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TRANSATLANTIC DIFFERENCES IN BANK RESILIENCY

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TRANSATLANTIC DIFFERENCES IN BANK RESILIENCY

Abstract

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JEL Classification: G12, G21, G24, M14

Keywords: Esg-scores, Bank resiliency, Systemic risk, Financial stability, Sustainable banking

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Transatlantic differences in bank resiliency*

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May 2, 2023

Abstract

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1 Introduction

Only 15 years after the Great Financial Crisis (GFC) a depositor run on Californian Silicon Valley Bank on Thursday, March 9th, 2023, and on Credit Suisse, one of the two Swiss mega banks a couple of days later on March 15th, sent shock-waves through the banking markets both in the United States as well as in Europe. While the turbulences are still unfolding as this article is being written and while the world still faces the resolution of multiple crises[1], this ongoing episode clearly illustrates the current lack of resiliency of banking markets both in the US and in Europe.

This current experience is rather disturbing since in the aftermath of the GFC regulators had vowed on both sides of the Atlantic not to tolerate another great crisis in banking markets in the near future and to spare tax payers further expenses[2]. And while the timing of the stress is closely related to steep interest rate increases induced by restrictive monetary policy of the Fed and the ECB in order to curb rampant inflation, the nature of the stress so far developed quite differently across the Atlantic. In the US it is especially larger regional banks such as Silicon Valley Bank, Signature Bank and First Republic, while in Europe it is largest banks, the so-called globally systemically important banks (GSIBs) that are under particular stress.[3] The March experience suggests that business models and regulatory focus have developed quite differently across the Atlantic. What does this tell us about the resiliency of the respective banking systems?

In this article we want to take a somewhat broader perspective and analyse the evolution of the resiliency of the respective banking systems prior to the GFC and afterwards all the way up to the recent events. Essentially, the period prior to the GFC was characterized by increasing globalization and integration of financial markets. After the crisis had struck, apparently, different lessons had been learned. Accordingly, different policies had been implemented afterwards such that we now experience

[1]The expiration of public loan guarantees granted during the Covid-19 pandemic as well as the spillovers of the Ukrainian war are likely to add to the stress of bank assets in 2023.

[2]In addition to a CHF 50 billion support package by the Swiss National Bank the Swiss tax payer was forced to issues far ranging guarantees of 109 billion CHF

[3]With asset of more than $200 billion Silicon Valley Bank was about the 16th largest bank in the US when it was closed on March 10th, 2023, while Credit Suisse hat asset under management of more than $1.5 trillion.

marked differences in the way the respective banking systems are able to deal with steep increases in interest rates.

We start our analysis by tracing various measures of financial integration from 2001-2021 in section 2, which will illustrate a trend towards increasing integration until 2008 and a certain amount of disintegration afterwards. In section 3 We continue surveying the literature on relative performance measures between the two regions as a condition for building up resiliency. We first concentrate on measures of profitability and competitiveness. In section 4 we discuss the ability of the respective financial systems to deal with risk, in particular systemic risk in the respective jurisdictions. In the last section 5, we address directly the issue of resiliency, which extends the notion of risk and includes the ability of the financial system to recover from negative shocks. This latter role of resiliency essentially measures how the financial systems can cope with long-run risks and how they can cope with potential sequences of perverse future shocks.

2 Financial Integration Across the Atlantic

A first question to ask is whether we observe that the process of financial integration lead to convergence of the financial systems. If it did, presumably in the long-run all differences between the systems would wipe out and the systems would operate similarly. Accordingly, how did financial integration between Europe and the US unfold in recent decades? In order to address this question proper measures of integration need to be developed. The obvious solution would seem to compare the performance of the financial systems across the Atlantic. The more similar performance, one might conjecture, the more integrated the systems. However, there are challenges to this view. In case of dissimilar developments, other unobserved factors might generate different outcomes even under similar economic conditions or in a completely integrated economic system.

One example of the challenges in measuring financial integration might be the domestic bias in stock investments. As widely documented since Cooper and Kaplanis (1994), aggregate national portfolio holdings of stocks and bonds (Gehrig, 1993) are concentrated on domestic stocks. In terms of our regional focus, American investors on average hold a proportionally larger part in US stocks, while European investors favour proportionally European stocks. While it is tempting to use the extent of the domestic bias, however measured, as a measure of financial disintegration, it turns out the regional stock market bias also occurs in completely integrated markets internally. This is why Coval and Moskowitz (2001) discuss the "domestic bias at home". In fact, one explanation of this observation might rest in the unobserved variable of "local information", or simply regional information, as has been pointed

out by Gehrig (1993), Brennan and Cao (1997), Karolyi (2016), and many others.

The example of domestic bias, however, illustrates how disparity in performance measures might open up analytical work on underlying reasons that affect differential outcomes. Financial integration may be one of the contributing factors, but there may co-exist other economic forces in parallel affecting performance measures. This caveat needs to be kept in mind when we compare the financial systems according to profitability and competitiveness measures, risk and systemic risk measures as well as resiliency measures.

A potentially simpler direct way of measuring financial integration across financial systems is in measuring the comovement in stock returns of participants of each system. Following Bilio et al. (2012) and Gehrig, Iannino (2018), we measure the number of connections between the two systems as the number of significant Granger causalities in pairwise VAR models between American and European GSIBs. Four our analysis we focus on 25 GSIBs headquartered in either US or Europe. For each pair of American and European firms, we run a vector autoregression (VAR) model on the average weekly returns of US bank i and European bank j:

$$R_{it} = \alpha_i + \sum_s^S \gamma_{is} R^i_{t-s} + \sum_s^S \beta_{js} R^j_{t-s} + \varepsilon_t \quad (1)$$

$$R_{jt} = a_j + \sum_s^S \lambda_{js} R^j_{t-s} + \sum_s^S b_{is} R^i_{t-s} + \xi_t \quad (2)$$

We determine the optimal number of lags for each pair according to the Aikaike information criterion and perform the VAR whenever there is at least one optimal lag. Moreover, we can assign the direction of a connection, identifying either bank i or bank j as the leader. We perform a Granger causality test after each regression and classify the pair as a connection if either j Granger-causes i (if β is statistically significant), or vice-versa i Granger-causes j (if b is significant). This method has proven useful to Gehrig and Iannino (2018) for establishing the increasing integration between banking and insurance companies between 1990-2017.

Following Gehrig and Iannino (2018), we also include tail properties. Hence, we can better account for spill-overs in tail events, such as crises phenomena. We evaluate measures of performance in the event of an extreme aggregate shock, such as the case in which the daily market index falls more than its 95% VaR. Thus, the Marginal Expected Shortfall is the expected loss in bank returns in case of such a negative event:

$$MES_{it}(c) = E_{t-1}(r_{it} | r_{mt} < c = q_{5\%}) \quad (3)$$

We assume the equity loss in a six-month horizon, the long-run marginal expected shortfall (LRMES), is approximated to (1-e(log(1-d)*beta)), where d is the 40% six-

month crisis threshold for the market index decline and beta is a dynamic market beta between the bank returns and the market returns (Engel, 2002). Hence, we estimate lead-lag patterns in their Marginal Expected Shortfalls (MES) between US and European GSIBs to identify connections that might only arise in periods of critical market conditions. In order to do this, we consider the number of significant Granger causality connections in MES, as above.[4]

Figure 1 reports the number of connections between 25 USA and European Global Systemically Important Banks (GSIBs). We consider GSIB any institution, headquartered either in the USA or in Europe, that has been so qualified by the Financial Stability Board at least once from 2011 to 2021. We observe that the connections between US and European banks in their mean returns (top frame) have been increasing until 2009, and significantly decreasing thereafter. This evidence seems to suggest that the interconnectedness has been steadily strengthening in the run-up to the Great Financial Crisis with peaks during the 2007-08 years. Moreover, connections measured via mean returns have significantly been decreasing afterwards to a level that the evidence suggests disintegration started after the GFC. When interconnectedness is measured by tail returns (bottom frame), connections are much more numerous and steady across the period, showing clearly the contagion effects of the major crisis episodes in the 20 years. We observe peaks during the IT crisis, the GFC and the European debt crisis. These results suggest a high and increasing risk of contagious spill-overs, especially after the GFC, between USA and European systemically relevant banks. By and large, however, judging from interconnections the view emerges that the process of integration has not been monotonic and smooth.

3 Profitability and Competitiveness as Sources of Resiliency

Let us now concentrate on the main drivers of resiliency, namely measures of bank performance and relative competitiveness. How do interconnections affect the relative positions of the banking systems on both sides of the Atlantic? Interestingly, we do observe significant reversals in the relative competitiveness of the banking systems within the past two decades. While European banks apparently have lost competitiveness, US banks have regained strong competitive positions.

