The Impact of Legal Frameworks on Bank Loan Portfolio risk in Europe

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Abstract

The economic crisis put financial and banking sector on the viewfinder of regulators and policymakers across EU and more widely across the world. Indeed, the improvement of the quality of banks' balance sheet has proved crucial for economic stability and growth.

In this paper, we use several panel specifications to provide an innovative viewpoint of the impact of insolvency regimes and macroeconomic factors on quality of banks loans portfolio. Our results about macroeconomic factors are consistent with the related literature and show that a better insolvency framework is associated with a higher quality of bank loan portfolio.

JEL classification: G21, G28, G38, K22

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I. Introduction

Since the global financial crisis and the drifts of finance of previous years, the European banking sector is heavily supervised and scrutinized by regulators given the importance of the financial and banking sector for the economic activity and given the links between European banks and sovereign exposure (Claessens and Kose (2018), ECB (2017c)). Despite the interest from regulators at the EU level and that of policy makers from national authorities the level of loan quality is still a subject of primary importance in the European banking sector. Even if the level of loan quality is increasing since 2014 a large heterogeneity between States remains. Indeed, macroeconomic situation differs widely between several European economies as the asset quality and the way to improve it (Enria et al. (2017) ESRB (2017)).

Banking risk has determinants that can widely be separated into two sub-groups: economic determinants (the macroeconomic situation but also the microeconomic context), and juridical or legal determinants (such as the quality, the independence or the efficiency of the legal framework). The role played by economic determinants is widely analyzed in banking literature, but the impact of the legal framework is a bit less developed. However, it recently became subject to an increasing scrutiny in term of its efficiency but also regarding its contribution to economic growth (European Parliament (2016, 2017)).

The problematic of this article is less to discuss about banking and financial system efficiency than to study if the legal framework gives relevant tools to understand banking risk in terms of asset quality.

Indeed, this paper tries to investigate the role played by the efficiency of insolvency regimes on the risk of banks loans portfolio. From data from macroeconomic stress tests from the EBA and using several panel data estimators we investigate on the impact of macroeconomic situation and insolvency regimes on the quality of banks loans portfolio (proxied by Defaulted Asset, DA hereafter[3]). The micro level and the nature of data allow us to control for numerous novel fixed effects including bank and country specific factors (Chiorazzo et al (2017) and Haselmann et al. (2010)). This is one of the main contributions of the present paper to the literature, which is threefold.

First, from our knowledge, no study uses both these families of factors to explain banks quality of loan portfolio for European countries in post crisis period using stress tests data.

Secondly, few studies focus over all European Union members States. Thirdly, our data allow

[3] An asset is qualified as defaulted if its past-due exceeds 90 days as non-performing loans which is often used as a proxy for asset quality. However the past-due threshold is 180 days for retail and SMEs exposures.

us to control for numerous unobserved effects not only from the bank of origin but also from the counterpart country which is, from our knowledge, new in the literature. It is conceivable for example that the corporate portfolio of Barclays in Germany has sensitivity to German GDP which could be different from the one in France to French GDP. Moreover, the EBA provides a specific scenario for each country of the sample to consider the heterogeneity of macroeconomic situations. Indeed, the characterization of idiosyncratic factors is crucial because individual heterogeneity can lead to biases in the estimations.

Our results are in line with previous results on this topic and highlight that macroeconomic variables such as GDP growth rate, unemployment rate, or inflation rate play an important role in the quality in banks loans portfolio. The findings also underline the significant impact of insolvency regimes as well as economic freedom. Indeed, the creditor-friendly regimes (i.e. those that have higher recovery rates (Osterkamp (2006))) are associated with a better quality of bank loans' portfolios. The costs of an Insolvency procedure are associated with a lower portfolios' quality and the implication of stakeholders during the procedure is associated to a better loan quality.

The reminder is structured as follows: the second section describes relevant literature. In a third section the dataset used is described, the main findings of the econometric framework and their scope are displayed in a fourth section. While the robustness of the findings is discussed in a fifth section, a sixth section concludes.

II. Literature Review

The economic and financial crisis of 2008 left the private sector with high debt and with highlighted latent banking (Nkusu (2011) and Klein (2013)) and institutional inefficiencies (Djankov et al. (2008) and Bricongne et al. (2016)). The recent crisis experienced by emerging as well as developed countries is characterized, among other things, by a decline in the quality of banking portfolios (Beck et al. (2013) and Reinhart and Rogoff (2010)). These events have struck particularly the EU and let most of its member States with high debt levels both in private and public sectors. This debt overhang, considering the current macroeconomic situation of the EU (low inflation and growth), is a main challenge for EU policy makers. As Bricongne et al. (2016) previously noted, "The main motivation for addressing insolvency frameworks at the current juncture is the high level of private sector debt in a number of EU countries". Moreover, the role played by banks is still increasing since the deregulation period in the 1990s' for most developed economies and has led the banking sector under the spotlights of macroeconomic and monetary policymakers. One important criterion for policy makers and regulators is loan quality (ECB (2017c)), even if this latter is widely decreasing since 2014, the situation is heterogeneous among EU countries and highlights idiosyncratic situations related to loan quality and financial stability. Loan quality from its determinants to its consequences in terms of economic activity and credit supply is a well debated across academic literature. Berger and De Young (1997) used a Granger causality framework to study banks risk and efficiency relationship. Along the same lines, Louizis et al. (2010) have resumed Berger and De Young's hypotheses to test the macroeconomic and bank specific determinants of NPLs (Non-Performing Loans). They improved the Granger causality-framework by applying GMM and dynamic panel estimators. Both these empirical studies retained the "bad management" hypothesis. Bellas et al. (2014) focused on the Eurozone during the pre-crisis period (2000-2008) a similar methodology to Jimenez and Saurina (2006) and Louizis et al. (2010) is used to find that GDP and unemployment rate for macroeconomic factors and capital ratio and ROE (Return on Equity) for bank-specific factors affect their NPLs' index.

