Short-Selling Restrictions and Financial Stability in Europe

Evidence from the Covid-19 Crisis

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Abstract

In March 2020, six European countries imposed temporary short-selling bans to prevent further stock price declines, to reduce price volatility, and to ensure financial stability during the Covid-19 pandemic, whereas other countries abstained from implementing these restrictions. We examine the effects of these regulatory interventions on stock returns and market quality for major European countries with and without bans. Our results reveal that the ban did not stabilize stock prices and adversely affected market liquidity, as reflected in wider bid-ask spreads and lower turnover. In addition, smaller markets and smaller firms in particular suffered from the deterioration in market quality. Using logit regressions, we investigate the determinants of the probability that a country would impose short-selling restrictions. The results suggest that countries with weaker economies, lower fiscal capacity, less financial development, and stricter lockdown measures were more likely to adopt a ban. Consequently, restricting short selling did not function as an effective precautionary measure to minimize the negative effects of this crisis, but rather lead to the opposite outcome as envisioned by some regulators.

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1. Introduction

The essential functions of organized securities markets are to provide a fair and orderly market environment, in which prices instantaneously and fully reflect all information, and where trading occurs immediately at minimal costs and risks (Schmidt, 1977). These informational (external) and operational (internal) efficiencies results in an optimal allocation of resources with funds employed at its greatest usage (Tinic and West, 1979, pp. 91-98). This paradigm needs to hold not only during normal times but also during extreme market distress, such as the recent Covid-19 crisis. It is therefore important to investigate and determine whether regulators should impose any restrictions during crisis periods to guarantee that securities markets continue functioning efficiently. Interestingly, some European countries implemented short-selling bans immediately at the outbreak of the pandemic, presumably to prevent further stock price declines, higher price volatility, investor misbehavior and most importantly to ensure financial stability, while other European countries abstained from imposing restrictions. This is in sharp contrast to the regulatory activities during the global financial crisis (2007-2009), when most countries introduced short-selling bans at different times, in particular to protect banks and the stability of the financial system. For the same reasons, some Eurozone countries imposed a temporary ban on short selling for financial stocks during the European sovereign debt crisis (2011-2012).

The aim of this research is to investigate whether allowing initiations of new and increases of existing net short positions during the Covid-19 crisis ignited investor misbehavior and illegal insider trading or threatened market quality and financial stability, and whether restricting short selling alleviated these problems.[1] These complex issues require taking a comprehensive perspective on the factors negatively influencing fair and orderly markets, especially during crisis periods and whether preventing trading based on negative information and expectations hinders price efficiency, resulting in negative market quality effects.

In this study, we first investigate how short-selling restrictions affected stock prices and in particular market quality measures in 12 European countries between 2 January and 30 June 2020. We

[1] The FT reported that market abuse and insider trading has increased since the start of Covid-19 due to working from home, resulting in less direct oversight from peers and control over communications, which are in place at the office (FT, 2021).

employ cross-sectional regressions and fixed-effects panel regressions to provide empirical evidence for the effects of the short-selling ban. To address potential endogeneity concerns of the ban, we also use propensity score matching and instrumental variables (IV) regressions. In the second part of the paper, we address under which conditions countries imposed these restrictions. In addition, we analyze the role of circuit breakers, possible market manipulation and insider trading activities as well as financial stability issues, all presumably resulting from allowing short selling during crisis periods. Overall, this study aims to shed some light on how regulators should proceed with regulatory interventions during future crises.

Our findings suggest that restricting short selling had a negative impact on stock returns and market quality in these particular European countries. More specifically, the regulatory intervention did not reduce price volatility or boosted stock prices, although these effects are difficult to distinguish from the monetary and fiscal policy measures announced contemporaneously in support of the economy. With respect to liquidity, the short-selling bans increased bid-ask spreads and decreased turnover. Especially smaller markets and smaller stocks, as measured by market capitalization at the end of 2019, suffered from the negative market quality effects. Robustness tests support our findings in a matched sample setting as well as when we instrument the ban decision with the country's default risk and financial stress level. Focusing on the determinants of the short-selling ban, we document that countries with weaker economic conditions, lower fiscal capacity, a less developed financial system and more stringent lockdown measures were more likely to impose the ban. In addition, we do not find evidence for a higher probability of market manipulation and greater increases in short positions in ban countries during the Covid-19 crisis.

Our main conclusions are that regulators should allow short-selling activities even in times of crisis, as long as exchanges and regulators can prevent any price manipulation and insider trading as well as guaranteeing that financial stability prevails at all times. Then markets can benefit from the positive functions of short sellers, such as information efficiency, higher liquidity, and the resulting greater market quality. We organize the rest of our paper as follows. Section 2 contains the literature review and hypotheses development on short selling and market quality. Section 3 describes the data, sample and methodology. In Section 4, we analyze the effects on equity market quality in countries with

and without short-selling restrictions, and subsequently we investigate the determinants of the introduction of short-selling bans in a country. In Section 6, we discuss the role of circuit breakers, market manipulation, insider trading, short selling, and financial stability concerns. Section 7 concludes.

2. Literature Review and Hypotheses

In this section, we examine the informational and real effects of short selling (2.1.1) and the impact of short selling during market distress (2.1.2) Finally, we discuss and the effects of short-selling restrictions on market quality and develop our hypotheses (2.2).

2.1 Effects of Short Selling on Stock Markets

2.1.1 Short Sellers as Information Intermediaries and the Effects on Corporate Decisions

Previous research provided considerable findings with respect to short selling. Jiang et al. (2021) and Reed (2013) offer excellent reviews of the theoretical and empirical short-selling literature. Short sellers usually target overvalued stocks with high market-to-book ratios and with more institutional investors (Dechow et al., 2001; Christophe et al., 2004), and often have the ability to correctly predict negative stock returns (Boehmer et al., 2008; Diether et al., 2009). By collecting and processing publicly available information (Engelberg et al., 2012), and most importantly, private information (Karpoff and Lou, 2010), they detect miss-valuation of stocks (Jones and Lamont, 2002). As a result, short selling contributes to the price discovery process by incorporating negative information into stock price. This increases the information efficiency and orderly functioning of financial markets (Bris et al., 2007; Chen and Rhee, 2010; Boehmer and Wu, 2013). Hence, short sellers as information intermediaries gather and possess superior information relative to other market participants (Chen et al., 2016).

Various studies also indicate that short-selling activities have real effects on corporate policies such as financing, investment, and payout decisions. More specifically, as short selling reduces stock prices, this results in lower equity issuances and investments (Grullon et al., 2015), higher external financing costs (Meng et al., 2020), discipline management with respect to M&As (Chang et al., 2019), and increase cash dividends (Chen et al., 2019). Short sellers' activities also enhance the information environment by uncovering financial misconduct (Karpoff and Lou, 2010), reducing earnings management (Fang et al., 2016; Massa, Zhang and Zhang, 2015), and improving the financial reporting quality

(Li and Zhang, 2015). Overall, short sellers perform a positive and essential information function in the financial markets.

2.1.2 Short Selling in Periods of Market Distress

The empirical evidence clearly indicates that short selling is beneficial during non-crisis or "normal" times. However, excessive short selling may create destabilizing effects in financial markets during periods with substantial stock prices declines. Geraci et al. (2018) report that short selling accelerates negative return trends and increases volatility, with stronger effects observed for smaller stocks. This may prompt regulators to impose short-selling restrictions, aiming to reduce the probability and severity of a stock market panic in exceptional times of market distress.

2.2 Hypotheses Development

Previous research suggests negative effects from short-selling bans on market quality during the global financial crisis in 2007/2008 and the European sovereign debt crisis in 2011/2012. Constraining short selling may result in an overvaluation of banned stocks as prices only reflect optimistic views (Miller, 1977). Consistent with this theoretical predictions, empirical studies suggest that any form of short-selling restrictions result in overvaluation of these stocks (Beber and Pagano, 2013; Boehme et al., 2006; Boehmer et al., 2013; Chang et al., 2007; Bris et al., 2007; Frino et al., 2011), and generate negative returns after the ban is abandoned (Autore et al., 2011). The motivation of financial market regulators to restrict short selling is to stabilize stock prices and reduce volatility. However, there are also monetary and fiscal policy options that achieve the same goal. On March 12, 2020, the European Central Bank announced a comprehensive package of measures (ECB, 2020a), including the €750 billion Pandemic Purchase Program (PEPP). This occurred exactly on 18 March 2020 (ECB, 2020b), the day when many regulators implemented the short-selling ban.[2] Immediately afterwards, stock prices started to recover.[3] These important confounding events may cloud the direct effect of the ban on stock performance. Therefore, it is empirically challenging to differentiate between the effects of the short-selling ban and

[2] The ECB decided to increase the volume by €600 billion (June 4, 2020) and by €500 billion (December 10, 2020) to a total of €1,850 billion.
[3] Two months later, on 18 May 2020, the German and French governments jointly proposed an economic recovery plan with a €500 billion reconstruction fund, making another important turning point in financial markets' perception of the fiscal strength to overcome the pandemic in the EU.

other measures implemented to support the economy and equity prices. Nevertheless, we hypothesize a reversal and increase in stock prices, which we express in our first hypothesis:

Hypothesis 1: When regulators impose short-selling restrictions, banned stocks experience **positive abnormal returns**.

Theoretical models on short-selling restrictions predict negative effects on market liquidity and wider bid-ask spreads, as the speed of incorporating negative information into stock prices is lower (Diamond and Verrecchia, 1987). Empirical studies report that banned stocks experienced a substantially increase in bid-ask spreads and lower trading volumes for many markets around the world (Beber and Pagano, 2013; Boehmer et al., 2013; Boulton and Braga-Alves, 2010; Frino et al., 2011; Marsh and Payne, 2012). Moreover, market makers are less inclined to provide liquidity for smaller stocks due to higher risks resulting from information asymmetries and adverse selection problems (Glosten and Harris, 1988). Therefore, if restrictions in short selling requires market makers to hold more of these stocks on inventory, they are more likely to reduce trading in smaller stocks and more volatile stocks that have no options traded (Beber and Pagano, 2013). In contrast, other studies for the U.S. find that the effects are concentrated in larger (Boehmer et al., 2013) and ex-ante more liquid stocks (Autore et al., 2011). Moreover, in countries that implement short-selling constraints, prices reflect negative information only with a time lag, consistent with lower price efficiency (Bris et al., 2007; Marsh and Payne, 2012; Saffi and Sigurdsson, 2011). Based on the theoretical predictions and empirical observations, we formulate the second hypothesis:

Hypothesis 2: When regulators impose short-selling restrictions, the **bid-ask spreads** for banned stocks **widen.**

Another important measure for liquidity is trading volume. The previous arguments leads to our third hypothesis:

Hypothesis 3: When regulators impose short-selling restrictions, the **trading volume** of these stocks **decrease.**

It seems possible that imposing short-selling bans increase the risk for stock market crashes (Hong and Stein, 2003) and asset price bubbles (Scheinkman and Xiong, 2003), causing excessive volatility. Indeed, Boehmer et al. (2013), Félix et al. (2016) and Beber et al. (2021) find that short-selling bans in-

crease volatility. Based on this theoretical arguments and empirical evidence, we derive our fourth hypothesis:

Hypothesis 4: When regulators impose short-selling restrictions, the **volatility** for banned stocks **increases.**

Overall, the adoption of short-selling restrictions often do not generate the expected benefits, but rather reduces financial stability, weakens market efficiency, and interferes with orderly functioning securities markets. Whether this was the case during the Covid-19 crisis, requires a detailed empirical analysis, which we provide in this study.

3. Data, Sample and Methodology

3.1 Dataset Construction

We construct our dataset for 12 European countries for the period from 2 January 2020 to 30 June 2020 by employing the constituent lists of stock indices (as of January 2020) and country-specific research lists of all stocks included in Refinitiv Datastream. This includes the six countries (Austria, Belgium, France, Italy, Greece, and Spain) in which the financial market regulators introduced temporary short-selling bans for all stocks between 18 March and 18 May 2020. The control group consists of six countries (Germany, Netherlands, Portugal, Sweden, Switzerland, and United Kingdom) that did not implement bans.[4] The ban prohibits the initiation of new and the increase of existing net short positions for regulated and OTC markets. **Table 1** contains an overview of the short-selling bans. Our sample period consists of four different periods in 2020: pre-crash (2 January to 19 February), crash (20 February to 17 March), the short-selling ban (18 March to 18 May) and (4) post-ban (19 May to 30 June).

We follow the recent literature and clean our data with common filters (Ince and Porter, 2006; Karolyi et al., 2012). Thus, our daily panel dataset includes only *domestic* common equities and excludes preferred stocks, depositary receipts, REITS, mutual funds and other special type securities. We also exclude non-trading days, meaning that more than 90% of the stocks have zero-returns on a given day and given exchange. We omit observations with stock prices of less than €1 (penny stocks) and stocks with more than 80% of the days with zero returns (non-trading stocks), to avoid distortions from very

[4] There have also been two one-day bans for specific stocks on March 13 (Italy and Spain) and March 17 (Italy, France, and Belgium), but we will neglect the two-one day bans and analyze the two-month period only.

small and scarcely traded stocks. Finally, we matched our data with stock-level data from Refinitiv Datastream and discard all observations with missing, negative, or zero values in components required for the calculation of the market quality measures.