Table 1 and Figure 2 report the total assets development of US banks and EU banks in terms of book values. We can see that from 2000-2007, EU banks were

[4]We assume a bivariate daily time series model of the equity returns of institution i, dependent on a value-weighted market index m which we proxy with the MSCI Europe index. Volatilities are estimated with an asymmetric GJR GARCH process (Glosten, Jagananthan and Runkle, 1993) and correlations with a DCC correlation model (Engle, 2002).

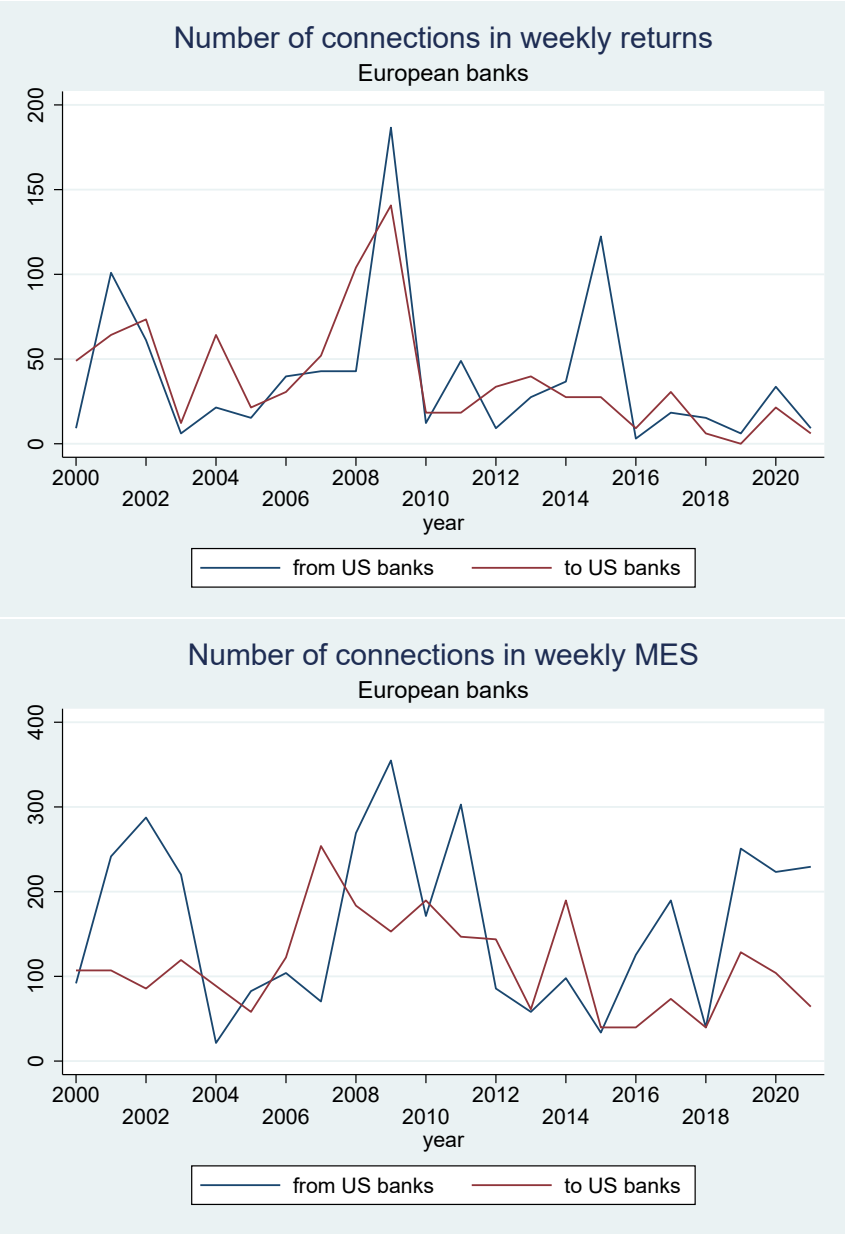


Figure 1: Connectedness of GSIBs. This figure reports the interconnectedness between 25 GSIBs in USA vs. Europe 2000 to 2021, according to their stock returns (top frame) and their Marginal Expected Shortfalls (bottom frame). Interconnectedness is measured as the number of significant Granger causalities in pairwise comparisons between the GSIBs of USA vs. Europe, following a VAR model on the average weekly returns of each pair of banks (top) and weekly MES (bottom). We consider GSIBs any institution that has been so qualified by the Financial Stability Board at least once from 2011 to 2021.

Table 1: GSIBs sorted by Total Assets

2002		2012		2021	
Bank	**Total Assets**	**Bank**	**Total Assets**	**Bank**	**Total Assets**
Citigroup	$ 1,056,067	Deutsche Bank	$ 2,816,458	JPMorgan Chase & Co	$ 3,631,967
Deutsche Bank	849,144	HSBC	2,641,929	BNP Paribas	3,124,025
UBS	794,248	BNP Paribas	2,542,010	Bank Of America	2,978,129
BNP Paribas	731,183	Barclays	2,500,645	HSBC	2,971,858
JPMorgan Chase & Co	722,550	Credit Agricole	2,322,648	Credit Agricole	2,413,142
HSBC	721,472	JPMorgan Chase & Co	2,299,393	Citigroup	2,316,698
ING	670,138	Bank Of America	2,159,472	Wells Fargo & Co	1,953,863
Credit Suisse	639,633	Citigroup	1,916,636	Barclays	1,886,039
Bank Of America	635,246	Banco Santander	1,661,858	Banco Santander	1,842,241
Barclays	559,286	ING	1,618,618	Societe Generale	1,772,759
Morgan Stanley	511,698	Societe Generale	1,588,796	Deutsche Bank	1,567,288
Societe Generale	488,855	Lloyds	1,522,341	Goldman Sachs	1,325,936
Commerzbank	461,912	UBS	1,500,832	Lloyds	1,198,417
Credit Agricole	440,793	Wells Fargo & Co	1,339,609	Morgan Stanley	1,157,207
Lloyds	361,475	Unicredit	1,226,143	ING	1,151,002
Goldman Sachs	325,067	Credit Suisse	1,104,925	Unicredit	1,117,741
Banco Santander	324,910	Goldman Sachs	943,055	UBS	1,102,004
Dexia	317,947	Nordea Bank	917,015	Credit Suisse	884,671
Wells Fargo & Co	317,183	Commerzbank	875,427	BBVA	816,699
BBVA	276,085	BBVA	799,053	Standard Chartered	801,774
Nordea Bank	231,019	Morgan Stanley	761,137	Nordea Bank	694,416
Unicredit	195,598	Standard Chartered	618,251	Commerzbank	630,939
Standard Chartered	110,153	Dexia	515,887	Bank Of New York Mellon	468,021
Bank Of New York Mellon	79,881	Bank Of New York Mellon	323,846	State Street	320,395
State Street	75,355	State Street	202,455		

[a] The table reports the ranking in terms of Total Assets of the 25 GSIBs in our sample. We consider Total Assets at the year end of 5 subperiods, as Compustat Global and US annual data. We consider GSIBs any institution that has been so qualified by the Financial Stability Board at least once from 2011.

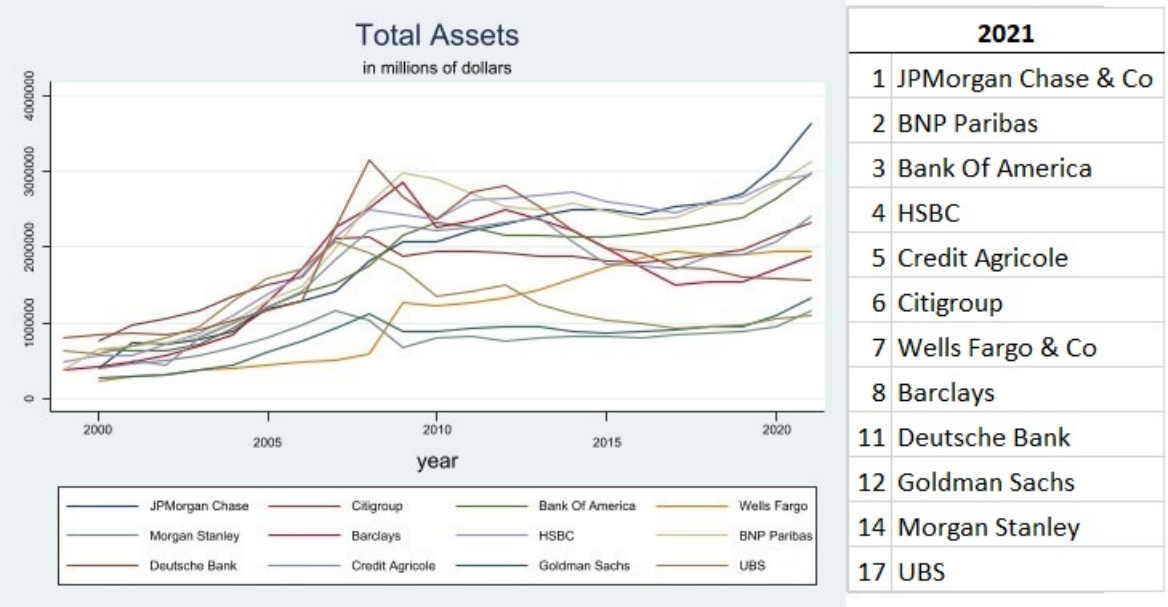


Figure 2: Total Assets for selected GSIBs. This figure reports the time evolution of Total Assets for 12 selected GSIBs from 2002 to 2021, as Compustat Global and US annual data. We consider GSIBs any institution that has been so qualified by the Financial Stability Board at least once from 2011 to 2021.