In a more recent study on the European continent, Anastasiou et al. (2016a) focused on European Banks from 1990 to 2015. Their GMM estimators showed that both output gap and taxes are found to affect negatively NPLs. In a Bank of Greece's working paper, Anastasiou et al. (2016b) also analyzed the long-term relationship between macroeconomic factors and NPLs thanks to a fully modified OLS and panel cointegrated VAR to disentangle

determinants of NPL in core versus periphery European countries from 2003 to 2013. Their VAR specification suggests that the determinants of NPLs are broadly the same, but the responses of periphery countries are stronger. Unlike most studies[4] that focus either on CESEE countries (Jakubik and Reininger (2013), Klein (2013) Arakelyan (2018)[5] de Haas and Lelyveld (2018)) or on advanced economies (Nkusu (2011)) or even on only one EU member State (Salas and Saurina (2002), Marcucci and Quagliariello (2007), Fidrmuc and Hainz (2010), Louzis et al. (2012) among others) the focus of this paper is made on EU members States plus Norway.

The investigation on the interaction between banking sector and economic activity can be separated into two groups as discussed by Chiorazzo et al. (2017). The first group focuses on the impact of real economy on loan quality whereas the second one focuses on the impact of loan quality on real economy. In the first group, Haselmann et al. (2010) for example, studied the effect of legal change on the lending behaviour of banks in Central Eastern European countries thanks to a difference in difference methodology. Their results highlight a positive link between formal legal changes and lending. They also documented that foreign banks benefit more from legal changes than national banks. Unlike Haselmann et al. (2010) our aim is less to focus on volume than quality of loans. Yet, their main specifications and their results could be considered as a reference and are improved on some aspects, using the variability of banks portfolio quality depending on counterpart countries, controlling for structural banks characteristics.

Stulz and Williamson (2003) also study the link between law and finance thanks to the dataset provided by one of the reference papers on related literature, La Porta et al. (1997). They looked at the origin of legal system and religion to explain the role of culture on the cross-country differences in terms of creditor rights. With a similar goal, Osterkamp (2006) wanted to describe levels and long-term trends of business and individual insolvency in a country-comparative perspective. He postulates that the frequency of bankruptcies could be determined by the average size of a firm, size distribution, the available form of an enterprise or by the sectoral structure of an economy. His study leads him to conclude that the creditor friendliness of an insolvency regime (i.e. regimes that have higher recovery rates) is

[4] Exception from: Lorenzani and Lucidi (2014) and few others that focus on EU countries and thanks to a two-step methodology have looked at the impact of civil justice reforms on some economic risk indicators (as FDI or entrepreneurial activity).

[5] This working paper from IMF presents credit dynamics in CESEE countries from 2005 to 2014. It uses bank specifics variables, and indicators of both domestic and destination countries to study credit growth.

associated with lower insolvency cases. He finds that some regulation reforms may have negative effects on the quality of banks loans portfolio (Santomero (1980, 1988)[6]).

Despite some policy papers argue that loan quality is linked to inefficiency of judicial systems (ECB (2017a, b)), empirical papers hardly find any clear relationship (Jassaud and Kang (2015) and Chiorazzo (2017)). The aim of this paper is to reduce this gap.

[6] Indeed, he took the example in Germany in 1999 with the settlement of a new debtor friendly law that allows for debt discharge. This new law led to an important increase of insolvency cases because if debtors are allowed by law to discharge, there is no doubt that they will do it in most cases.

III. Data

The main dataset used in this article, which refers to balance sheet data of banks, comes from the annual dataset of the EBA[7] (European Banking Authority). The scope of consolidation is the perimeter of the banking group as defined by the CRR/CRD IV. We notice that insurance activities are not included in balance sheet data. Our dataset encompasses regulatory exercises from 2013 to 2017.

In 2013, the transparency exercise records balance sheet data for 64 banks from 21 countries of the European Economic Area (EEA). In 2014 the EU-wide stress test exercise is carried out on a sample of 123 banks covering at least 50%[8] of the national banking sector in each EU Member State and Norway, as expressed in terms of total consolidated assets as of end of 2013.

There is not any stress test for 2015; the EBA provides instead a transparency exercise. Unfortunately, transparency exercises do not focus exactly on the same data, but data allow for time comparison.