3.2 Structure of the Dataset and Samples

We split our dataset into two samples. The first sample consists of all stocks contained in the *leading stock indices* of 12 European countries: *FTSE 100* (only largest 50), *DAX 30, SMI 20, AEX 25, OMX Stockholm 30, PSI-20,* and *CAC 40, FTSE MIB 40, IBEX 35, BEL20, ATX 20, FTSE Athex 20*. This *first* sample includes 350 stocks, with 175 stocks for ban and 175 stocks for no-ban countries. The second sample consists of the 800 *largest stocks* based on market capitalization from 10 European countries, excluding Greece and Portugal relative to the first sample due to data quality issues. We apply a specific ranking procedure for the stock selection. Every country belongs either to the *large* market (Germany, Switzerland, UK, France, Italy, and Spain) or to the *small* market (Netherlands, Sweden, Austria, and Belgium) group based on total market capitalization at the end of 2019. Finally, we select the largest 100 and largest 50 stocks of *large* and *small* countries, which results in 400 stocks for both ban and non-ban country groups. **Table 2** provides an overview of the dataset structure and composition of our different samples. In the *Internet Appendix*, we provide additional evidence from our analysis of the Euro Stoxx 50 index.

4. Effects of the Short-Selling Ban on Market Quality

In this section, we investigate the valuation effects (buy-and-hold abnormal returns) for the short-selling ban period (4.1), present the results for the different liquidity and volatility measures (4.2), and discuss some additional findings and our robustness tests (4.3).

4.1 Stock Returns

4.1.1 Buy-and-Hold Abnormal Returns

To analyze how the short-selling ban affected the equity prices, we calculate buy-and-hold abnormal returns (BHAR) for each stock *i* relative to the stock market index *M* on a daily basis and created equal-weighted portfolio groups:

$$BHAR = \frac{1}{n}\sum_{i=1}^{N}\left(\prod_{t=1}^{T}(1+R_{i,t})\right) - \left(\prod_{t=1}^{T}(1+R_{M,t})\right) \quad (1)$$

where *n* is the number of stocks, $R_{i,t}$ is the return of stock *i* on day *t* and $R_{M,t}$ is the market return for the same day. As our analysis focusses on European stock markets, the *Datastream Europe Total Market* equity index is the appropriate benchmark. We analyze different event windows around the day when the ban was imposed (18 March 2020 = Day 0), including the crash and the pre- and post-ban period. As our focus is on the performance differences between stocks with and without ban, we calculate the BHAR for each group separately.

To identify differences for stocks subject to shorts-selling ban and to control for other stock-specific factors, we employ the following model:

$$r_i = \beta_1 BAN_{i,t} + \gamma' X_{i,t} + \varepsilon_{i,t} \quad (2)$$

where r_i is vector of BHARs across various intervals, BAN_{it} is an indicator variable and our primary variable of interest that is one when stocks are banned from short selling, $X_{i,t}$ is a vector of control variables. We follow the literature and include market capitalization (*MKTCAP*), Euro value of trading volume (*EVOL*), volume-weighted average share price (*VWAP*), and volatility (*VOLA*) (Boehmer et al., 2013). These variables capture time-varying effects related to stock valuation, price levels, trading volume and volatility. We use robust standard errors in the regressions. **Table 3** includes all the definitions of our variables.

4.1.2 Descriptive Evidence

Responding to the projected negative effects of the Covid-19 pandemic on the real economy, equity markets reacted promptly with quickly declining stock prices (Fahlenbrach et al., 2020; Ramelli and Wagner, 2020), putting pressure on governments and central banks to react swiftly and appropriately. With the aim to stabilize stock markets and due to fears that excessive short selling could lead to further price declines or even market instability, six European countries imposed a ban on short selling. In this section, we analyze how successful regulators have been in effectively preventing price declines by supporting stock prices.

Figure 1 graphs the valuation effects for the interval (-40; 80) covering 40 days before, during and after the introduction of the short-selling ban on 18 March 2020 (Day 0). A clear pattern emerges

across the three sub-periods. In the interval prior to the event, all stocks perform relatively similarly. However, we notice a considerable divergence in performance when the ban came effective, with banned stocks (red) underperforming stocks without restrictions (blue) across the ban and post-ban periods. This pattern is consistent over different market and firm sizes.

Table 4 depicts the results for the constituents of *major stock indices* (Panel A) and for the *800 largest stocks* (Panel B) and confirms the visual evidence. It reveals that ban stocks not only underperform relative to the benchmark (-7.98% and -4.60%), but also relative to stocks without a ban (0.63% and 1.17%) over the (-40; 80) interval. To examine whether the effects depend on the market size, we divide the samples into *larger* and *smaller* markets. For the (-40;80) interval, we find that the BHAR differences between banned and non-banned stocks increases substantially when we move from larger to smaller stock markets. On average, we find significant differences of -6.31% and -3.31% for larger markets and -12.77% and -12.87% for smaller markets. Finally, we differentiate between firm size quartiles (**Panel C**). The BHAR performances differences between ban and no-ban stocks is larger for smaller firms (quartiles 3, 2 and 1). We also extend our analysis to the Euro Stoxx 50 and other intervals and present figures and tables in the *Internet Appendix* (**Table IA1, Figure IA1, IA2**).

4.1.3 Cross-Sectional Regressions: Short-Selling Ban Effects

In **Table 5,** we present the findings from the cross-sectional OLS regressions on the BHARs. For banned stocks included in one of the *major stock indices*, we find lower returns for the 40- and 80-days period after the inception of the ban (Panel A, overall sample). For *larger* (0; 40) and *smaller markets* (-40; 80), the *BAN* coefficients indicate statistically significant lower BHARs of -9.84% and -10.57%, respectively.

For the *800 largest stocks* we document that the short selling ban negatively affected stock prices, resulting in BHARs of (-7.79%) and (- 10.38%) over the 41-days and 81-days intervals, respectively (Panel B, overall sample). Interestingly, stocks in ban countries achieve abnormal returns that are 2.03% higher during the 40-days pre-ban period, while they remain lower (-5.31%) over the longer interval (-40; 80). Importantly, in *larger markets*, we observe a relative underperformance of banned stocks com-

pared to non-banned stocks, which becomes somewhat lower with -8.28% after the ban (0; 80). In contrast, this difference has a higher magnitude in *smaller* markets (-14.69%). Finally, we analyze the effects of the short selling ban for each size quartile and find that the *BAN* coefficient is more negative in the smaller firms (Panel C). Stocks that are banned from short selling realize 7.98% (Q3) and 10.66% (Q2) lower BHAR over the (0; 40) event window, while this coefficient is only at 6.05% in the largest quartile (Q4).

Overall, our results suggest that regulators' goal of stabilizing stock prices hardly succeeded in that it could not prevent an underperformance relative to the benchmark (*Datastream Europe Total Market Return* index). This result also holds for control stocks without a ban, as the BHAR start to diverge considerably after the regulatory intervention. Consequently, we have to reject the full set of *Hypothesis 1*. Although our analysis clearly reveals that the beginning of pandemic resulted in a short-term stock market crash, other measures most likely contributed to the subsequent extreme recovery. Most important, the European Central Bank announced quantitative easing (QE) interventions exactly on the same day when the ban started (18 March 2020) and governments begun implementing fiscal policy actions.

Moreover, our findings contradict the "Overvaluation"-Hypotheses of Miller (1977), which predicts that short-selling bans positively bias fundamental values causing stock prices to rise temporarily during restrictions. Nevertheless, the previous empirical evidence is rather inconclusive, as there is more (Boulton and Braga-Alves, 2010); Frino et al., 2011; and Beber and Pagano, 2013) or less support for Miller's theory (Beber et al., 2021; Boehmer et al., 2013). However, a conceivable explanation for the lower stock returns could result from a negative impact of the ban on market quality, which we will examine next.

4.2 Liquidity and Volatility

4.2.1 Measures of Market Quality

In this study, we employ four different quantitative measures of market quality: *Spreads at €10k, Turnover*, *Price Range* and *Volatility*. As liquidity affects the pricing and trading costs of a security as well as the net returns for investors, it is central for measuring market quality. During periods of rapidly

and sharply declining stock prices, liquidity often diminishes and even more severely when short selling is restricted. To investigate the effects of the short-selling bans on liquidity, we employ a price-based (*Spreads at €10k)* and a volume-based (*Turnover)* measure. $Spreads\ at\ €\ 10k_{it}$ is defined as the weighted difference between best bid (PB_{it}) and best ask price (PA_{it}) for an order volume of € 10,000 in stock *i* at time *t*, expressed in basis points. The weighting factor w_{itc} is based on market turnover at each trading venue *c* including the primary exchange of the stock and pan-European venues such as Aquis, Cboe BXE, Cboe CXE and Turquoise. The difference widens when liquidity decreases, resulting in higher trading costs:

$$Spreads\ at\ €\ 10k_{it} = \sum_{c=1}^{n} w_{itc} * (PA_{\ it} - PB_{it}) \qquad (3)$$

$Turnover_{it}$ is the ratio of the number of traded stocks (VO_{it}) relative to the total number of stocks outstanding ($NOSH_{it}$), multiplied by 100. A higher turnover ratio means more liquidity and the ability to execute larger orders without affecting stock prices:

$$Turnover_{it} = \frac{VO_{it}}{NOSH_{it}} * 100 \qquad (4)$$

With respect to stock market volatility, we employ two measures: *Price Range* and *Stock Return Volatility*. Since high fluctuations in intra-day or daily prices causes concerns for investors, volatility is also an important indicator for market quality. It reflects diverging opinions and high uncertainties between market participants about the correct valuation of stock prices. For both measures, a higher value indicates higher dispersions of prices and returns. We define $Price\ Range_{it}$ as the highest stock price achieved on a given day (PH_{it}) divided by the lowest price on that day (PL_{it}):

$$Price\ Range_{it} = \frac{PH_{it}}{PL_{it}} \qquad (5)$$

$Volatility_{it}$ is the 20-day rolling standard deviation of the return on a given stock. We obtain daily data of the individual stocks by Refinitiv Datastream and big xyt (*Spreads at € 10k*). To mitigate potential effects of outliers, we winsorize all continuous variables by eliminating the observations at the 1st and 99th percentile within a country (Beber and Pagano, 2013). Table 3 contains all definitions and descriptions of our variables.

4.2.2 Descriptive Evidence

Since we are particularly interested in examining the effect of the short-selling ban on market quality measures such as *Spreads, Turnover, and Volatility* for *smaller* and *larger* markets as well as for different periods. We divide our sample into stocks *with* and *without bans* (groups) and investigate four distinct periods: (1) *Pre-Crash,* (2) *Crash,* (3) *Ban* and (4) *Post-Ban*.

Major Stock Indices

In **Panel A of Figure 2**, we present the results for the *major stock indices* and distinguish again between *larger* and *smaller* stock markets. The graphical analysis indicates the percentage change of market quality over the sample period with January1, 2020, functioning as the reference point. We find that the *Spreads, Turnover, and Volatility* increase sharply during the crash period but reverses and start its recovery slowly at the ban initiation and subsequently remain at the higher level. For the different groups, we observe a quite similar behavior in the periods before and during the crash. However, market quality measures start diverging when the ban became effective, with higher spreads, lower turnover and higher volatility in ban countries. Comparing larger and smaller markets, the overall impression remains unchanged with the percentages changes in spreads being lower in smaller markets.

Table 6, Panel A, provides the statistical tests for the visual evidence by comparing the differences in our measures over the four periods between countries with and without bans (difference-in-differences; DiD). The turbulence during the crash period affected market quality in both groups negatively ((2) - (1)), with a severely higher impact on the stocks subsequently banned from short selling. This funding supports the reasoning for the regulatory intervention. We also find that spreads increased and turnover decreased more for short-selling banned stocks during the ban period relative to the periods before ((3) - (2) / (1)). After the ban, the enhancement of market quality is stronger in the ban countries ((4) - (3)), possibly indicating the severity of the negative effects on market quality in these countries that then begun to calm down.

Largest 800 Stocks

We observe a similar overall pattern for the *800 largest stocks (***Panel B, Figure 2***)*. In general,

the market quality of stocks from ban countries is inferior during the period in which the ban was effective but it starts slowly converging thereafter. Interestingly, the relative changes in liquidity appear to be lower in *smaller* markets. In **Panel C**, we take firm size into account and find that the percentage changes of spreads are relatively smaller when we move from the fourth quartile (largest stocks) to the first quartile (smallest stocks), while turnover reveals no clear pattern. We observe the same effects for volatility, as the relative change for the highest quartile is higher compare to other quartiles, suggesting that higher valued stocks experienced a larger decline in market quality.

We perform the statistical tests presented in **Table 6, Panel B** and find that stocks from ban countries experience significantly higher spreads and volatility in the crash relative to the previous period ((2)-(1)). Again, the difference-in-difference results indicate that the short selling ban had severe negative effects on market quality ((3)-(2) / (1)). When the ban expired, we observe market quality improvements ((4)-(3)), which are significantly stronger for stocks from ban countries.

In the *Internet Appendix*, **Section and Table A1** confirms all our univariate results for the periodic market quality differences in a multivariate setting. Moreover, we provide several additional analyses based on the Euro Stoxx 50 (**Figure IA3, Table IA2**), the level of each market quality measures (**Figure IA4**), and for an extended period from January 2019 to December 2020 (**Figure IA5, Table IA4)**. All previous findings remain qualitatively unchanged.

