, No.3, pp.396-423.
- [21] ECB (2013), “Assessing the retail bank interest rate pass-through in the euro area at times of financial fragmentation”, *European Central Bank, Monthly Bulletin*, August.
- [22] Elton E., Gruber M., Agrawal D. and Mann C. (2001), “Explaining the rate spread on corporate bond”, *Journal of Finance*, Vol.56, No.1, pp.247-277.
- [23] Garcia de Andoain, C., Hoffmann P., Manganelli S. (2014) “Fragmentation in the euro overnight unsecured money market”, *ECB Working Paper* 1755.
- [24] Georgoutsos, D. A. and Migiakis P.M (2013), “Heterogeneity of the determinants of euro-area sovereign bond spreads: what does it tell us about financial stability?”, *Journal of Banking and Finance*, Vol.37, pp.4650-4664.
- [25] Giannetti M. and Laeven L. (2012), “The flight home effect: Evidence from the syndicated loan market during financial crises”, *Journal of Financial Economics*, Vol.104, pp.23-43.
- [26] Gilchrist, S., Mojon, B. (2014). “Credit Risk in the Euro Area”. *NBER Working Paper* 20041.

- [27] Gilchrist, S. and Zakrajsek E. (2012), “Credit Spreads and Business Cycle Fluctuations”, *American Economic Review*, Vol.102, pp.1692–1720.
- [28] Giordano R., Pericoli M. and Tommasino P. (2013), “Pure or wake-up-call contagion? Another look at the EMU sovereign debt crisis”, *International Finance*, Vol.16, pp.131-160.
- [29] Hartmann, P., Maddaloni, A., Manganelli, S., (2003), “The euro area financial system: structure, integration, and policy initiatives”, *Oxford Review of Economic Policy*, Vol.19, pp.180-213.
- [30] Hollo, D., Kremer M., Lo Duca M. (2012). “CISS - A composite indicator of systemic stress in the financial system”, *ECB Working Paper No. 1426*.
- [31] Horny, G., Manganelli S., Mojon B. (2016), “Measuring Financial Fragmentation in the Euro Area Corporate Bond Market”, *Banque de France, Working Paper 582*.
- [32] Klose, J., Weigert, B. (2014), “Sovereign Yield Spreads During the Euro Crisis: Fundamental Factors Versus Redenomination Risk”, *International Finance*, Vol. 17, pp.25-50.
- [33] Mayordomo, S., Abascal M., Alonso T., Rodriguez-Moreno M. (2015), “Fragmentation in the European interbank market: Measures, determinants, and policy solutions”, *Journal of Financial Stability*, Vol. 16, pp.1-12.
- [34] Mishkin, F. (2006), “How big a problem is too big to fail?”, *Journal of Economic Literature*, Vol.44, pp.988-1004.
- [35] Morgan D.P. and Stiroh K.J. (2001), “Market Discipline of Banks: the Asset Test”, *Journal of Financial Services Research*, Vol. 20, pp.195-208.

- [36] Popov, A., Van Horen N. (2015), “Exporting sovereign stress: Evidence from syndicated bank lending during the euro area sovereign debt crisis” *Review of Finance*, Vol.19, pp.1825-1866.
- [37] Santos J. (2014), “Evidence from the bond market on banks’ too-big-to-fail subsidy”, *Economic Policy Review*, Vol.20, No.2.
- [38] Sironi A. (2003), “Testing for market discipline in the European banking industry: evidence from subordinated debt issues”, *Journal of Money, Credit and Banking*, Vol.35, pp.443-472.
- [39] van Rixtel A., Gasperini G. (2013), “Financial crises and bank funding: recent experience in the euro area”, *BIS Working Papers* 406.
- [40] Wang, J., Wu C. (2015), “Liquidity, credit quality, and the relation between volatility and trading activity: Evidence from the corporate bond market”, *Journal of Banking and Finance*, Vol.50, pp.183-203.
- [41] Zaghini A. (2016), “Fragmentation and heterogeneity in the euro-area corporate bond market: Back to normal?”, *Journal of Financial Stability*, Vol.23, pp.51-61.