Following a wide-ranging exercise in 2014, the EBA decided to focus on a more homogeneous sample of large banks, to ensure greater comparability while ensuring a significant coverage of EU banking assets. The 2016 EU-wide stress test exercise is carried out on a sample of 51 banks from 15 EU and EEA countries. The sample is supposed to cover 70% of the banking sector in the Eurozone, in each non-Eurozone EU Member State and in Norway and, to be included, banks should have a minimum of EUR 30 bn[9] in terms of total consolidated assets. This may reflect the will of regulators to frame systemic financial institutions activity.

In 2017 the EBA disclosed a new transparency exercise that covers 132 banks across EU. Data provided by the EBA brings us information about granular credit risk of individual banks of the sample. To have a proxy for the quality of bank loans portfolio we use the ratio of Defaulted Assets (DA) which is computed as the ratio of the defaulted exposure divided by the total exposure of a considered bank to a specific country on a specific year. An asset is

[7] To get more information on the dataset, see the EBAs methodological notes for 2014 and 2016 respectively. https://www.eba.europa.eu/documents/10180/669262/Methodological+Note.pdfhttps://www.eba.europa.eu/documents/10180/1259315/2016+EU-wide+stress+test-Methodological+note.pdf

[8] http://www.eba.europa.eu/documents/10180/669262/FAQs+on+EU-wide+stress+test.pdf/2ab790e8-ca25-43ce-9041-8fa86277e7ba

[9] This threshold is consistent with the criterion used for inclusion in the sample of banks reporting supervisory reporting data to the EBA, as well as with the ECB-Banking Supervision definition of a significant institution.

qualified as defaulted if its past-due is above 90 days[10].

Other variables come from IMF (World Economic Outlook (WEO) and International Financial Statistics (IFS)) and the Global Financial Development database (World Bank) and from Hermitage Foundation (see Annex A table A.1 for detailed information about independent variables).

For insolvency frameworks, the dataset constructed in (Djankov et al. (2008)) is used.

This dataset uses a theoretical study case based on the insolvency procedure of an hotel called Mirage which is a limited liability domestically-owned hotel business located in the largest city. Mirage has 201 employees and 50 suppliers, has a domestic loan from bizbank, collateralized on real estate (the hotel building) and is 51 percent owned by Mr Douglas. Questions are asked to competent respondents on the management of the insolvency case in their countries. They indicate which legal procedure is likely to occur for the case of Mirage. Several indicators have been constructed thanks to answers from respondents to evaluate efficiency of the legal framework.

The merge of these datasets leads us to consider very granular data on a given bank (dimension i) from a country (dimension k) that lends to a destination country (dimension j) for a given asset class[11] (dimension z) on a given year (dimension t).

Table A.1 and A.2 in Annex A summarize respectively main variables and the matrix of correlation for main variables in the sample.

[10] The definition of a defaulted asset is closely related to NPLs definition except for some asset classes for which the threshold is 120 days, like retail and SMEs.
[11] In our context asset class and exposure are used interchangeably.

IV. Empirical estimations

In this paper, we follow the specification hereafter, for each asset class:

$$ratio(DA)_{i,j,k,z,t} = \alpha_i + \alpha_j + \alpha_k + \alpha_t + \alpha_z + \beta_1 * X_{j,t} + \beta_2 * X_{k,t} + \beta_3 * X_{i,t} + \varepsilon_{i,j,t} \quad (1)$$

Where the independent variable is the DA ratio expressed in percentage of defaulted loans on total loans granted by a given bank into a given country of a given asset class on a given year.

X_j refers to the matrix of independent variables related to destination countries.

X_k refers to the matrix of independent variables related to banks home country.

X_i refers to the matrix of independent idiosyncratic variables related to banks.

β_i i:={1,2,3} refers to the matrix of interest coefficients

$\varepsilon_{i,j,t}$ is the error term

The matrix of fixed effects depends on the specifications used but encompasses at least time (t) alone or with destination countries (j) fixed effects (this level control of unobserved characteristics (j and t) is the most granular to our knowledge in literature). $\alpha_i + \alpha_j + \alpha_k + \alpha_t + \alpha_z$ represents respectively bank, destination countries, home countries, time and assets class fixed effects.

Since the period is short compared to the cross-country dimension, banks characteristics should not evolve much over time and thus including banks fixed effects should capture most individual banks' dimensions.

This particularity of our data is not unique, in macroeconomic studies: individual dimension is often larger that time dimension. This characteristic is not neutral.

Indeed, the choice of the model is dependent on dataset structure and sample characteristics (Hausman (1978)). When time dimension is low for example, as is often the case in macro-econometric studies, there may be rather important differences between panel estimators. If the sample is chosen in a non-randomly way, then the statistical inference is conditional to the sample and this is likely the fixed effect model that must be retained. On the opposite, if the sample is drawn randomly among a large population, the inference is no longer conditional,

and we can generalize the estimates to the whole population and retain random effects.

About the sample selection one can doubt that the sample chosen by the EBA to carry stress test exercises is drawn randomly, and even if it was the case, the rather important coverage of data nuances the conditional inference. However, the computation needs to estimate numerous coefficients (as many as fixed effects) that lower the degree of freedom of parameters estimated and could lead to biased estimations and lower robustness of results.

While fixed effects specifications introduce correlation between individual effects and explanatory variables, the random effect specification postulates the exogeneity of individual heterogeneity. In our case, there are some reasons to believe that unobserved heterogeneity is correlated with our explanatory variables.