4.2.3 Panel Regressions: Overall Market Quality Effects

To examine the effects of the short-selling ban on market quality, we perform fixed-effects panel regressions that control for stock-specific characteristics and time-varying factors at the stock- and market-level. We estimate the following baseline model:

$$Y_{i,t} = \beta_1 BAN_{i,t} + \gamma' X_{i,t} + \varphi_{i,t} + \varepsilon_{i,t} \qquad (6)$$

where $Y_{i,t}$ is a vector with our measures of market quality; $BAN_{i,t}$ is an indicator variable and main variable of interest that takes the value of one when the stock is subject to the short-selling ban and zero otherwise. $X_{i,t}$ is a vector of control variables as specified in Equation (2) and $\varphi_{i,t}$ is a vector of stock dummies that net out unobservable time-invariant effects that are specific to a stock.

Our previous results suggest that the ban on short selling had negative effects on market quality.

In **Panels A of Table 7 and 8,** our multivariate results confirm the descriptive evidence for the stocks of *major stock indices* and the *largest 800 stocks*. The coefficients of the *BAN* dummies are positive for *Spreads, Price Range* and *Volatility,* and negative for *Turnover,* all statistically significant at the 1% level. In the *Internet Appendix*, regressions for the Euro Stoxx 50 (**Table IA3**) and over the extended period January 2019 to December 2020 also confirm our results (**Table IA5 and IA6**). The results provide supporting evidence for our main *Hypotheses 2, 3 and 4*.

4.2.4 Panel Regressions: Differential Market and Firm Size Effects

To address the issue that the effects of the short-selling ban may depend on the size of the stock market, we estimate the following variant of Equation (6):

$$Y_{i,t} = \beta_1 BAN_{i,t} + \beta_2 SMALL_{i,t} + \beta_3 BAN_{i,t} \times SMALL_{i,t} + \gamma' X_{i,t} + \phi_{i,t} + \varepsilon_{i,t} \quad (7)$$

where $SMALL_{i,t}$ is an indicator variable equal to one for each stock that is listed on *smaller* stock markets (**Table 2**). As BAN_{it} is perfectly collinear with $SMALL_{i,t}$, we include time fixed effects $\phi_{i,t}$ as a vector of calendar day dummies that controls for unobservable market-wide trends common to all stocks.

Moreover, we are interested whether the effects depend on the firm size and estimate the following variant of Equation (7):

$$Y_{i,t} = \beta_1 BAN_{i,t} + \sum_{j=1}^{k} \beta_{j+1} Q_j + \sum_{j=1}^{k} \beta_{j+1} BAN_{i,t} \times Q_j + \gamma' X_{i,t} + \phi_{i,t} + \varepsilon_{i,t} \quad (8)$$

where Q_j denotes dummy variables that represent each size quartile based on the market capitalization at the end of 2019. Since we are concerned about serial correlation and cross-correlation, we estimate robust standard errors ($\varepsilon_{i,t}$) that we cluster at the stock- and time-level (Thompson, 2011) in all our regressions. Table 3 summarizes all variables. For the additional and robustness tests, we describe the methodology employed directly in the respective sections.

In **Panel B of Table 7**, we present the results for the market size analysis of the *major stock indices*. Column 1 and 2 indicate that liquidity is not only lower in *smaller* markets but the short-selling ban affects *Spreads* and *Turnover* also more severely. For volatility, we do not find any statistically significant differences in *smaller* markets relative to *larger* markets.

We next analyze the *largest 800 stocks* in Europe. **Panel B of Table 8** reveals a positive (negative) coefficient for the *BAN* × *SMALL* interacting term with respect to *Spreads* (*Turnover*). These results suggest that the ban more negatively affects the liquidity of stocks in *smaller* markets. We observe that the coefficient of *BAN* × *SMALL* is uninformative for *Price Range* and *Volatility (column 4)*. We also provide robust supporting evidence for an extended period in the *Internet Appendix* (**Table IA5 to IA7, Panel B**).

Finally, we investigate whether the effects of the restrictions on short selling depend on firm size (**Panel C and Panel D of Table 8**). For this, we divide our second sample into size quartiles based on market capitalization at the end of 2019 and compute the quartiles for each country separately. We also incorporate the dummies for the *smaller* quartiles (*Q1*, *Q2* and *Q3*) in the panel regressions, with the *largest* quartile (*Q4*) as reference point **(Panel C)**. When we move from *BAN* × Q_3 to *BAN* × Q_1 for *Spreads at 10k*, *Turnover*, *Price Range* and *Volatility*, the positive and negative coefficients of the interaction term increase and all are statistically significant at the 1% level. We also perform the regressions for subsamples of each size quartile but only report the estimates of the *BAN* coefficients (Panel D). The coefficients in column 1 and 2 indicate that the short-selling restrictions affect the liquidity of smaller stocks more negatively relative to larger stocks, confirming our previous results. Interestingly, in column 3 and 4 (volatility), stocks with lower capitalization (Q1) experience a lower increase of volatility during the ban compared to larger stocks (Q3 and Q4). The *Internet Appendix* contains supporting evidence over the period 2019-2020 in **Table IA6, Panel C and D**. Moreover, our results remain unchanged in several robustness tests on potential endogeneity issues using propensity score matching and instrumental variable regressions in **Sections IA2** and **Tables IA8 and IA9**.

Overall, we find that the results are only partially consistent with our predictions. We observe that the ban affects the liquidity of smaller stocks more negatively. In contrast, volatility is significantly lower for stocks in the smaller size quartile during the ban period.. Nevertheless, the results are consistent with the related literature on the 2008 short-selling ban, which reports that the liquidity of small-cap stocks has declined more severely (Beber and Pagano, 2013).

5. Determinants of a Country Imposing a Short-Selling Ban

As a precautionary measure to minimize possible adverse effects resulting from a future crisis event, it is important to analyze, determine and predict which countries are likely candidates to implement a short-selling ban to protect its financial market and financial system. Based on the analysis and experience from the current Covid-19 crisis, it appears more likely that countries with relatively weaker economic conditions, lower fiscal capacity (Martin and Nagler, 2021), and less developed financial system will impose short-selling restrictions. Moreover, regulators have a higher probability of imposing market-wide decisions when they face an increasing level of systemic risk. Overall, different indicators may lead to the inevitability of implementing specific policy actions in a country to lessen the consequences of a crisis and guarantee its financial stability.

Methodology

To investigate these issues we create two different panel datasets for the 12 European countries: (1) annual data over the period from 2004 to 2019 and (2) daily data between 1 January 2020 and 17 March 2020. Using the following logistic regression model, we identify the determinants of the likelihood that a country imposed a short-selling ban:

$$Short - Selling\ Ban_c = \gamma' X_{c,t} + \phi_{c,t} + \varepsilon_{c,t} \qquad (10)$$

where $Short - Selling\ Ban_c$ is an indicator variable that is one when the country c implemented the short-selling ban in 2020, $X_{c,t}$ is a vector of explanatory variables and $\phi_{c,t}$ is a vector of year or calendar-day dummies to net out unobservable global trends common to all countries. We use heteroscedasticity robust standard errors in all regressions. The annual dataset includes aggregated variables to capture the macroeconomic (*GDP Growth, Inflation, Unemployment*), financial system (*Stock Turnover, Private Credit*) and institutional (*Institutional Quality*) characteristics of a country. Moreover, we employ *Current Account* and *Government Debt* as a measure for the fiscal capacity. In the daily dataset, we include the international *Oil Price*, the *VIX* and *VSTOXX* indices, and the U.S. and European interbank spreads (*TED Spreads*) to account for global economic shocks, investor sentiment, and funding conditions. To control for the severity of the pandemic, we introduce the number of *Covid-19 Death* (as percentage of population) and the *Stringency Index* of lockdown measures. We use the *Sovereign 5-Year*

CDS Spread as proxy for the government's financial flexibility and fiscal spending during the pandemic. All variables are defined in **Table 3**.

In **Table 9, Panel A**, we present our findings from the annual dataset and observe that countries with higher *Inflation* and *Unemployment* rates are more likely to impose a ban in all models. The results for the financial system indicate that a higher *Stock Market Turnover* and greater bank lending (*Private Credit)* decrease the likelihood for a ban (column 1). In column 2, we account for a country's financial flexibility and observe that the coefficient of *Government Debt* is positive and significant at the 1% level. Furthermore, a higher level of *Institutional Quality* as measured with the average of government effectiveness and regulatory quality negatively affects the ban decision (column 3). We find further supporting evidence for our ideas when we combine the quality of institutions with the development of the financial system (column 4) or fiscal capacity of a country in one model (column 5).

The results from our daily dataset we present in **Panel B**. For all models, we find that the coefficients for *Sovereign 5-Year CDS Spread* and *Stringency Index* are positive and highly significant at the 1% level. This indicates that the sovereign default risk and uncertainties due to the lockdown measures increase the likelihood of a short-selling ban on 18 March 2020. In column 1, we account for global market conditions (*Oil Price*), investor sentiment (*VIX*) and credit risk in the banking system (*TED Spread*) and hardly find supporting evidence (insignificant coefficients) for these variables, as other factors than the pandemic in Europe might determine its influence. The same holds for the European version of these indicators using the *VSTOXX* and *Eurozone TED Spread* (column 2). Moreover, we observe that countries with higher levels of systemic stress (*Systemic Stress Indicator*) are less likely to implement a ban (column 3). Most importantly for our analysis, however, is that the severity of the Covid-19 pandemic is positively associated with the ban decision (column 4). In the full model setting, our results remain unchanged (column 5).

Overall, our findings suggest that the long-term characteristics with which the countries entered the pandemic and the short-term effects of the Covid-19 pandemic increased the likelihood of introducing a short-selling ban. This provides some explanations and hindsight justifications for specific countries why they introduced a ban. The characteristics of these countries we can summarize as (1) weaker

state of the economy, (2) higher vulnerability to economic crises, (3) less developed financial system and (4) increased level of sovereign default risk. The interesting question is whether other market mechanism can act as a substitute or a first line of defense for market quality and therefore delay the introduction of a short-selling ban in the future, as these effects as reported above are negative. We devote this discussion to the next section.

6. Circuit Breakers, Market Manipulation, Insider Trading and Financial Stability

Although the positive effects resulting from short selling on market quality are well established, restricting short position is justifiable when market manipulation, insider trading and financial system instability pose a potential threat. Therefore, abstaining from implementing short-selling restrictions during crisis periods is only acceptable when regulators can guarantee the orderly functioning of securities markets and financial stability. In this section, we discuss the role of circuit breakers as mechanisms to protect financial markets (6.1), potential concerns about market manipulation, insider trading, and short-selling (6.2), and financial stability (6.3), all in the context of the Covid-19 crisis.

6.1 Circuit Breakers

The recent Covid-19 crisis and the extreme stock market declines in February-March 2020 has reignited the debate of imposing short-selling restrictions for an extended period to guarantee fair and orderly markets in Europe, as some countries have done so while others have not imposed bans. However, stock exchanges usually implement circuit breakers (CB) to prevent extreme stock price fluctuations and to prevent investor overreaction (e.g., panic selling), as well as to ensure investor protection and market integrity during short-term price swings and major crises. CBs such as price limits, trading halts and volatility interruptions, if working well, could have provided a similar investor protection already on an intra-day basis and could have been sufficient during this period.[5] Therefore, it is essential to investigate the effectiveness of these mechanisms for ensuring fair and efficient markets.

[5] For a more detailed institutional background of these protective mechanisms, see section IA.3 in the *Internet Appendix*.

6.1.1 Effectiveness of Circuit Breakers

Previous research offered different conclusions with respect to the effectiveness and consequences of circuit breakers.[6] Although most exchanges implement CBs, they often vary across trading venues in the U.S. and Europe, which allows assessing the benefits of different mechanisms. For the U.S., empirical studies find that market-wide (Kuhn et al., 1991) and stock-level trading halts (Fong, 1996; Corwin and Lipson, 2000; Christie et al., 2002; Cui and Gozluklu, 2016) are inefficient in reducing volatility, preserving liquidity and enhancing price discovery. This is in contrast to price limits for which Ma et al. (1989), Goldstein (2015) as well as Borgaard and Roshak (2016) report positive effects on market quality, suggesting a cooling-off period for the market.

For European markets, price limits (Kim et al., 2008; Brugler and Linton, 2014; Danisoglu and Guner, 2016) and trading halts (Abad and Pascual, 2007) are associated with an increase in volatility and bid-ask spreads as well as a delay in price discovery. In contrast, Engelen and Kabir, (2006) report that trading halts are efficient in disseminating new information into stock prices and do not increase volatility. With respect to volatility interruptions, Abdad and Pascual (2010), Reboredo (2012), Zimmermann (2014) and Clapham et al. (2017) find a significant reduction in volatility and an improvement in the price discovery process after exchanges implemented circuit breakers, while the impact on liquidity is mixed.

Overall, the empirical evidence for the impact of circuit breakers on market quality are diverse. While price limits are more effective than trading halts in stabilizing U.S. markets, both mechanisms have mixed effects in Europe. The evidence is largely positive for volatility interruptions when trading start subsequently with a call auction.

6.1.2 Circuit Breakers during the Covid-19 Crisis

For Europe, we observe a dramatic increase in circuit-breaker occurrences during the beginning of the Covid-19 crisis, which subsequently, however, returned to previous levels as depicted in **Figure 3**. More specifically, the weekly number of trigger events reached all-time records with around 2,400 and 4,000 in the second and third week of March 2020, with a return to the long-term average of around

[6] For an excellent review of the literature on circuit breakers, see Sifat and Mohamed (2019).

150 per week after April 2020. Broken down by sector, circuit breakers triggered, on average, trading holds of 35% for banks and 28% for industrial firms.

