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Very preliminary version: June23, 2016

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Abstract

We investigate how bank charter value affects risk for a sample of OECD banks by using standalone and systemic risk measures before (2000-2006), during (2007-2009) and after (2010-2013) the global financial crisis. Prior to the crisis bank charter value is positively associated withrisk-taking and systemic risk for very large "too-big-too-fail" banks and large U.S. and European banks but such a relationship is inverted during and after the crisis. A deeper investigation shows that such a behavior before the crisis is mostly relevant for very large banks and large banks with high growth strategies. Banks' Business models also influence this relationship. In presence of strong diversification strategies, higher charter value increases standalone risk for very large banks. Conversely, for banks following a focus strategy, higher charter value amplifies systemic risk for very large banks and both standalone and systemic risk for large U.S. and European banks.

Keywords: Systemic risk, Standalone risk, Charter value, Bank strategies, Too-big-too-fail, Global financial crisis, Bank regulation

JELcodes: G01, G21, G28, G32, G34.

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Abstract

We investigate how bank charter value affects risk for a sample of OECD banks by using standalone and systemic risk measures before (2000-2006), during (2007-2009) and after (2010-2013) the global financial crisis. Prior to the crisis bank charter value is positively associated withrisk-taking and systemic risk for very large "too-big-too-fail" banks and large U.S. and European banks but such a relationship is inverted during and after the crisis. A deeper investigation shows that such a behavior before the crisis is mostly relevant for very large banks and large banks with high growth strategies. Banks' Business models also influence this relationship. In presence of strong diversification strategies, higher charter value increases standalone risk for very large banks. Conversely, for banks following a focus strategy, higher charter value amplifies systemic risk for very large banks and both standalone and systemic risk for large U.S. and European banks.

1. Introduction

This paper revisits the charter value hypothesis (CVH) and the effectiveness of its risk-disciplining effect in the light of the major transformations of the banking industry before and after the global financial crisis of 2007-2008 (GFC). Worldwide, in the years preceding the GFC, banks experiencedtremendous changes.Specifically, value enhancing mergers and acquisitions (M&A) arrangements lead banks to grow in size, become more powerful, and yet, more riskier (Anginer, Demirguc-Kunt, and Zhu 2014; Martinez-Miera and Repullo 2010; De Jonghe and Vennet 2008). Mechanically, banks gained competitive advantageand an increase in their charter value, backed by size, operational complexity and higher profit expectations driven by more aggressive risk-taking policies(Stiroh 2004; Furlong and Kwan 2005; Jones, Miller, and Yeager

2011)[1]. Such operations had altered bank charter value but also the importance of large "too-big-to-fail" (TBTF) banks and institutions which were later recognized as "systemically important financial institutions" (SIFIs) or "too-complex-to-unwind" banks[2]. These banks were at the heart of the GFC. They were deeply involved in complex activities and tended to accumulate less capital and less stable funds before the crisis(Laeven, Ratnovski, and Tong 2014; Bostandzic and Weiss 2013; Brunnermeier, Dong, and Palia 2012).

It is widely recognized that charter value (or franchise value, proxied by Tobin's q) self-disciplines bank risk, the so-called charter value hypothesis (CVH), and provides banks with a valuable source of monopoly power (Jones, Miller, and Yeager 2011; Ghosh 2009; González 2005; Gan 2004; Demsetz, Saidenberg, and Strahan 1996; Keeley 1990). Higher charter value is expected to lower risk-taking incentives and increase capital because of the higher bankruptcy costs that banks could endure if they fail. Nevertheless, banks have systematically looked for higher profitability, more returns and higher margins, by increasing their exposure to new market-based instruments (Martynova, Ratnovki and Valhu 2014). This shift towards new financial instruments at a large scale and riskier business models is puzzling for high chartered banks.

Meanwhile, systemic risk has considerably increased in the banking industry with a higher threat posed by large banks, including those with high charter values which pursued higher risk policies prior the global financial crisis. Market imperfections and system vulnerability to contagion have also enhanced systemic risk (Hartmann 2009). Also, banks had benefited from implicit guarantees and deposit insurance, particularly for SIFIs, which allowed them to gain competitive advantages and to change their growth strategy and business model and therefore to take more risk. Another factor that has received less attention, before the GFC, is the increase in bank charter value. This leads us to adopt a different approach on the disciplining role of increasing charter value in such a risk-accumulating period (before the GFC).

[1](Jones, Miller, and Yeager 2011)emphasize three factors to explain the increase of charter value during the 1988-2008period: a rise in banks' noninterest income, a run-up in the stock market, potentially "irrational exuberance", and a strong economic growth.

[2]M&A operations have significantly reduced the degree of competition andhave positivelyaffected prices and margins. They were achieved for other strategic reasons, such as improving market share, profitability, or efficiency (De Jonghe and Vennet 2008; Jones, Miller, and Yeager 2011).

The perception of bank risk has also changed, based not only on its individual dimension (idiosyncratic risk and individual defaultrisk), but also more and more on the vulnerability of banks and their contribution to systemic risk. Hence,throughout this paper, we look at both risk dimensionsand consider standalone alongside systemic risk measures. We go beyond the literature addressing the nexus between bank charter value and risk by considering systemic risk indicators(Anginer, Demirguc-Kunt, and Zhu 2014; Hovakimian, Kane, and Laeven 2012; Jones, Miller,and Yeager 2011; Soedarmono, Sitorus, and Tarazi 2015) along the traditional standalone proxies (Hovakimian, Kane, and Laeven 2012; Niu 2012; Jones, Miller, and Yeager 2011).

Large banks, TBTF banks and SIFIs, have a natural tendency to grow further, change their business model and hence follow high risk strategies presumably more than socially optimal (Acharya, Engle, and Richardson 2012). Their failure propagates contagion across the system and could also trigger global bankruptcy[3]. Although there is no unique definition of systemic risk, wherein the entire financial system is distressed, it is commonly accepted that a bank's systemic risk exposure refers to the comovement of individual bank risk and sensitivity to an extreme shock (Haq and Heaney 2012; Weiß, Bostandzic, and Neumann 2014; L. Laeven, Ratnovski, and Tong 2015). Various measures have been proposed in the literature to capture bank systemic risk. Adrian and Brunnermeier (2011) have introduced a comovement measure (ΔCoVaR) of financial system value at risk (VaR) conditionally on banks' VaR; Acharya (2009) considers the sensitivity of bank equity losses to market crashes (MES); while, the tail-beta used among others by (Campbell, Hilscher, and Szilagyi 2008; Anginer, Demirguc-Kunt, and Zhu 2014) captures the sensitivity of systematic riskto extreme events (tail risk). The inherent unstable nature of systemic risk (pre and post GFC), suggests that the relationship between charter value and risk may possibly change depending on the opportunities and constraints that banks face in different environments preand post crisis.

Although there is a broad literature looking at the impact of charter value on bank individual risk (Niu 2012; Jones, Miller, and Yeager 2011; González 2005; Konishi and Yasuda 2004; Demsetz, Saidenberg, and Strahan 1996; Keeley 1990) there is no clear-cut consensus on the effect of bank charter value on banks' standalone risk and systemic risk in normal versus abnormal economic conditions (i.e. pre and post GFC). Hence, this paper examines the stability

[3](L. Laeven and Levine 2007) argue that SIFIs engaged in multiple activities (charter-gain-enhancing) suffer from increased agency problems and poor corporate governance that could be reflected in systemic risk. Demirgüç-Kunt and Huizinga (2010) find that banks that rely to a larger extent on non-deposit funding and non-interest income are more profitable but also riskier.

of the relationship between charter value and risk to track possible changes before the crisis (2000-2006), during thecrisis (2007-2009), and after (2010-2013). It also looks into possible differences for U.S. banks, European banks and the more conservative banks in the rest of OECD countries which rely on a more traditional banking model[4]. It also considers possibly different impacts of charter value on standalone and systemic bank risk measures. To the best of our knowledge, this is the first study that investigates the charter value hypothesis by considering both standalone and systemic risk measures of bank risk by further differentiating the exceptional risk-building period prior to the global financial crisis of 2007-2008 from the acute crisis and post-crisis periods.

We use a sample, spanning from 2000 to 2013, of 667 banks established in OECD countries. The results show that prior to the global financial crisis charter value positively impacts both standalone and systemic bank risk measures but that such a relationship is inverted during and after the crisis. A deeper investigation shows that such a behavior before the crisis is mostly relevant for very large banks and large banks with high growth strategies. Banks' business models also influence this relationship. In presence of strong diversification strategies, higher charter value increases standalone risk for very large banks. Conversely, for banks following a focus strategy, higher charter value amplifies systemic risk for very large banks and both standalone and systemic risk for large U.S. and European banks.

The remainder of the paper is organized as follows. Section 2 presents the data and variables used in this paper. In section 3, we present the empirical specifications. In section 4, we present the results of the econometric investigation. Section 5 reports robustness checks and concludes.

[4]Banks in these three geographical areas have very different business models and operate in differentlyorganized banking systems. U.S. and European banks are more market-oriented whereas, Australian, Canadian and Japanese banks are more reliant on traditional intermediation activities. (Haq et al. 2013a) argue that Australian and Canadian banks appear to pursue safer policies, even before the GFC (1995-2006), hence preserving financial stability.

2. Data and variables

2.1. Sample selection

The sample comprises publicly traded OECD banks, for which stock price informationand accounting data are available in both Bloomberg and Thomsen-Reuters databases. To compute market-based risk indicators restricting our investigation to listed banks is prerequisite which nevertheless allows considering the major banks in each country. To ensure that we use the most informative risk indicators,we delete banks with missing historical stock market prices or infrequently traded stocks. We disregard stocks if daily returns are zero over 30%, and more, of the whole trading period. Hence, we only consider bank stocks that are very liquid,i.e. those that are most likely to reflect important extreme events in their movements.Subsequently, we retrieve accounting data and filter out bank year observations bydropping the top and bottom 1 percent level to eliminate the adverse effects of outliers and misreported data. Due to the delisting of many banks, mainly due to mergers and acquisitions, we end up with an unbalanced panel dataset of 667 commercial, cooperatives and savings banks, from the 28 major advanced OECD economies, among which 22 are European[5] (Table 1). Our sample period runs from January 03, 2000 to December 31, 2013 (Table 2). The sample is dominated by commercial banks and by U.S. banks. It consists of 506 U.S. banks and 353 non-U.S. banks (of which 245 are European and 84 are Japanese). Taken together, listed banks account for more than 55% of the total assets of the European banking industry and 77% in the U.S..For the other OECD countries, the coverage varies between 9% for Mexico to 31% for Japan.

[Insert Tables 1 and 2]

Data on individual bank daily stock prices, stock market indexes, as well as generic government bond yields, implicit volatility indexes and three-month LIBOR and Overnight Indexed Swap (OIS) spreads were collected from Bloomberg. Annual income statement and

[5]From 988 banks, we end up with 667 banks due to our data cleaning process as well as the data availability that varies depending on the combination of variables used in regressions. Our sample consists of 22 European countries, three Americas countries (U.S., Canada and Mexico) and three Asian-Pacific countries (Japan, South Korea, Australia). Iceland and New Zealand were dropped because of insufficient liquid stocks (see Table 1).

balance sheet data are obtained from Thomson Reuters whereas the OECD stats Metadata provide year-basis macroeconomic data: inflation rates and gross domestic product growth.

In line with previous research, we define very large “too-big-too-fail” banks (if total assets exceed USD20 billion), large banks (if total assetsUSD in 1-20 billion) and small banks (if total assets bounded in USD1 billion and USD500 million) (Köhler 2015; M. L. Laeven, Ratnovski, and Tong 2014; Barry, Lepetit, and Tarazi 2011; Lepetit et al. 2008;

Rogers and Sinkey Jr. 1999). Because of their specific business models, we exclude community banks with less than USD500 million of total assets (Distinguin, Roulet, and Tarazi 2013).

2.2. Systemic risk measures

Empirical analyses consider several systemic risk variables.We follow Acharya et al. 2010 and Brownlees and Engle 2012) and use the Marginal Expected Shortfall (MES) which corresponds to the marginal participation of bank i to the Expected Shortfall (ES) of the financial system[6]. Formally, it corresponds to the mean expected stock return for bank i, conditional on the market return when the latter performs poorly. Acharya, Engle, and Richardson (2012) define the MES as the expectation of the bank’s equity return conditional on market crash.

$$MES_{i,t}^{q} \equiv E\left(R_{i,t} | R_{M,t} \leq VaR_{R_M,t}^{q}\right),$$

where $R_i$is one-day stock return for bank i, $R_M$is one-day market return[7], q is a pre-specified quantile and $VaR_{R_M,t}^{q}$ is the critical threshold equal to the p-percent quantile of the market return $R_{M,t}$ distribution. Herewith, we take q to be equal to 5%, the term $R_{M,t} \leq \mathrm{VaR}_{\mathrm{R_M},\mathrm{t}}^{\mathrm{q}}$ reflects the set of days when the market return is being at or below the worst 5 percent tail outcomes. Thus, under the nonparametric assumption,the MES is the average of bank stock returns during market crash times, that correspond to the 5% worst days of the stock market index. It is expressed as:

$$MES_{i,t}^{q=5\%} = \frac{\sum R_{i,t} \times I\left(R_{M,t} < VaR_{R_M,t}^{5\%}\right)}{\sum I\left(R_{M,t} < VaR_{R_M,t}^{5\%}\right)} = \frac{1}{N} \sum_{R_{M,t} < VaR_{5\%}} R_{\mathrm{i,t}}.$$

[6]Economically, the term “marginal” means that for each unit increase or decrease in the equity value $\mathrm{MES}_{\mathrm{i,t}}^{\mathrm{q}}$ implies the variation in the bank’s capital shortfall.

[7] We refer to the broader stock market index, as market portfolio benchmark; so as to, catch bank’s contribution to the economy stability and evaluate bank’s sensibility to the whole market risk. To estimate risk measures, either we employ financial sector index, for the most developed financial market, or otherwise, the broad market index, as in standard CAPM.

where, I (.) is the indicator function defining the set of days where the market experienced 5% worst days and N is the number of 5% worst days for the aggregate equity return of the entire market (proxied by a market index) during the crash (Weiß, Neumann, and Bostandzic 2014). The higher a bank's MES is, higher is its contribution in the aggregate systemic risk and so its probability to be undercapitalized in bad economic conditions[8].