RECENTLY PUBLISHED “TEMI” (*)

- N. 1073 – *Search costs and the severity of adverse selection*, by Francesco Palazzo (July 2016).
- N. 1074 – *Macroeconomic effectiveness of non-standard monetary policy and early exit. A model-based evaluation*, by Lorenzo Burlon, Andrea Gerali, Alessandro Notarpietro and Massimiliano Pisani (July 2016).
- N. 1075 – *Quantifying the productivity effects of global sourcing*, by Sara Formai and Filippo Vergara Caffarelli (July 2016).
- N. 1076 – *Intergovernmental transfers and expenditure arrears*, by Paolo Chiades, Luciano Greco, Vanni Mengotto, Luigi Moretti and Paola Valbonesi (July 2016).
- N. 1077 – *A “reverse Robin Hood”? The distributional implications of non-standard monetary policy for Italian households*, by Marco Casiraghi, Eugenio Gaiotti, Lisa Rodano and Alessandro Secchi (July 2016).
- N. 1078 – *Global macroeconomic effects of exiting from unconventional monetary policy*, by Pietro Cova, Patrizio Pagano and Massimiliano Pisani (September 2016).
- N. 1079 – *Parents, schools and human capital differences across countries*, by Marta De Philippis and Federico Rossi (September 2016).
- N. 1080 – *Self-fulfilling deflations*, by Roberto Piazza, (September 2016).
- N. 1081 – *Dealing with student heterogeneity: curriculum implementation strategies and student achievement*, by Rosario Maria Ballatore and Paolo Sestito, (September 2016).
- N. 1082 – *Price dispersion and consumer inattention: evidence from the market of bank accounts*, by Nicola Branzoli, (September 2016).
- N. 1083 – *BTP futures and cash relationships: a high frequency data analysis*, by Onofrio Panzarino, Francesco Potente and Alfonso Puorro, (September 2016).
- N. 1084 – *Women at work: the impact of welfare and fiscal policies in a dynamic labor supply model*, by Maria Rosaria Marino, Marzia Romanelli and Martino Tasso, (September 2016).
- N. 1085 – *Foreign ownership and performance: evidence from a panel of Italian firms*, by Chiara Bentivogli and Litterio Mirenda (October 2016).
- N. 1086 – *Should I stay or should I go? Firms’ mobility across banks in the aftermath of financial turmoil*, by Davide Arnaudo, Giacinto Micucci, Massimiliano Rigon and Paola Rossi (October 2016).
- N. 1087 – *Housing and credit markets in Italy in times of crisis*, by Michele Loberto and Francesco Zollino (October 2016).
- N. 1088 – *Search peer monitoring via loss mutualization*, by Francesco Palazzo (October 2016).
- N. 1089 – *Non-standard monetary policy, asset prices and macroprudential policy in a monetary union*, by Lorenzo Burlon, Andrea Gerali, Alessandro Notarpietro and Massimiliano Pisani (October 2016).
- N. 1090 – *Does credit scoring improve the selection of borrowers and credit quality?*, by Giorgio Albareto, Roberto Felici and Enrico Sette (October 2016).
- N. 1091 – *Asymmetric information and the securitization of SME loans*, by Ugo Albertazzi, Margherita Bottero, Leonardo Gambacorta and Steven Ongena (December 2016).
- N. 1092 – *Copula-based random effects models for clustered data*, by Santiago Pereda Fernández (December 2016).
- N. 1093 – *Structural transformation and allocation efficiency in China and India*, by Enrica Di Stefano and Daniela Marconi (December 2016).
- N. 1094 – *The bank lending channel of conventional and unconventional monetary policy*, by Ugo Albertazzi, Andrea Nobili and Federico M. Signoretti (December 2016).
- N. 1095 – *Household debt and income inequality: evidence from Italian survey data*, by David Loschiavo (December 2016).

(*) Requests for copies should be sent to:

Banca d’Italia – Servizio Studi di struttura economica e finanziaria – Divisione Biblioteca e Archivio storico – Via Nazionale, 91 – 00184 Rome – (fax 0039 06 47922059). They are available on the Internet www.bancaditalia.it.