During the recent Covid-19 crisis, market-wide trading halts in March 2020 increased volatility and bid-ask spreads in the U.S. markets (Li and Yao, 2021). In addition, stock-level circuit breakers reduced liquidity and impeded the price discovery process, especially in smaller, less liquid and more volatile stocks (Moise, 2021). The negative impact of circuit breakers on market quality during the Covid-19 crisis point to the need to review the existing mechanisms to better deal with market distress.

6.2 Market Manipulation, Insider Trading and Short Selling

For regulators it is a pivotal task to protect investors especially during turbulent markets and crisis periods when a tremendous volume of news and information arrives. Trading strategies based on privileged access to information usually results in abnormally high profits. The most common strategies to benefit from illegal activities are insider trading, stock-price manipulation, and the dissemination of false or misleading information (see Putniņš, 2020 for an excellent review).

6.2.1 Role of Insider Trading for Market Efficiency

One perspective is that insider trading usually facilitates more informationally efficient financial markets, but this may come at costs. Aussenegg et al. (2018) and Kim et al. (2019) find that purchases and sales by insiders reveal significant private information to the public, especially in countries with active enforcement of insider trading regulation. This effect is stronger for sale transactions during crisis periods, characterized by higher pronounced information asymmetries between insiders and outsiders (Anginer et al., 2020; FT, 2021; WSJ, 2021). Therefore, studies indicate that insider-trading activities are particularly informative in countries with effective regulation, in which insiders' trade reveal private information, but where they cannot freely exploit their information advantage. However, it is important to distinguish between legal and illegal insider trading[7], with the former increasing information efficiency when properly supervised. Although the public enforcement of U.S. insider-trading laws deters illegal activities (Cline and Posylnaya, 2019), improves liquidity (Del Guercio et al., 2017) and increases

[7] The legal form of insider trading is that corporate insiders report the trading activities in their own company to the financial market regulator. In contrast, illegal insider trading is the breach of fiduciary duty and violation of insider-trading laws using material non-public information about the company.

stock returns (Meulbroek, 1992), it comes at the cost of lower price information and market inefficiency (Kacperczyk and Pagnota, 2020).

Another important aspect is the strategic interaction between insiders and short sellers. Insiders concern that short sellers may obtain access to the same private information (ex-ante), are sensitive to order flow information and the exploitation of trade opportunities (ex-post). For this reason, insiders sell more from their shares and trade faster in case of high short-selling potential (Massa, Qian, Xu & Zhang, 2015), such as during crisis periods. The effects are stronger for insider sales that are motivated by private information (i.e. are more informative), suggesting that the potential competition from short sellers improve market efficiency. Alternatively, insiders adopt a defensive trading strategy and split their trades over time to escape competition when they anticipate a high presence of short sellers (Gu, Liu, Sun & Zhao, 2020).

6.2.2 Activist Short Selling versus Short-and-Distort Manipulation

A recent phenomenon often claims that activist hedge funds intentionally disseminate negative information while holding short positions to profit from falling stock prices. For this, activists disclose their concerns in public statements, issue negative research reports and launch short-selling campaigns. This negative activism not only seeks to reveal private information (Apple and Fos, 2020) and to uncover overvaluation or fraud, but also seeks to incite other shareholders to sell the target stocks (Bliss et al., 2020; Molk and Partnoy, 2021; Brendel and Ryans, 2021). Interestingly, short sellers more often attack firms with higher information asymmetries that are smaller and have less liquidity, resulting in more negative returns (Zhao, 2020; Jank et al., 2020). However, this behavior does not constitute market manipulation when the information is accurate and verifiable. In contrast, "short-and-distort" is an illegal tactic in which speculators short the stock and intentionally distribute false or misleading information about the firm.[8]

[8] Whether a negative information is correct or made-up by the short seller is often difficult to verify. Management will usually argue against it and provide supporting evidence by hiring auditors. In the case of Wirecard and Grenke, the negative information was confirmed after several months. For Wirecard, the regulators (BaFin) even imposed a short-selling ban, as they judged that the negative information was incorrectly distributed by the Financial Times and hedge funds to profit from falling stock prices. Ultimately, this conjecture turned out to be inaccurate, while also the German central bank (Bundesbank) did not support the short-selling ban. For another critique of BaFin's regulatory enforcement during the 2008 Volkswagen short squeeze, see Allen et al. (2021).

6.2.3 Insider Trading and Market Manipulation during the Covid-19 Crisis

During periods of market crisis, such as the start of the Covid-19 pandemic, negative activism as well as insider and short seller trading activities may have become even more attractive, exacerbating stock price declines. In Canada, Italy, Spain, South Korea, and the U.S., insider sales already increased in January and early February 2020, in anticipation of declining stock prices (Anginer et al., 2020). However, corporate insiders already began investing significant amounts of shares in late February 2020, especially at larger firms with high leverage, revealing their believes, that the economic impact from Covid-19 would be temporary and the recovery would be rapid as it eventually did.

Ex-Ante Risk of Market Manipulation

Many international studies highlight the importance of the enforcement of securities laws and regulations against financial market misconduct to promote market integrity and investor confidence (Cumming et al., 2015). Market manipulation and securities fraud not only causes significant financial damage, it also has a negative impact on real investment decisions such as innovation (Cumming et al., 2020).

We conjecture that countries with a higher ex-ante risk of financial market misconduct due to weaker securities laws are more likely to impose short-selling bans in response to the Covid-19 crisis. More specifically, we examine the quality of market manipulation and insider trading rules and their legal enforcement. For this, we employ different country-level indices for exchange trading rules (Cumming et al., 2011), private enforcement (Spamann, 2010), public enforcement (Djankov et al., 2008) and legal enforcement (Kaufmann et al., 2010; La Porta et al., 2006). In **Table 10**, we compare the average and median index values for each group of countries with and without a ban. We observe slightly higher values for no-ban countries, indicating stricter regulation and enforcement. However, the differences are statistically insignificant, except for the *Rule of Law*, the extent to which actors trust in and abide by rules, and the quality of legal enforcement. Overall, our results indicate that there are ex-ante no significant differences in exchange trading rules across our sample countries.[9] From the regulatory perspective, a relatively higher threat from market manipulation and insider trading is not visible, which does

[9] In November 2007, the Directive on Markets in Financial Instruments (MiFID) became effective and harmonized the exchange trading rules with respect to disclosure and transparency at the European Union level.

not mean that this is an unlikely reason for the ban.

6.2.4 Short-Selling Activity during the Covid-19 Crisis

Greppmair et al. (2021) investigate two key issues associated with the short-selling activity and the economic impact of the Covid-19 crisis. They find that short sellers targeted financially less liquid firms headquartered in countries with lower credit ratings. This suggests that short sellers attack firms in countries where governments have limited fiscal capabilities, which is crucial in providing the required support to all firms with liquidity problems and ensuring their survival. Considering the severity of the Covid-19 pandemic and the stringency of policy responses, the relationship remains unchanged. Short sellers initiated this trading strategy already two weeks before the stock market crashed at the end of February 2020 and therefore profited sizably.

In **Figure 4,** we present the daily number of reported net short positions in Europe over the period from 1 January to 30 June 2020 and depict the development for countries with and without short-selling bans separately. **Panel A** displays market size (first row), sectors (second row), and firm size (third row). Before the Covid-19 crash, the number of reported short positions in ban and no-ban countries follows a similar pattern. However, short-selling activity increased significantly in all markets around 19 February 2020, and peaked between 16 and 18 March. It declined thereafter, but remained at a higher level in no-ban countries, while the positions declined significantly in ban countries. Interestingly, we find that the number of short positions is higher in larger stock markets. In financial stocks, short selling did not increase excessively, suggesting that short sellers did not expect the crisis to hit banks more severely. The same holds for sectors that strongly depend on favorable views about future growth opportunities in an economy (e.g. IT). In contrast, industrial firms experienced the most pronounced increase in short positions. With respect to firm size, we find a more intense shorting behavior in stocks with larger capitalization while the development is comparable for mid and small cap stocks. Overall, our descriptive evidence does not suggest that short sellers increased their positions in smaller markets and stocks (i.e. more vulnerable), but rather that they focused on sectors where the economic shock will be most severe.

We present the short positions for the individual countries with and without a short-selling ban

in Panel B and C of Figure 4. All countries follow mostly the same pattern, we find that before and during the market crash, the number of reported positions is much lower in countries that later imposed a ban, with the exception of France and Italy. In **Table 11**, we present the average number and value of net short positions reported in European countries across different market periods. We again distinguish between countries with and without a ban. In the crash period, the daily average number of reported short positions almost doubled from 105.2 to 197.3 in all countries, whereas the average position declined marginally (0.98% versus 0.93%). Interestingly, we observe that short positions increased more in the six countries that later introduced a short-selling ban (from 24 to 48, 99%) compared to no-ban countries (from 81 to 149, 84%). During the ban, average short positions declined in ban countries (-77%), but also in no-ban countries (-23%), indicating that investors reduced or closed their positions in the recovery period. After regulators lifted the ban, the short-selling activity increased again by 35% in the ban countries. Overall, we do not observe an excessive increase in short-selling activity in ban countries that might justify the decision.

The observation that the number and the size of short positions changed during periods of high volatility and declining stock prices is not that surprising but expected, as many portfolio and fund managers usually have to adjust their total risk exposure during these periods. Fund withdrawals in these periods also require adjustments. Alternative strategies are to sell the stocks, possibly causing a much faster and steeper price decline and maybe causing more harm, to buy put options or to sell stock index futures or shorten ETFs. As this is all part of a managers' optimal portfolio optimization strategies during bear markets and crisis periods (Bessler et al., 2021a, 2021b), this is hardly troublesome. Trying to differentiate for each transaction between portfolio rebalancing activities, speculation or hedging is a fruitless endeavor, unless the market participant believably reveals the motivation for the trade. Hence, the short-selling activity did not created any concerns except that restricting short selling possible made the markets in these countries for the ban period less informationally efficient.

6.3. Financial Stability – Development of Systemic Stress in the Financial System

We use the Composite Indicator of Systemic Stress (CISS) to investigate (1) whether countries with a ban experienced a higher level of financial stress during the crash period and (2) whether the ban reduced systemic stress. In Table 12, we divide our sample between ban and no-ban countries and compare the average CISS values over four distinct periods: *Pre-Crash, Crash, Ban* and *Post-Ban*. The turbulences during the Covid-19 crash substantially increased the systemic stress level in all countries, with an even lower increase in ban countries. In addition, the difference-in-differences results do not indicate that countries with bans had significantly higher increases in stress levels. We also find that the indicator continues to rise during the ban period, but subsequently drops to the pre-ban levels. There are no significant differences in this trend between countries with and without a ban. Overall, our results do not suggest that there were more systemic stress in ban countries during the crash, nor that the short-selling ban resulted in more financial stability.

7. Conclusion

The unprecedented shock of the Covid-19 pandemic has raised concerns about organized securities markets to perform their essential functions of providing a fair, efficient and orderly market environment during times of extreme market distress. Consequently, it is important to analyze whether regulators should intervene in crisis periods to ensure the stability of the financial system. The objective of our study is to examine whether the introduction of a market-wide short-selling ban provided the expected benefits such as stabilizing stock prices, preserving market quality, and restoring investor confidence in financial markets. We first compare stock returns and various measures of liquidity and volatility for six ban and six no-ban countries over the period from 2 January to 30 June 2020. We then address the question whether the financial stability was negatively affected and whether we can predict which countries might have to impose short-selling restrictions when the next crises arrives, and which country specific characteristics determine this decision.

Our empirical analysis for the effects of the short-selling ban imposed during the Covid-19 crisis on stock prices and market quality provides support for the theories and most of our hypotheses. *First*,

the regulators' aim to boost stock prices failed, as banned stocks had negative abnormal returns and underperformed non-banned stocks. This pattern holds across all market and firm sizes so we can reject our full set of *Hypothesis 1*. *Second*, we find that the regulatory restrictions are associated with a statistically significant deterioration of liquidity, as evidenced by a widening of bid-ask spreads and a decrease in trading volume (*Hypothesis 2 and 3*). Our results also indicate that these negative effects on liquidity are stronger for smaller stock markets and for smaller stocks. *Third* and consistent with *Hypothesis 4*, we provide evidence that the ban did not stabilize stock prices, as measured by price range and stock return volatility. Interestingly, we do not find that the ban increased the volatility for stocks of smaller markets and firms.

In robustness tests, we confirm our main results for changes in market quality measures. To address the potential issues of endogeneity, we employed (i) a matched sampled based on firm size and industry (self-selection bias) and (ii) instrumented the ban decision to overcome the concern that the decline in market quality itself triggered the intervention (simultaneity bias). Our results remain unchanged after considering these endogeneity issues. Overall, our results are robust to alternative economic explanations and statistical techniques. We provide robust evidence that imposing bans on short selling during the Covid-19 crisis had negative effects on market liquidity and volatility, especially for smaller markets and smaller stocks. These findings are consistent with previous research on the negative effects of short-selling bans during the 2008/2009 global financial crisis (Beber and Pagano, 2013; Boehmer et al., 2013) and 2011/2012 European sovereign debt crisis (Beber et al., 2021).

In additional analyses, we find that countries with a weaker state of the economy, lower fiscal capacity, lower financial development, higher vulnerability of the banking sector and stricter lockdown measures were more likely to introduce restrictions on short selling. Moreover, our results suggest that ban countries experienced no more excessive short-selling activity and higher threat of market manipulation due to its weaker legal environment. Overall, it is more than astonishing that six European regulators nevertheless imposed short-selling bans, motivated by the danger of financial instability resulting from the economic consequences of the Covid-19 pandemic crisis.