We also use CoVaR introduced by Adrian and Brunnermeier (2011) as a similar concept as VaR. It corresponds to the VaR_M of the entire financial system (i.e. the reference market index) R_M conditional on an extreme event leading to the fall ofa bank i's stock return $R_i$beyond its critical threshold level (VaR_i). $CoVaR^q_{R_{M|i}}$is the q% quantile of this conditional probability distribution and can be written as [9]:

$$\mathrm{Prob}_{t-1}\left(\mathrm{R_M} \leq \mathrm{CoVaR}^{\mathrm{qp}}_{\mathrm{R_{M|i}}} \mid \mathrm{R_i} = \mathrm{VaR}^{\mathrm{q}}_{\mathrm{R_i}}\right) = \mathrm{q}$$

Explicitly, Adrian and Brunnermeier (2011) define bank ΔCoVaR as the difference between VaR of the financial system conditional on the firm being in distress and VaR of the system conditional on the bank being in its median state. It catches the externality a bank causes to the entire financial system. Therefore, bank ΔCoVaR is the difference between the $\mathrm{CoVaR}^{\mathrm{q=distress\ state}}_{\mathrm{R_{M|i}}}$ of the financial system when bank i is in financial distress, i.e. the bank stock return is at its bottom q probability level, and the $\mathrm{CoVaR}^{\mathrm{q=median}}_{\mathrm{R_{M|i}}}$ of the financial system when this bank i is on its median return level, i.e.the inflection point at which bank performance starts becoming at risk. Hence, $\mathrm{CoVaR}^{\mathrm{q}}_{\mathrm{R_{M|i}}}$ measures the systemic risk contribution of bank i when its return is in its q% quantile (distress state). Here, we set q equals to 1%. Whereas, $\mathrm{CoVaR}^{0.50}_{\mathrm{R_{M|i}}}$ measures the systemic risk contribution of bank i when bank i's is in a normal state. The $\Delta\mathrm{CoVaR}^{\mathrm{q}}_{\mathrm{R_{M|i}}}$isdefined as[10]:

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[8]As an alternative, we estimate also the parametric MES, under the assumption of normality. We suppose at day horizon t, the conditional bank stock return and market index is normally distributed. Therefore, bank's MES is proportional to its systematic risk (time-varying beta) and the expected shortfall of the market. MES is computed at time t given information available in t-1 basis on the system ES, it is expressed as: $MES^q_{i,t} = \rho_{i,M,t}\sigma_{i,t}ES^q_{m,t}$, where $\rho_{i,M,t}$ is correlation coefficient between the bank's stock return and the market return, $\sigma_{i,t}$ is standard deviation of the bank's stock return, $\rho_{i,M,t}\sigma_{i,t}$ denotes time-varying beta and $ES^q_{m,t} = \mathbb{E}_{t-1}\left(R_{M,t} \middle| R_{M,t} < VaR^q_{R_M,t}\right)$ denotes the expected shortfall of the market. These measures of MES are highly correlated, 0.65.

[9]As MES, CoVaR is a conditional VaR computed at time t given information available in t-1 basis on the financial system ES.

[10]In risk analysis, we do not control for economic conditions; we take only a market reference index that sets a global portfolio of institutions, mirrors the global state of financial system and reflects the global spillovers.

$$\Delta\mathrm{CoVaR}^{q}_{R_{M|i},t} = \mathrm{CoVaR}^{q,q}_{R_{M|i},t} - \mathrm{CoVaR}^{q,\mathrm{median}}_{R_{M|i,t}}$$

Therefore the systemic risk contribution of an individual bank at q=1% can be written as:

$$\Delta\mathrm{CoVaR}^{q=1\%}_{R_M|R_i=VaR^{1\%}_{R_i},t} = \widehat{\lambda^{1\%}_{R_{M|i},t}}\left(VaR^{1\%}_{R_i,t} - VaR^{50\%}_{R_i,t}\right).$$

To estimate the individual bank's$\Delta\mathrm{CoVaR}^{q}_{R_{M|i}}$, we estimate VaR of the individual bank i and the conditional VaR, by running separately, 1% and 50% quantile regressions[11], using daily stock prices over the whole period, (Adrian and Brunnermeier 2011). Specifically, we run the following quantile regressions over the sample period:

$$R_{i,t} = \alpha_{i|M} + \lambda_{i|M} R_{M,t-1} + \varepsilon_{M|i,t}$$

$$\mathrm{CoVaR}^{q,q=1\%}_{R_{M|i},t} = \widehat{R}_{M,t} = \widehat{\alpha}_i + \widehat{\lambda}^{1\%}_{R_{M|i},t} VaR^{1\%}_{R_i,t}$$

Firstly, we estimateλ_q, by regressing the market return Rm on each individual bank stock return Ri. $\lambda_{1\%}$is the predicted bank stock return coefficient of the regression. Secondly, we estimate $VaR^{1\%}_{R_i,t}$and$VaR^{50\%}_{R_{i,t}}$, using quantile regressionsand daily stock returns data (Mayordomo, Rodriguez-Moreno, and Peña 2014; Adrian and Brunnermeier 2011)[12].

An extension of MES, Long Run Marginal Expected Shortfall (LRMES) has also been proposed by Acharya, Pedersen, Phillipon, and Richardson (2012). It is an approximation of the expected returns of the firm's equity in the crisis scenarios when the market goes down below a given threshold, 40 percent over 180 days (L. Laeven, Ratnovski, and Tong 2015; V. Acharya, Engle, and Richardson 2012). We use the following approximation to compute long-run MES based on one-day MES (tail expectation of the bank's return conditional on a market decline)[13]:

$$\mathrm{LRMES}_{i,t} \cong 1 - \exp^{\left(-18 \times MES^{q=5\%}_{i,t}\right)}.$$

2.3. Standalone risk variables

[11]The approach by regression of quantiles was introduced by (Koenker 2006; Buchinsky 1995; Koenker and Bassett 1978). It consists of modelling directly the evolution of the quantile in the period span (instead of modelling the return distribution) and then deduct the quantile (i.e. VaR).

[12] As alternative, following (V. Acharya, Engle, and Richardson 2012), we metric the parametric $\Delta\mathrm{CoVaR}^{q}_{R_{M|i}}$. That is: $\Delta\mathrm{CoVaR}^{q}_{R_{M|i}} = \lambda_{i,t}\mathrm{VaR}^{q}_{i,t} = \rho_{i,m,t}\sigma_{m,t}\Phi^{-1}(q)$, where $\rho_{i,m,t}$ is correlation coefficient between the bank's stock return and the market return, $\sigma_{m,t}$ is standard deviation of the market return,Φ^{-1} is the inverse function of the standard normal cumulative distribution function (CDF). These measures of ΔCoVaR are highly correlated, 0.52.

[13]Our paper derives numerical results of systemic risk based on two standard risk measures of tail risk: value-at-risk (VaR) and expected shortfall (ES). Losses are expressed in positive sign. Risk measures: MES, LRMES and ΔCovaR are positive, given in absolute risk value. So, an increase in these bank's systemic risk measuresis thus given by a positive change.

Besides the above systemic risk measures, we also consider five standalone risk indicators; four measures of equity based risk: total risk, bank-specific risk, systematic risk and a market based z-score. Based on a single index mode we also split total risk into two components: systematic risk stemming from market conditions and firm-specific risk. Total risk is computed as a moving standard deviation of bank daily returns. This is calculated each day for each bank using a moving window of 252 daily return observations. Similarly, we estimate the rest of the standalone risk measures with the following single index rolling model[14]:

$$\mathrm{R_{i,t}} = \alpha_\mathrm{i} + \beta_\mathrm{i,m}\mathrm{R_{m,t}} + \varepsilon_\mathrm{i,t}$$

Where $\mathrm{R_{i,t}}$is the daily (t) stock return of bank i, $\mathrm{R_{m,t}}$the daily return on the market index which is proper to the country where the bank is located and $\varepsilon_\mathrm{i,t}$is the residual term. With this, $\beta_\mathrm{i,m}$,the equity market betas are used as a proxy of banks' systematic risk[15]. From the residual term we proxy the idiosyncratic risk. Hence, bank specific risk is estimated as the standard deviation of the residuals generated from the single index rolling regressions of a bank's daily stock returns on the market index[16].

Furthermore, we use the market z-score, a metric for insolvency risk and default which is calculated as follows: $\text{MZ-Score} = (\overline{\mathrm{R}}_\mathrm{i} + 1)/\sigma_{\mathrm{R_i}}$, where $\overline{\mathrm{R}}_\mathrm{i}$is the mean and $\sigma_{\mathrm{R_i}}$the standard deviation of the monthly returns for a given year. A higher value of MZ-Score statistic indicates a lower probability of failure (Lepetit, Nys, Rous, and Tarazi 2008)[17].

2.4. Long-term performance: Bank charter value

Bank charter (franchise) valueis our main explanatory variable and based on existing literature, we use Tobin's q as the proxy[18]. Charter value equals the net present value of normal expected stream of rents, which characterizes a bank's profit-generating potential beyond its

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[14]We use a rolling regressions of a bank's daily stock returns on market index returns, as a return generating process. They estimate risk for each bank using a moving window of 252 daily observations.

[15]We estimate Tail-beta (quantile-beta), to metric the bank's sensitivity to extreme movements. For that, we use 1% quantile regression using daily market return R_m on daily bank return R_i to predict coefficients of tail-beta, i.e. the bank stock return coefficients in the quantile regression.

[16]Risk measures are estimated on daily basis, using both bank's daily stock returns data and market benchmark index, for each fiscal year. Thus, in the second stage, we make variables homogenous and comparable with the rest of accounting data sets; then, we shift from daily to the annual basis. Thereby we average the daily estimated risk values for each calendar year.

[17]MZ-Score is a risk-adjusted return measure. The larger the return and/or the lower the risk the higher the value of the MZ-score will be. It varies inversely with insolvency risk.

[18]Tobin's q incorporates both market valuation of diversity and each bank's set of activities; therefore it provides a direct assessment of the diversity impact per se on the market's valuation of banks (L. Laeven and Levine 2007).

merchantable assets[19] (Marcus, 1984; Leibowitz and Kogelman, 1991; Demsetz, Saidenberg and Strahan, 1996; etc). This value reveals more information than bank size. It sums up intangible assets as goodwill, growth possibilities, economic rents, degree of market power, financial strength, etc. (Furlong and Kwan 2005; Jones, Miller, and Yeager 2011). It is often used for comparability among varying size banks and/or banks with different pricing power (in loan, deposit or other marketable securities) (Keeley 1990). Furthermore, it has a cyclical featureand is also dependant on banks' earnings expectations (Saunders and Wilson 2001). Hence, the advocates of the so-called CVH argue that when charter is built, banks (i.e. shareholders) seek to preserve it from adverse shocks, otherwise it cannot be fully liquidated at the event of closure. Bankruptcy is costly when charter value is high, with regards also to the additional cost of failure (Jones, Miller, and Yeager 2011; Hellmann, Murdock, and Stiglitz 2000a; Demsetz, Saidenberg, and Strahan 1996).

For publicly traded banks, Tobin's q is calculated as the bank's future economic profits reflected in the market value of assets (i.e. debt and market value of equity) divided by total assets book value. It is defined as(Soedarmono, Sitorus, and Tarazi 2015; Haq and Heaney 2012; Gropp and Vesala 2001; Keeley 1990):

$$q_{i,t} = \frac{MVE_{i,t} + BVL_{i,t}}{BVA_{i,t}}.$$

where$MVE_{i,t}$, $BVL_{i,t}$ and $BVA_{i,t}$ represent respectively: market value of equity of bank i at time t, book value of liabilities and book value of assets. Market value of equity is the annual average of daily bank market capitalization at year t and the two accounting measures denote values at the end of year t. The numerator of Tobin's q is the market value of assets, i.e. $MVA_{i,t} \equiv MVE_{i,t} + BVL_{i,t}$. It refers partly to higher run-up in stocks price with regards to other investments. Whereas, the denominator reflects accounting value of assets and is equal to: $BVA_{i,t} + BVE_{i,t}$ (book value of equity).

Moreover, the literature highlights various factors that affect bank charter value. (Furlong and Kwan 2005; Demsetz, Saidenberg, and Strahan 1996) emphasize two main determinants: market regulation which leads to higher market power through M&A operations, and bank-related aspects other than market power as the expansion of off-balance-sheet activities and

[19]Charter value is the capitalized value of bank's future profits (Keeley, 1990; Marcus, 1984). Hence, the discounted stream of normal profits (those earned in a perfectly competitive economy) equals the book value of equity because the market values of perfectly competitive financial assets and liabilities equal their book values (Jones, Miller, and Yeager 2011).

noninterest income[20]. In a similar vein, (González 2005; Allen and Gale 2004; Hellmann, Murdock, and Stiglitz 2000a) argue that bank charter value stems from financial liberalization, regulatory restrictions, deposit insurance and competition[21]. Again, (Haq et al. 2013b) argue that market discipline, bank capital, contingent liabilities, and non-interest income are factors that lead to enhance bank charter value. In fact, bank charter value may have multiple roles. According to the CVH, it gives banks self-disciplining incentives and restrains excessive risk-taking appetite. Nevertheless, (Gropp and Vesala 2004) find the CVH to be only effective for small banks, with lower charter values and that such a result could reflect lower moral hazard with the introduction of explicit deposit insurance in Europe. However, for large banks which are presumably "TBTF", charter value does not explain their risk-taking. Other papers argue that higher charter value may derive from high risky strategies(L. Laeven and Levine 2007; Konishi and Yasuda 2004; Saunders and Wilson 2001; Park 1997). Moreover, although, many papers report a negative relationship between bank risk taking and bank charter value, consistent with the CVH(Park and Peristiani 2007; Konishi and Yasuda 2004; Anderson and Fraser 2000; Hellmann, Murdock, and Stiglitz 2000b; Demsetz, Saidenberg, and Strahan 1996; Keeley 1990, Agusman et al 2006)), others find a positive or an non-linear relationship, i.e. a “U” shape relationship(Niu 2012; Jones, Miller, and Yeager 2011; Haq and Heaney 2012; Martinez-Miera and Repullo 2010; Saunders and Wilson 2001; Nicolo and Gianni 2001).

2.5. Control variables

We consider various control variables in our regressions. Specifically, two main types of controls are considered: bank-specific controls and country-level determinants. For bank specific controls, we follow previous studiesin the literature to address bank size effect, capital ratio, profitability, bank’s involvement in market-based activities, operational efficiency, and bank business model. For each bank we compute bank size (natural logarithm of total bank assets in

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[20] According to the CVH, regulation promotes bank franchise value through: more entry restrictions and more market concentration enhancing profit opportunities. In contrast, deregulatory efforts that increase financial service competition may erode charter value and thereby increase risk taking incentives (Anginer, Demirguc-Kunt, and Zhu 2014; Allen and Gale 2004; Hellmann, Murdock, and Stiglitz 2000a).