	2021
1	JPMorgan Chase & Co
2	Bank Of America
3	Wells Fargo & Co
4	Morgan Stanley
5	Citigroup
6	Goldman Sachs
7	HSBC
8	BNP Paribas
10	UBS
15	Credit Agricole
16	Barclays
21	Deutsche Bank

Figure 3: Market capitalization for selected GSIBs. This figure reports the time evolution of Market Capitalization for 12 selected GSIBs from 2002 to 2021, as Compustat Global and US annual and market data. We consider GSIBs any institution that has been so qualified by the Financial Stability Board at least once from 2011.

leading US banks in size, while we observe the opposite from 2013-2020 US banks were leading EU banks. An even stronger picture emerges with regard to market values, such as market capitalization (Figure 3), which takes into account the views of market participants, and, therefore, is an even stronger measure of (relative) competitiveness.

Figure 4 reports the relative profitability development of US banks vs. European banks from 2000-2020. We can see that leading to the Great Financial Crisis of 2008, US banks as well as EU banks exhibited diminishing returns on equity (ROE). Obviously, the ROE of US banks has always been larger than the ones of EU banks. However, after the crisis of 2008, different sets of regulations were set in place in the US and in Europe. We can see that these regulations led to much more favourable outcomes for US banks than for EU banks, as ROEs of US banks have been recovering since then, while the ROEs of EU banks never really recovered due to Basel III. The same picture can be seen from non-interest income.

Clair and O'Driscoll Jr. (1993) contrast general differences between the U.S. and the European banking sector. They identify that while the U.S. has a larger number of small, undiversified banks, the European sector has a smaller number of large, more diversified banks. They further identify regulatory differences between the U.S. and European regulatory approaches. While the U.S. pursues a host state regulation, the European community relies on the home country regulation of banks. This has

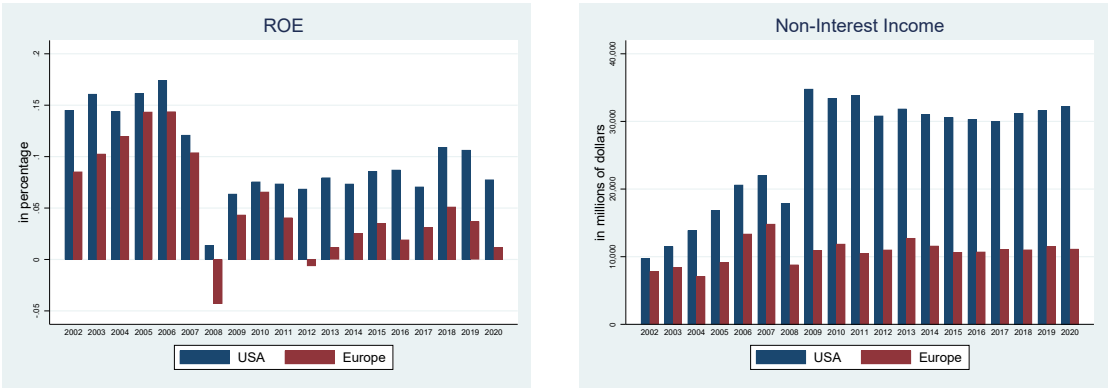


Figure 4: Average performance measures of GSIBs. This figure reports the average evolution of profitability measures among 25 USA and European GSIB, from 1987 to 2020. In particular, we observe Return on Equity, and Non-interest Income, as re-elaborations from Compustat Global annual fundamental data. We consider GSIBs any institution that has been so qualified by the Financial Stability Board since 2011.

important implications on competitive market entry as a home country regulation facilitates a competitive entry, while a host state regulation inhibits it. One of the biggest differences between the U.S. and the European banking system lies not only in the regulatory framework, but also in the way how performance is achieved. This manifests on the operational as well as the managerial level. Baele et al. (2013) examine driving factors of equity returns of U.S. financial institutions. They measure banking risk as the exposure of bank stock returns to a set of pre-defined risk factors. Interestingly, they find that the most likely model explaining banking sector returns only has a probability of 25%, with the market, real estate, and the high-minus-low (HML) FamaFrench factor being the most important drivers of bank stock returns. They don't find interest rate factors to be reliably related to bank stock returns.

Weigand (2015) compares financial performance, growth, asset mix, risk, operational efficiency, profitability and capital holdings of the 20 largest commercial banks in the U.S. and Europe from 2001-2013. He finds that U.S. banks earned significantly larger stock returns than their European counterparts in the post-crisis years, accompanied by higher rates of revenue and loan growth, superior profitability and loan portfolio quality, and lower risk. European banks, on the other hand, remain trapped in a downward spiral of negative revenue and loan growth, decreasing profitability, rising rates of impaired and nonperforming loans, and borderline insolvency. U.S. banks can therefore afford to pay smaller dividends to their investors, as well as lower interest rates to depositors, compared to European banks. However, Weigand identifies regulatory loopholes in the U.S. which allow them to hold trillions of dollars in risky derivatives positions off-balance, which highlights the risk U.S. banks are exposed to, and they might cause through contagion in case of a market stress event.

Another difference between the U.S. and the European banking system can be

found in the net interest margin. Hanzlik and Teply (2020) examine the determinants of net interest margin of the European and US banks in a zero lower bound situation. They find that net interest margin is significantly influenced by different institutional designs of capital-based (UK and US) and bank-based financial markets (continental Europe). Further, they find differences in net interest margin caused by bank size. Moreover, they show significant differences by bank type: Savings banks, real estate and mortgage banks, and cooperative banks report consistently lower net interest margins than commercial banks and bank holdings.

Kolia and Papadopoulos (2022) investigate the development of efficiency and the progress of banking integration in the European Union by checking convergence among banks of European and Eurozone countries as well as contrasting the results with those of the United States. They find that the bank efficiency of the US is considerably higher than that of the Eurozone and the European Union. Although there is no evidence of convergence across the banking groups, our results indicate the presence of club convergence. They conclude that the US banking system is closer to convergence than the Eurozone and the European Union banks. However, this might change in the future due to the fact that Eurozone and European Union banks' speed of convergence is higher than that of US banks.

4 Different Views on Bank Capital and Systemic Risk

How does profitability relate to risk attitudes in banks in both regions? Having discussed relative profitability and competitiveness in the preceding section, we will now focus on risk measures, and in particular on systemic risk measures. How much are the banking systems across the Atlantic exposed to systemic risk and to what extent do individual banks contribute to systemic risk? While numerous measures of systemic risk have been developed and discussed in the literature (see Giglio et al. 2016) for the purpose of this chapter we concentrate on Delta CoVaR (Adrian, Brunnermeier, 2016) and expected capital shortfall, SRISK (Brownlees, Engle, 2017), where empirical results seem most striking.

Delta CoVaR is a contribution measure of systemic risk and can be interpreted as measuring the intensity of contagion from one bank to the overall banking system. Hence it is a spreading measure. We follow Adrian and Brunnermeier (2016) in measuring the contribution to systemic risk by the use of Delta CoVaR. Using a quantile regression approach, we identify this distress event of firm i as an equity loss equal to its $(1-\alpha)\%$ VaR, such as $r_{it} = VaR_{it}(\alpha)$, and CoVaR represents the maximum loss of the market return within the $\alpha\%$-confidence interval, conditionally on some event $C(r_{it})$ observed for bank i: $Pr(r_{mt} \leq CoVaR_t^{m|C(r_{it})}) = \alpha$. Then, the $

Delta CoVaR of the bank i is then defined as the difference between the CoVaR of the financial system conditional on firm i being in distress and the CoVaR of the financial system conditional on firm i being in its median state, weighted by the bank's market capitalization:

$$\$\Delta CoVaR_{it}(\alpha) = -(CoVaR_t^{m|r_{it}=(VaR_{it}(\alpha))} - CoVaR_t^{m|r_{it}=Median(r_{it})}) * MV. \quad (4)$$

In line with the authors, we transform Delta CoVaR to positive values.

In contrast, SRISK is an exposure measure and can be interpreted as measuring the likelihood of individual banks of getting affected by shocks to other banks. Hence, it is an infection measure.