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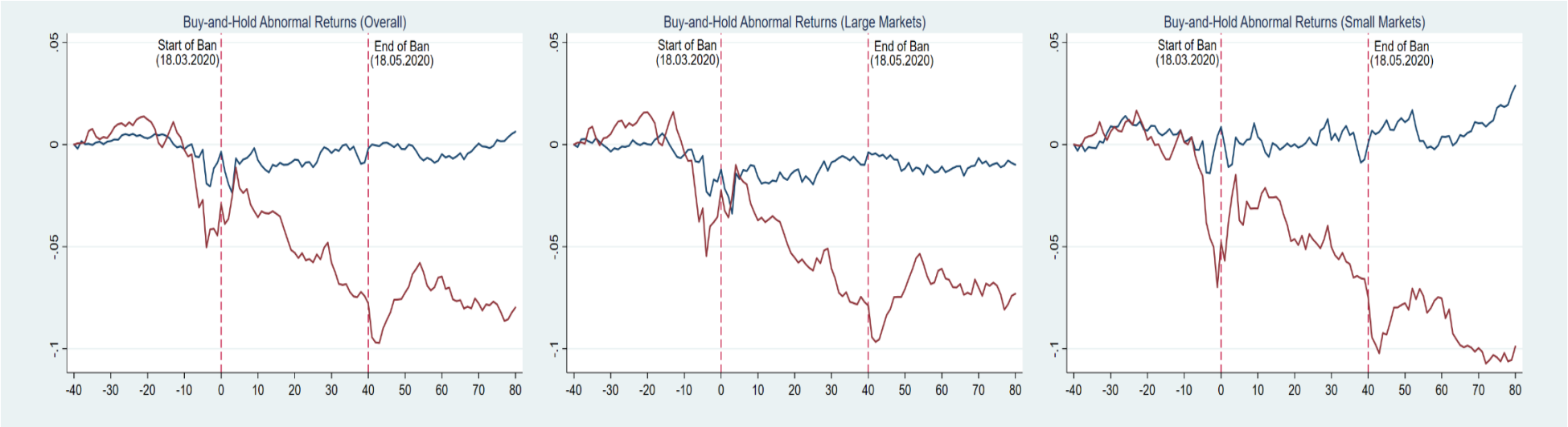
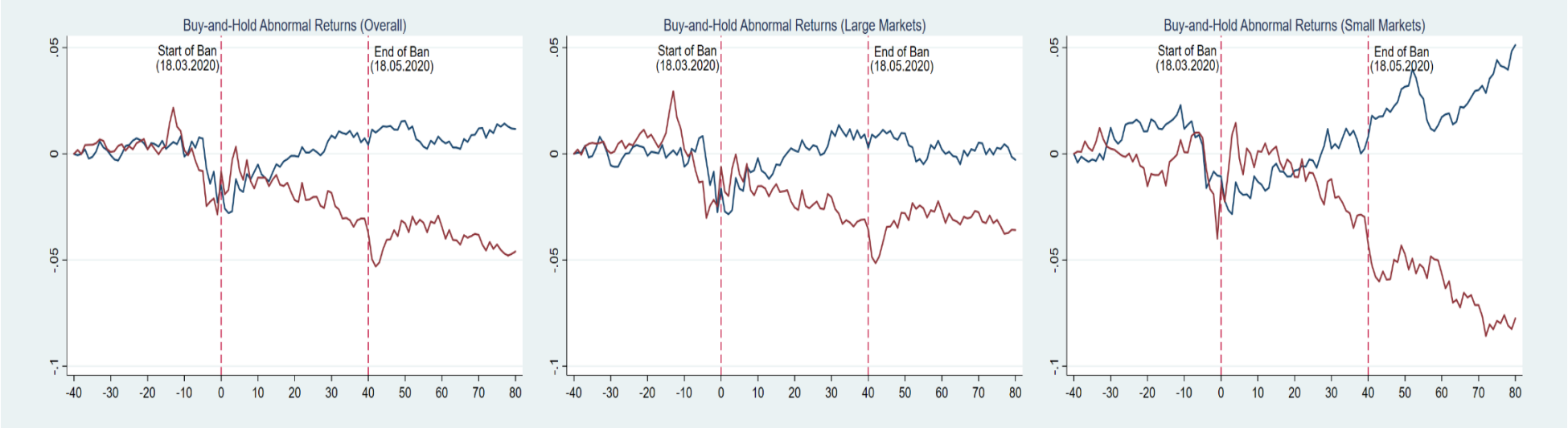
Figure 1: Buy-and-Hold Abnormal Returns around the Short-Selling Ban in Europe

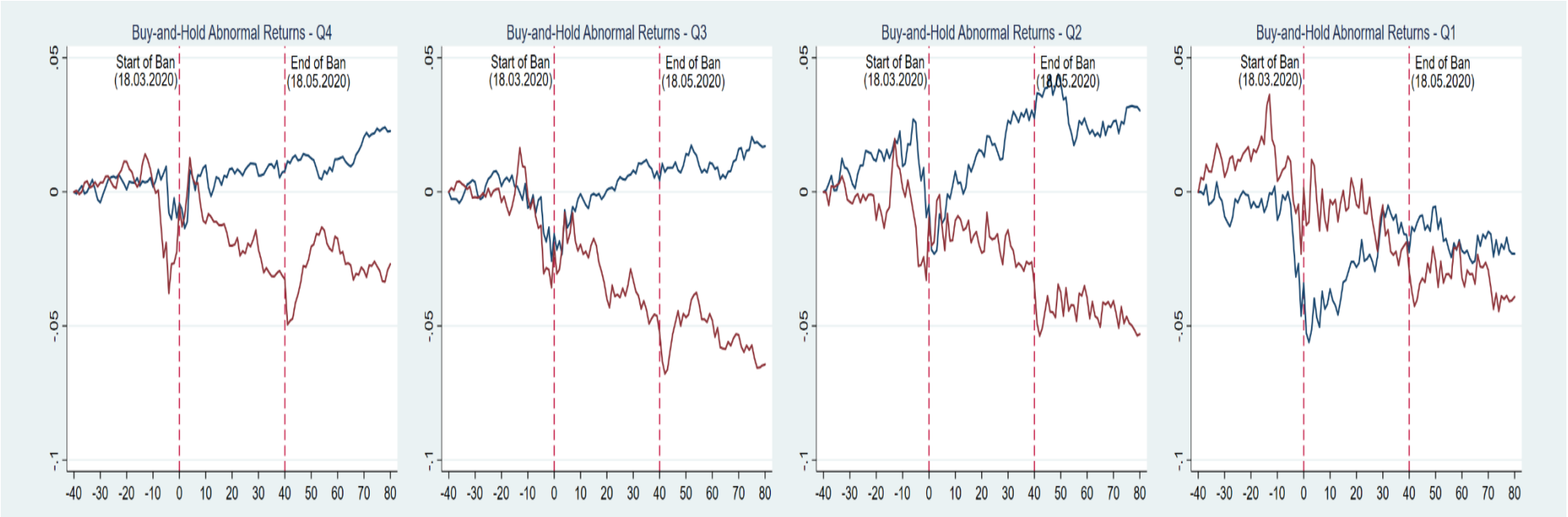
Panel A: Major Stock Indices from 12 Countries



Panel B: Largest 800 Stocks from 10 European Countries



Panel C: Market Capitalization Quartiles of Largest 800 Stocks

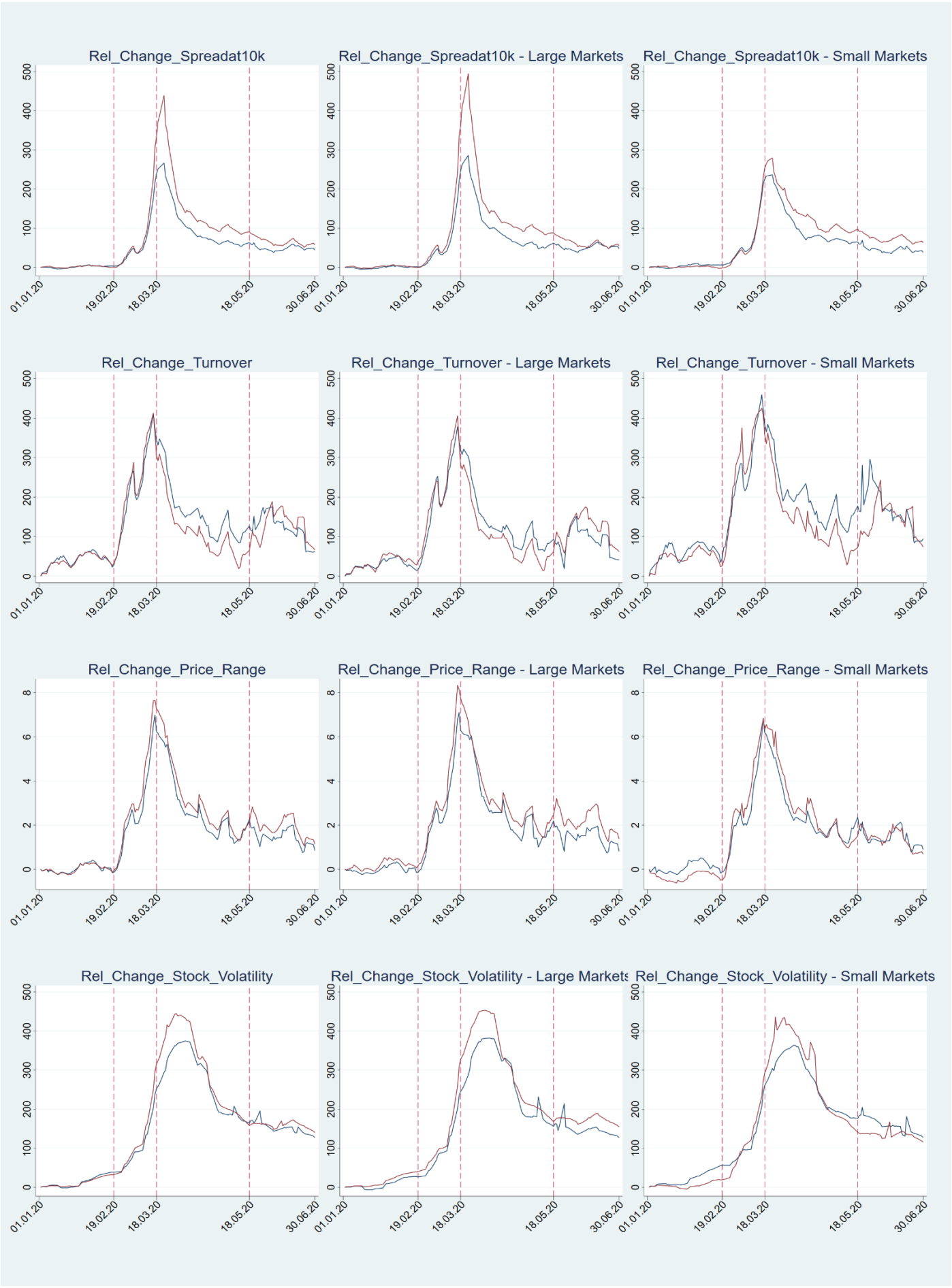


Notes:

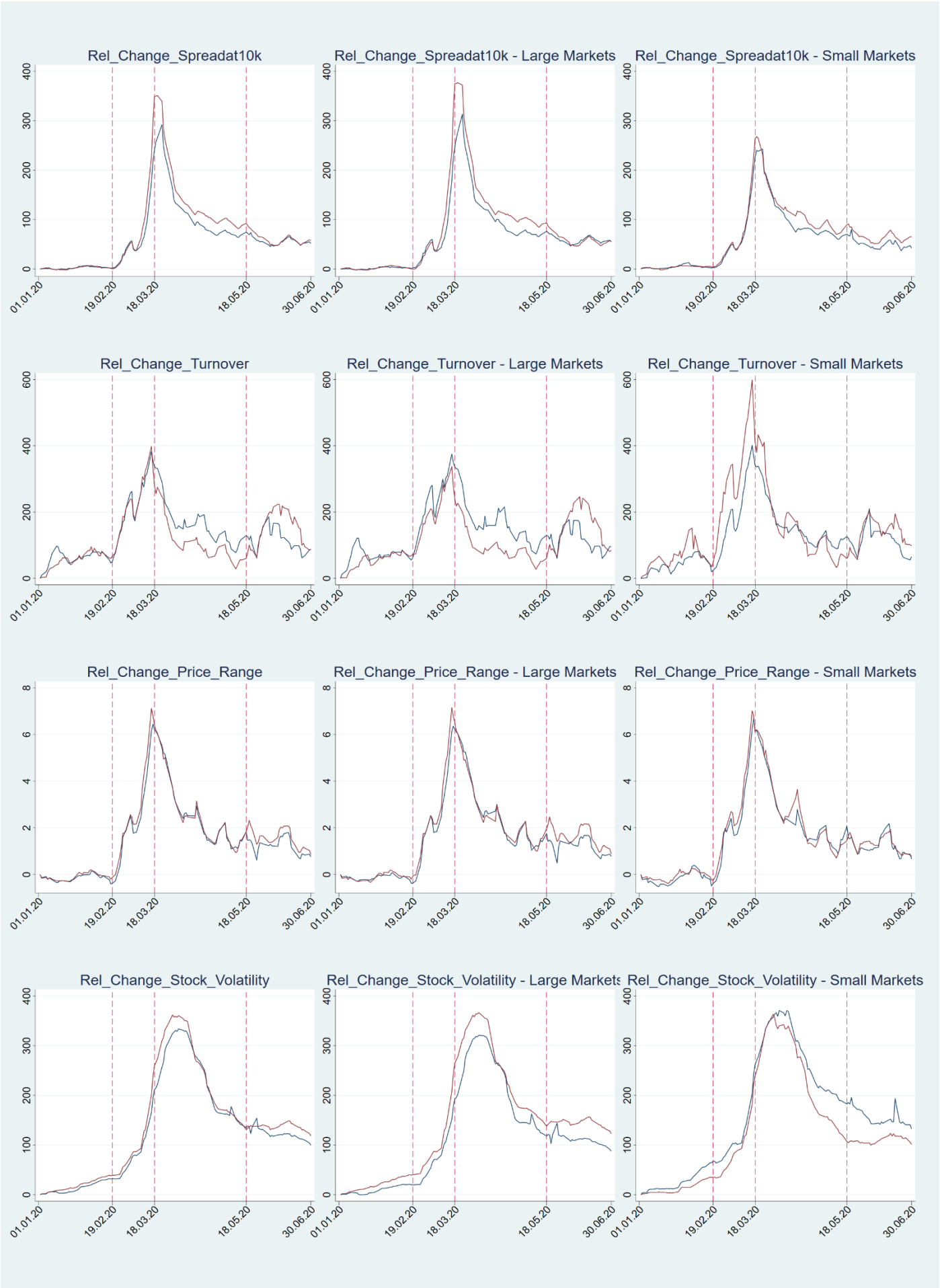
These figures present the buy-and-hold abnormal returns (BHARs) around the short selling ban. The samples include 12 *major stock indices* in Europe (Panel A) and the *800 largest stocks* from 10 European countries (Panel B). Panel C depicts quartiles based on year-end 2019 *market capitalization*. The red (blue) lines represent the countries *with* (*without*) ban. Day 0 and Day 40 on the horizontal axis denotes the *Start* (18.03.2020) and *End of Ban* (18.05.2020). We separate the BHARs for *large* markets and *small* markets based on the total of market capitalization at the end of 2019 (**Table 2**). BHARs are calculated using the Datastream Europe Total Market Return Index as benchmark.