[21] (Anginer, Demirguc-Kunt, and Zhu 2014; Allen and Gale 2004) argue that in high competitive markets, banks earn lower rents, which also reduces their incentives for monitoring.

U.S. dollars)[22], capital ratio (total assets over equity), return on assets ratio (net income divided by total assets),ratio of net loans to total assets, cost-to-income ratio (non-interest expense to total operating revenue), andbank complexity and diversification (ratio of non-interest income to total operating revenue) (Ghosh 2009; De Jonghe and Vennet 2008).

As regards to country-level factors that capture cross-country variations in banking industry, we control for the gross domestic product growth rate and the annual inflation rate. We also introduce the overall capital stringency index to control for the extent of the country regulatory requirements (Barth, et al. 2008). In the extension of our analysis, we consider macro-financial controls. We use interbank markets rates to control for bank procedures and overnight cash markets heterogeneity in OECD countries (Haq et al. 2013b; Furlong and Kwan 2005). We introduce LIBOR-OIS spread(difference between London Interbank Offered Rateand Overnight Indexed Swap) as a proxy of liquidity risk premium[23]. Besides, we control for M&Asby introducing a dummy that takes the value of 1 if total assets grow by more than 15% in one year and 0 otherwise (De Jonghe and Öztekin 2015). Finally, we use year dummies for period 2001 to 2013 to capture year-specific effects.

2.6. Summary statistics

Descriptive statistics of our variables are presentedin Table 3. It is interesting to note that over the study period, the average (median) charter value is 1.06 (1.02), indicating that,on average, the market value of bank assets exceeds their book value by 5.60%. Charter value dispersion remains low with a standard deviation of 0.17. The remaining controls are comparable to what is observed in previous studies (De Jonghe, Diepstraten, and Schepens 2015; M. L. Laeven, Ratnovski, and Tong 2014; Black et al. 2013; Niu 2012; González 2005). With regard to risk measures, all the measures exhibit substantial variations over the 13 years covered by our study[24]. MES ranges between -1.13% and 9.63% with an average of 1.56%. ∆CoVaR varies around an average of 1.39%. Regarding standalone risk measures the average values are 2.18%, 0.52, 2.36%, 0.64% and 53.64 for specific, systematic, total and MZ-score, respectively.

[22]We took the natural logarithm on the size, the total assets at the end of each year.

[23]Repo rate, LIBOR-3M, reflects banks' default risk and liquidity risk over the next three months, while the overnight rate is essentially riskless and hence not subject to pressures associated with these risks.

[24] The difference in the number of observations is due to missing accounting and market data for some banks.

We report the pair-wise correlation coefficients among the explanatory variables in Table4. We perform the variation inflation factor (VIF) test which confirms the absence of major multicollinearity problems.

[Insert Tables 3 and 4]

3. Empirical specifications

3.1. Baseline model

We consider a simultaneous equations model with unbalanced panel data. The specification of the second stage is represented by the following reduced form model:

$$\mathrm{Risk}_{\mathrm{i,t}} = \beta_1 \widehat{Charter}_{\mathrm{i,t}} + \beta_2 X_{\mathrm{i,t-1}} + \beta_3 C_{\mathrm{i,t}} + \lambda_{\mathrm{t}} + \mu_{\mathrm{i,t}} + \varepsilon_{\mathrm{2i,t}}$$

where, $\mathrm{Risk}_{\mathrm{i,t}}$ is a set of risk measures, subscripts i denotes individual banks and t denotes each fiscal year. $\widehat{Charter}_{\mathrm{i,t}}$represents the predicted value of bank charter value of the first stage regression. $X_{\mathrm{i,t-1}}$and$C_{\mathrm{i,t}}$ are respectively vectors of bank-level explanatory variables for each bank i lagged by one year, to mitigate any potential endogeneity concern, and country-level explanatory variables of each bank i at year t, to control for macroeconomic variations. The coefficient $\beta_1$captures the effect of charter value on bank risk and the rest of the coefficients (βs)arethose of the control variables. The risk functions were estimated using calendar year fixed effects. $\lambda_{\mathrm{t}}$are year dummies ($\sum_{t=2001}^{2013} year_t$) included to further account for time trend varying effects through the business cycle and for possible structural changes in the banking industry. Standard errors are clustered at the individual bank level.

3.2. Endogeneity issues and estimation method

Our empirical setup may suffer from reverse causality. High-chartered banks might be systemically important and/or involved in high risky activities, or vise-versa.We hence adopt an instrumental variable approach. In theory, bank charter value and risk taking may be simultaneously targeted (Martinez-Miera and Repullo 2010; Ghosh 2009; Boyd and De Nicoló

2005; Gropp and Vesala 2001; Keeley 1990), Jimenez, Lopez, & Saurina (2010)[25]. Besides, our proxy of charter value, the Tobin's q ratio, reflects historical costs of assets, instead of marked-to-market costs. Thus, ex post Tobin's q value may differ from 1, if ex-post assets return realizations differfrom ex-ante expectations, rather than a pricing power degree that could be reflected in the ex-anteTobin's q(Gropp and Vesala 2001; Keeley 1990)[26].

To tackle possible endogeneity issues and measurement problems that could alter the relation between bank charter value and risk, we proceed by using the two-stage least squares instrumental variables method with fixed effects. In the first stage, we instrument and estimate charter value $\widehat{Charter}_{\mathrm{i,t}}$. Previous literature has identified different determinants of charter value (Sturm et al., 2005; Moser and Sturm, 2011). Hereafter, we use three continuous and exogenous variables to instrument the charter value. First, we use one year lagged values of charter value, assumed to be perfectly exogenous. Second, we follow (González 2005) and include assets tangibility ratio measured as tangible assets over total assetsto account for possible differences due tothe extentof tangible assets, differences in efficiency, branching policy, or country size. Third, we follow (L. Laeven and Levine 2009; Keeley 1990) and use market share (relative size) measured in terms of assets, defined as total assets of bank i over the aggregate assets of the banking system in a given country (all banks included, listed and non-listed) as a proxy of market power[27]. Subsequently in the second stage, risk regressions incorporate the predicted values of charter valuefrom the first stage with the rest of the explanatory variables.

To ensure the reliability of the subsequent empirical results at the second stage, we statistically test the validity and strength of the chosen instruments. We perform the Hansen j test's over-identification and the weak identification test using the rank statistics proposed by Kleibergen–Paap (KP), which is robust under heteroscedasticity and robust-clustering. Under the

[25]Bank with greater default risk could have a greater market-to-book asset ratio if deposit insurance were underpriced and its value were capitalized in financial market (but not book). Riskier banks could be over valuated, because risk shifting increases the option value of equity (Keeley 1990).

[26](Keeley 1990; Smirlock, Gilligan, and Marshall 1984) state that when Tobin's q is greater than 1, it could reflect the bank capitalized value of efficiency enhancing factor of production. Though, with Tobin's q, bank would have the same incentives to protect its value as would a firm possessing market power. Also, (Gropp and Vesala 2004) propose a similar two-stage procedure to analyze the influence of explicit deposit insurance on bank risk-taking in Europe. Similarly, (González 2005) use TSLS-IV to analyze the influence of bank regulation on bank charter value and risk-taking.

[27]Although core deposit is regarded as a determinant of charter value (Jones, Miller, and Yeager 2011), it is not considered because of non-availability of sufficient observations for banks in countries other than the United-States. Similarly, we do not use the entry denied index as an instrument of charter value, such as in (L. Laeven and Levine 2009), because the index is not available for almost all countries, includng the U.S., during the period 2008-2012. Hence, we substitute it with a proxy of market power.

assumptions, we report the KP-rank-LM statistics(underidentification test) and the KP Cragg-Donald Wald F statistic (weak identification test) reported to 5% critical value of the Stock and Yogo (2005)[28]. Statistics from these respective testsare reported in the tables of the results (see next section). We reject the null hypothesis of a weak correlation between the chosen instruments and the endogenous regressor. We also reject the null hypothesis of the underidentification.

4. Empirical Results

4.1. Impact of charter value on bank risk taking

Table 5 displays TSLS estimations regarding standalone risk (even columns) and systemic risk (odd columns) over the pre-crisis period (2000-2006) and later (2007-2013). We match individual and systemic risk measures to investigate whether the impact of charter value may differ depending on the type of risk and economic conditions (pre-crisis period versus crisis and post-crisis). The coefficients estimates for bank charter value are positive and statistically significant at 1% in the pre-crisis period (models 1, 4, 6, and 7), suggesting that an increase in charter value is associated with an increase in bank individual risk and systemic risk over the pre GFC period. Similarly, the negative and significant relationship at the 1% level between charter value and market z-score (model 8 for the crisis and post crisis period) shows that higher charter value increases bank default but only later on. On the whole, table 5 shows that bank charter value and risk move together during the profitable, pre-crisis period (2000-2006). Therefore, the self-disciplining role induced by charter value is not effective during the years that preceded the GFC. The well-known result consistent with the CVH, i.e. a negative relationship of charter value with both standalone and systemic risk measures, can only be observed during the subsequent 2007-2013 period. When we split the subsequent period (2007-2013) into acute crisis (2007-2009) and post crisis (2010-2013) periods (Table 6), we find that the disciplining effect of charter value is only effective after the crisis and that charter value does not play any role during the crisis.

[28]The Cragg-Donald Wald F statistics of the First stage that show values greater than the Stock-Yogo's critical values for 5% maximal IV size (relative bias is 16.85). Stock and Yogo (2005) tabulate 95% critical values of the canonical correlation rank statistic for the first-stage F-statistic to test whether instruments are weak.

The impact of charter value on risk is also economically meaningful. For instance, to judge the economic significance of charter value effect on risks, an one standard deviation increase in the charter value (0.17) leads to an increase in the MES during calm period of 1.4% (8.03*0.17) (model 1 of Table 5) and a decrease in the MES during crisis periodof 0.11% (-0.66*0.17) (model 1 of Table 6, period[2010-2013])[29]. Results are supportive of the charter-instability view that charter value lead excessive risk incentives and contributed more to financial instability during calm period, and charter-stability view that charter value fosters more stable banking system during crisis period.

Regarding our control variables, most of them enter significantly and the coefficientscarry the signs as in previous studies. Bank size has a positive and statistically significant effect on systemic risk and systematic riskand negative and statistically significant effect on the rest of standalone risk variables. The coefficient of the capital ratio variable is positive and statistically significant for systemic and systematic risk, whereas it is negative and statistically significant for the other standalone risk proxies. The coefficient of the return on assets is negative and significant in all periods for all risk measures, indicating that a higher ROA is associated with lower risk. The coefficient of the M&A dummy is positive and statistically significant only for systematic risk and systemic risk. With respect to macroeconomic factors, the inflation rate has a positive and significant impact on risk measures. Thus, in presence of bad economic conditions such inflationary pressures or high interbank rates,banking system becomes vulnerable to systemic shock. The coefficients on economic growth are negative and significantas suggested by economic theory andearlier empirical studies, whereas it is found that the coefficients are positive and significantforsystemic risk measures in the pre-crisis period. This suggests that although higher economic growth is good for individual bank stability it might have adverse effects onthe threat that banks might pose to the entire financial system. The coefficients of capital stringency are negative and significant, suggesting that regulatory requirements lessen risk taking at the individual level and exposure risk.We also present interactions analysis using charter value and dummy variables for time periodsin (Appendix B 11, Panels A and B).

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[29]The marginal effect is computed by multiplying the standard deviation of charter value in the sample (0.17) by the coefficient estimates (8.03) of regression 1 in pre-crisis period (Table 5) and (-.67) of regression 1 in crisis period [2010-2013] (Table 6), all else equal.Figures give the average economic impact of charter valueon the MES in both periods.

[Insert Tables 5 and 6]

In what follows, we go through the positive relationship between charter value and bank risk over the pre-crisis period. Specifically, we test whether differences in risk-taking culture across countries, bank size, and growth and diversification strategies are possible explanations.

4.2. Charter value-bank risk taking relationship: the impact of cross-country heterogeneity, bank size, and growth and diversification strategies

The relationship between charter value and bank risk taking may depend on differences in risk taking cultures. For instance, Japanese banks are well known to be more conservative than their counterparts in the U.S.(Haq et al. 2013b). We therefore take advantage of the heterogeneity of our OECD bank sample that comprises different countries and banking systems (more market-based system vs. more bank-based system). We define three geographical sub-groups: U.S., European countries and the rest of OECD countries (which is dominated by Japan). Table 7 displays the results. They show that the positive relationship between charter value and bank risk during the pre-crisis period holds only for banks in the U.S. (Panel A) and Europe (Panel B).

Through the crisis, charter value negatively affects individual risk measures for U.S. banks (Panel A, Table 1 in Appendix B) and all risk measures for the rest of OECD banks (Panel C, Table 1 in Appendix B). After the crisis, charter value is effective in reducing systemic risk and default risk of U.S. banks (Panel A, Table 2 of Appendix B) andboth systemic risk and individual risk of European banks (Panel B, Table 2 of Appendix B).

[Insert Table 7]

In the next step, we only keep U.S. and European banks, i.e. we eliminate from our sample banks from the rest of OECD countries, and test whether the charter value-bank risk relationship may differ according to the bank size. We use an absolute size cutoff and distinguish three sets of banks: very large banks (too-big-to-fail with total assets exceeding USD20 billion), large banks (with total assets bounded in USD1-20 billion) and small banks (with total assets less than USD1 billion but higher than SD500 million)million)[30]. Table 8 reports the results. We find that a high charter value increases both standalone and systemic risks for very large and large banks whereas for small banks (Table 8), such a relationship is not found for half of our specifications (models 1, 4, 7 and 8 in Table 8).

[Insert Table 8]

Lastly, we consider the sample of very large and large banks for which the positive relationship between charter value and risk is confirmed and explore if differences in growth strategies and business models alter such a relationship. We define banks with high growth strategies as those in the top 75th percentile of bank total assets variation while banks with low growth strategies are those in the bottom 25th percentile. We use similar cutoffs for the business model and consider the non-traditional income ratio as an indicator of bank diversification[31].Tables 9 and 10 display the results. While the positive impact of charter value on both standalone and systemic risks is confirmed for the sample of very large banks regardless of the growth strategies (Table 9, panels A and B), we do find differences for the sample of large banks. In fact, for the latter sample, charter value has no impact on both standalone and systemic risks when banks are characterized by a low growth strategy (Table 9, panel A). As regards to bank business model, a quasi-similar pattern is noticeable. Irrespective of the degree of diversification, the positive impact of charter value on bank risk is also confirmed for the sample of very large banks. Nevertheless, compared to the previous findings, the impact on standalone risk is weaker for less diversified banks (Table 10, panel B, even columns) while it is non-existent when considering the systemic risk for highly diversified banks (Table 10, panels A, odd columns). Considering the sample of large banks, charter value is positively associated with both standalone and systemic risks only when banks have a strong diversification strategy (Table 10,

[30]We follow the literature to choose the cutoff levels. Using absolute cutoffs is appropriate here because we focus on globally active banks. (L. Laeven, Ratnovski, and Tong 2015) provide possible explanations for why large banks are different: banks benefit from economies of scale and differ by their business model, TBTF subsidies and risky market-based activities,and managerial empire-building and bad corporate governance.