2015

- AABERGE R. and A. BRANDOLINI, *Multidimensional poverty and inequality*, in A. B. Atkinson and F. Bourguignon (eds.), *Handbook of Income Distribution*, Volume 2A, Amsterdam, Elsevier, **TD No. 976 (October 2014)**.
- ALBERTAZZI U., G. ERAMO, L. GAMBACORTA and C. SALLESO, *Asymmetric information in securitization: an empirical assessment*, *Journal of Monetary Economics*, v. 71, pp. 33-49, **TD No. 796 (February 2011)**.
- ALESSANDRI P. and B. NELSON, *Simple banking: profitability and the yield curve*, *Journal of Money, Credit and Banking*, v. 47, 1, pp. 143-175, **TD No. 945 (January 2014)**.
- ANTONIETTI R., R. BRONZINI and G. CAINELLI, *Inward greenfield FDI and innovation*, *Economia e Politica Industriale*, v. 42, 1, pp. 93-116, **TD No. 1006 (March 2015)**.
- BARDOZZETTI A. and D. DOTTORI, *Collective Action Clauses: how do they Affect Sovereign Bond Yields?*, *Journal of International Economics*, v. 92, 2, pp. 286-303, **TD No. 897 (January 2013)**.
- BARONE G. and G. NARCISO, *Organized crime and business subsidies: Where does the money go?*, *Journal of Urban Economics*, v. 86, pp. 98-110, **TD No. 916 (June 2013)**.
- BRONZINI R., *The effects of extensive and intensive margins of FDI on domestic employment: microeconomic evidence from Italy*, *B.E. Journal of Economic Analysis & Policy*, v. 15, 4, pp. 2079-2109, **TD No. 769 (July 2010)**.
- BUGAMELLI M., S. FABIANI and E. SETTE, *The age of the dragon: the effect of imports from China on firm-level prices*, *Journal of Money, Credit and Banking*, v. 47, 6, pp. 1091-1118, **TD No. 737 (January 2010)**.
- BULLIGAN G., M. MARCELLINO and F. VENDITTI, *Forecasting economic activity with targeted predictors*, *International Journal of Forecasting*, v. 31, 1, pp. 188-206, **TD No. 847 (February 2012)**.
- CESARONI T., *Procyclicality of credit rating systems: how to manage it*, *Journal of Economics and Business*, v. 82, pp. 62-83, **TD No. 1034 (October 2015)**.
- CUCINIELLO V. and F. M. SIGNORETTI, *Large banks, loan rate markup and monetary policy*, *International Journal of Central Banking*, v. 11, 3, pp. 141-177, **TD No. 987 (November 2014)**.
- DE BLASIO G., D. FANTINO and G. PELLEGRINI, *Evaluating the impact of innovation incentives: evidence from an unexpected shortage of funds*, *Industrial and Corporate Change*, v. 24, 6, pp. 1285-1314, **TD No. 792 (February 2011)**.
- DEPALO D., R. GIORDANO and E. PAPAPETROU, *Public-private wage differentials in euro area countries: evidence from quantile decomposition analysis*, *Empirical Economics*, v. 49, 3, pp. 985-1115, **TD No. 907 (April 2013)**.
- DI CESARE A., A. P. STORK and C. DE VRIES, *Risk measures for autocorrelated hedge fund returns*, *Journal of Financial Econometrics*, v. 13, 4, pp. 868-895, **TD No. 831 (October 2011)**.
- CIARLONE A., *House price cycles in emerging economies*, *Studies in Economics and Finance*, v. 32, 1, **TD No. 863 (May 2012)**.
- FANTINO D., A. MORI and D. SCALISE, *Collaboration between firms and universities in Italy: the role of a firm's proximity to top-rated departments*, *Rivista Italiana degli economisti*, v. 1, 2, pp. 219-251, **TD No. 884 (October 2012)**.
- FRATZSCHER M., D. RIMEC, L. SARNOB and G. ZINNA, *The scapegoat theory of exchange rates: the first tests*, *Journal of Monetary Economics*, v. 70, 1, pp. 1-21, **TD No. 991 (November 2014)**.
- NOTARPIETRO A. and S. SIVIERO, *Optimal monetary policy rules and house prices: the role of financial frictions*, *Journal of Money, Credit and Banking*, v. 47, S1, pp. 383-410, **TD No. 993 (November 2014)**.
- RIGGI M. and F. VENDITTI, *The time varying effect of oil price shocks on euro-area exports*, *Journal of Economic Dynamics and Control*, v. 59, pp. 75-94, **TD No. 1035 (October 2015)**.
- TANELI M. and B. OHL, *Information acquisition and learning from prices over the business cycle*, *Journal of Economic Theory*, 158 B, pp. 585-633, **TD No. 946 (January 2014)**.