Figure 2: Market Quality Effects of the Short-Selling Ban as Percentage Change (in %)

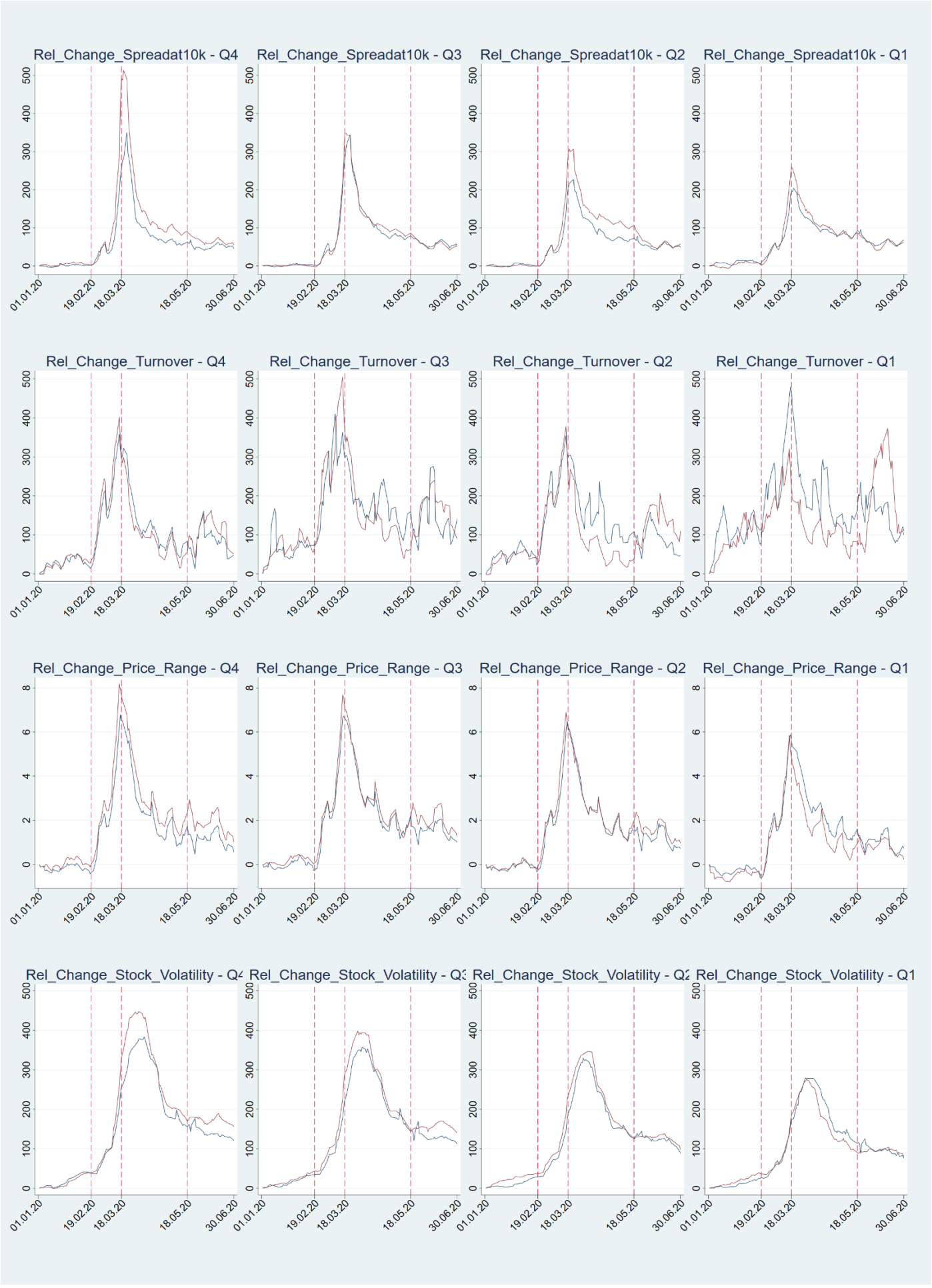
Panel A: *Major Stock Indices* from 12 European Countries



Panel B: *Largest 800 Stocks* from 10 European Countries



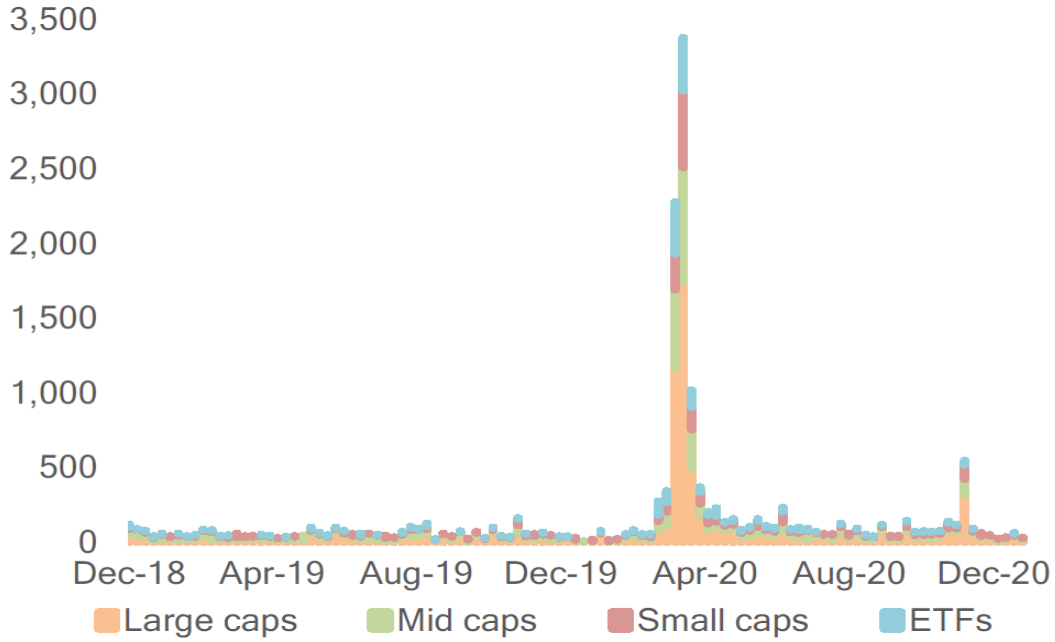
Panel C: *Quartiles* of *Largest 800 Stocks* based on Year-End 2019 Market Capitalization



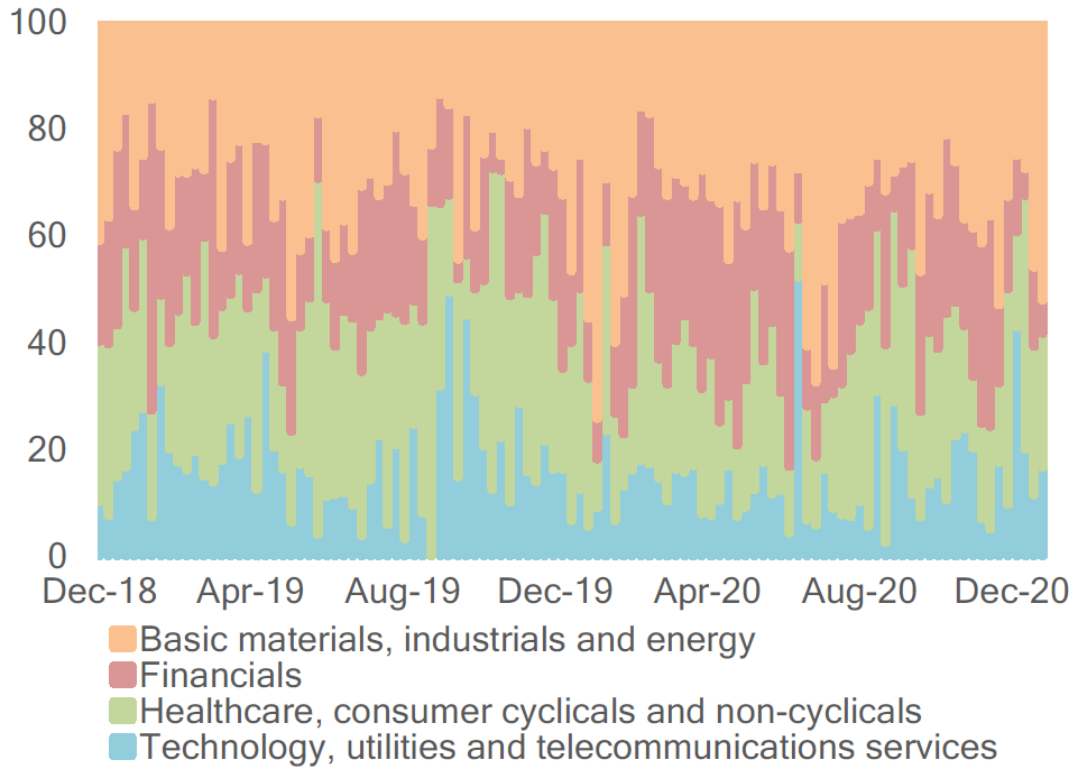
Notes: These figures compare the *percentage change* of market quality over the sample period from 1 January to 30 June 2020 for each of our three samples. It compares the constituents of the *major stock market indices* from *12* European countries (Panel A), the *800 largest stocks* from *10* European countries (Panel B) and *quartiles* based on the year-end 2019 market capitalization (Panel C) that are clustered into six ban countries and six no-ban countries (**Table 2**). The red (blue) lines represent the countries with (without) the ban. The dotted vertical lines indicate the following key events: (1) February 19, the beginning of the global stock market crash; (2) March 18, the introduction of the ban on selling in all of the respective countries; (3) May 18, the lift of the ban in these countries. We employ four quantitative measures of market quality as defined in **Table 3**. We depict the 5-day moving average of the cross-sectional average of each measure. The rows report the daily values for all countries *combined*, and separately for *large* markets and *small* markets, based on the total of *year-end 2019 market capitalization.*

Figure 3: Occurrence of Circuit Breakers on European Exchanges during the Covid-19 Crisis