[31]We use non-interest income to interest income ratio. Alternately, we consider non-interest income to operating income and obtain similar results.

panels B). We conduct other regressions to investigate the effects of top/bottom quartiles of growth strategy and business model changefor the same bank sample (Appendix B, Panels C and D).

[Insert Tables 9 and 10]

5. Robustness checks and conclusion

5.1. Robustness checks

To check the robustness of the results, we perform the following: firstly, we consider an alternative proxy of charter value, we use standardized market value added(MVA)[32], and obtain similarconclusions(Table 11). Secondly, in Tables 12 and 13, we use the median as a new cutoff to define high and low bank growth and diversification strategies during the pre-crisis period, instead of the top 75thand bottom 25th quartiles. Consistent with our results, we find that in the presence of an expansion strategy (above the median), a high charter value leads to an increaseof both individual and systemic risks, during the pre GFC period. Similarly, in presence of strongdiversification strategies (above the median), charter value increases both risk dimensions for very large and large banks; whereas, for banks following a focus strategy (below the median), a positive relationship between charter value andboth risk measuresis found only for very large banks. Ours results are therefore robust to the definition of the charter value and the choice of the cutoffs.

[Insert Tables 11, 12 and 13]

5.2. Conclusion

Previous studies on the relationship between charter value and bank risk-taking have mainly focused on standalone risk measures and report mixed results. Although higher charter value is generally considered as beneficial in terms of bank stability by reducing a bank's risk

[32] We calculate standardized market value added asMVA (current market capitalization –total equity) divided by total equity.

taking incentives some studies find this relationship not be linear. This paper considers both standalone and systemic risk measures and shows that the relationship between charter value and risk is different during normal times and distress periods dependent on the state of the economy and the business cycle. Specifically, based on our investigation of 667 publicly-traded banks in 28 OECD countries over the 2000–2013period we find that before the global financial crisis charter value has positively impacted bothindividual and systemic. Such a behavior is mostly effective for large "too-big-to-fail" banks with aggressive diversification strategies or other large banks with fast growth policies. Our findings highlight thatinstead of mitigating risk, charter value may have provided incentives to accumulate risk which in turn might have contributed to higher systemic risk. By contrast, the results show that during global financial crisis, banks tend to protect their charter and lessen their risk exposure thereby reducing their contribution to systemic risk.

Our findings have important policy implications. The one size fits all capital conservation buffers introduced by Basel III may not be enough to guarantee bank stability and should not only be based on the business cycle but also on the state of the financial system. Although banks are required to accumulate buffers during economic upturns banks with a stronger position with higher charter value might be building up more aggressive expansion strategies during bullish financial markets. Regulators and supervisors should hence closely look into the behavior of very large "too-big-to fail banks" and large banks with high growth or strong diversification (business mix) strategies. For such banks the impact of charter value on bank stability can be a double-edged sword.

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Appendix

Table 1. Sample composition

Country	Num.	Obs.	Country	Num.	Obs.
Australia	6	84	Luxembourg	1	12
Austria	7	89	Mexico	3	39
Belgium	3	40	Netherlands	3	36
Canada	11	144	Norway	17	212
Czech	1	13	Poland	12	155
Denmark	40	476	Portugal	3	42
Finland	2	27	Slovakia	2	23
France	21	227	South Korea	7	80
Germany	18	219	Spain	15	162
Greece	12	141	Sweden	4	53
Hungary	1	14	Switzerland	24	306
Ireland	2	28	Turkey	16	188
Italy	25	301	United-Kingdom	13	150
Japan	84	1121	United-States	506	6255

Table shows the sample country composition. It presents the distribution of 859 listed banks in each 28 countries, Australia, Austria, Belgium, Britain, Canada, Czech, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Luxembourg, Mexico, Netherlands, Norway, Poland, Portugal, Slovakia, South Korea, Spain, Sweden, Switzerland, Turkey, and United-States, that makes up the whole sample. Total number is dominated by U.S. banks with 424 banks. The total number of European banks stands 245 banks.

Table 2. Sample distribution by calendar year

Year	Freq.	Percent
2000	684	6.40
2001	711	6.66
2002	726	6.8
2003	744	6.96
2004	773	7.24
2005	812	7.60
2006	843	7.89
2007	855	8.00
2008	835	7.82
2009	822	7.70
2010	805	7.54
2011	768	7.19
2012	776	7.26
2013	528	4.94

Table shows the sample distribution by calendar year and its part of representativeness in the whole sample observations. The sample covers a time period of 14 years from 2000 to 2013. Total bank observations per year changes between 528 and 855 bank observations.

Table 3. Descriptive statistics and variables definition

Table reports descriptive statistics for all variables, bank risks and explanatory variables used in the paper, for our sample of publicly traded OECD banks over the period ranging 2000 and 2013. The imbalanced sample makes not all variables are available for all countries or for the full sample period. This explains why the number of observations are different. Then, we report thee most informative basic summary statistics (observation, mean, standard deviation and median). So, we document also basic definitions for variables and data source. Detailed information on the construction of bank risk proxies and bank-level characteristics are provided in section 3.

Variable	Description	Count	Mean	Sd.	Median	Data Source
Charter	Charter value proxied by Tobin's q.	10417	1.056	0.171	1.018	Bloomberg, Thomsen-Reuters Advanced Analytic (TRAA)
Size	Natural logarithm of bank total assets (in USD billion).	10584	8.211	2.186	7.745	TRAA
CAPR	Capital ratio, total equity over total assets.					Bloomberg, TRAA
Diversification	Income diversification, noninterest income over total income.	10238	0.210	0.127	0.186	TRAA
Loans	Loans to total assets, net loans over total assets.	9608	0.693	0.160	0.700	TRAA
Efficiency	Cost income ratio, non-interest expense over total income.	9480	0.463	0.149	0.446	TRAA
ROA	Return on assets, ratio of net income to total assets.	10321	0.006	0.012	0.007	TRAA
d(merger)	Mergers and acquisitions dummy, takes value of 1, if bank had an M&A experience, the annul total assets variation exceeds 15%; 0, otherwise.	10682	0.37	0.48	0.000	SNL, Bloomberg
ΔTA	Change in total assets during 2000 and 2006 divided by the average total assets in period.	5293	0.646	0.534	0.604	TRAA
ΔDiv.	Change in diversification ratio during 200 and 2006 divided by the average diversification ratio in the period	5122	0.203	0.423	0.236	TRAA
LiborOis	Liquidity premium, defined as the spread between 3-month London Inter-Bank Offered Rate (LIBOR) and Overnight Indexed Swaps rate (OIS). It reflects soundness of the banking system.	10682	27.340	26.038	19.135	Bloomberg
InterbankRate	Short-term interbank lending interest rates, in each country.	10509	2.500	2.121	1.802	Bloomberg
GDP	Gross domestic product growth, defined as annual real GDP growth rate.	10682	1.759	2.153	1.880	OECD stats Metadata, IMF WEO
Inflation	Inflation, defined as annual inflation rate.	10682	2.332	3.127	2.300	OECD stats Metadata, IMF WEO
MarketShare	Share of individual bank's total assets in domestic total assets of the country's banking system.	10467	0.016	0.053	0.001	Bankscope, TRAA
TNG	Tangible assets ratio, book value of tangible assets to total assets.	8803	0.011	0.005	0.009	TRAA

Risk values	Count	Mean	Sd.	Median
Specific Risk (%)	10321	2.181	1.223	1.831
MES (%)	10321	1.560	1.832	1.155
Systematic Risk	10321	0.521	0.521	0.362
Tail-beta	10321	0.644	0.855	0.668
Total Risk (%)	10321	2.358	1.263	2.007
ΔCoVaR (%)	10321	1.389	1.707	1.201
MZ-score	10321	53.640	23.410	50.724
LRMES (%)	10321	19.393	21.925	17.655

Table 4. Correlation matrix

This table presents the pairwise correlation matrix for each systemic risk, bank-level characteristics and macroeconomics variables, * p < 0.05, ** p < 0.01, *** p < 0.001 denote statistical significance at the 10%, 5% and 1%, respectively. See above for variables definition.

	Charter	(1)	(2)	(3)	(4)	(5)
Size (1)	-0.125***	1				
ROA (2)	0.216***	-0.052***	1			
CAPR (3)	-0.239***	0.499***	-0.330***	1		
Diversification (4)	0.035***	0.400***	0.112***	0.120***	1	
Efficiency (5)	0.042***	-0.030**	-0.313***	0.084***	0.400***	1
Loans (6)	0.254***	-0.189***	-0.0295**	-0.114***	-0.235***	-0.069***
MarketShare (7)	-0.043***	0.575***	-0.001	0.281***	0.186***	-0.177***
InterbankRate (8)	-0.044***	-0.035***	0.182***	-0.093***	-0.108***	-0.395***
LiborOis (9)	-0.069***	0.037***	-0.170***	0.019	-0.076***	-0.042***
GDP (10)	0.101***	-0.074***	0.275***	-0.103***	-0.020*	-0.118***
Inflation (11)	0.078***	-0.082***	0.093***	-0.174***	-0.109***	-0.234***

	(6)	(7)	(8)	(9)	(10)
MarketShare (7)	-0.159***	1			
InterbankRate (8)	-0.065***	0.175***	1		
LiborOis (9)	0.032**	-0.007	0.034***	1	
GDP (10)	-0.023*	0.057***	0.281***	-0.480***	1
Inflation (11)	-0.029**	0.155***	0.811***	0.041***	0.210***

Table 5.Standalone and systemic risks: effect of bank charter valuein two sub-periods, pre-crisis and abnormal periods

This table presents the regression results for various bank risk measures on bank charter value over the pre-crisis period (2000-2006) and the aftermath of the GFC period (2007-2013). We employ a two-stage least squares (TSLS) IV estimator with bank-specific fixed effects, time dummies and a robust-clustering at the bank-level. $\text{Risk}_{i,t} = \beta_1 \widehat{Charter}_{i,t} + \beta_2 X_{i,t-1} + \beta_3 C_{i,t} + \lambda_t + \mu_{i,t} + \varepsilon_{2i,t}$. Our dependent variables are four systemic risk measures (MES, Tail-beta, CoVaR and LRMES, models in the odd columns: 1,3,5,7) matched with four standalone risk measures (specific risk, systematic risk, total risk and market z-score, models in the even columns: 2,4,6,8). Bank charter value (Charter) is the main independent variable, proxied by Tobin's q. Charter is modelled endogenously in all regressions. We instrument Charter by its one-year lagged value, tangible assets ratio and RelativeSize= bank total assets over domestic total assets of the country banking system. Regressions control for one-year lagged bank-level characteristics to mitigate endogeneity concerns and possible omitted variables. We control also for macro-financial variables and country-level variables. Year dummies are also included as controls, yet, they are not reported. Variables definition: Size=natural log of total assets, Loans=Loans to total assets, Diversification=noninterest income over total income, Efficiency=cost income over total income, CAPR=capital ratio, equity to total assets, ROA= Return on assets, d(merger)= dummy takes one if the bank experienced a merger-acquisition event (annul total assets variation exceeds 15%), and zero otherwise, and zero otherwise, d(crisis)= dummy takes one during crisis time (2007-2009), and zero otherwise, GDP=gross domestic product growth, Inflation=annual inflation rate and Cap_String=capital stringency. The table reports only second stage results. Adjusted standard errors are reported in brackets below their coefficients estimates. Hansen j test report p-value of overidentification test. Kleibergen-Paap rank LM statistic testing the null hypothesis that the excluded instruments are not correlated with the endogenous regressor. Kleibergen-Paap rk Wald F-statistic testing for weak (Cragg-Donald Wald test, Stock and Yogo (2005) 5% critical value is 16.85). We do not face muticollinearity problems (if VIF test is less than 10 basis points, not reported). Heteroscedasticity consistent and robust standard errors t statistics are in parentheses, p-values * p < 0.1, ** p < 0.05, *** p < 0.01 denote statistically significant at 10%, 5% and 1% levels, respectively.