In table A.2 in Annex A, it is first checked that variables are not too collinear, except the ones from doing business (costs and property rights).

In order to capture economic activity we introduce GDP growth rate of both home and host country lagged by one period to reduce endogeneity issues.

In the following tables, it appears that GDP growth in home country (first line of tables 1 to 3) alleviates the defaulted asset ratio, as expected. Namely results (table 1) indicate that a one point increase of GDP growth rate of home country of a bank is found to reduce DA ratio of the bank in country j between 0.28 to 0.39 point depending on the structure of fixed effects. One can notice that the impact of home country GDP growth is robust to the addition of fixed effects, even when controlling for destination country characteristics which is novel in literature unlike Haselmann et al. (2010).

GDP growth in destination country always has negative expected sign. We can see that the economic activity in host country seems to have a greater impact in terms of magnitude on loan quality than the economic activity in home country. Even if the significance varies results (table 1 and 2 respectively model (1) to (5) and models (1) to (6)) indicate that a one point increase of GDP growth in destination country would reduce DA ratio on the bank of interest between 0.63 to 1 point. These results are in line with Nkusu (2011), Klein (2013) and Arakelyan (2018) respectively on the impact on macroeconomics factor on loan quality and on the impact of home country characteristics.

Credit risk in home country is positively linked to the one of counterpart countries: in other words, if a bank performs well at home, it may be due to idiosyncratic factors (potentially time-varying and not fully captured by banks fixed effects when introduced) that will also

impact results in other countries. This result is also found in Chen and Lio (2011) for 70 developing countries from 1992 to 2005. Classens and van Horen (2012) also investigated this relation and find that domestic credit risk is positively correlated with foreign one as in Kosmidou et al. (2007) that studied Greek banks in 11 nations between 1995 and 2001.

Namely results highlight that a one-point increase in home country loan quality for a given bank would increase loan quality into destination country by 0.23 point (table 1 and table 2). One can notice that this effect is robust to the specification (table 1 versus table 2) and also robust to the addition of fixed effects (table 1) even when controlling for destination countries characteristics. Costs of procedure worsen the defaulted asset ratio whereas creditor rights improve it. One can easily imagine that a distressed firm that enters into bankruptcy procedure is less likely to get over it if the costs linked to this procedure are high. The magnitude of the effect is widely the same regardless the specification (table 1, 2 and 3). When table 1 contains fixed effects estimations for both domestic and foreign loans, table 2 focuses on foreign loans only as table 3 that also contains regressions on alternative variables relative to insolvency frameworks for robustness checks. These latter are completed by table 1.1 for main specification and table 4 for alternative specification.

The recovery rate is negatively associated to DA ratio. Table 4 shows that a one point increase in the recovery rate index would reduce DA ratio between 1.01 and 1.08 point depending if one considers the DA ratio in level or in logarithm. We can highlight that these results are also robust to the way to compute the independent variable and also to the addition of fixed effects, even when controlling for destination countries characteristics.

One can also notice that systemic risk (last column of tables 1 and 2), which captures other banks risk, is quite significant. This variable has been computed as the DA ratio of all banks performing in a given country and year except the one of interest to avoid endogeneity issues. Indeed, if the systemic risk encompasses the one of the bank of interest this would bias the estimation as the regression would explain the asset quality of a bank by a variable including its own asset quality. The positive sign associated to this coefficient highlights that idiosyncratic risk is positively associated to systemic one. This variable seems to be quite relevant when discussing about asset quality given it significance (p-value<0.01) and the magnitude of the coefficient.

Table 1. Main Specification (OLS fixed effects)

Dependent Variable: DA ratio (%)	(1)	(2)	(3)	(4)	(5)	(6)
GDP (k,t-1)	-0.38*	-0.39*	-0.37*	-0.37*	-0.37*	-0.28*
	(0.20)	(0.21)	(0.19)	(0.20)	(0.21)	(0.15)
Home Inflation (k,t)	0.32	0.31	0.40	0.40	0.39	0.50
	(0.40)	(0.39)	(0.44)	(0.47)	(0.46)	(0.53)
Home BankConcentration (k,t)	0.00	0.01	0.01	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Home Property rights (k,t)	0.01	0.01	0.01	0.01	0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
GDP (j,t-1)	-1.01***	-0.99***	-0.81***	-0.74***	-0.74***	-0.27
	(0.06)	(0.06)	(0.17)	(0.16)	(0.16)	(0.20)
Inflation (j,t)	0.55***	0.55***	0.68***	0.77***	0.77***	-0.47*
	(0.03)	(0.03)	(0.17)	(0.19)	(0.19)	(0.27)
Property rights (j,t)	-0.03***	-0.03***	-0.03*	-0.03	-0.03	-0.02
	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)
Bank Concentration (j,t)	0.16***	0.17***	0.18***	0.21***	0.21***	0.05
	(0.01)	(0.01)	(0.04)	(0.06)	(0.06)	(0.03)
Cost of insolvency procedure (j,t-1)	0.26***	0.26***	0.26***	0.25***	0.25***	0.02
	(0.02)	(0.02)	(0.05)	(0.06)	(0.06)	(0.10)
Creditor rights (j,t-1)	-1.75***	-1.78***	-1.87***	-1.90**	-1.91**	-0.60*
	(0.19)	(0.19)	(0.48)	(0.82)	(0.81)	(0.35)
HomeBank[12] (i,k,t)					-0.24	-0.48
					(0.72)	(0.72)
Home risk (i,k,t)						0.23*
						(0.12)
Systemic risk (i,j,t)						39.23***
						(6.62)
Intercept	-4.70***	-5.74***	-10.71**	-11.26*	-11.25*	-1.21
	(1.33)	(1.45)	(5.28)	(6.11)	(6.13)	(3.89)
Time (t) fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Destination Country (j) fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Asset Class (z) fixed effect	No	Yes	Yes	Yes	Yes	Yes
Bank (i) fixed effect	No	No	Yes	Yes	Yes	Yes
Origin country (k) fixed effect	No	No	No	Yes	Yes	Yes
N	2453	2453	2453	2453	2453	2201