Panel A: Number of Daily Circuit-Breaker Trigger Events by Market Capitalization



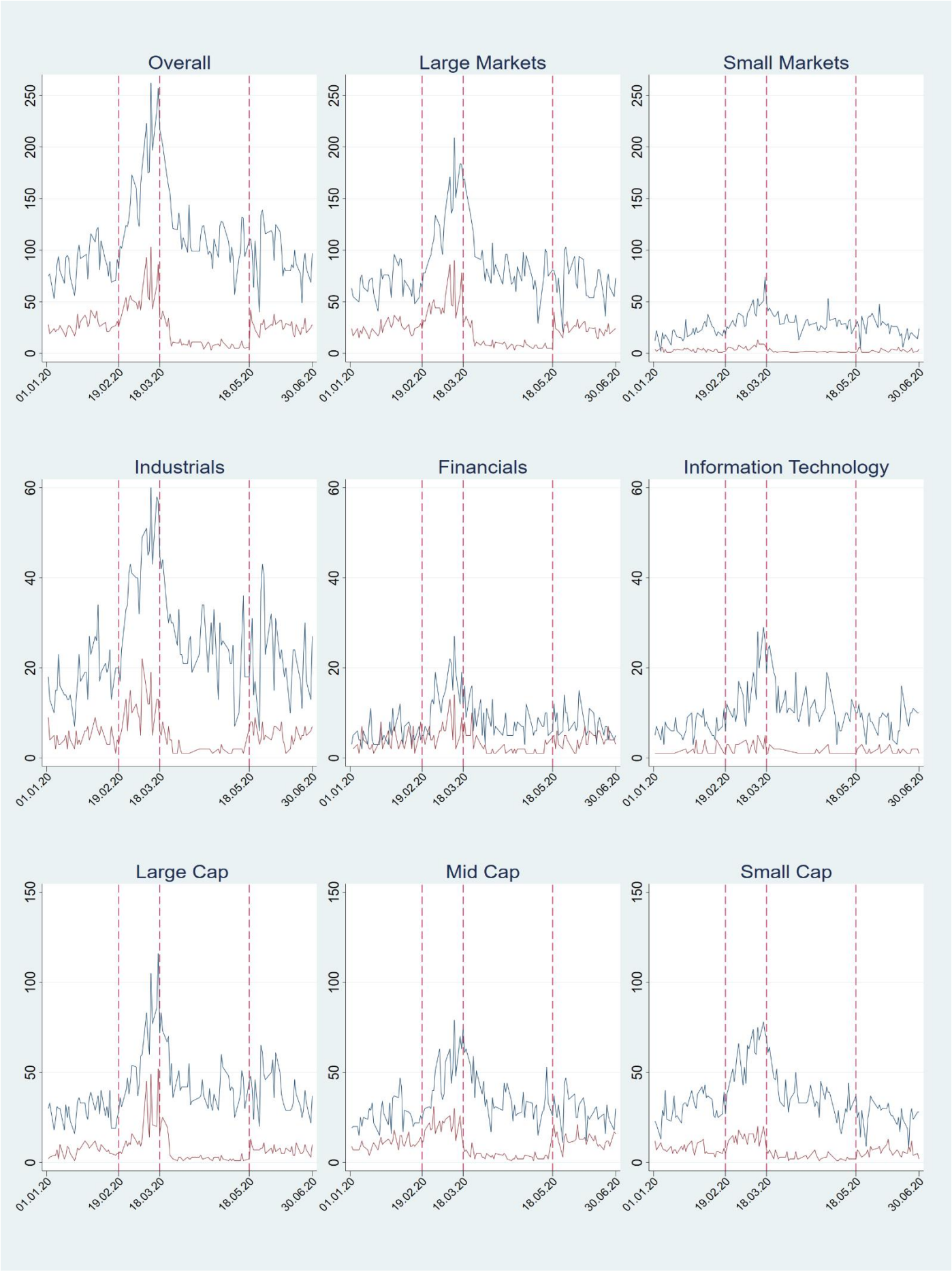
Panel B: Relative Share of Circuit-Breaker Trigger Events by Sector



Notes: These figures present the daily number of circuit-breaker trigger events by market capitalization and financial instrument (Panel A) and the relative share of circuit-breaker trigger events by sector (Panel B). The data is based on 29 European trading venues and the constituents of the STOXX Europe Large/Mid/Small 200 stock indices. Figures are displayed as weekly averages. Source is the ESMA Report on Trends, Risks and Vulnerabilities No. 1, 2021 (Statistical Annex) with data from Morningstar Real-Time Data and ESMA.

Figure 4: Daily Reported Net Short Positions in Europe

Panel A: Market Size, Sectors and Firm Size



Notes: These figures present the daily number of reported net short positions over the period from 1 January 2020 to 30 June 2020. We distinguish between countries *with* (Austria, Belgium, France, Greece, Italy, Spain) and *without* (Finland, Germany, Netherlands, Norway, Sweden, U.K.) a short-selling ban in 2020. The red (blue) lines represent the countries with (without) the ban. The dotted vertical lines indicate the following key events: (1) February 19, the beginning of the global stock market crash; (2) March 18, the introduction of the ban on selling; (3) May 18, the lift of the ban. Panel A provides an overview by market size, sectors and firm size. Panels B and C presents the ban and no-ban country individually, sorted by market size.

Table 1: National 2020 Short-Selling Bans in Europe

Country	National Competent Authority	Start	Expiry
Austria	Finanzmarktaufsicht (FMA)	18-Mar-20	18-May-20
Belgium	Financial Securities and Markets Authority (FSMA)	17-Mar-20	17-Mar-20
Belgium	Financial Securities and Markets Authority (FSMA)	18-Mar-20	18-May-20
France	Autorité des Marchés Financiers (AMF)	17-Mar-20	17-Mar-20
France	Autorité des Marchés Financiers (AMF)	18-Mar-20	18-May-20
Greece	Hellenic Capital Market Commission (HCMC)	18-Mar-20	18-May-20
Italy	Commissione Nazionale per le Società e la Borsa (CONSOB)	13-Mar-20	13-Mar-20
Italy	Commissione Nazionale per le Società e la Borsa (CONSOB)	17-Mar-20	17-Mar-20
Italy	Commissione Nazionale per le Società e la Borsa (CONSOB)	18-Mar-20	18-May-20
Spain	Comision Nacional del Mercado de Valores (CNMV)	13-Mar-20	13-Mar-20
Spain	Comision Nacional del Mercado de Valores (CNMV)	17-Mar-20	18-May-20

Notes: This table presents the 2020 short-selling bans in Europe. These emergency measures include the creation of new net short positions or increase in existing net short positions for regulated and OTC markets. Dates are from the European Securities and Markets Authority (ESMA). In our analysis, we abstract from the two one-day bans and focus on the two-month period in our analysis.

Table 2: Structure of the Dataset and Samples

Country	Sample I	Sample II	Market Cap (in € million)
U.K.	50	100	2,056,347
Germany	30	100	1,674,532
Switzerland	20	100	1,491,729
Netherlands	25	50	868,319
Sweden	30	50	525,512
Portugal	20	-	48,690
Non-Ban Countries	175	400	6,665,128
France	40	100	2,275,705
Italy	40	100	597,921
Spain	35	100	597,592
Belgium	20	50	327,404
Austria	20	50	109,495
Greece	20	-	38,328
Ban Countries	175	400	3,946,445
Total	**350**	**800**	**10,611,573**

Notes: This table presents the structure of our dataset, composition of two different samples and total market capitalization at the end of 2019. *First*, stocks from the leading stock index of 12 countries: *FTSE 100* (only largest 50), *DAX*, *SMI*, *AEX*, *OMX Stockholm 30*, *PSI-20*, and *CAC 40*, *FTSE MIB*, *IBEX 35*, *BEL20*, *ATX*, *FTSE Athex*. *Second*, the 800 largest stocks for 10 countries based on market capitalization at the end of 2019, excluding Greece and Portugal due to data quality issues. Every country is categorized as either *large* market (Germany, Switzerland, UK, France, Italy, Spain) or *small* market (Netherlands, Sweden, Austria, Belgium) according to the total market capitalization of the largest 100 or 50 stocks, respectively.

Table 3: Description of Variables

Variable	Definition / Description / Source	Source
	Market Quality	
Spreads at € 10k	Difference between the best bid price (PB) and best ask price (PA) for a volume of EUR 10,000 weighted by market turnover, expressed in basis points. The weighting factor (w_{itc}) is based on turnover at each trading venue *c* including primary exchanges of the stock and pan-European venues such as Aquis, Cboe BXE, Cboe CXE and Turquoise.	big xyt
Turnover	Ratio between the number of traded stocks in 1,000 (VO) and the number of stocks outstanding in 1,000 ($NOSH$), scaled by 100.	Refintiv
Price Range	Ratio between is the highest price achieved on a given day (PH) and the lowest price achieved on a given day (PL).	Refinitiv
Volatility	Standard deviation of EUR returns on stock prices over a 20-day rolling window.	Refinitiv
BAN	Indicator variable that takes the value of one when the stock is banned from short selling on a given day and zero otherwise.	-
MKTCAP	Market Capitalization in EUR is equal to the stock price multiplied by the number of shares outstanding.	Refinitiv
EVOL	EUR value of all stocks traded (in 1,000) for a stock on a day.	Refinitiv
VWAP	Volume-weighted average price is the ratio of the total value of shares traded to the total volume of shares traded on a given day.	Refinitiv
SMALL	Indicator variable that takes the value of one when the stock is traded on a smaller stock market based on year-end 2019 total market capitalization.	
Q1, Q2, Q3	Indicator variable that takes the value of one when the stock belongs to the first, second or third quartiles of year-end 2019 market capitalization.	-
Financial Stress Index	A country-specific index of financial stress focusing on the systemic risk in key segments of financial markets, i.e. equity, bonds and foreign exchange (Duprey et al., 2015).	ECB
5Y CDS Spread	The premium/spread on a 5-year credit default swap (CDS) contract.	Refinitiv
	Determinants of Short-Selling Ban	
GDP Growth	Natural logarithm of GDP growth (annual %). Aggregates are based on constant 2010 USD.	WDI
Inflation	Inflation as measured by the consumer price index that reflects the change in the cost to the average consumer of acquiring a basket of goods and services (annual %).	WDI
Unemployment	The share of the labor force that is without work but available for and seeking employment (Harmonized ILO definition).	WDI
Current Account	Current account balance is the sum of net exports of goods and services, net primary income, and net secondary income (% of GDP).	WDI

Government Debt	Government gross debt (% of GDP).	WEO
Stock Market Turnover	Total value of shares traded divided by the average market capitalization in a given year (%).	GFD
Private Credit	The financial resources provided to the private sector by domestic money banks (% of GDP).	GFD
Institutional Quality	The average of the "government effectiveness" and "regulatory quality" governance indicators.	WGI
Sovereign 5Y CDS Spread	The premium/spread on a 5-year credit default swap (CDS) contract based on the Datastream Sovereign CDS index of a country.	Refinitiv
Stringency Index	A composite index of Covid-19 government responses based on nine country-level indicators, including school closing, workplace closing, cancel public events, close public transport, stay-at-home requirements, restrictions on gathering size and traveling.	OxCGRT
VIX	A volatility index based on the implied volatility of S&P 500 index options calculated by the Chicago Board Options Exchange (CBOE).	Refinitiv
TED Spread	The spread between 3-month LIBOR based on USD and 3-month treasury bill.	FRED
Oil price	The price for Brent crude oil in USD per barrel.	Refinitiv
VSTOXX	A volatility index based on the implied volatility of EURO STOXX 50 options calculated by Qontigo.	Refinitiv
Eurozone TED Spread	The spread between 3-month EURIBOR and 3-month German government bond yields.	Refinitiv
Systemic Stress Indicator	Composite Indicator of Systemic Stress (CISS) measures the level of frictions, stresses and strains in the financial system, comprising financial intermediation, money markets, equities markets, bonds markets and foreign exchanges markets (Holló et al., 2012).	ECB
Covid-19 Deaths (% pop)	The daily number of new reported deaths of Covid-19 (% of population in million).	ECDC
	Other	
Insider Trading Rules	Index that sums dummy variables for front-running, client precedence, trading ahead of research reports, separation of research and trading, broker ownership limit, restrictions on affiliation, restrictions on communications, investment company securities, influencing or rewarding the employees of other, and anti-intimidation/coordination.	CJL'11
Market Manipulation Rules	Index that sums sub-indices of price manipulation, volume manipulation, spoofing rules, and false disclosure rules.	CJL'11
Private Enforcement	The revised anti-director rights index consisting of voting by mail, voting without blocking of shares, calling an extraordinary meeting, proportional board representation, preemptive rights and judicial remedies.	S'10
Public Enforcement	Index that captures whether suspect corporate transactions can	DLLS'08

	lead to a fine or jail sentences for the approving entity or offender.	
Rule of Law	Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular, the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	WGI
Efficiency of the Judiciary	Assessment of the efficiency and integrity of the legal environment as it affects business, particularly foreign firms.	LLS'06

Notes: This table represents the definitions, calculations, and description of the used variables in our analysis. Abbreviations:

CJL'11 = Cumming et al. (2011);
DLLS'08 = Djankov et al. (2008);
ECB = European Central Bank;
ECDC = European Centre for Disease Prevention and Control;
FRED = Federal Reserve Economic Data by Federal Reserve Bank of St. Louis;
GFD = Global Financial Development database by World Bank;
FSI = Financial Soundness Indicators database by International Monetary Fund (IMF);
LLS'06 = La Porta et al. (2006);
OxCGRT = Oxford COVID-19 Government Response Tracker by Blavatnik School of Government, University of Oxford;
S'10 = Spamann (2010);
WDI = World Development Indicators database by World Bank;
WEO = World Economic Outlook database by International Monetary Fund (IMF);
WGI = Worldwide Governance Indicators database by World Bank.