	Pre-crisis period [2000-2006]								Crisis periods[2007-2013]							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	8.029***	2.035***	2.342***	2.926***	5.073***	3.494***	97.45***	-79.91***	-1.086***	-0.359**	-0.305**	-0.202***	-0.125	-0.532***	-9.581***	7.681***
	(6.15)	(2.59)	(3.32)	(6.35)	(4.72)	(5.20)	(5.61)	(-5.57)	(-4.62)	(-2.07)	(-2.38)	(-3.41)	(-0.50)	(-3.02)	(-3.39)	(2.67)
Size	0.0593	-0.315***	0.115	0.0980**	0.232**	-0.238***	1.852	3.855*	0.394**	-0.647***	0.100	0.160***	0.348**	-0.516***	4.856**	10.37***
	(0.44)	(-3.76)	(1.19)	(2.02)	(2.14)	(-2.72)	(1.04)	(1.90)	(2.34)	(-6.31)	(1.16)	(3.18)	(2.33)	(-4.90)	(2.30)	(6.45)
CAPR	1.004	-1.576*	1.876*	1.215**	2.123*	-0.999	20.31	58.74***	-0.428	-5.082***	1.129*	0.763***	2.837**	-3.766***	0.746	53.75***
	(0.73)	(-1.73)	(1.68)	(2.24)	(1.77)	(-1.04)	(1.02)	(2.86)	(-0.39)	(-6.64)	(1.82)	(2.67)	(2.50)	(-5.06)	(0.06)	(4.13)
Diversification	-0.755*	0.125	0.0801	-0.00344	-0.538	0.0391	-6.817	10.34	-0.447	0.505	-0.500*	0.0220	0.497	0.594	-5.777	-1.782
	(-1.76)	(0.44)	(0.24)	(-0.02)	(-1.34)	(0.13)	(-1.16)	(1.39)	(-0.85)	(1.32)	(-1.65)	(0.20)	(0.92)	(1.52)	(-1.06)	(-0.34)
Loans	-0.0466	-0.467*	0.242	-0.149	0.350	-0.570**	2.598	5.738	0.883***	-0.0423	0.419**	0.0527	-0.0296	0.161	11.52***	-0.0533
	(-0.13)	(-1.79)	(0.78)	(-1.15)	(1.02)	(-2.03)	(0.53)	(0.88)	(2.88)	(-0.19)	(2.32)	(0.81)	(-0.09)	(0.71)	(3.06)	(-0.01)
Efficiency	0.260	0.101	0.148	0.0445	0.476	0.202	2.973	-5.376	-0.333	-0.581*	-0.140	-0.200**	-0.840**	-0.789**	-0.583	1.547
	(0.59)	(0.35)	(0.45)	(0.30)	(1.33)	(0.64)	(0.51)	(-0.78)	(-0.72)	(-1.92)	(-0.61)	(-2.09)	(-2.03)	(-2.52)	(-0.12)	(0.39)
ROA	-6.771	-13.71***	-0.590	-2.525*	-2.235	-14.99***	-42.31	131.9*	-7.811**	-37.68***	0.241	-1.344*	2.596	-39.02***	11.59	263.5***
	(-1.20)	(-2.91)	(-0.16)	(-1.72)	(-0.49)	(-3.11)	(-0.67)	(1.83)	(-2.13)	(-13.59)	(0.13)	(-1.86)	(0.76)	(-13.83)	(0.27)	(9.51)
d(merger)	0.0815**	-0.00496	0.00888	0.0311**	0.0738*	0.0122	1.163**	-0.314	-0.0412	-0.142***	-0.0483	-0.0209*	0.344***	-0.133***	-0.114	0.940*
	(2.16)	(-0.24)	(0.24)	(2.25)	(1.81)	(0.57)	(2.28)	(-0.49)	(-0.72)	(-4.53)	(-1.58)	(-1.70)	(5.30)	(-4.08)	(-0.19)	(1.68)
d(crisis)									-0.312	0.0787	-0.0139	-0.148*	0.529**	-0.137	1.639	6.419***
									(-0.69)	(0.54)	(-0.09)	(-1.88)	(2.05)	(-0.82)	(0.34)	(2.58)
LiborOis	-0.448***	-0.108***	-0.139***	-0.0265**	-0.465***	-0.133***	-5.579***	4.259***	0.0287**	0.0369***	-0.00723*	0.00155	0.0224***	0.0496***	0.0444	-0.965***
	(-11.27)	(-5.42)	(-3.33)	(-1.97)	(-10.77)	(-6.29)	(-10.54)	(6.70)	(2.14)	(8.56)	(-1.78)	(0.64)	(2.99)	(10.60)	(0.29)	(-11.14)
InterbankRate	-0.0989***	-0.0593***	-0.0200	0.00285	-0.110***	-0.0562***	-1.239***	2.281***	-0.199***	-0.173***	-0.0686***	-0.0421***	-0.170***	-0.211***	-2.188***	4.239***
	(-4.00)	(-4.84)	(-1.20)	(0.34)	(-4.02)	(-4.28)	(-3.67)	(5.75)	(-7.35)	(-11.61)	(-4.91)	(-6.20)	(-6.17)	(-13.33)	(-7.38)	(13.46)
GDP	0.0273	-0.106***	0.0388*	-0.00181	0.124***	-0.109***	0.912**	1.577***	-1.086***	-0.359**	-0.305**	-0.202***	-0.125	-0.532***	-9.581***	7.681***
	(0.93)	(-6.06)	(1.76)	(-0.20)	(3.46)	(-5.87)	(2.38)	(2.83)	(-4.62)	(-2.07)	(-2.38)	(-3.41)	(-0.50)	(-3.02)	(-3.39)	(2.67)
Inflation	0.283***	0.0752***	0.0741**	0.0670***	0.100**	0.0907***	3.411***	-3.997***	0.394**	-0.647***	0.100	0.160***	0.348**	-0.516***	4.856**	10.37***
	(6.32)	(3.35)	(2.06)	(5.02)	(1.97)	(3.54)	(6.01)	(-4.83)	(2.34)	(-6.31)	(1.16)	(3.18)	(2.33)	(-4.90)	(2.30)	(6.45)
Cap_String	-0.00658	-0.0396***	-0.0165	-0.000896	0.0443*	-0.0378***	0.146	0.975**								
	(-0.31)	(-3.18)	(-1.18)	(-0.15)	(1.75)	(-2.86)	(0.52)	(2.21)								
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Observations	3319	3278	3265	3263	3319	3279	3320	3279	4010	4059	4052	4054	4001	4069	4000	4066
Banks	592	590	591	591	592	589	592	588	667	666	663	667	667	666	667	666
Hansen j test (p-value)	0.000	0.345	0.633	0.000	0.352	0.069	0.000	0.000	0.000	0.036	0.039	0.009	0.386	0.001	0.001	0.004
KP rk LM statistic	29.44***	29.50***	29.55***	29.46***	29.21***	29.58***	29.32***	29.54***	138.1***	135.2***	136.1***	133.9***	136.2***	137.8***	137.7***	137.9***
KP Wald rk F statistic	45.34	45.04	44.43	45.16	45.15	44.98	45.29	44.93	31.67	30.58	31.00	31.47	32.42	31.54	32.24	31.39

Table 6.Standalone and systemic risks: effect of bank charter valuein acute-crisis and post crisis periods

This table presents the regression results for various bank risk measures on bank charter value over the acute-crisis period (2007-2009) and the post-crisis period (2007-2013). We employ a two-stage least squares (TSLS) IV estimator with bank-specific fixed effects, time dummies and a robust-clustering on the bank-level. $\text{Risk}_{i,t} = \beta_1 \widehat{Charter}_{i,t} + \beta_2 X_{i,t-1} + \beta_3 C_{i,t} + \lambda_t + \mu_{i,t} + \varepsilon_{2i,t}$. Dependent variables are mix of four systemic risk measures (MES, Tail-beta, CoVaR and LRMES, models in the odd columns: 1,3,5,7) matched with four standalone risk measures (specific risk, systematic risk, total risk and market z-score, models in the even columns: 2,4,6,8). Bank charter value (Charter) is the main independent variable, proxied by Tobin's q. Charter is modelled endogenously in all regressions. We instrument Charter by one-year lagged Charter, tangible assets ratio and RelativeSize= bank total assets over domestic total assets of the country banking system. Regressions control for one-year lagged bank-level characteristics to mitigate endogeneity concerns and possible omitted variables. We control also for macro-financial variables and country-level variables. Year dummies are also includes as controls, yet, they are not reported. Variables definition: Size=natural log of total assets, Loans=Loans to total assets, Diversification=noninterest income over total income, Efficiency=cost income over total income, CAPR=capital ratio, equity to total assets, ROA= Return on assets, d(merger)= dummy takes one if the bank experienced a merger-acquisition event (annul total assets variation exceeds 15%), and zero otherwise, GDP=gross domestic product growth, Inflation=annual inflation rate and Cap_String=capital stringency. The table reports only second stage results. Adjusted standard errors are reported in brackets below their coefficients estimates. Hansen j test report p-value of overidentification test. Kleibergen-Paap rank LM statistic testing the null hypothesis that the excluded instruments are not correlated with the endogenous regressor. Kleibergen-Paap rk Wald F-statistic testing for weak (Cragg-Donald Wald test, Stock and Yogo (2005) 5% critical value is 16.85). We do not face muticollinearity problems (if VIF test is less than 10 basis points, not reported). Heteroscedasticity consistent and robust standard errors t statistics are in parentheses, p-values * p < 0.1, ** p < 0.05, *** p < 0.01 denote statistically significant at 10%, 5% and 1% levels, respectively.

	Acute-crisis period [2007-2009]								Post-Crisis period [2010-2013]							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	-2.584	-3.216	-2.626	-1.626	5.896	-3.460	-29.53	28.24	-0.657***	-0.385**	-0.102	-0.104**	-0.586**	-0.521***	-5.673*	7.498***
	(-0.43)	(-0.91)	(-1.03)	(-1.00)	(0.91)	(-0.96)	(-0.68)	(0.63)	(-2.83)	(-2.32)	(-0.63)	(-2.42)	(-1.98)	(-3.26)	(-1.87)	(3.74)
Size	1.002	-0.141	0.158	0.248*	-0.244	0.0972	14.47*	1.747	0.458*	-0.537***	-0.0931	0.0924	-0.00466	-0.486***	6.992**	13.13***
	(1.05)	(-0.27)	(0.45)	(1.84)	(-0.36)	(0.18)	(1.78)	(0.27)	(1.72)	(-3.27)	(-0.50)	(1.12)	(-0.02)	(-2.82)	(2.14)	(5.60)
CAPR	6.584	-0.883	-0.0132	-0.164	4.456	2.507	18.15	71.10**	0.948	-5.497***	-0.156	0.799**	0.557	-4.648***	8.023	55.13***
	(1.62)	(-0.41)	(-0.01)	(-0.25)	(1.09)	(1.07)	(0.49)	(2.43)	(0.58)	(-5.24)	(-0.14)	(2.19)	(0.33)	(-4.48)	(0.38)	(3.50)
Diversification	-3.601***	0.270	-1.193**	-0.68***	-1.124	-0.0880	-40.91***	26.3***	-0.00475	-0.0337	0.279	0.286*	-0.891	-0.0496	-3.800	-2.013
	(-3.46)	(0.34)	(-2.27)	(-3.41)	(-0.87)	(-0.11)	(-3.85)	(2.94)	(-0.01)	(-0.07)	(0.61)	(1.68)	(-1.18)	(-0.10)	(-0.45)	(-0.30)
Loans	1.360	-0.841	-0.471	0.0511	-0.479	-0.478	8.204	7.958	0.872**	0.783***	0.867**	-0.20***	0.632	0.821***	12.09**	-1.697
	(1.00)	(-1.07)	(-0.90)	(0.25)	(-0.35)	(-0.58)	(0.65)	(0.74)	(2.05)	(3.13)	(2.56)	(-2.67)	(1.55)	(3.28)	(2.20)	(-0.40)
Efficiency	0.518	-0.727	-0.133	-0.278	-0.265	-1.038	10.72	2.253	-0.516	-1.135***	-0.0412	-0.269**	-0.798	-1.370***	-1.494	9.598**
	(0.47)	(-0.94)	(-0.26)	(-1.43)	(-0.22)	(-1.35)	(0.99)	(0.28)	(-0.87)	(-3.08)	(-0.12)	(-2.07)	(-1.44)	(-3.65)	(-0.20)	(2.17)
ROA	-13.97	-45.12***	-3.529	-1.944	-10.64	-49.01***	25.26	71.77	-4.108	-27.83***	1.723	-1.342	3.561	-28.95***	60.78	207.0***
	(-1.46)	(-7.71)	(-1.06)	(-1.21)	(-1.23)	(-8.30)	(0.25)	(1.29)	(-0.97)	(-8.52)	(0.66)	(-1.57)	(0.83)	(-9.03)	(1.12)	(7.38)
d(merger)	-0.163	-0.123**	-0.0921**	-0.0312*	0.485***	-0.136**	-1.111	1.346	0.253***	-0.188***	0.0113	0.0296*	0.173*	-0.131***	3.116***	0.129
	(-1.62)	(-2.10)	(-2.18)	(-1.84)	(4.22)	(-2.30)	(-1.17)	(1.64)	(3.33)	(-4.51)	(0.19)	(1.75)	(1.91)	(-3.06)	(3.40)	(0.16)
LiborOis	0.001	0.003	0.006	-0.001	0.005	0.001	0.06	0.004	0.03***	0.023***	-0.01***	0.00**	0.001	0.034***	0.23***	-0.791***
	(0.13)	(0.44)	(1.32)	(-0.29)	(0.45)	(0.17)	(0.70)	(0.05)	(4.25)	(5.42)	(-3.21)	(2.11)	(0.13)	(7.52)	(2.99)	(-9.18)
InterbankRate	-0.15***	-0.19***	-0.07***	-0.024**	-0.0541	-0.22***	-1.71***	4.01***	-0.32***	-0.16***	-0.014	-0.01	-0.20**	-0.20***	-2.89***	4.633***
	(-3.22)	(-6.27)	(-3.15)	(-2.19)	(-0.88)	(-6.86)	(-3.80)	(10.18)	(-4.46)	(-4.52)	(-0.35)	(-0.70)	(-2.20)	(-5.25)	(-4.29)	(7.26)
GDP	0.0166	0.0359	0.00286	0.0144	0.123	0.0389	-0.562	-0.164	-0.145***	-0.064***	-0.06***	-0.010**	-0.198***	-0.0752**	-1.356***	1.520***
	(0.20)	(0.75)	(0.09)	(1.19)	(1.55)	(0.74)	(-0.81)	(-0.27)	(-4.50)	(-4.29)	(-3.98)	(-2.04)	(-5.61)	(-4.81)	(-3.69)	(7.25)
Inflation	-0.192**	-0.268***	-0.0568	0.025**	-0.211**	-0.30***	-0.288	1.92***	0.150**	0.0411	0.0399	0.00231	0.196***	0.0679**	1.819***	-2.305***
	(-2.17)	(-5.18)	(-1.49)	(2.03)	(-2.10)	(-5.36)	(-0.36)	(3.06)	(2.53)	(1.26)	(1.14)	(0.23)	(3.27)	(1.97)	(2.99)	(-4.44)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Observations	1803	1864	1870	1872	1764	1858	1798	1852	2167	2153	2143	2138	2189	2167	2162	2169
Banks	640	640	638	642	630	638	641	637	628	622	622	619	630	621	626	622
Hansen j test (p-value)	0.638	0.169	0.039	0.903	0.964	0.367	0.206	0.167	0.002	0.146	0.305	0.001	0.100	0.004	0.002	0.000
KP rk LM statistic	9.378**	9.141**	9.979**	9.856**	9.791**	8.994**	9.281**	8.887**	105.0***	101.0***	101.6***	99.32***	103.3***	104.3***	103.4***	104.4***
KP Wald rk F statistic	3.818	4.200	4.229	4.674	3.997	4.031	3.319	4.010	60.03	55.70	56.80	63.67	61.84	60.54	61.91	60.40

Tables7.Geographical sub-panels analysis: effect of bank charter value on riskin pre-crisis period [2000-2006]

American banks (Panel A), European bank (Panel B) and other banks (in Australia, Canada, Japan, South Korea and Turkey) (Panel C). Tables presents the regression results for various bank risk measures on bank charter value over the post normal time, pre-crisis period from (2000 to 2006). We employ a two-stage least squares (TSLS) IV estimator with bank-specific fixed effects, time dummies and a robust-clustering on the bank-level. $\text{Risk}_{i,t} = \beta_1 \widehat{Charter}_{i,t} + \beta_2 X_{i,t-1} + \beta_3 C_{i,t} + \lambda_t + \mu_{i,t} + \varepsilon_{2i,t}$. Dependent variables are mix of four systemic risk measures (MES, Tail-beta, CoVaR and LRMES, models in the odd columns: 1,3,5,7) matched with four standalone risk measures (specific risk, systematic risk, total risk and market z-score, models in the even columns: 2,4,6,8).