SRISK for bank i in period t can be estimated as:

$$\begin{aligned} SRISK_{i,t} &= E_{t-1}[Capital\ shortfall_i | Crisis] \\ &= E_{t-1}[k(Debt_{i,t}) - (1-k)(1 - LRMES_{i,t})Equity_{i,t}], \end{aligned} \quad (5)$$

where k is the prudential capital ratio, that we assume at 8% (Engle (2002)); $LRMES_{it} = 1 - \exp(ln(1-d)beta)$ is the expected loss in equity value of bank i, if the market were to fall by more than a $d = 40\%$ threshold within the next six months (according to V-lab documentation[5]), and the market beta is a dynamic correlation coefficient between the bank's and the market returns (Engle, 2002). SRISK is estimated daily and then aggregated annually.

Figure 5 presents the trajectories of these systemic risk measures from 2002-2018 for USA and Europe (Gehrig, Iannino, Unger, 2021). It can readily be seen that the trajectories on Delta CoVaR closely move in tandem on both sides of the Atlantic, while aggregate SRISK is a lot higher for Europe. This evidence is consistent with Bostandzic and Weiss (2018), who find very similar patterns for the years 1991-2014 on a slightly different data set. Accordingly, European countries are significantly more exposed to systemic risk, while the contribution to systemic risk is similar to the USA.

But what can explain this higher build-up of systemic risk in Europe? There are various channels proposed in the literature. Colletaz et al. (2018) suggest that the higher capital shortfall is related to the ECB's monetary policy. In their cross-sectional study, Gehrig, Iannino (2021) find that the capital shortfall is particularly concentrated in the globally systemically important banks (GSIBs), which happens to be the largest 1 quintile of the cross-section of SRISK. These authors find that SRISK has built up especially in the run-up the Great Financial Crisis (GFC) in 2007-8 in the highest quintile of banks, and continues to increase in the second quintile even after the GFC, whereas the increases in SRISK in the lower quintiles have been

[5]https://vlab.stern.nyu.edu/docs/srisk/MES

Figure 5: Risk measures in Europe and the USA (Gehrig, Iannino and Unger, 2021).
The Figure reports the average evolution of the risk measures for all banks in Gehrig, Iannino and Unger (2021), from 2002 to 2018. We compare USA vs. European banks in: SRISK (Expected Capital Shortfall), measured as Brownlees and Engle (2017) (top frame); Delta CoVaR estimated as Adrian and Brunnermier (2016) (middle frame) (bottom frame).

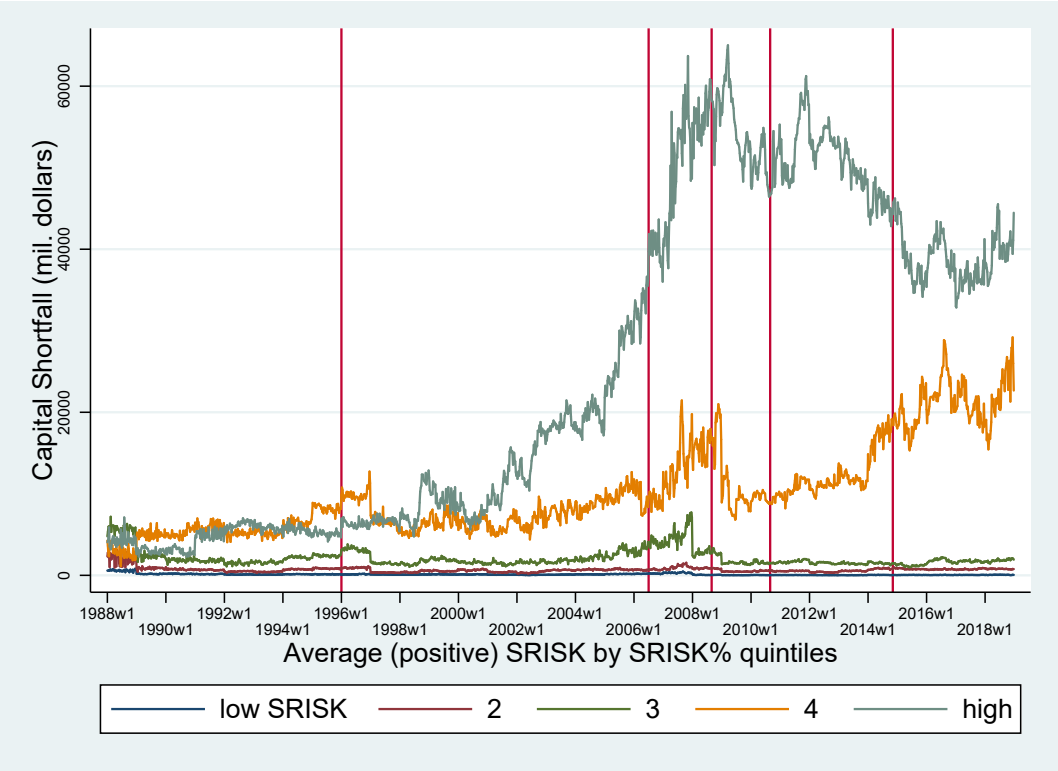


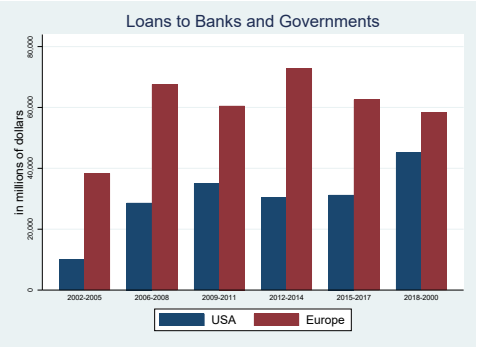
Figure 6: SRISK Quintiles (Gehrig, Iannino, 2021). The figure reports the evolution of the daily average estimated SRISK, distinguishing five equal-size quintiles of the relative capital shortfall, rebalanced annually. The top quintile (high) corresponds to the group of banks with the highest level of positive SRISK, while the bottom quintile (low) corresponds to the group of banks with the lowest level of capital shortfall.

rather moderate (see Figure 6). Moreover, the reduction in SRISK has not receded to pre-crisis levels in the upper quintile. A similar development can be observed when insurance companies are included in the analysis (Gehrig, Iannino, 2018).

These findings suggest that the differential regulatory treatment of GSIBs in the Eurozone constitutes a major reason for the higher risk build-up. Indeed European GSIBs are the major holders of (European) government bonds (Correa et al. 2014), and, therefore, relatively more exposed to government debt, as illustrated in Figure 7 for GSIBs. Loans to private customers take similar developments in GSIBs on both sides of the Atlantic.

The larger funding of government debt in Europe is also reflected in lower Basel leverage ratios as seen in Figure 8.[6] Consequently, Eurozone GSIBs are also major actors in the derivatives markets on European sovereigns (Acharya and Steffen, 2015). And indeed, the studies of Correa et al. (2014) and Acharya and Steffen (2015) suggest

[6]Note that Figure 8 reports the ratio of stockholders' equity over total assets. Thus, it slightly differs from the Basel leverage ratio, which considers Tier1 capital over total assets (BCBS, 2014).



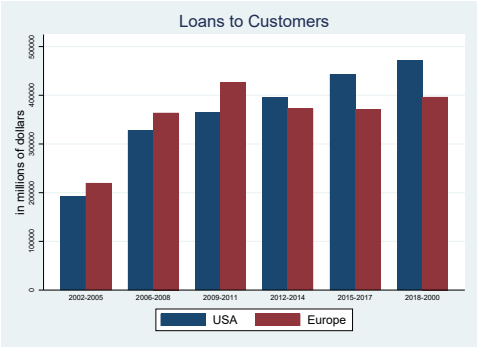
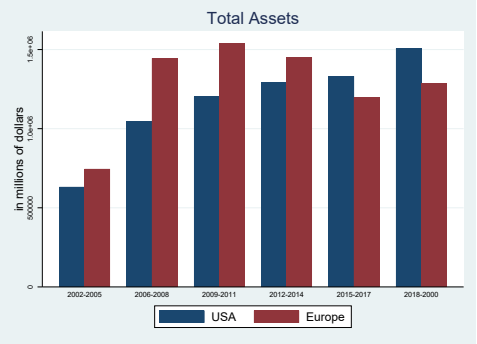


Figure 7: Loans. This figure reports the average evolution of loans among 25 USA and European GSIB, from 1987 to 2020. In particular, we distinguish Loans (as the sum of loans/claims/advances) to banks and governments and to customers, as data from Compustat Global annual fundamental data. We consider GSIBs any institution that has been so qualified by the Financial Stability Board at least once since 2011.