*Note: Robust standard errors are clustered at country of destination*time level and are in parenthesis.*

****, **, and * indicate respectively significance at 0.1%, 1% and 5% levels. Unlike Chiorazzo et al. (2017) and Nkusu (2011) we do not find that interest rates (proxied by lending rates, deposit rates and spread) have a significant impact on loan quality. Further investigations are needed using alternative indicators of interest rates.*

[12] This variable refers to a dummy that equals 1 if the bank of interest is a domestic bank and 0 otherwise.

Table 2. Main Specification with subsample (foreign loan, excluding loans in domestic country): OLS fixed effects

Dependent Variable: DA ratio (%)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP (k,t-1)	-0.443*	-0.444*	-0.441*	-0.440*	-0.439*	-0.348**	-0.386**
	(0.233)	(0.239)	(0.229)	(0.238)	(0.244)	(0.170)	(0.164)
Home Inflation (k,t)	-0.092	-0.069	-0.032	-0.046	-0.044	-0.007	-0.078
	(0.431)	(0.429)	(0.454)	(0.465)	(0.462)	(0.492)	(0.468)
Home Bank Concentration (k,t)	-0.004	-0.003	-0.001	-0.001	-0.001	-0.001	0.001
	(0.011)	(0.012)	(0.012)	(0.013)	(0.013)	(0.014)	(0.014)
Home Property rights (k,t)	0.028	0.026	0.027	0.027	0.027	0.033	0.037
	(0.025)	(0.025)	(0.027)	(0.026)	(0.026)	(0.026)	(0.026)
GDP (j,t-1)	-1.021***	-1.003***	-0.841***	-0.773***	-0.773***	-0.639***	0.092
	(0.055)	(0.055)	(0.163)	(0.147)	(0.142)	(0.194)	(0.183)
Inflation (j,t)	0.517***	0.526***	0.606***	0.553***	0.552***	-0.498	-0.351*
	(0.044)	(0.044)	(0.176)	(0.186)	(0.186)	(0.321)	(0.194)
Property rights (j,t)	-0.037***	-0.041***	-0.027*	-0.006	-0.007	-0.059	0.003
	(0.007)	(0.008)	(0.015)	(0.024)	(0.025)	(0.036)	(0.014)
Bank Concentration (j,t)	0.163***	0.173***	0.164***	0.120*	0.120*	0.052	-0.038***
	(0.015)	(0.016)	(0.045)	(0.070)	(0.071)	(0.044)	(0.012)
Cost of insolvency procedure(j,t-1)	0.275***	0.273***	0.281***	0.301***	0.302***	0.031	-0.077
	(0.019)	(0.019)	(0.063)	(0.079)	(0.078)	(0.133)	(0.053)
Creditor rights (j,t-1)	-1.636***	-1.675***	-1.767***	-1.202	-1.197	-0.541	-0.261
	(0.181)	(0.175)	(0.630)	(0.926)	(0.917)	(0.464)	(0.212)
HomeBank (i,t)					0.071	-0.238	-0.285
					(0.739)	(0.776)	(0.738)
Home risk (i,k,t)						0.231*	0.231**
						(0.115)	(0.107)
Systemic risk (i,j,t)						40.853***	36.458***
						(8.036)	(7.016)
Intercept	-5.098***	-6.270***	-9.414***	8.866***	-8.900***	1.833	1.469
	(1.469)	(1.756)	(2.173)	(3.013)	(3.077)	(5.122)	(2.504)
Time (t) fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Destination Country (j) fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	No
Asset Class (z) fixed effect	No	Yes	Yes	Yes	Yes	Yes	Yes
Bank (i) fixed effect	No	No	Yes	Yes	Yes	Yes	Yes
Origin country (k) fixed effect	No	No	No	Yes	Yes	Yes	Yes
N	2120	2120	2120	2120	2120	1879	1879
R-sq	0.091	0.110	0.113	0.113	0.113	0.124	0.112

*Note: Robust standard errors are clustered at country of destination*time level and are in parenthesis. This table is presented for robustness checks. We only consider here foreign loans (i.e. loans for whose country of origin and destination are not the same).*