Panel A: Charter value and risk for U.S. banks

	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	14.75***	1.588	5.822***	6.767***	6.943***	4.983***	186.1***	-172.7***
	(6.61)	(1.45)	(3.68)	(7.14)	(4.42)	(3.95)	(6.51)	(-4.44)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	1896	1872	1848	1862	1898	1886	1896	1885
Banks	340	339	339	339	340	339	340	338
Hansen j test (p-value)	0.174	0.799	0.243	0.280	0.680	0.389	0.177	0.182
KP rk LM statistic	29.50***	28.47***	28.74***	28.89***	29.34***	29.06***	29.35***	29.07***
KP Wald rk F statistic	53.92	52.47	55.34	53.08	53.55	52.27	53.38	52.33

Panel B: Charter value and risk for European banks

	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	4.832***	4.302***	1.498**	0.947***	4.147**	4.627***	52.21***	-73.67***
	(3.38)	(4.88)	(2.07)	(2.82)	(2.49)	(5.23)	(2.88)	(-3.80)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	915	897	909	892	914	884	915	885
Banks	162	161	162	162	162	160	162	160
Hansen j test (p-value)	0.349	0.141	0.064	0.169	0.848	0.062	0.407	0.068
KP rk LM statistic	19.35***	18.74***	19.07***	19.19***	19.34***	18.50***	19.35***	18.47***
KP Wald rk F statistic	22.15	21.64	22.40	22.36	22.17	21.42	22.15	21.48

Panel C: Charter value and risk for the rest of OECD sample

	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	9.763	6.072	-5.893	0.771	20.67***	5.315	175.5*	-60.30
	(1.29)	(1.44)	(-1.02)	(0.44)	(2.76)	(1.17)	(1.86)	(-0.59)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	508	509	508	509	507	509	509	509
Banks	90	90	90	90	90	90	90	90
Hansen j test (p-value)	0.014	0.361	0.509	0.205	0.516	0.341	0.006	0.035
KP rk LM statistic	18.47***	17.82***	17.64***	17.82***	18.47***	17.82***	17.82***	17.82***
KP Wald rk F statistic	1.643	1.781	1.788	1.781	1.591	1.781	1.781	1.781

Table 8.TBTF and size effects on the relation between charter value and riskin pre-crisis period for U.S. and European banks

Tables presents regression results for size effect and TBTF character in the relation between charter value on risk for only U.S. and European banks in pre-crisis period (2000-2006). We consider very large banks (as banks with total assets greater than USD20 billion), large banks (total assets ranged between USD1 and USD20 billion) and small banks (total asset bunded between USD500 million and USD1 billion). We employ a two-stage least squares (TSLS) IV estimator with bank-specific fixed effects, time dummies and a robust-clustering on the bank-level. $\text{Risk}_{i,t} = \beta_1 \widehat{Charter}_{i,t} + \beta_2 X_{i,t-1} + \beta_3 C_{i,t} + \lambda_t + \mu_{i,t} + \varepsilon_{2i,t}$. Dependent variables are mix of four systemic risk measures (MES, Tail-beta, CoVaR and LRMES, models in the odd columns: 1,3,5,7) matched with four standalone risk measures (specific risk, systematic risk, total risk and market z-score, models in the even columns: 2,4,6,8).

	Very large banks							
	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	14.36***	5.094***	4.772***	1.975**	9.106**	6.958***	148.9***	-188.9***
	(4.43)	(3.39)	(2.77)	(2.42)	(2.42)	(4.33)	(4.15)	(-3.22)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	610	597	605	602	610	603	610	605
Banks	107	107	107	107	107	107	107	107
Hansen j test (p-value)	0.149	0.597	0.535	0.126	0.999	0.380	0.085	0.086
KP rk LM statistic	22.82***	22.33***	22.70***	22.87***	22.82***	22.62***	22.82***	22.72***
KP Wald rk F statistic	25.20	22.54	25.46	24.13	25.20	23.01	25.20	23.11

	Large banks							
	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	5.479***	1.704*	1.751**	2.579***	3.052***	2.776***	68.77***	-39.83**
	(4.71)	(1.73)	(2.37)	(5.58)	(2.98)	(3.26)	(4.21)	(-2.27)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	1614	1591	1594	1577	1614	1587	1614	1585
Banks	286	285	286	286	286	284	286	283
Hansen j test (p-value)	0.271	0.272	0.144	0.374	0.496	0.261	0.268	0.118
KP rk LM statistic	12.85***	12.71***	13.45***	12.62***	12.71***	12.76***	12.85***	12.74***
KP Wald rk F statistic	30.34	30.63	30.53	30.30	30.19	30.78	30.34	30.76

Table 8 (continued)

	Small banks							
	1	2	**3**	**4**	**5**	**6**	**7**	**8**
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	11.20**	5.688	0.933	6.114***	2.722	7.750	158.7**	-231.7**
	(2.49)	(1.26)	(0.16)	(4.29)	(1.01)	(1.59)	(2.46)	(-2.18)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	587	581	558	575	588	580	587	580
Banks	109	108	108	108	109	108	109	108
Hansen j test (p-value)	0.866	0.638	0.902	0.244	0.470	0.453	0.700	0.706
KP rk LM statistic	13.82***	13.28***	12.48***	12.72***	14.07***	13.31***	13.69***	13.31***
KP Wald rk F statistic	17.39	15.88	14.72	17.58	17.84	15.91	16.81	15.91

Tables 9. Charter value and risk: effects of variations in total assets in pre-crisis period for U.S. and EU banks

Panel A and B present regression results for effects of top (Q75) and bottom quartile (Q25) of bank total assets variations during pre-crisis period (2000-2006). Panel C presents interactions between charter value and top quartile (d.Quartile75(ΔTA) dummy takes one if total assets variations in pre-crisi period are above q75, otherwise zero) and bottom quartile (d.Quartile25(ΔDiv.) dummy takes one if diversification ratio variations in pre-crisis period are below q25, otherwise zero) . Tables differentiate between effects on very large banks (TBTF with total asset ranged greater than USD20 billion) and large banks (total assets ranged between USD1 and USD20 billion). We employ a two-stage least squares (TSLS) IV estimator with bank-specific fixed effects, time dummies and a robust-clustering on the bank-level. $\mathrm{Risk}_{i,t} = \beta_1 \widehat{Charter}_{i,t} + \beta_2 X_{i,t-1} + \beta_3 C_{i,t} + \lambda_t + \mu_{i,t} + \varepsilon_{2i,t}$. Dependent variables are mix of four systemic risk measures (MES, Tail-beta, CoVaR and LRMES, models in the odd columns: 1,3,5,7) matched with four standalone risk measures (specific risk, systematic risk, total risk and market z-score, models in the even columns: 2,4,6,8). We instrument the interactions terms by using one-year lagged charter, tangible assets ratio, market share and the lag value of interaction tem.

Panel A. Effects of top quartile75 of total assets variations

	Very Large banks							
	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	12.49**	5.704*	2.911	2.741*	3.543	6.707**	121.8*	-194.4*
	(2.13)	(1.75)	(1.10)	(1.70)	(0.58)	(2.05)	(1.88)	(-1.93)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	188	186	185	186	188	186	188	186
Banks	32	32	32	32	32	32	32	32
Hansen j test (p-value)	0.462	0.272	0.806	0.139	0.074	0.901	0.238	0.550
KP rk LM statistic	9.082**	8.517**	8.148**	9.022**	9.082**	8.517**	9.082**	8.517**
KP Wald rk F statistic	9.242	8.260	7.643	9.386	9.242	8.260	9.242	8.260

	Large banks							
	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	5.850***	3.300***	1.100	2.154***	4.174**	4.121***	70.12***	-53.01***
	(3.57)	(2.91)	(1.23)	(3.86)	(2.45)	(3.81)	(3.16)	(-2.70)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	357	358	355	357	358	358	357	358
Banks	63	63	63	63	63	63	63	63
Hansen j test (p-value)	0.455	0.182	0.503	0.391	0.761	0.151	0.536	0.114
KP rk LM statistic	11.17**	10.70**	10.09**	10.69**	10.70**	10.70**	11.17**	10.70**
KP Wald rk F statistic	24.73	23.41	22.90	23.45	23.41	23.41	24.73	23.41

Panel B. Effect of bottom quartile25 of total assets variations

	Very Large banks							
	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Ris	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	11.52**	6.799***	-0.138	1.489*	10.74*	6.656***	91.32*	-142.8**
	(2.39)	(4.37)	(-0.03)	(1.69)	(1.92)	(3.74)	(1.93)	(-2.20)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	106	105	105	106	106	106	106	106
Banks	20	20	20	20	20	20	20	20
Hansen j test (p-value)	0.214	0.516	0.108	0.368	0.460	0.828	0.212	0.660
KP rk LM statistic	4.778	4.786	4.853	4.778	4.778	4.778	4.778	4.778
KP Wald rk F statistic	36.47	38.58	36.40	36.47	36.47	36.47	36.47	36.47

	Large banks							
	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	4.059	2.079	-1.002	0.0936	6.472**	2.259	54.80	-25.88
	(1.13)	(1.25)	(-0.43)	(0.07)	(2.20)	(1.19)	(1.16)	(-0.51)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	439	436	433	423	437	438	439	438
Banks	78	78	78	78	78	78	78	78
Hansen j test (p-value)	0.148	0.017	0.645	0.730	0.432	0.018	0.156	0.026
KP rk LM statistic	12.28***	12.21***	13.03***	11.94***	12.45***	12.05***	12.28***	12.05***
KP Wald rk F statistic	14.57	14.72	15.94	14.12	15.19	14.26	14.57	14.26

Table 10. Charter value and risk: effects of business model change (diversification ratio variations) in pre-crisis period for U.S. and EU banks

Panel A and B present regression results for effects of top (Q75) and bottom quartile (Q25) of diversification ratio variations during pre-crisis period (2000-2006). Panel C present interactions between chrter value and top quartile (d.Quartile75(ΔDiv.) dummy takes one if diversification ratio variations in pre-crisis period are above q75, otherwise zero) and bottom quartile (d.Quartile25(ΔDiv.) dummy takes one if diversification ratio variations in pre-crisis period are below q25, otherwise zero). Tables differentiate between effects on very large banks (TBTF with total asset ranged greater than USD20 billion) and large banks (total assets ranged between USD1 and USD20 billion). We employ a two-stage least squares (TSLS) IV estimator with bank-specific fixed effects, time dummies and a robust-clustering on the bank-level. $\text{Risk}_{i,t} = \beta_1 \widehat{Charter}_{i,t} + \beta_2 X_{i,t-1} + \beta_3 C_{i,t} + \lambda_t + \mu_{i,t} + \varepsilon_{2i,t}$. Dependent variables are mix of four systemic risk measures (MES, Tail-beta, CoVaR and LRMES, models in the odd columns: 1,3,5,7) matched with four standalone risk measures (specific risk, systematic risk, total risk and market z-score, models in the even columns: 2,4,6,8). We instrument the interactions terms by using one-year lagged charter, tangible assets ratio, market share and the lag value of interaction tem.

Panel A. Effect of top quartile75 of diversification ratio variations

	Very Large banks								Large banks							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score	MES	Specific Risk	Tail-beta	Systemat c Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	14.01*	8.600***	-4.715	-0.191	15.67	10.14***	118.9	-301.5***	3.536	-0.246	-0.416	1.371	2.254	0.400	65.53*	-15.93
	(1.81)	(3.62)	(-1.41)	(-0.12)	(1.61)	(3.08)	(1.38)	(-3.41)	(1.57)	(-0.16)	(-0.24)	(1.49)	(0.97)	(0.30)	(1.71)	(-0.36)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Observations	175	173	173	172	175	175	175	175	382	380	375	376	381	379	382	377
Banks	30	30	30	30	30	30	30	30	66	66	66	66	66	66	66	65
Hansen j test (p-value)	0.031	0.205	0.305	0.102	0.196	0.161	0.011	0.171	0.333	0.824	0.296	0.225	0.686	0.677	0.328	0.677
KP rk LM statistic	11.65***	11.68***	11.15***	11.52***	11.65***	11.65***	11.65***	11.65***	6.771*	6.797*	6.837*	6.737*	6.743*	6.770*	6.771*	6.713*
KP Wald rk F statistic	21.26	21.30	19.69	19.99	21.26	21.26	21.26	21.26	45.07	44.93	53.55	45.11	44.74	43.53	45.07	43.11

Panel B. Effect of top quartile25 of diversification ratio variation

	Very Large banks								Large banks							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	19.13***	4.714	6.164**	1.414	15.93***	6.713**	207.7***	-132.4	6.164***	2.200*	2.441**	2.687***	2.633*	3.492***	69.71***	-56.31**
	(4.02)	(1.37)	(2.13)	(0.94)	(2.98)	(2.25)	(3.45)	(-1.44)	(4.33)	(1.85)	(2.09)	(5.28)	(1.85)	(3.11)	(3.88)	(-2.24)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Observations	160	158	158	158	160	158	160	158	384	374	379	377	385	370	384	370
Banks	27	27	27	27	27	27	27	27	72	71	72	72	72	70	72	70
Hansen j test (p-value	0.351	0.593	0.454	0.116	0.654	0.731	0.483	0.131	0.478	0.790	0.115	0.509	0.0191	0.351	0.499	0.217
KP rk LM statistic	7.904**	7.420*	7.953**	8.133**	7.904**	7.420*	7.904**	7.420*	12.47***	11.76***	11.20***	11.45***	11.49***	11.91***	12.47***	11.91***
KP Wald rk F statistic	45.24	13.85	34.38	35.73	45.24	13.85	45.24	13.85	67.38	60.23	62.18	66.19	64.90	56.78	67.38	56.78

Tables 11. Alternative measure of bank charter value: standardized market value added