- ALBANESE G., G. DE BLASIO and P. SESTITO, *My parents taught me. evidence on the family transmission of values*, Journal of Population Economics, v. 29, 2, pp. 571-592, **TD No. 955 (March 2014)**.
- ANDINI M. and G. DE BLASIO, *Local development that money cannot buy: Italy's Contratti di Programma*, Journal of Economic Geography, v. 16, 2, pp. 365-393, **TD No. 915 (June 2013)**.
- BARONE G. and S. MOCETTI, *Inequality and trust: new evidence from panel data*, Economic Inquiry, v. 54, pp. 794-809, **TD No. 973 (October 2014)**.
- BELTRATTI A., B. BORTOLOTTI and M. CACCAVAIO, *Stock market efficiency in China: evidence from the split-share reform*, Quarterly Review of Economics and Finance, v. 60, pp. 125-137, **TD No. 969 (October 2014)**.
- BOLATTO S. and M. SBRACIA, *Deconstructing the gains from trade: selection of industries vs reallocation of workers*, Review of International Economics, v. 24, 2, pp. 344-363, **TD No. 1037 (November 2015)**.
- BOLTON P., X. FREIXAS, L. GAMBACORTA and P. E. MISTRULLI, *Relationship and transaction lending in a crisis*, Review of Financial Studies, v. 29, 10, pp. 2643-2676, **TD No. 917 (July 2013)**.
- BONACCORSI DI PATTI E. and E. SETTE, *Did the securitization market freeze affect bank lending during the financial crisis? Evidence from a credit register*, Journal of Financial Intermediation, v. 25, 1, pp. 54-76, **TD No. 848 (February 2012)**.
- BORIN A. and M. MANCINI, *Foreign direct investment and firm performance: an empirical analysis of Italian firms*, Review of World Economics, v. 152, 4, pp. 705-732, **TD No. 1011 (June 2015)**.
- BRANDOLINI A. and E. VIVIANO, *Behind and beyond the (headcount) employment rate*, Journal of the Royal Statistical Society: Series A, v. 179, 3, pp. 657-681, **TD No. 965 (July 2015)**.
- BRIPI F., *The role of regulation on entry: evidence from the Italian provinces*, World Bank Economic Review, v. 30, 2, pp. 383-411, **TD No. 932 (September 2013)**.
- BRONZINI R. and P. PISELLI, *The impact of R&D subsidies on firm innovation*, Research Policy, v. 45, 2, pp. 442-457, **TD No. 960 (April 2014)**.
- BURLON L. and M. VILALTA-BUFI, *A new look at technical progress and early retirement*, IZA Journal of Labor Policy, v. 5, **TD No. 963 (June 2014)**.
- BUSETTI F. and M. CAIVANO, *The trend-cycle decomposition of output and the Phillips Curve: bayesian estimates for Italy and the Euro Area*, Empirical Economics, V. 50, 4, pp. 1565-1587, **TD No. 941 (November 2013)**.
- CAIVANO M. and A. HARVEY, *Time-series models with an EGB2 conditional distribution*, Journal of Time Series Analysis, v. 35, 6, pp. 558-571, **TD No. 947 (January 2014)**.
- CALZA A. and A. ZAGHINI, *Shoe-leather costs in the euro area and the foreign demand for euro banknotes*, International Journal of Central Banking, v. 12, 1, pp. 231-246, **TD No. 1039 (December 2015)**.
- CIANI E., *Retirement, Pension eligibility and home production*, Labour Economics, v. 38, pp. 106-120, **TD No. 1056 (March 2016)**.
- CIARLONE A. and V. MICELI, *Escaping financial crises? Macro evidence from sovereign wealth funds' investment behaviour*, Emerging Markets Review, v. 27, 2, pp. 169-196, **TD No. 972 (October 2014)**.
- CORNELI F. and E. TARANTINO, *Sovereign debt and reserves with liquidity and productivity crises*, Journal of International Money and Finance, v. 65, pp. 166-194, **TD No. 1012 (June 2015)**.
- D'AURIZIO L. and D. DEPALO, *An evaluation of the policies on repayment of government's trade debt in Italy*, Italian Economic Journal, v. 2, 2, pp. 167-196, **TD No. 1061 (April 2016)**.
- DOTTORI D. and M. MANNA, *Strategy and tactics in public debt management*, Journal of Policy Modeling, v. 38, 1, pp. 1-25, **TD No. 1005 (March 2015)**.
- ESPOSITO L., A. NOBILI and T. ROPELE, *The management of interest rate risk during the crisis: evidence from Italian banks*, Journal of Banking & Finance, v. 59, pp. 486-504, **TD No. 933 (September 2013)**.
- MARCELLINO M., M. PORQUEDDU and F. VENDITTI, *Short-Term GDP forecasting with a mixed frequency dynamic factor model with stochastic volatility*, Journal of Business & Economic Statistics, v. 34, 1, pp. 118-127, **TD No. 896 (January 2013)**.
- RODANO G., N. SERRANO-VELARDE and E. TARANTINO, *Bankruptcy law and bank financing*, Journal of Financial Economics, v. 120, 2, pp. 363-382, **TD No. 1013 (June 2015)**.