****, **, and * indicate respectively significance at 0.1%, 1% and 5% levels.*

Table 3. Regressions using insolvency indicators for foreign loans

Dependent variable : DA ratio (%)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP (k,t-1)	-0.428*	-0.388	-0.373	-0.381	-0.309*	-0.295	-0.302
	(0.233)	(0.244)	(0.241)	(0.245)	(0.178)	(0.176)	(0.181)
Home Unemployment (k,t)	-0.025	-0.044	-0.044	-0.037	-0.096	-0.088	-0.082
	(0.042)	(0.045)	(0.055)	(0.054)	(0.060)	(0.069)	(0.069)
Home Bank Concentration (k,t)	-0.008	-0.001	-0.000	-0.001	0.001	-0.000	-0.001
	(0.012)	(0.012)	(0.011)	(0.011)	(0.013)	(0.012)	(0.012)
GDP (j,t-1)	-0.106	-0.185	-0.238	-0.233	-0.221	-0.271	-0.266
	(0.349)	(0.302)	(0.270)	(0.265)	(0.292)	(0.264)	(0.261)
Inflation (j,t)	-0.166	-0.136	-0.095	-0.107	-0.263	-0.218	-0.231
	(0.250)	(0.189)	(0.184)	(0.185)	(0.210)	(0.201)	(0.201)
Management of Debtor assets (j,t-1)	-0.324	-0.293	-0.414*	-0.405*	-0.330	-0.439**	-0.429**
	(0.434)	(0.238)	(0.207)	(0.206)	(0.232)	(0.208)	(0.209)
Costs of insolvency framework (j,t-1)		0.125	0.116	0.112	0.124*	0.116*	0.111
		(0.076)	(0.073)	(0.073)	(0.069)	(0.068)	(0.068)
Creditor rights (j,t-1)		-0.757**	-0.721*	-0.731**	-0.734**	-0.713*	-0.724**
		(0.351)	(0.361)	(0.353)	(0.339)	(0.356)	(0.348)
HomeBank (i,t)					0.098	0.142	0.078
					(0.744)	(0.653)	(0.662)
Home risk (i,k,t)					0.242*	0.242**	0.242**
					(0.123)	(0.118)	(0.118)
Intercept	9.340**	8.875***	6.086**	5.343**	8.608***	6.064**	5.386**
	(3.686)	(2.993)	(2.713)	(2.510)	(2.869)	(2.673)	(2.458)
Time (t) fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Origin country (k) fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank (i) fixed effect	No	Yes	Yes	Yes	No	Yes	Yes
Asset Class (z) fixed effect	No	No	No	Yes	No	No	Yes
N	2131	2120	2120	2120	2120	2120	2120
R-sq	0.019	0.032	0.057	0.063	0.062	0.086	0.092

*Note: Robust standard errors are clustered at country of destination*time level and are in parenthesis. The regression has been performed for foreign loans subsample for robustness checks. We did not introduce all variables related to insolvency procedure due to collinearity issues.*

****, **, and * indicate respectively significance at 0.1%, 1% and 5% levels.*

Table 4. Regression with Recovery rates using several independent variables and indicators for foreign loans

Dependent variable:	DA ratio	DA ratio	Log(1+DA)	Log(1+DA)	DA ratio	DA ratio	Log(1+DA)	Log(1+DA)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP (k,t-1)	-0.437**	-0.441**	-0.056***	-0.056***	-0.437***	-0.441***	-0.056***	-0.056***
	(0.171)	(0.170)	(0.020)	(0.020)	(0.130)	(0.129)	(0.015)	(0.015)
Home Unemployment (k,t)	-0.029	-0.032	-0.001	-0.001	-0.029	-0.032	-0.001	-0.001
	(0.053)	(0.053)	(0.006)	(0.006)	(0.052)	(0.052)	(0.006)	(0.006)
Home Bank Concentration (k,t)	-0.012	-0.008	-0.001	-0.001	-0.012	-0.008	-0.001	-0.001
	(0.012)	(0.012)	(0.002)	(0.002)	(0.015)	(0.015)	(0.002)	(0.002)
GDP (j,t-1)	0.540	0.516	0.063	0.062	0.540	0.516	0.063	0.062
	(0.973)	(0.958)	(0.065)	(0.065)	(1.079)	(1.059)	(0.069)	(0.068)
Inflation (j,t)	1.182	1.613	-0.237**	-0.220*	1.182	1.613	-0.237**	-0.220**
	(2.417)	(2.479)	(0.110)	(0.111)	(1.738)	(1.767)	(0.109)	(0.110)
Recovery rate (j,t-1)	-1.012**	-1.018**	-0.079***	-0.079***	-1.012*	-1.018*	-0.079**	-0.079**
	(0.423)	(0.421)	(0.014)	(0.014)	(0.562)	(0.556)	(0.032)	(0.031)
HomeBank (i,t)	-0.382	-0.514	-0.065	-0.070	-0.382	-0.514	-0.065	-0.070
	(0.835)	(0.854)	(0.085)	(0.086)	(0.655)	(0.660)	(0.063)	(0.063)
Home risk (i,k,t)	0.269**	0.266**	0.031**	0.031**	0.269***	0.266***	0.031***	0.031***
	(0.109)	(0.109)	(0.013)	(0.013)	(0.044)	(0.044)	(0.004)	(0.004)
Financial freedom (j,t-1)		-1.403***		-0.054***		-1.403**		-0.054
		(0.401)		(0.019)		(0.620)		(0.039)
Intercept	89.237***	184.358***	7.140***	11.027***	93.792*	189.085***	8.366***	12.055***
	(31.101)	(29.742)	(1.273)	(1.715)	(49.350)	(43.556)	(2.702)	(3.227)
Time (t) fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Destination Country (j) fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Asset Class (z) fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank (i) fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Origin country (k) fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3020	3011	3020	3011	3020	3011	3020	3011
R-sq	0.193	0.195	0.171	0.171	0.193	0.195	0.17	0.17