	Calm period [2000-2006]								Crisis periods [2007-2013]							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	1.001***	0.0384	0.195**	0.329***	0.760***	0.218***	12.40***	-7.685***	0.183	-0.767***	0.0924	0.100**	0.143	-0.722***	4.183**	7.579***
	(7.13)	(0.58)	(2.31)	(6.19)	(5.91)	(2.97)	(7.24)	(-3.81)	(0.91)	(-5.52)	(1.00)	(2.03)	(0.87)	(-5.28)	(2.01)	(3.85)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Observations	3304	3265	3250	3248	3304	3266	3305	3266	3971	4027	4015	4013	3956	4032	3962	4029
Banks	592	590	591	591	592	589	592	588	666	665	662	666	666	665	666	665
Hansen j test (p-value)	0.00000624	0.446	0.503	0.000308	0.164	0.110	0.0000134	0.0000207	0.000136	0.0831	0.0262	0.000727	0.349	0.0480	0.00104	0.169
KP rk LM statistic	71.22***	69.17***	70.48***	70.38***	71.22***	69.64***	71.10***	69.60**	96.04***	94.57***	122.1***	97.66***	96.05***	95.41***	99.30***	95.48***
KP Wald rk F statistic	97.48	94.97	97.68	96.24	97.43	95.94	97.21	95.90	42.85	43.13	63.81	42.93	43.78	43.34	45.73	43.37

Tables 12. Charter value and risk: effects of variations in total assets in pre-crisis period for U.S. and EU banks

Panel A and B present regression results for effects of top (Q50) and bottom quartile (Q50) of bank total assets variations during pre-crisis period (2000-2006). Panel C presents interactions between charter value and top quartile (d.Quartile75(ΔTA) dummy takes one if total assets variations in pre-crisi period are above q75, otherwise zero) and bottom quartile (d.Quartile25(ΔDiv.) dummy takes one if diversification ratio variations in pre-crisis period are below q25, otherwise zero) . Tables differentiate between effects on very large banks (TBTF with total asset ranged greater than USD20 billion) and large banks (total assets ranged between USD1 and USD20 billion). We employ a two-stage least squares (TSLS) IV estimator with bank-specific fixed effects, time dummies and a robust-clustering on the bank-level. $\mathrm{Risk}_{i,t} = \beta_1 \widehat{Charter}_{i,t} + \beta_2 X_{i,t-1} + \beta_3 C_{i,t} + \lambda_t + \mu_{i,t} + \varepsilon_{2i,t}$. Dependent variables are mix of four systemic risk measures (MES, Tail-beta, CoVaR and LRMES, models in the odd columns: 1,3,5,7) matched with four standalone risk measures (specific risk, systematic risk, total risk and market z-score, models in the even columns: 2,4,6,8). We instrument the interactions terms by using one-year lagged charter, tangible assets ratio, market share and the lag value of interaction tem.

Panel A. Effects of top quartile 50 of total assets variations

	Very large banks								Large banks							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	16.49***	6.316***	4.330*	3.009**	11.50*	9.015***	178.5***	-283.5***	5.887***	2.139**	2.373***	2.516***	3.256**	3.147***	72.70***	-42.96***
	(3.78)	(3.30)	(1.75)	(2.38)	(1.80)	(4.18)	(3.56)	(-3.24)	(4.29)	(2.07)	(2.86)	(5.41)	(2.52)	(3.34)	(3.84)	(-2.70)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Observations	323	319	320	319	323	320	323	320	792	790	786	788	794	785	792	783
Banks	55	55	55	55	55	55	55	55	141	141	141	141	141	140	141	139
Hansen j test (p-value)	0.294	0.719	0.848	0.278	0.222	0.625	0.243	0.288	0.639	0.287	0.160	0.475	0.332	0.408	0.695	0.524
KP rk LM statistic	13.52***	13.85***	13.08***	13.18***	13.52***	13.67***	13.52***	13.67***	11.84	11.61	11.40	11.40	11.58	11.73	11.84	11.70
KP Wald rk F statistic	14.93	12.56	13.85	14.95	14.93	12.66	14.93	12.66	37.50	36.82	36.27	36.74	36.35	37.45	37.50	37.40

Panel B. Effects of bottom quartile 50 of total assets variations

	Very large banks								Large banks							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	11.43***	3.341**	4.213*	1.276	9.424**	4.864***	109.2**	-94.77*	4.792*	-0.887	0.470	3.188**	2.352	0.511	70.93*	-4.340
	(2.72)	(2.14)	(1.87)	(1.62)	(2.26)	(2.75)	(2.54)	(-1.68)	(1.80)	(-0.57)	(0.27)	(2.42)	(1.17)	(0.33)	(1.94)	(-0.10)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Observations	287	278	285	283	287	283	287	285	822	801	808	789	820	802	822	802
Banks	52	52	52	52	52	52	52	52	145	144	145	145	145	144	145	144
Hansen j test (p-value)	0.208	0.517	0.486	0.0727	0.306	0.535	0.135	0.108	0.102	0.233	0.609	0.346	0.394	0.110	0.103	0.0864
KP rk LM statistic	9.827**	9.584**	9.982**	9.672**	9.827**	9.961**	9.827**	10.07*	17.71***	17.64***	18.17***	17.99***	17.67***	17.59***	17.71***	17.59***
KP Wald rk F statistic	22.95	21.54	25.06	21.76	22.95	24.82	22.95	25.35	40.58	31.93	42.70	44.36	40.35	29.61	40.58	29.61

Table 13. Charter value and risk: effects of business model change (diversification ratio variations) in pre-crisis period for U.S.and EU banks

Panel A and B present regression results for effects of top (Q50) and bottom quartile (Q50) of diversification ratio variations during pre-crisis period (2000-2006). Panel C present interactions between chrter value and top quartile (d.Quartile75(ΔDiv.) dummy takes one if diversification ratio variations in pre-crisis period are above q75, otherwise zero) and bottom quartile (d.Quartile25(ΔDiv.) dummy takes one if diversification ratio variations in pre-crisis period are below q25, otherwise zero). Tables differentiate between effects on very large banks (TBTF with total asset ranged greater than USD20 billion) and large banks (total assets ranged between USD1 and USD20 billion). We employ a two-stage least squares (TSLS) IV estimator with bank-specific fixed effects, time dummies and a robust-clustering on the bank-level. $\text{Risk}_{i,t} = \beta_1 \widehat{Charter}_{i,t} + \beta_2 X_{i,t-1} + \beta_3 C_{i,t} + \lambda_t + \mu_{i,t} + \varepsilon_{2i,t}$. Dependent variables are mix of four systemic risk measures (MES, Tail-beta, CoVaR and LRMES, models in the odd columns: 1,3,5,7) matched with four standalone risk measures (specific risk, systematic risk, total risk and market z-score, models in the even columns: 2,4,6,8). We instrument the interactions terms by using one-year lagged charter, tangible assets ratio, market share and the lag value of interaction tem.

Panel A. Effect of top quartile50 of diversification ratio variations

	Very large banks								Large banks							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	11.14**	5.193***	1.508	1.407	13.81**	6.851***	103.8*	-210.2***	4.650**	-0.490	1.212	2.551***	1.714	0.605	78.42**	-6.485
	(2.13)	(3.33)	(0.52)	(1.09)	(1.99)	(3.38)	(1.77)	(-2.95)	(2.28)	(-0.43)	(0.88)	(2.76)	(1.00)	(0.62)	(2.27)	(-0.19)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Observations	304	298	302	301	304	303	304	303	827	818	815	807	825	815	827	813
Banks	54	54	54	54	54	54	54	54	143	143	143	143	143	143	143	142
Hansen j test (p-value)	0.0731	0.0933	0.298	0.0726	0.136	0.158	0.0387	0.215	0.249	0.955	0.308	0.359	0.784	0.636	0.260	0.459
KP rk LM statistic	10.11**	10.07**	9.940**	10.09**	10.11**	10.11**	10.11**	10.11**	9.003**	8.919**	9.980**	8.955**	8.974**	8.865**	9.003**	8.809**
KP Wald rk F statistic	30.37	28.88	28.80	29.03	30.37	30.39	30.37	30.39	48.85	48.94	55.80	48.58	49.12	48.45	48.85	48.14

Panel B. Effect of top quartile50 of diversification ratio variations

	Very large banks								Large banks							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	15.74***	3.609*	6.634***	2.187*	8.956*	6.012***	170.1***	-164.6**	5.646***	2.280**	2.060**	2.526***	3.065**	3.350***	63.29***	-55.88***
	(3.63)	(1.71)	(2.75)	(1.91)	(1.92)	(2.59)	(3.66)	(-1.98)	(4.17)	(2.21)	(2.31)	(4.77)	(2.35)	(3.71)	(3.70)	(-2.84)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Observations	306	299	303	301	306	300	306	302	787	773	779	770	789	772	787	772
Banks	53	53	53	53	53	53	53	53	143	142	143	143	143	141	143	141
Hansen j test (p-value)	0.398	0.781	0.767	0.338	0.486	0.967	0.509	0.122	0.710	0.273	0.254	0.735	0.104	0.0779	0.844	0.0680
KP rk LM statistic	10.47**	10.24**	11.08**	10.61**	10.47**	10.41**	10.47**	10.48**	11.63***	11.40***	11.13***	10.84***	11.25***	11.59***	11.63***	11.59***
KP Wald rk F statistic	9.821	7.741	9.882	9.055	9.821	7.762	9.821	7.780	54.37	52.78	51.16	53.63	52.83	52.81	54.37	52.81

Appendix A: Robustness checks. Analysis on U.S. and Europeans banks with total assets greater to USD1 billion

Panel A. Effects of acute-crisis and post-crisis, U.S. banks, with total assets greater to USD1 billion

	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter (α1)	2.160*	2.599***	1.548**	2.234***	-0.780	2.052***	38.18**	-26.58*
	(1.65)	(2.94)	(2.45)	(5.57)	(-0.84)	(2.85)	(2.56)	(-1.87)
Charter*d.(acute-crisis) (α2)	5.221***	-6.112***	-0.278	-0.798**	4.887***	-3.707***	38.75**	-13.70
	(2.66)	(-7.05)	(-0.37)	(-2.11)	(2.72)	(-4.27)	(2.20)	(-0.93)
Charter* d.(post-crisis) (α3)	-2.994**	-2.810***	-1.518**	-2.373***	-0.397	-2.432***	-45.93***	36.62***
	(-2.36)	(-3.15)	(-2.46)	(-5.99)	(-0.43)	(-3.36)	(-3.22)	(2.71)
d.(acute-crisis)	356.7***	252.4***	6.411	-15.01	454.8***	381.9***	2978.4***	-8139.6***
	(7.72)	(7.65)	(0.23)	(-1.22)	(10.05)	(11.87)	(5.76)	(-13.84)
d.(post-crisis)	84.63***	58.26***	2.905	-1.071	104.4***	87.61***	730.3***	-1872.9***
	(7.94)	(7.57)	(0.46)	(-0.38)	(10.08)	(11.71)	(6.14)	(-13.96)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	2884	2906	2915	2923	2877	2932	2881	2930
Banks	260	259	259	260	260	259	260	259
Hansen j test (p-value)	0.182	0.068	0.702	0.057	0.281	0.006	0.067	0.022
KP rk LM statistic	39.85***	36.44***	38.79***	40.00***	38.86***	39.34***	39.76***	39.31***
KP Wald rk F statistic	8.491	7.840	7.920	7.514	7.527	7.999	8.320	8.001
Wald tests: $\alpha_1+\alpha_2$	7.38***	-3.51***	1.27*	1.44***	4.11**	-1.66*	76.93***	-40.28***
$\alpha_1+\alpha_3$	-0.83	-0.21	0.03	-0.14	-1.18**	-0.38	-7.75	10.04

Panel B. Effects of acute-crisis and post-crisis, European banks, with total assets greater to USD1 billion

	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter (α1)	4.135***	3.975***	1.453**	0.838***	2.181	4.023***	54.48***	-66.23***
	(3.31)	(4.46)	(2.36)	(2.64)	(1.55)	(4.37)	(3.75)	(-3.99)
Charter*d.(acute-crisis) (α2)	0.653	-0.434	0.742	-0.120	0.245	0.811	-7.116	2.274
	(0.39)	(-0.27)	(0.98)	(-0.29)	(0.14)	(0.45)	(-0.41)	(0.11)
Charter* d.(post-crisis) (α3)	-8.245***	-6.651***	-1.950**	-1.264***	-5.204***	-7.480***	-93.88***	117.4***
	(-4.38)	(-4.54)	(-2.39)	(-3.10)	(-2.78)	(-4.68)	(-4.69)	(4.81)
d.(acute-crisis)	-669.6	4.975	0.0456	0.476	-580.6	-103.4	-4975.4	-1744.4
	(-1.35)	(0.02)	(0.03)	(1.12)	(-1.54)	(-0.29)	(-1.00)	(-0.27)
d.(post-crisis)	-114.6	7.887	2.031**	1.624***	-101.8	-10.96	-814.9	-458.3
	(-1.24)	(0.14)	(2.21)	(4.07)	(-1.44)	(-0.16)	(-0.88)	(-0.38)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	1874	1862	1865	1817	1888	1843	1870	1845
Banks	175	175	175	175	175	175	175	175
Hansen j test (p-value)	0.348	0.105	0.765	0.337	0.886	0.172	0.382	0.553
KP rk LM statistic	16.13***	15.14***	33.14***	24.03***	15.51***	15.03***	16.13***	15.03***
KP Wald rk F statistic	3.633	3.377	7.281	4.701	3.462	3.361	3.625	3.361
Wald tests: $\alpha_1+\alpha_2$	4.79**	3.54*	2.20**	0.72	2.43	4.83**	47.36**	-63.96***
$\alpha_1+\alpha_3$	-4.11**	-2.68**	-0.50	-0.43	-3.02**	-3.46**	-39.40**	51.17**

Panel C. Effects of top/bottom quartiles of total assets variations, U.S. and European banks, with total assets greater to USD1 billion

	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter (α1)	16.47***	0.511	5.640***	6.926***	8.527***	3.904***	208.2***	-147.0***
	(7.29)	(0.47)	(3.15)	(7.50)	(4.52)	(3.19)	(7.05)	(-4.27)
Charter*d.Quartile75(ΔTA) (α2)	-9.082***	1.899	-3.138*	-4.150***	-4.432**	-0.225	-118.9***	71.35**
	(-3.57)	(1.53)	(-1.66)	(-4.12)	(-2.07)	(-0.18)	(-3.52)	(1.98)
Charter* d.Quartile25(ΔTA) (α3)	-11.51***	0.268	-4.189*	-5.172***	-3.837	-1.974	-162.6***	119.5**
	(-3.62)	(0.16)	(-1.89)	(-3.72)	(-1.46)	(-1.11)	(-3.98)	(2.46)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	2224	2188	2199	2179	2224	2190	2224	2190
Banks	393	392	393	393	393	391	393	390
Hansen j test (p-value)	0.051	0.239	0.156	0.095	0.554	0.092	0.045	0.006
KP rk LM statistic	42.51****	41.51****	43.25****	42.29****	42.48****	42.15****	42.51****	41.95****
KP Wald rk F statistic	38.92	38.41	41.74	38.04	39.19	38.97	38.92	38.84
Wald tests: $\alpha_1 + \alpha_2$	7.67***	2.4***	2.50***	2.78***	4.10***	3.68***	89.3***	-75.65***
$\alpha_1 + \alpha_3$	5.19*	0.78	1.45	1.754	4.69**	1.93	45.60	-27.50