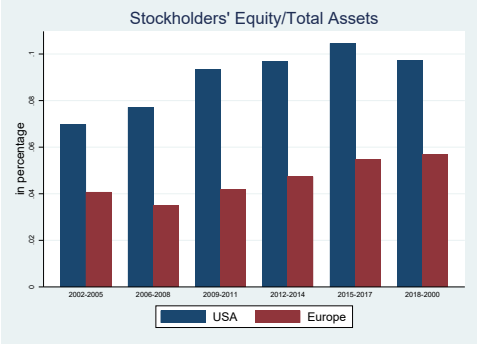
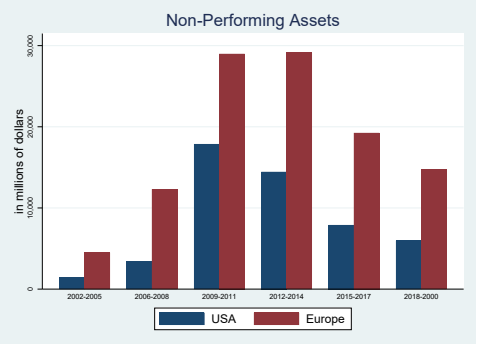


Figure 8: Assets and Leverage. This figure reports average total assets and leverage among 25 USA and European GSIB, from 2011 to 2020. In particular, we observe Total Assets and Leverage (stockholders' equity over assets), as re-elaborations from Compustat Global annual fundamental data. We consider GSIBs any institution that has been so qualified at least once since 2011.



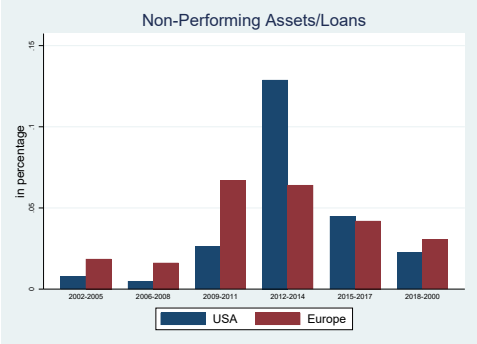


Figure 9: Non-Performing Assets. This figure reports the average evolution of non-performing assets among 25 USA and European GSIB, from 1987 to 2020. In particular, we observe total Non-Performing Assets (NPA) and NPA over Loans, as re-elaborations from Compustat Global annual fundamental data. We consider GSIBs any institution that has been so qualified by the Financial Stability Board at least once since 2011.

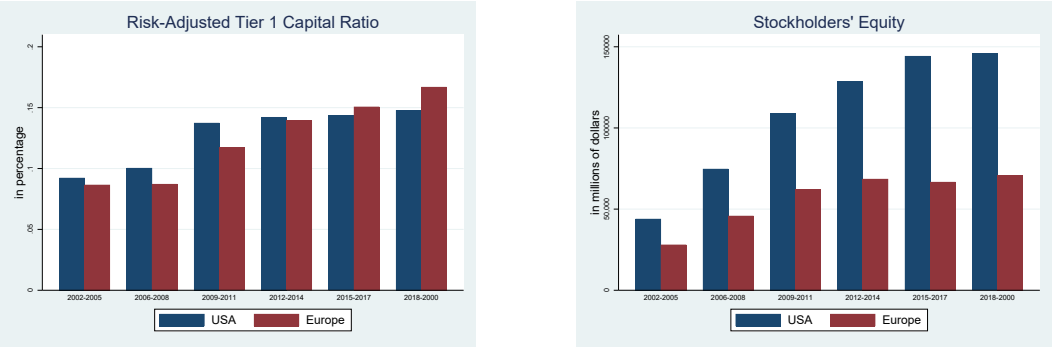


Figure 10: Capital. This figure reports average capital measures among 25 USA and European GSIB, from 2011 to 2020. In particular, we observe Tier 1 capital ratio and Stockholders' Equity, as Compustat Global annual fundamental data. We consider GSIBs any institution that has been so qualified at least once since 2011.

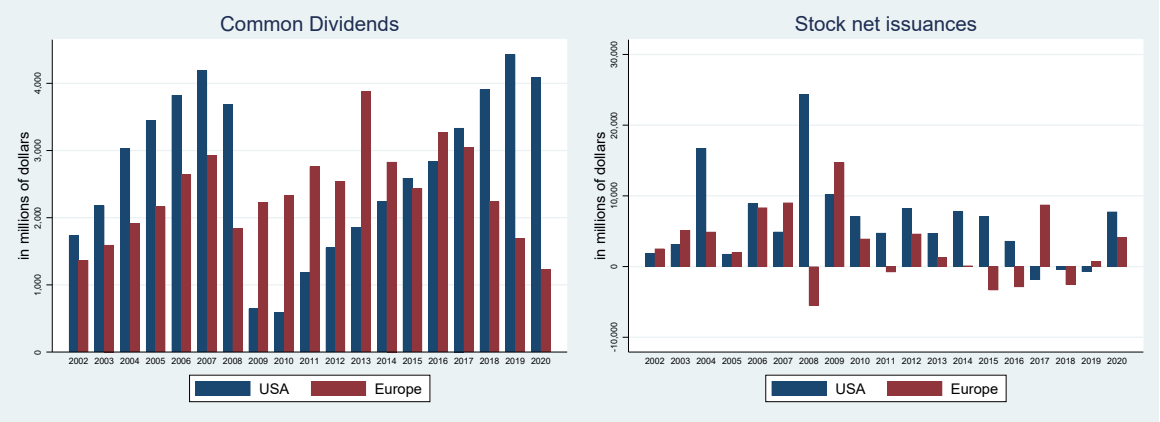


Figure 11: Dividends and Net Stock Issuances. This figure reports the average evolution of dividends payments and stock issuances among 25 USA and European GSIB, from 2011 to 2020. In particular, we observe Common Dividends and Net Stock Issuances, as re-elaborations from Compustat Global annual fundamental data. We consider GSIBs any institution that has been so qualified at least once since 2011.

that the bond market activities of European banks did contribute significantly to increasing their systemic risk exposure.

While the strong decline in NPA (Figure 9) suggests that European banks have cleaned up their loan books in absolute terms, there is less of a difference in relative terms. In relative terms, it becomes clear that the US has taken a far more concentrated effort to clean up the loan books in the period 2012-2014.

Moreover, Figure 10 reports big differences in stockholders' equity, that are not reflected in differences in Tier 1 capital though. It appears consistent with the fact that Basel II regulation did allow large European banks to reduce equity relative to their US peers by means of internal credit risk models.

The differential regulatory treatment of GSIBs on both sides of the Atlantic can

also be observed when it comes to payout performance as reported in Figure 11. US banks tend to pay higher common dividends. Only in the post-crisis period of 2009-2014 US banks were forced to recapitalize relatively more than European banks. Accordingly, they reduced dividend payments and issued new stocks. European banks in contrast continued high dividend payments even post-crisis and even repurchased stocks after the GFC had struck.[7]

Interestingly, the major stumbling block for the conclusion of the Basel III framework at the Santiago Summit in 2016 has been disagreement about the usage of banks' internal credit risk models for determining regulatory capital requirements. While the US administration insisted on reducing capital regulation on a simple statutory framework, the European administrations insisted on using the self-regulatory option that allows banks, typically GSIBs, to reduce their regulatory burden and reduce the cost of financing government debt. While the Santiago Summit failed in finalizing the Accord, one year later a compromise was struck that limits the capital reductions based on internal models of 27.5% by establishing an output floor at 72.5% relative to the standard approach (Basel, 2017). These different regulatory assessments can be understood by the different roles that banks play in funding government budgets in the US and in Europe and are reflected in the different systemic risk exposures of the GSIBs, respectively. While the US favours a stricter approach to capital regulation, the European approach relies more heavily on self-regulation leaving banks more leeway to reduce their safety buffers. At the same time, European sovereigns are more dependent on their large banks and, therefore, more willing to support their GSIBs in case of serious troubles, which explains the larger tolerance for systemic risk in Europe. Additionally, most of the European GSIBs enjoy the status of national champions, which even enhances their effective protection by the various European taxpayers.

Therefore, it comes at little surprise that systemic risk exposure of the largest six European GSIBs dominates those of the largest six GSIBs fom the US by roughly a factor of two to three (see Table 2 and Figure 12). One alarming common feature remains, however, since the systemic risk exposures post-GFC years for all banks, except for Wells Fargo & Co, have never regressed to pre-GFC levels.

5 Differences in Resiliency

The concept of resiliency is broader than just the management of (systemic) risk. Most concepts of resiliency go beyond the ability to survive a crisis or a shock, and

[7]Stock net issuances in our data set is calculated as the first difference in stockholders' equity. Thus, a negative entry implies that stock repurchases exceed issuances of new stocks.