*Note: regressions (1) to (4) are OLS regressions with fixed effects whereas regressions (5) to (8) are random effect regressions. Model (1), (2), (5) (6) and (3), (4), (7), (8), use respectively DA ratio and log (1+DA) as dependent variable. Robust standard errors are clustered at country of destination*time level and are in parenthesis. We did not introduce all variables related to insolvency procedure due to collinearity issues.*

****, **, and * indicate respectively significance at 0.1%, 1% and 5% levels.*

V. Robustness checks

Using different specifications (OLS, GLS with random effects and maximum likelihood estimations) in the following table for robustness checks, without counterpart country fixed effects, it is checked that the main results are unchanged.
Table 1.1 records alternative regression where asset quality is computed in logarithm. The logarithm change could be a problem as banks often record a DA ratio of 0% and log (0) is undefined. To overcome this problem, we use log (1+ratio DA) instead. We perform alternatives models using several panel estimators and sets of fixed effects. Results are robust to the specification (OLS, GLS with panel random effects and maximum likelihood) to the choices of indicators that proxy economic activity or institutional framework and to the addition of fixed effects to control for unobserved characteristics related to banks, countries, asset classes and years. .

The economic situation, taken into account with unemployment, plays a significant role: more unemployment worsens the defaulted asset ratio. To see if the impact of GDP on asset quality is linked to GDP indicators, we included contemporaneous GDP per capita PPP. Results about the impact of GDP growth are confirmed by table 1.1.

The favourable role of stakeholder's participation is confirmed. However creditor participation seems to have a greater impact than debtor participation on asset quality. Home risk for a given bank and systemic risk of other banks also influence defaulted asset ratio in the same direction.

Table 1.1 Regressions using several estimators, without counterpart country fixed effects

Log (1+DA ratio)	(1) OLS	(2) OLS (foreign loans)	(3) R.E.	(4) R.E. (foreign loans)	(5) M.L.E.	(6) M.L.E. (foreign loans)
GDP (k,t)	-0.005	-0.007	-0.005	-0.007	-0.007	-0.010
	(0.009)	(0.006)	(0.005)	(0.005)	(0.008)	(0.010)
GDP per Capita PPP (j,t)	-0.017**	-0.026***	-0.017**	-0.026***	-0.012	-0.022**
	(0.008)	(0.008)	(0.007)	(0.007)	(0.009)	(0.011)
Home Inflation (i,t)	0.050	0.036	0.050	0.036	0.166***	0.132***
	(0.038)	(0.042)	(0.038)	(0.040)	(0.042)	(0.047)
Home Financial Freedom (i,t)	0.000	0.003	0.000	0.003	-0.001	0.001
	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)
Unemployment (j,t)	0.011**	0.013***	0.011**	0.013***	0.016***	0.019***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Inflation (j,t)	-0.026	-0.028	-0.026	-0.028	-0.015	-0.027
	(0.020)	(0.019)	(0.019)	(0.019)	(0.022)	(0.023)
Financial Freedom (j,t)	0.002	0.003	0.002	0.003	0.003	0.003
	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)
Creditor Participation (j,t-1)	-0.044*	-0.060**	-0.044**	-0.060***	-0.082***	-0.099***
	(0.025)	(0.026)	(0.021)	(0.021)	(0.028)	(0.030)
Management of Debtor Assets (j,t-1)	-0.023	-0.031	-0.023	-0.031*	-0.010	-0.029
	(0.025)	(0.024)	(0.017)	(0.018)	(0.025)	(0.026)
Home Bank (i,t)	0.059	0.064	0.059	0.064	0.053	0.056
	(0.055)	(0.044)	(0.043)	(0.049)	(0.055)	(0.063)
Home Risk (i,k,t)	0.017*	0.017*	0.017***	0.017***	0.018***	0.018***
	(0.009)	(0.009)	(0.003)	(0.004)	(0.003)	(0.003)
Systemic Risk (i,j,t)	4.414***	4.561***	4.414***	4.561***	4.274***	4.397***
	(0.866)	(0.743)	(0.592)	(0.572)	(0.397)	(0.413)
Intercept	0.377	-0.342	0.751**	0.605*	-0.666*	-0.727*
	(0.446)	(0.333)	(0.316)	(0.340)	(0.347)	(0.383)
Time (t) fixed effect	Yes	Yes	Yes	Yes	No	No
Asset Class (z) fixed effect	Yes	Yes	Yes	Yes	No	No
Bank (i) fixed effect	Yes	Yes	Yes	Yes	No	No
Origin country (k) fixed effect	Yes	Yes	Yes	Yes	No	No
N	4548	3871	4548	3871	4548	3871
R-sq.	0.110	0.110	0.10	0.110	0.068	0.071