- ALESSANDRI P. and H. MUMTAZ, *Financial indicators and density forecasts for US output and inflation*, Review of Economic Dynamics, v. 24, pp. 66-78, **TD No. 977 (November 2014)**.
- MOCETTI S. and E. VIVIANO, *Looking behind mortgage delinquencies*, Journal of Banking & Finance, v. 75, pp. 53-63, **TD No. 999 (January 2015)**.
- PATACCHINI E., E. RAINONE and Y. ZENOU, *Heterogeneous peer effects in education*, Journal of Economic Behavior & Organization, v. 134, pp. 190-227, **TD No. 1048 (January 2016)**.

FORTHCOMING

- ADAMOPOULOU A. and G.M. TANZI, *Academic dropout and the great recession*, Journal of Human Capital, **TD No. 970 (October 2014)**.
- ALBERTAZZI U., M. BOTTERO and G. SENE, *Information externalities in the credit market and the spell of credit rationing*, Journal of Financial Intermediation, **TD No. 980 (November 2014)**.
- BRONZINI R. and A. D'IGNAZIO, *Bank internationalisation and firm exports: evidence from matched firm-bank data*, Review of International Economics, **TD No. 1055 (March 2016)**.
- BRUCHE M. and A. SEGURA, *Debt maturity and the liquidity of secondary debt markets*, Journal of Financial Economics, **TD No. 1049 (January 2016)**.
- BURLON L., *Public expenditure distribution, voting, and growth*, Journal of Public Economic Theory, **TD No. 961 (April 2014)**.
- CONTI P., D. MARELLA and A. NERI, *Statistical matching and uncertainty analysis in combining household income and expenditure data*, Statistical Methods & Applications, **TD No. 1018 (July 2015)**.
- DE BLASIO G. and S. POY, *The impact of local minimum wages on employment: evidence from Italy in the 1950s*, Regional Science and Urban Economics, **TD No. 953 (March 2014)**.
- FEDERICO S. and E. TOSTI, *Exporters and importers of services: firm-level evidence on Italy*, The World Economy, **TD No. 877 (September 2012)**.
- GIACOMELLI S. and C. MENON, *Does weak contract enforcement affect firm size? Evidence from the neighbour's court*, Journal of Economic Geography, **TD No. 898 (January 2013)**.
- MANCINI A.L., C. MONFARDINI and S. PASQUA, *Is a good example the best sermon? Children's imitation of parental reading*, Review of Economics of the Household, **TD No. 958 (April 2014)**.
- MEEKS R., B. NELSON and P. ALESSANDRI, *Shadow banks and macroeconomic instability*, Journal of Money, Credit and Banking, **TD No. 939 (November 2013)**.
- MICUCCI G. and P. ROSSI, *Debt restructuring and the role of banks' organizational structure and lending technologies*, Journal of Financial Services Research, **TD No. 763 (June 2010)**.
- MOCETTI S., M. PAGNINI and E. SETTE, *Information technology and banking organization*, Journal of Financial Services Research, **TD No. 752 (March 2010)**.
- NATOLI F. and L. SIGALOTTI, *Tail co-movement in inflation expectations as an indicator of anchoring*, International Journal of Central Banking, **TD No. 1025 (July 2015)**.
- RIGGI M., *Capital destruction, jobless recoveries, and the discipline device role of unemployment*, Macroeconomic Dynamics, **TD No. 871 July 2012)**.
- SEGURA A. and J. SUAREZ, *How excessive is banks' maturity transformation?*, Review of Financial Studies, **TD No. 1065 (April 2016)**.
- ZINNA G., *Price pressures on UK real rates: an empirical investigation*, Review of Finance, **TD No. 968 (July 2014)**.