Table 2: GSIBs sorted by SRISK

2002		2012		2021	
Bank	**SRISK**	**Bank**	**SRISK**	**Bank**	**SRISK**
Deutsche Bank	$ 48,949	Deutsche Bank	$206,664	BNP Paribas	$201,283
BNP Paribas	37,397	Credit Agricole	175,887	Credit Agricole	164,730
Credit Suisse	34,244	Barclays	175,265	HSBC	137,204
ING	33,644	BNP Paribas	174,069	Barclays	124,420
Commerzbank	32,191	Bank Of America	122,407	Societe Generale	123,834
JPMorgan Chase & Co	29,760	Societe Generale	115,036	Banco Santander	109,852
UBS	28,743	ING	113,588	Deutsche Bank	107,486
Societe Generale	26,162	Citigroup	105,842	Citigroup	90,951
Credit Agricole	24,090	JPMorgan Chase & Co	102,756	Unicredit	70,531
Morgan Stanley	17,516	Lloyds	98,770	Lloyds	68,945
Barclays	16,613	Banco Santander	96,636	ING	62,344
Dexia	15,675	UBS	91,588	Credit Suisse	52,245
Nordea Bank	9,718	Unicredit	84,165	UBS	51,545
Banco Santander	8,045	Credit Suisse	71,847	Standard Chartered	50,169
BBVA	5,692	HSBC	70,069	Wells Fargo & Co	45,231
Goldman Sachs	5,323	Commerzbank	63,489	Commerzbank	43,522
Unicredit	1,801	Nordea Bank	53,647	BBVA	41,606
Standard Chartered	732	Goldman Sachs	47,643	Goldman Sachs	31,448
State Street	- 2,401	Morgan Stanley	45,016	Nordea Bank	28,176
Lloyds	- 3,273	BBVA	43,971	Bank Of America	24,311
Bank Of NY Mellon	- 7,094	Dexia	41,089	State Street	9,334
Bank Of America	- 13,735	Standard Chartered	16,958	Bank Of NY Mellon	8,063
Citigroup	- 19,796	Wells Fargo & Co	12,244	JPMorgan Chase & Co	2,663
HSBC	- 31,474	Bank Of NY Mellon	10,977	Morgan Stanley	2,638
Wells Fargo & Co	- 31,475	State Street	4,663		

[a] The table reports the ranking in terms of SRISK of the 25 GSIBs in our sample. SRISK is estimated following Equation 5, as Compustat Global and US annual and market data. We consider GSIBs any institution that has been so qualified by the Financial Stability Board at least once from 2011.

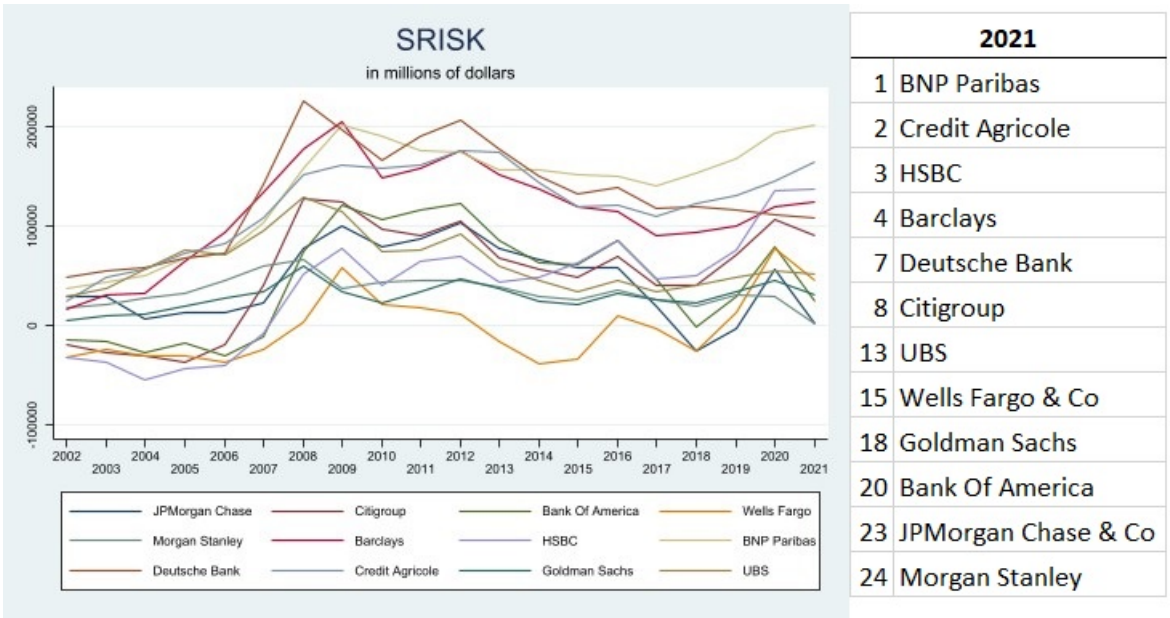


Figure 12: SRISK for selected GSIBs. This figure reports the time evolution of SRISK for 12 selected GSIBs from 2002 to 2021, as Compustat Global and US annual and market data. We consider GSIBs any institution that has been so qualified by the Financial Stability Board at least once since 2011.

include the ability to learn and adjust as well as the capacity to foresee and avoid crises (see Buyl et al. 2022). Accordingly, the concept of resiliency exceeds the mere notion of risk management, be it at the level of a single institution or at the level of the financial system at large. While it is difficult to define precise measures of resiliency, the very notion of resiliency is essentially related to the long-term survival of an institution or a system, and, therefore, requires a long-term planning horizon. Bank business models based on short-term horizons, such as "gambling-for-resurrection", would typically not qualify for resilient business models.

Interestingly, the CSR and ESG literature has developed proxies for long-term orientation in business models that seem to be supported by empirical work. Cornett et al. (2016), for example, find that US banks with high CSR scores tend to be highly capitalized and characterized by economic out-performance relative to their peers. This positive correlation between CSR characteristics and an institution's survival probability, however, weakens significantly in the aftermath of the GFC after 2009.

In the absence of a single generally accepted resiliency measure, we follow Gehrig et al. (2021) and Scholtens and van't Klosters (2019) and use ESG scores as proxies for resiliency measures. As Gehrig et al. (2021) argue, the informational content of ESG is largely related to forward-looking elements of the institutions' business models. Therefore, in this section, it is interesting to survey the literature on the relationship between ESG scores and economic performance. In this regard, the question of how ESG scores affect risk or even systemic risk of an institution is of particular importance.

Various papers find an impact of corporate social responsibility on bank lending and bank performance for various countries, e.g. Goss (2011) for the US, El Khoury et al (2021) for the MENAT region (Middle East, North Africa and Turkey). While most of this work applies to profitability and return measures, only small literature addresses the relation between CSR or ESG and measures of bank risk.[8] For US banks, Anginer et al. (2018) report that shareholder-friendly corporate governance is related to higher individual as well as higher systemic risk of banks. This reflects among other items a larger degree of stock repurchases, and, hence, lower capitalization. Bax et al. (2022) find that for European banks higher ESG ratings are related to lower systemic risk impact on other banks.

The relation between ESG scores and risk in banking has been analysed only by a few studies so far. Dorfleitner et al. (2020a, 2020b) have analysed the correlation between ESG scores and insolvency in a global sample of banks. While the control

[8]Note that for non-bank industries there is already a fast-growing literature on the effects of ESG on firm performance like Ferrell et al. (2016), Lins et al. (2017) and the meta-study of Friede et al. (2015).

for country-specific fixed effects, they do not systematically analyse differences across countries, and therefore cannot contribute to a transatlantic comparison. Chiaramonte et al. (2020) perform a similar analysis for the insurance sector and, likewise, do not research transatlantic differences.

Bouslah et al. (2013) is the first paper that analyses the impact of the three ESG components on systemic risk in banking. While they identify significant effects especially of the G-factor on systemic risk, because of the aggregated nature little can be said about the underlying structure. Also Scholtens and van't Klosters (2019) document the significant impact of the aggregate ESG pillars on risk exposure for a small sample of 43 banks from 10 European countries. They find strong effects both on the level of individual banking risk as well as systemic risk.

Aevoae et al. (2022) consider the impact of ESG scores on systemic risk contribution. Measuring contribution risk with help of Delta CoVaR, they find that corporate governance is significantly and negatively correlated with systemic risk in a sample of banks across 47 countries.

None of the papers above addressed specifically endogeneity and reverse causality.

Gehrig et al. (2021) provide a more detailed analysis of systemic as well as individual risk of more than 200 banks on both sides of the Atlantic. In terms of systemic risk, they analyse both, exposure to as well as contribution to systemic risk. Importantly, they address issues of endogeneity in the causal relationship between ESG scores and systemic exposure. Unlike the papers discussed before they also disaggregate the pillars into their constituting elements.

The authors investigate the transatlantic differences in the impact of ESG score change of European and U.S. banks on systemic risk, measured through the exposure measure, SRISK, and, additionally, the contribution measure, Delta CoVaR. Moreover, they regress the aggregate ESG scores on two measures of firm individual risk, Z-score (insolvency risk) and market beta (systematic risk).[9] They find a strongly significant and resiliency-enhancing effect of the aggregate ESG score on all systemic risk measures. Figure 13 reports the average evolution of ESG scores in the US as well as in Europe.