Panel D. Effects of top/bottom quartiles of diversification ratio variations, U.S. and European banks, with total assets greater to USD1 billion

	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter (α1)	13.29***	1.644	6.109***	5.626***	8.170***	4.418***	165.2***	-139.5***
	(6.16)	(1.56)	(4.15)	(6.41)	(4.71)	(3.92)	(6.13)	(-4.15)
Charter*d.Quartile75(ΔDiv.) (α2)	-5.243	-1.240	-5.295***	-2.724**	-3.256	-2.299	-60.92	60.77
	(-1.45)	(-0.85)	(-2.87)	(-2.03)	(-1.11)	(-1.54)	(-1.26)	(1.43)
Charter* d.Quartile25(ΔDiv.) (α3)	-6.035**	0.583	-3.715**	-2.843***	-4.269**	-0.951	-79.33**	84.80**
	(-2.34)	(0.42)	(-2.13)	(-2.77)	(-2.06)	(-0.70)	(-2.46)	(2.25)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	2220	2184	2195	2175	2220	2186	2220	2186
Banks	391	390	391	391	391	389	391	388
Hansen j test (p-value)	0.173	0.221	0.196	0.374	0.831	0.090	0.205	0.006
KP rk LM statistic	39.39***	38.73***	39.50***	38.94***	39.43***	39.16***	39.39***	39.31***
KP Wald rk F statistic	42.79	42.47	44.92	41.75	43.08	43.19	42.79	43.42
Wald tests: $\alpha_1 + \alpha_2$	8.05**	0.40	0.81	2.90***	4.91*	1.43**	104.28**	-77.73***
$\alpha_1 + \alpha_3$	7.26***	1.06**	2.39***	2.78***	3.90**	3.467***	85.87***	-53.7***

Appendix B

Tables 1.Geographical sub-panels analysis: effect of bank charter value on riskin acute-crisis period [2007-2009]

American banks (Panel A), European bank (Panel B) and other banks (in Australia, Canada, Japan, South Korea and Turkey) (Panel C). Tables presents the regression results for various bank risk measures on bank charter value over the post normal time, acute-crisis period from (2007 to 2009). We employ a two-stage least squares (TSLS) IV estimator with bank-specific fixed effects, time dummies and a robust-clustering on the bank-level. $\mathrm{Risk}_{i,t} = \beta_1 \widehat{Charter}_{i,t} + \beta_2 X_{i,t-1} + \beta_3 C_{i,t} + \lambda_t + \mu_{i,t} + \varepsilon_{2i,t}$. Dependent variables are mix of four systemic risk measures (MES, Tail-beta, CoVaR and LRMES, models in the odd columns: 1,3,5,7) matched with four standalone risk measures (specific risk, systematic risk, total risk and market z-score, models in the even columns: 2,4,6,8).

Panel A: U.S. Banks

	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	13.22*	-10.80***	3.449	0.809	-9.133	-9.845**	87.21	-9.186
	(1.79)	(-2.63)	(1.63)	(0.91)	(-1.34)	(-2.50)	(1.49)	(-0.21)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	1053	1111	1119	1121	1008	1111	1050	1107
Banks	383	383	381	384	373	383	384	383
Hansen j test (p-value)	0.425	0.824	0.597	0.968	0.212	0.469	0.272	0.369
KP rk LM statistic	11.70***	14.32***	15.88***	15.80***	14.33***	14.40***	12.27***	14.61***
KP Wald rk F statistic	11.39	14.29	17.75	17.88	16.77	14.07	12.01	14.49

Panel B: EU Banks

	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	0.325	-8.376	1.445	-0.174	-1.055	-7.086	-13.44	71.56
	(0.03)	(-1.24)	(0.33)	(-0.11)	(-0.16)	(-1.02)	(-0.21)	(1.26)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Non	Non	Non	Non	Non	Non	Non	Non
Observations	467	470	468	469	476	464	465	462
Banks	162	162	162	163	162	160	162	159
Hansen j test (p-value)	0.273	0.362	0.107	0.544	0.526	0.350	0.336	0.854
KP rk LM statistic	9.253**	11.96***	8.011**	10.08****	10.56**	12.21***	6.903*	12.02***
KP Wald rk F statistic	2.940	4.822	2.675	2.972	3.918	4.831	2.016	4.771

Panel C: Other Banks

	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	-33.73***	-9.109***	-1.819	-3.260**	-1.685	-14.52***	-294.5***	128.4*
	(-3.17)	(-3.44)	(-0.46)	(-2.34)	(-0.22)	(-4.03)	(-2.61)	(1.77)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	283	283	283	282	280	283	283	283
Banks	95	95	95	95	95	95	95	95
Hansen j test (p-value)	0.103	0.005	0.315	0.201	0.928	0.010	0.184	0.455

KP rk LM statistic	7.278*	7.278*	7.278*	7.281*	7.284*	7.278*	7.278*	7.278*
KP Wald rk F statistic	9.029	9.029	9.029	8.931	9.197	9.029	9.029	9.029

Tables 2. Geographical sub-panels analysis: effect of bank charter value on risk in post-crisis period [2010-2013]

American banks (Panel A), European bank (Panel B) and other banks (in Australia, Canada, Japan, South Korea and Turkey) (Panel C). Tables presents the regression results for various bank risk measures on bank charter value over the post normal time, post-crisis period from (2010 to 2013). We employ a two-stage least squares (TSLS) IV estimator with bank-specific fixed effects, time dummies and a robust-clustering on the bank-level. $\text{Risk}_{i,t} = \beta_1 \widehat{Charter}_{i,t} + \beta_2 X_{i,t-1} + \beta_3 C_{i,t} + \lambda_t + \mu_{i,t} + \varepsilon_{2i,t}$. Dependent variables are mix of four systemic risk measures (MES, Tail-beta, CoVaR and LRMES, models in the odd columns: 1,3,5,7) matched with four standalone risk measures (specific risk, systematic risk, total risk and market z-score, models in the even columns: 2,4,6,8).

Panel A: U.S. Banks

	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	-1.225***	-0.173	0.166	-0.105*	-1.725***	-0.387*	-15.83***	8.972***
	(-3.60)	(-0.74)	(0.81)	(-1.66)	(-3.91)	(-1.70)	(-3.34)	(3.16)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	1262	1253	1245	1276	1281	1266	1259	1267
Banks	361	356	357	362	363	357	359	358
Hansen j test (p-value)	0.069	0.108	0.783	0.002	0.777	0.004	0.408	0.001
KP rk LM statistic	54.83***	50.74***	51.88***	52.32***	52.67***	52.91***	52.77***	52.81***
KP Wald rk F statistic	55.27	52.10	54.12	56.63	56.41	57.11	53.14	56.82

Panel B: EU Banks

	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	-2.310**	-0.961	-0.391	-0.104	-0.655	-1.505*	-11.84	14.66
	(-2.13)	(-1.49)	(-0.48)	(-0.53)	(-0.73)	(-1.90)	(-1.51)	(1.64)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	487	488	484	446	493	484	485	485
Banks	158	157	157	149	158	155	158	155
Hansen j test (p-value)	0.675	0.105	0.458	0.843	0.616	0.101	0.419	0.521
KP rk LM statistic	7.932**	7.570*	8.064**	7.047*	7.503*	7.538*	7.955**	7.476*
KP Wald rk F statistic	10.18	11.15	2.871	3.459	11.21	11.05	10.14	11.11

Panel C: Other Banks

	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter	1.790	-0.302	1.820	0.147	-1.214	-0.349	14.79	35.06
	(1.00)	(-0.47)	(1.44)	(0.37)	(-0.54)	(-0.49)	(0.75)	(1.63)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Observations	418	412	414	416	415	417	418	417
Banks	109	109	108	108	109	109	109	109
Hansen j test (p-value)	0.000	0.148	0.022	0.025	0.010	0.00	0.000	0.001
KP rk LM statistic	20.49***	19.96***	19.64***	20.06***	19.97***	20.73***	20.49***	20.73***
KP Wald rk F statistic	11.30	10.62	11.13	11.10	10.80	11.49	11.30	11.49

Table 3. Effects of top and bottom quartiles variations in total assets

	Very Large banks								Large banks							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter (α1)	15.09***	4.152*	5.568*	2.201**	12.29**	7.044***	165.2***	-230.0**	9.259***	0.639	2.997	5.604***	2.322	2.658*	125.0***	-55.01
	(2.98)	(1.71)	(1.86)	(2.08)	(2.14)	(2.62)	(2.90)	(-2.51)	(3.86)	(0.46)	(1.38)	(5.77)	(1.31)	(1.71)	(3.79)	(-1.51)
Charter*d.Quartile75 (ΔTA) (α2)	-2.490	1.516	-1.882	-0.968	-6.461	-0.791	-40.11	74.18	-3.482	1.479	-1.019	-3.147***	1.064	0.483	-52.45	3.005
	(-0.45)	(0.54)	(-0.60)	(-0.63)	(-1.01)	(-0.26)	(-0.64)	(0.69)	(-1.35)	(1.00)	(-0.45)	(-3.06)	(0.54)	(0.31)	(-1.43)	(0.08)
Charter*d.Quartile25 (ΔTA) (α3)	-4.616	-0.559	-1.765	-0.475	-5.452	-2.482	-62.24	115.4	-10.96***	0.537	-4.138*	-6.118***	-1.465	-1.618	-159.0***	110.3**
	(-0.85)	(-0.24)	(-0.48)	(-0.36)	(-0.93)	(-0.95)	(-1.02)	(1.28)	(-3.67)	(0.27)	(-1.70)	(-4.29)	(-0.65)	(-0.79)	(-3.94)	(2.16)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Observations	610	597	605	602	610	603	610	605	1614	1591	1594	1577	1614	1587	1614	1585
Banks	107	107	107	107	107	107	107	107	286	285	286	286	286	284	286	283
Hansen j test (p-value)	0.037	0.345	0.590	0.067	0.898	0.107	0.023	0.051	0.038	0.595	0.040	0.045	0.287	0.367	0.042	0.090
KP rk LM statistic	10.57**	9.444**	9.156**	10.73**	10.57**	8.763**	10.57**	8.753**	41.61***	40.09***	41.14***	41.63***	41.01***	40.16***	41.61***	39.77***
KP Wald rk F statistic	9.070	7.365	7.739	8.714	9.070	6.964	9.070	6.959	41.00	40.90	42.46	41.94	40.97	40.99	41.00	40.57
Wald tests: $\alpha_1+\alpha_2$	12.60****	5.67***	3.69*	1.23	5.83	6.25**	125.09***	-155.82*	5.78***	2.12**	1.98**	2.46***	3.39**	3.14***	75.55***	-52.00***
$\alpha_1+\alpha_3$	10.09***	3.59***	3.80	1.73*	6.84*	4.56***	101.96***	-114.6**	-1.70	1.18	-1.14	-0.51	0.86	1.04	-34.00	55.29

Table 4. Effects of top and bottom quartiles variations in diversification ratio

	Very Large banks								Large banks							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score	MES	Specific Risk	Tail-beta	Systematic Risk	ΔCoVaR	Total Risk	LRMES	MZ-score
Charter (α1)	16.39***	4.009*	7.917**	3.705***	8.728*	7.069***	178.4***	-247.1***	5.633***	2.203	3.885**	3.592***	3.871**	3.369**	80.43***	-47.09
	(2.99)	(1.93)	(2.29)	(2.75)	(1.79)	(2.78)	(3.11)	(-2.64)	(2.65)	(1.57)	(2.39)	(3.43)	(2.05)	(2.31)	(2.72)	(-1.19)
Charter* d.Quartile75(ΔDiv.) (α2)	-6.160	2.830	-8.939**	-4.608***	2.556	0.00296	-87.43	74.87	-1.094	-2.621	-3.737*	-1.135	-2.063	-2.459	-9.354	24.76
	(-0.97)	(1.33)	(-2.48)	(-3.28)	(0.35)	(0.00)	(-1.24)	(0.77)	(-0.38)	(-1.47)	(-1.85)	(-0.80)	(-0.92)	(-1.42)	(-0.22)	(0.53)
Charter* d.Quartile25(ΔDiv.) (α3)	-1.624	1.146	-3.423	-1.858	-0.576	-0.398	-24.88	124.7	0.429	0.199	-2.049	-1.222	-0.382	0.0368	-8.631	1.715
	(-0.31)	(0.47)	(-0.98)	(-1.14)	(-0.10)	(-0.15)	(-0.45)	(1.22)	(0.18)	(0.13)	(-1.07)	(-1.07)	(-0.17)	(0.02)	(-0.26)	(0.04)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Observations	610	597	605	602	610	603	610	605	1610	1587	1590	1573	1610	1583	1610	1581
Banks	107	107	107	107	107	107	107	107	284	283	284	284	284	282	284	281
Hansen j test (p-value)	0.177	0.478	0.317	0.140	0.992	0.291	0.110	0.078	0.216	0.262	0.102	0.438	0.485	0.310	0.236	0.126
KP rk LM statistic	8.899**	8.934**	9.379**	8.789**	8.899**	9.099**	8.899**	9.142**	26.12***	24.58***	27.66***	26.10***	25.61***	23.88***	26.12***	23.40***
KP Wald rk F statistic	4.724	4.765	5.128	4.611	4.724	4.826	4.724	4.850	50.73	49.12	54.71	50.35	50.42	48.33	50.73	47.71
Wald tests: $\alpha_1+\alpha_2$	10.23*	6.84***	-0.51	-0.90	11.28	7.07***	90.97	-172.23**	4.54*	-0.42	0.15	2.46**	1.81	0.91	71.08*	-22.33
$\alpha_1+\alpha_3$	14.77***	5.16***	4.49**	1.85	8.15*	6.67***	153.52***	-122.40*	6.06***	2.40**	1.84**	2.37***	3.49***	3.41***	71.80***	-45.38***