Notes: Models (1), (3) and (5) represent respectively OLS, Random effects and Maximum Likelihood estimations. Models (2), (4) and (6) are the subsamples where domestic loans have been excluded to avoid collinearity between home and destination variables.
*Robust standard errors are clustered at country of destination*time level and are in parenthesis.*

****, **, and * indicate respectively significance at 0.1%, 1% and 5% levels.*

VI. Conclusions and way forward

Using a detailed dataset on European banks portfolios, which enables to introduce variability depending on counterpart country and controlling potentially for home and destination country as well as for individual banks' characteristics and asset class, results first confirm findings in the literature about the impact of macroeconomic factors. Thus, growth, when significant, alleviates defaulted assets ratios whereas unemployment in destination countries worsens it.
The findings also underline the significant impact of insolvency regimes as well as economic freedom. Indeed the creditor-friendly regimes (i.e. those that have higher recovery rates (Osterkamp (2006))) are associated with a better quality of bank loans' portfolios. Moreover, the costs of a procedure are associated with a lower portfolios' quality. An important leverage is found with stakeholder participation that is shown to improve asset quality by reducing DA ratio.

This study may have policy implications by inciting supervisors and policy makers to adapt juridical process to idiosyncratic situations and could bring tools to enhance financial stability.

Annex A.

Table A.1 Main variables[13]

Note: variables are included for domestic and destination countries as in Arakelyan (2018).

	Variable	*Specification*	*Source*
Macroeconomic variables	*GDP growth (j,t-1) (k,t-1)*	*Growth rate of Gross Domestic Product of both domestic (k) and destination countries (j)*	*IMF (W.E.O.)*
	Inflation (j,t) (k,t)	*General Price Index growth ²*	*IMF (W.E.O.)*
	Unemployment rate (j,t) (k,t)	*Unemployment rate*	*IMF (W.E.O.)*
	Competition (j,t) (k,t)	*This variable is proxied by several indicators related to this field as the Lerner index or banking concentration.*	*World bank (G.F.D.)*
Institutional Variables	*Regulatory efficiency (j,t) (k,t)*	*This variable is proxied by business freedom, labor freedom and monetary freedom. All of these variables are indices.*	*Hermitage foundation*
	Rule of law Business (j,t) (k,t)	*This variable is proxied by the system of property rights, government integrity and judicial effectiveness.*	*Hermitage foundation*
	Openness (j,t) (k,t)	*This part of the institutional framework is proxied by the Investment freedom and financial freedom, both being indices. All of these variables are indices.*	*Hermitage foundation*
Bank specific	*Home risk (j,t) (k,t)*	*Computed as the contemporaneous risk of a bank i in home country*	*Authors Calculations*
	Systemic risk (j,t) (k,t)	*Computed as the default rate on loans for the banking sector in country j except for the bank i of interest, to avoid endogeneity*	*Authors calculations*
Insolvency variables	*Costs of the Procedure (j,t-1) (k,t-1)*	*It records the costs (in % on the asset collateralized) linked to the Insolvency procedure*	*Doing Business (Resolving Insolvency)*
	Recovery Rate (j,t-1) (k,t-1)	*It records the recovery rate in cents on the dollar*	*Doing Business (Resolving Insolvency)*
	Creditor participation (j,t-1) (k,t-1)	*This index records the degree of participation of the creditor to court decision*	*Doing Business (Resolving Insolvency)*
	Management of Debtor assets (j,t-1) (k,t-1)	*This index records the degree of flexibility granted to the debtor during the insolvency procedure*	*Doing Business (Resolving Insolvency)*

[13] For robustness checks, alternative variables have been included. For example, to capture contemporaneous economic activity we choose to include GDP per capita PPP.

Table 1.2 Correlation matrix of main variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1.0												
2	0.0	1.0											
3	0.0	-0.5	1.0										
4	0.0	0.3	0.2	1.0									
5	0.1	0.1	0.0	0.1	1.0								
6	0.0	-0.1	0.1	0.0	0.2	1.0							
7	0.1	-0.1	0.1	0.2	0.3	0.0	1.0						
8	0.0	-0.1	0.2	0.1	-0.5	-0.4	0.1	1.0					
9	-0.1	0.1	-0.2	-0.2	0.0	-0.1	-0.7	-0.3	1.0				
10	0.0	-0.1	0.1	0.0	-0.1	0.2	0.2	0.2	-0.3	1.0			
11	0.0	0.0	0.0	0.0	-0.1	-0.1	0.1	0.1	0.0	0.0	1.0		
12	-0.1	0.0	0.0	-0.1	0.0	0.1	-0.1	-0.1	0.1	0.0	0.0	1.0	
13	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.1	-0.1	0.0	0.1	1.0

Table 1.2.1 Correspondence for the matrix of correlations

Variable	Number	Variable	Number
GDP (i,t-1)	1	Bank Concentration (j,t)	8
Home Inflation (k,t)	2	Cost (j,t-1)	9
Home Bank Concentration (k,t)	3	Creditor (j,t-1)	10
Home Property rights (k,t)	4	HomeBank (i,t)	11
GDP (j,t-1)	5	Home risk (i,k,t)	12
Inflation	6	Systemic risk (i,j,t)	13
Property rights (j,t)	7		

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