After disentangling the components of the equal-weighted ESG score into its major pillars, Environmental, Social, Corporate Governance, and Economic score, the authors further find that the Social score contributes significantly to the reduction of both measures of systemic risk. In particular, one standard deviation increase in Social score will decrease SRISK by 0.146 standard deviations, ceteris paribus. Further, a change in the Environmental score will produce a decrease of 0.196 standard deviations in Delta CoVaR, indicating a significant reduction in contribution risk.

[9]In subsequent work Dursun et. al (2023) find that high ESG-banks did maintain resiliency by reducing risky lending.

The interaction of the Corporate Governance score with the variables indicates that European banks that score high on the governance dimension also tolerate higher capital shortfalls, and vice versa for US banks.

Regarding the transatlantic differences, their results show that European banks enjoy significantly lower exposure to systemic risk and individual insolvency risk, on average. However, the systemic resiliency-enhancing effect of ESG rating is significantly lower for European than for US banks. Also, the effect of CSR on small vs. large firms is significantly different, i.e. ESG measures tend to be more effective in enhancing resiliency for smaller firms. In the social pillar, European banks seem to benefit more from socially-responsible investments compared to US banks in terms of their perceived exposure risk, while US firms benefit more in terms of reducing contribution risk. The Corporate Governance score has a significantly destabilizing differential effect on contribution risk for Europe. Further, the authors detect most of the transatlantic differences in the contribution to systematic risk, i.e. market beta. Considering common drivers, the strongest effects on risk are (i) Customer/product responsibility, (ii) Society/human rights, (iii) Training and development/policy, (iv) Board Compensation Policy, and (v) Profitability/shareholder loyalty.

Another interesting insight the authors provide is the impact of the update of the calculation methodology of the ESG measures in 2017 by Refinitiv on the risk measures. First, banks that have seen an expected reduction in ESG are, after 2017, perceived riskier in terms of systemic exposure. This indicates that the market updates its beliefs on systemic exposure and considers ESG as an important driver of riskiness. Secondly, US banks were not affected by the change in the ESG calculation methodology.

By a way of summarizing our main findings, Gehrig et al. (2021) suggest that labour market institutions and board structure are important drivers for the resiliency of European banks, while social or human rights, product responsibility and resource allocation are the main drivers for US banks, besides that ESG has a stabilizing effect on systemic risk measures, both the exposure and the contribution measure, as well as individual risk measures for systematic risk and insolvency risk.

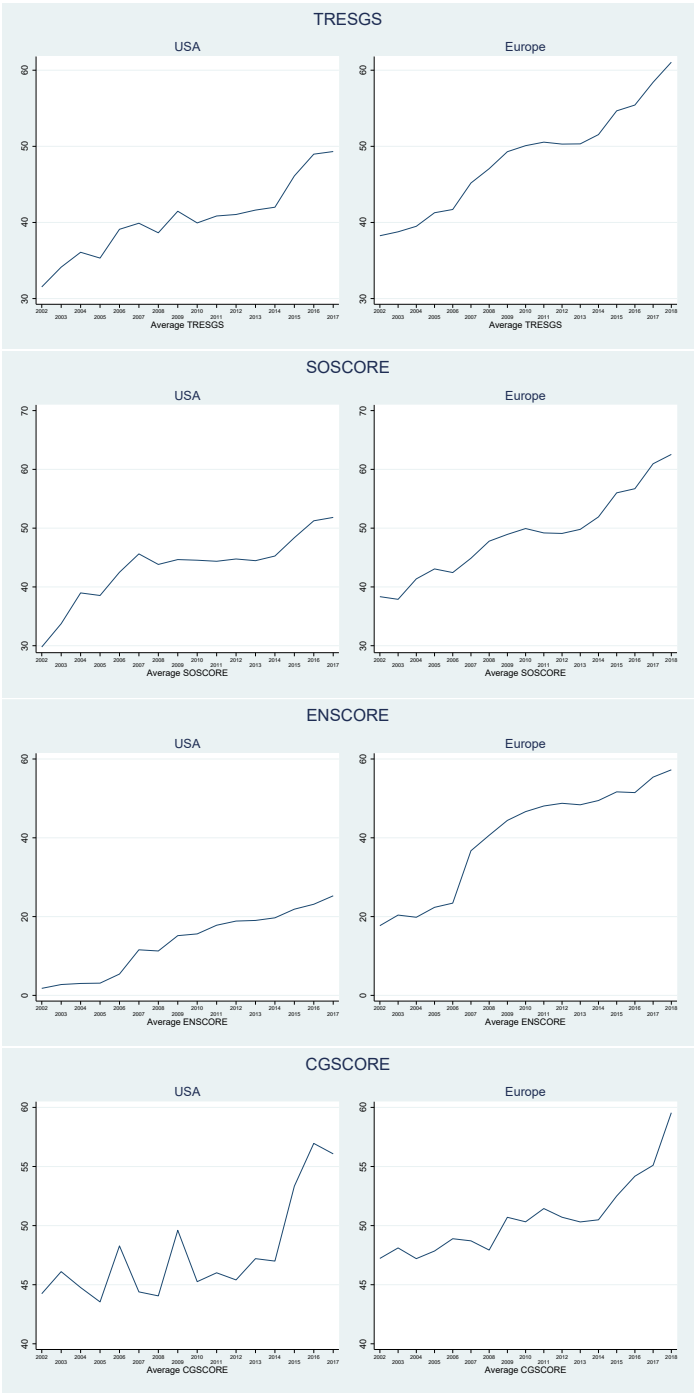


Figure 13: ESG scores (Gehrig, Iannino and Unger, 2021). This figure reports the average evolution of ESG scores. We report the weighted score TRSGS and its pillars, Social (SOSCORE), Environmental (ENSCORE) and Corporate Governance (CGSCORE), as TR Refinitiv data, 2002 to 2018. The sample includes 257 US and European firms where both Refinitiv and Compustat data are available, as Gehrig, Iannino and Unger (2021).

6 Prospects for Convergence of Resiliency

Despite enormous progress in the integration of global financial systems, in the previous sections, we have also established evidence about limitations, or even barriers to integration. While on both sides of the Atlantic the financial systems serve the needs of industry and private investors, there is a larger role for European banks in financing national government debt, for which in turn they are effectively rewarded with Too-big-to-fail guarantees (O'Hara, Shaw, 1990). This also implies fragmentation of resiliency within the banking systems on both sides of the Atlantic. Because of these differential public attitudes in a fragmented union of sovereign states, the playing field does not seem to be equally levelled. On the other hand, to the extent that stockholders are globally mobile, the question arises to what extent shareholder value considerations will affect bank business models and to what extent those will harmonize business models across different jurisdictions. And to the extent that formerly national champions are largely owned by foreign stockholders the incentives for national governments to patronize national champions may fade and induce governments to increasingly rely on funding public debt in global markets under competitive conditions. Accordingly, the evolution of global stock ownership might become an important driver of financial integration. And in fact, recent trends in global stock ownership seem supportive of this perspective.

For example, in their analysis of common ownership in European banks, Gehrig and Iannino (2022) document a strongly increasing role of common ownership after the GFC. We measure Common Ownership as a bi-directional, pair-level measure of overlap as Gilje et al. (2020). We measure the overlap of ownership between any two pairs of banks, thus, we are able to explore the evolution of common ownership across pairs. For each pair of banks A and B, we consider all investors $i_{A,B}$ who have strictly positive holdings in both banks. Per each investor i, we consider the percentage ownership stakes into bank A, $\alpha_{i,A}$, and into bank B, $\alpha_{i,B}$. Then, we calculate the arithmetic average ownership stake, the geometric average or the minimum common stake, and unweightedly sum them across all common investors per each bank pair:

$$Arithmetic\ Overlap_{A,B} = \sum_i \frac{\alpha_{i,A} + \alpha_{i,B}}{2} \tag{6}$$

$$Geometric\ Overlap_{A,B} = \sum_i (\alpha_{i,A} * \alpha_{i,B})^{1/2} \tag{7}$$

$$Min\ Overlap_{A,B} = \sum_i \min \alpha_{i,A}, \alpha_{i,B} \tag{8}$$

Figure 14 presents the trajectories of the three different common ownership measures from 2003-2018. While the informational content differs across measures, it can be readily seen that each of these measures is rising.

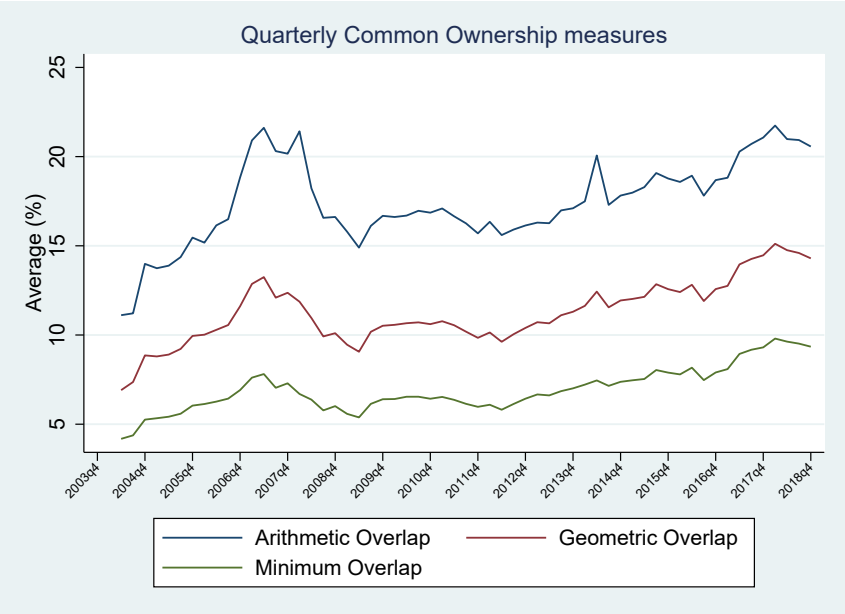


Figure 14: Overlap common ownership measures (Gehrig, Iannino, 2022). This figure reports the overlap common ownership measures as Equations 6 to 8, on a sample of 160 European banks, as Gehrig, Iannino (2022). Data: SNL, Compustat.

Figure 15 presents the holdings of particular GSIBs by the largest US-based investment funds Black Rock, Vanguard, State Street. But also by others, did increase their portfolio holdings in European banks (Gehrig, Iannino 2022). As the authors document, the common ownership has been particularly concentrated on the GSIBs, which are exactly those European banks with the largest systemic risk exposure SRISK (Figure 16).

This phenomenon seems puzzling. While investment funds, especially passive funds provide low-cost investment opportunities to their clients, one might expect that clients' interest is concentrated on low-risk banks, or high-risk adjusted returns or Sharpe ratios. As we document here GSIBs provide higher returns but at the cost of significantly larger systemic risk.

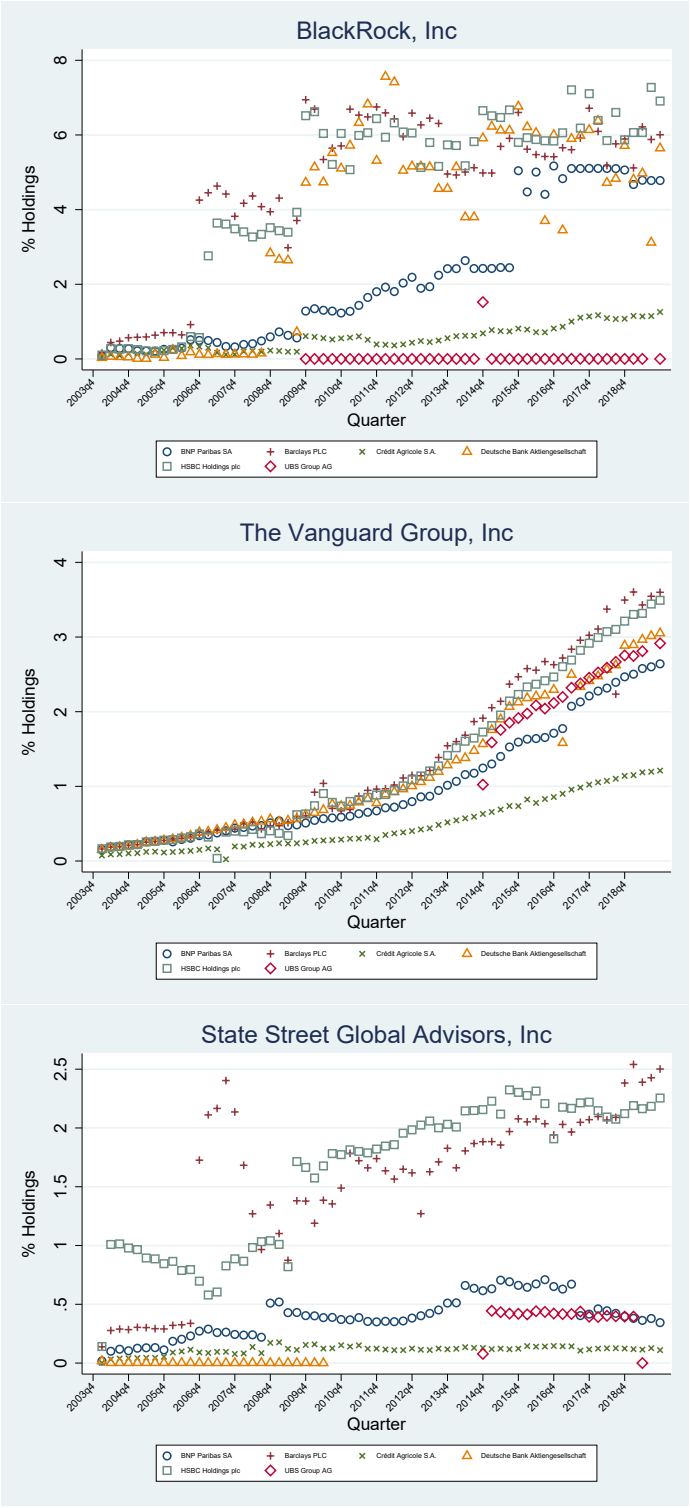


Figure 15: The "Big Three" (Gehrig, Iannino, 2022). This figure reports the ownership holdings of the "Big Three" (Blackrock, Vanguard and State Street) into a selection of European banks, from 2003 to 2020. Data: SNL, Compustat.

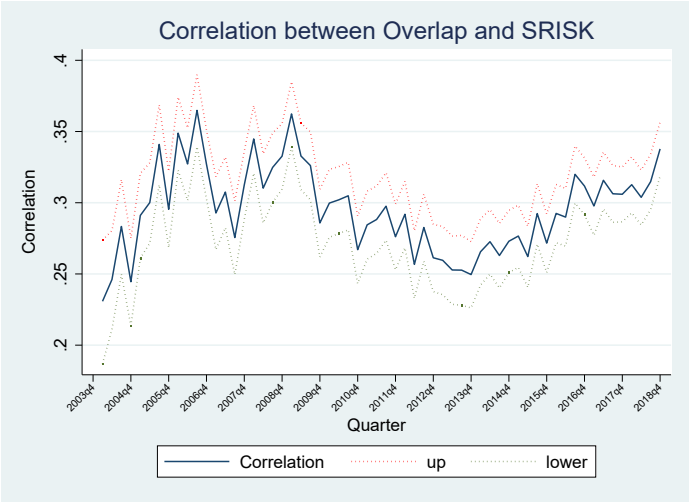


Figure 16: Correlation between Common Ownership and SRISK (Gehrig, Iannino, 2022). This figure reports the quarterly correlation between overlap arithmetic measure and SRISK, on a sample of 160 European banks as Gehrig, Iannino (2022). As Overlap is a pair-level measure, we consider SRISK as the sum of the capital shortfall of the two banks in the pair. We report confidence up and lower 95% bounds. Data: SNL, Compustat.

7 Conclusion

This chapter investigates the transatlantic differences in bank resiliency between the U.S. and the European banking sector. While globalization certainly has led to increasing integration of the financial systems in Europe and the US and harmonization of financial resiliency, in this chapter we document that the process of convergence has not been monotone. While there has been a high degree of convergence in the run-up to the GFC, in the aftermath the process of integration has slowed down and significant differences in the banking systems across the Atlantic have widened again. As the multiple global crises are in the process of winding down, we witness different reactions of the banking systems across the Atlantic. While in the US it is particularly the large regional banks that experience dramatic stress, it is the large banks in Europe that prove particularly vulnerable.

These observation reflect different degrees and properties of resiliency of the respective financial systems. On the basis of systemic risk exposures we document that the US banking system has proven more resilient, especially for the large banks. This finding is based on the different roles banks play in financing government debt on both sides of the Atlantic, but also to the different post-crisis policies applied by national policies. While US banks were largely recapitalized post-GFC, European nations only recapitalized failing banks and supported GSIBs with a light-handed approach to model-based risk. Since European banks are relatively more important

in government funding, European supervisors tolerate higher leverage and, for that reason, high systemic risk exposure. This light-handed approach also implies a lesser strain on public finances than mandatory recapitalization of the largest banks. This attitude is amplified by the fragmented structure of the Eurozone consisting of 27 sovereign countries with most championing at least one main national bank, their national champion.

So what are the prospects for further convergence of resiliency across the Atlantic? Maybe not surprisingly, our empirical analysis suggests that the answer will depend both, on the ability of large investment funds in aligning and coordinating bank business models across different national jurisdictions, and the extent to which public policy relies on their respective national banking systems rather than funding budgets on common global markets. To the extent that market-based systemic risk measures are used to assess resiliency, they will always reflect the market assessments of the resiliency of banks' individual business models as well as the effectiveness of the overarching financial supervision and its social safety net.

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