Table 4: Buy-and-Hold Abnormal Returns around the Short-Selling Ban

Interval	Overall				Large Markets				Small Markets			
	Ban	No-Ban	Diff.		Ban	No-Ban	Diff.		Ban	No-Ban	Diff.	
Panel A: Major Stock Indices from 12 European Countries												
BHAR [-40; 0]	-0.33%	-2.91%	2.58%		-2.25%	-1.19%	-1.06%		-4.78%	0.87%	-5.65%	*
BHAR [0; 40]	-5.80%	0.70%	-6.49%	***	-7.24%	2.12%	-9.36%	***	-1.73%	-1.30%	-0.43%	
BHAR [0; 80]	-6.05%	2.15%	-8.20%	***	-4.92%	2.42%	-7.34%	*	-6.45%	1.96%	-8.40%	***
BHAR [-40; 80]	-7.98%	0.63%	-8.61%	***	-7.30%	-0.99%	-6.31%	**	-9.88%	2.88%	-12.77%	**
Panel B: Largest 800 Stocks from 10 European Countries												
BHAR [-40; 0]	-0.90%	-1.50%	0.60%		-1.49%	-1.06%	-0.43%		-0.72%	-1.66%	0.94%	
BHAR [0; 40]	-3.50%	4.06%	-7.56%	***	-2.95%	3.64%	-6.59%	**	-3.67%	4.21%	-7.88%	***
BHAR [0; 80]	-4.65%	5.56%	-10.21%	***	-3.66%	3.79%	-7.45%	***	-7.71%	10.45%	-18.15%	***
BHAR [-40; 80]	-4.60%	1.17%	-5.77%	***	-3.59%	-0.28%	-3.31%		-7.75%	5.12%	-12.87%	***
Panel C: Market Capitalization Quartiles of Largest 800 Stocks												
Interval	Quartile 4				Quartile 3				Quartile 2				Quartile 1			
	Ban	No-Ban	Diff.		Ban	No-Ban	Diff.		Ban	No-Ban	Diff.		Ban	No-Ban	Diff.	
BHAR [-40; 0]	-0.47%	-0.50%	0.03%		-2.01%	-1.56%	-0.45%		-1.14%	-0.48%	-0.66%		-0.02%	-3.40%	3.39%	
BHAR [0; 40]	-3.01%	2.27%	-5.27%	**	-3.32%	4.22%	-7.54%	***	-3.47%	5.42%	-8.89%	***	-4.15%	4.28%	-8.42%	***
BHAR [0; 80]	-2.03%	4.89%	-6.92%	**	-4.71%	6.36%	-11.07%	***	-6.21%	6.12%	-12.33%	***	-5.54%	4.85%	-10.38%	***
BHAR [-40; 80]	-2.70%	2.27%	-4.97%		-6.43%	1.71%	-8.14%	***	-5.31%	3.04%	-8.34%	**	-3.91%	-2.31%	-1.61%	

Notes: This table present the mean buy-and-hold abnormal returns (BHARs) for different intervals around the short-selling ban on 18 March 2020 (Day 0). The samples include the *12 major stock indices* in Europe (Panel A) and the *largest 800 stocks* from 10 European countries (Panel B). Panel C reports the results for quartiles based on year-end 2019 market capitalization. In Panel B and C, we separate the BHARs for subsamples of *large* markets and *small* markets based on the total of market capitalization at the end of 2019 (**Table 2**). BHARs are calculated using the *Datastream Europe Total Market Return Index* as benchmark. **, *** indicate significance at the 0.05 and 0.01 level, respectively.

Table 5: Effects of the Short-Selling Ban on Stock Returns

Panel A: Major Stock Indices

	Overall Sample				*Large Markets*				*Small Markets*			
	I	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**
Dependent variable:	BHAR [-40; 0]	BHAR [0; 40]	BHAR [0; 80]	BHAR [-40; 80]	BHAR [-40; 0]	BHAR [0; 40]	BHAR [0; 80]	BHAR [-40; 80]	BHAR [-40; 0]	BHAR [0; 40]	BHAR [0; 80]	BHAR [-40; 80]
BAN	0.0033	**-0.0649*** **	**-0.0533** **	-0.035	0.0263	**-0.0984*** **	-0.055	0.0055	-0.0448	0.0006	-0.0394	**-0.1057*** **
	[0.23]	**[-3.25]**	**[-2.08]**	[-1.64]	[1.46]	**[-3.65]**	[-1.66]	[0.21]	[-1.74]	[0.02]	[-0.87]	**[-2.75]**
MKTCAP	0.0000***	0.0000*	0.0000	0.0000	0.0000**	0.0000	0.0000	0.0000	0.0000	0.0000***	0.0000	0.0000*
	[2.70]	[1.84]	[-1.25]	[-0.31]	[2.05]	[1.07]	[-1.62]	[-0.99]	[1.64]	[2.82]	[1.00]	[1.91]
EVOL	0.0000	0.0000	0.0000**	0.0000*	0.0000	0.0000	0.0000**	0.0000**	0.0000	-0.0000*	0.0000	0.0000
	[-0.78]	[-1.31]	[2.29]	[1.82]	[-0.07]	[-0.76]	[2.10]	[2.03]	[-0.95]	[-1.86]	[0.63]	[-0.47]
VWAP	0.0001***	0.0000	0.0000	0.0001	0.0001***	0.0000	0.0000	0.0000	0.0003	0.0004***	0.0005***	0.0006***
	[4.22]	[0.43]	[0.34]	[1.55]	[4.47]	[-0.58]	[-0.94]	[0.98]	[1.84]	[4.40]	[4.92]	[4.98]
VOLA	-2.5572***	1.0963	-4.5697**	-13.1715***	-2.0465**	1.8309	-5.2865**	-15.7117***	-4.1576***	0.4775	-3.094	-9.8095***
	[-3.43]	[1.04]	[-2.41]	[-8.26]	[-2.13]	[1.33]	[-2.00]	[-7.78]	[-3.51]	[0.31]	[-1.04]	[-6.04]
CONS	0.0786**	-0.0305	0.0707*	0.2099***	0.037	-0.029	0.0897	0.2374***	0.1685***	-0.059	0.0167	0.1633***
	[2.29]	[-0.91]	[1.77]	[6.20]	[0.83]	[-0.65]	[1.59]	[5.41]	[2.99]	[-1.18]	[0.29]	[3.79]
Adj. R^2	0.1114	0.0342	0.0599	0.255	0.113	0.0623	0.0513	0.2702	0.1534	0.1048	0.1579	0.3696
Obs.	311	310	309	309	204	203	202	202	107	107	107	107

Panel B: Largest 800 Stocks

	Overall Sample				*Large Markets*				*Small Markets*			
	I	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**
Dependent variable:	BHAR [-40; 0]	BHAR [0; 40]	BHAR [0; 80]	BHAR [-40; 80]	BHAR [-40; 0]	BHAR [0; 40]	BHAR [0; 80]	BHAR [-40; 80]	BHAR [-40; 0]	BHAR [0; 40]	BHAR [0; 80]	BHAR [-40; 80]
BAN	**0.0203** **	**-0.0779*** **	**-0.1038*** **	**-0.0531*** **	**0.0313*** **	**-0.0883*** **	**-0.0828*** **	-0.0319	-0.0076	-0.0552	**-0.1469*** **	**-0.0990*** **
	[2.11]	**[-5.60]**	**[-5.28]**	**[-3.00]**	**[2.80]**	**[-5.36]**	**[-3.64]**	[-1.50]	[-0.38]	[-1.93]	**[-3.63]**	**[-3.13]**
MKTCAP	0.0000*	0.0000***	0.0000	0.0000	0.0000*	0.0000**	0.0000	0.0000	0.0000	0.0000***	0.0000	0.0000
	[1.93]	[2.63]	[0.07]	[0.76]	[1.77]	[2.49]	[-0.03]	[1.04]	[-0.23]	[3.19]	[1.08]	[0.58]
EVOL	0	-0.0000**	0.0000	0.0000	0.0000	-0.0000**	0.0000	0.0000	0.0000	-0.0000*	0.0000	0.0000
	[0.88]	[-2.53]	[1.40]	[1.30]	[1.00]	[-2.33]	[0.91]	[0.55]	[0.35]	[-1.81]	[0.89]	[0.98]
VWAP	0.0000***	0.0000	0.0000	0.0000	0.0000***	0.0000	0.0000	0.0000	0.0001***	0.0001	0.0001	0.0002**
	[3.16]	[1.21]	[0.05]	[1.01]	[3.94]	[1.38]	[0.28]	[1.13]	[4.04]	[1.09]	[1.34]	[2.38]
VOLA	-3.0938***	3.2175***	5.9622***	-1.9768	-3.2364***	4.2678***	6.9628***	-1.1854	-2.6429***	1.0421	2.8212	-3.8771
	[-7.50]	[4.03]	[3.67]	[-0.83]	[-6.87]	[4.42]	[3.71]	[-0.41]	[-2.83]	[0.73]	[1.16]	[-1.55]
CONS	0.1031***	-0.0463*	-0.0699**	0.0378	0.1010***	-0.0706***	-0.1019***	0.0136	0.0957**	-0.0105	-0.0058	0.0629
	[5.53]	[-1.96]	[-2.05]	[0.82]	[4.88]	[-2.59]	[-2.69]	[0.25]	[2.00]	[-0.21]	[-0.09]	[1.09]
Adj. R^2	0.094	0.0725	0.0699	0.0274	0.1054	0.0911	0.0634	0.0047	0.105	0.0577	0.1464	0.2249
Obs.	722	725	723	721	537	544	540	538	185	181	183	183

Panel C: Market Capitalization Quartiles of Largest 800 Stocks

	Quartile 4				**Quartile 3**			
	I	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**
Dependent variable:	BHAR [-40; 0]	BHAR [0; 40]	BHAR [0; 80]	BHAR [-40; 80]	BHAR [-40; 0]	BHAR [0; 40]	BHAR [0; 80]	BHAR [-40; 80]
BAN	0.0345	**-0.0605****	-0.0504	-0.0238	0.0098	**-0.0798*****	**-0.1150*****	**-0.0909*****
	[1.85]	**[-2.06]**	[-1.33]	[-0.72]	[0.50]	**[-2.85]**	**[-2.92]**	**[-2.82]**
MKTCAP	0.0000	0.0000	0.0000	0.0000	0.0000*	0.0000	0.0000	0.0000
	[0.53]	[0.77]	[-1.59]	[-1.16]	[1.89]	[1.45]	[0.55]	[1.30]
EVOL	0.0000	0.0000	0.0000*	0.0000	0.0000**	-0.0000**	0.0000	0.0000
	[1.13]	[-0.95]	[1.75]	[1.51]	[2.56]	[-2.42]	[0.51]	[1.31]
VWAP	0.0000***	0.0000	0.0000	0.0000	0.0000*	0.0000	0.0000	0.0000
	[5.00]	[0.84]	[-0.87]	[-0.34]	[1.66]	[1.03]	[0.23]	[0.94]
VOLA	-2.6643***	0.7821	0.1424	-9.0701***	-2.6855***	3.4187**	0.597	-8.9802***
	[-3.29]	[0.49]	[0.04]	[-2.82]	[-3.48]	[2.40]	[0.22]	[-4.60]
CONS	0.0794**	0.0104	0.0251	0.1731***	0.0705**	-0.0338	0.0449	0.1745***
	[2.09]	[0.22]	[0.36]	[3.17]	[2.00]	[-0.70]	[0.72]	[3.91]
Adj. R^2	0.0785	0.001	0.0079	0.1036	0.0973	0.0797	0.03	0.1296
Obs.	177	179	178	177	182	182	182	182

	Quartile 2				**Quartile 1**			
	I	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**
Dependent variable:	BHAR [-40; 0]	BHAR [0; 40]	BHAR [0; 80]	BHAR [-40; 80]	BHAR [-40; 0]	BHAR [0; 40]	BHAR [0; 80]	BHAR [-40; 80]
BAN	-0.0021	**-0.1066*****	**-0.1346*****	**-0.0949****	0.0363*	-0.0521	**-0.0905****	0.0034
	[-0.10]	**[-3.78]**	**[-3.58]**	**[-2.45]**	[1.70]	[-1.65]	**[-2.12]**	[0.10]
MKTCAP	0.0000***	0.0000***	0.0000***	0.0000***	0.0000	0.0000	0.0000	0.0000
	[2.98]	[5.64]	[3.51]	[4.59]	[0.68]	[1.65]	[0.56]	[0.62]
EVOL	-0.0000*	-0.0000***	0.0000	-0.0000*	0.0000	0.0000	0.0000	0.0000
	[-1.90]	[-4.44]	[-0.99]	[-1.71]	[-0.32]	[0.55]	[1.03]	[0.94]
VWAP	0.0000	0.0000	0.0000	-0.0001*	0.0000	0.0000	0.0000	0.0000*
	[-1.64]	[-0.30]	[-1.14]	[-1.91]	[0.60]	[0.94]	[0.87]	[1.71]
VOLA	-4.1400***	5.4871***	11.2889***	4.7466	-2.4689***	3.8154***	8.3342***	0.6989
	[-4.63]	[2.85]	[4.36]	[0.97]	[-2.84]	[2.64]	[3.38]	[0.24]
CONS	0.1402***	-0.1325***	-0.2320***	-0.1281	0.0645	-0.0950*	-0.1570**	-0.0664
	[3.59]	[-2.91]	[-4.10]	[-1.43]	[1.51]	[-1.82]	[-2.42]	[-1.00]
Adj. R^2	0.1826	0.202	0.2369	0.1232	0.0482	0.1023	0.1068	0.0041
Obs.	182	185	182	181	181	179	181	181

Notes: This table present the results for cross-sectional regressions with buy-and-hold abnormal returns (BHARs) across different intervals as dependent variables. The samples include the 12 *major stock indices* in Europe (Panel A) and the *largest 800 stocks* from 10 European countries (Panel B). Panel C reports the results for quartiles based on year-end 2019 market capitalization. In Panel B and C, we separate the BHARs for subsamples of *large* markets and *small* markets based on the total of market capitalization at the end of 2019 (**Table 2**). BHARs are calculated using the *Datastream Europe Total Market Return* Index as benchmark. All variables are defined in **Table 3**. We report t-statistics based on robust standard errors in parentheses. **, *** indicate significance at the 0.05 and 0.01 level, respectively.

Table 6: Market Quality around the Crash and Short-Selling Ban Periods

Panel A: Major Stock Indices

Measure	Stocks from Ban Countries				Differences between Periods											
	Pre-Crash (1)	Crash (2)	Ban (3)	Post-Ban (4)	(2) - (1)		(3) - (2)		(3) - (1)		(4) - (3)					
Spreads at 10k	9.6675	14.7778	18.7961	14.5648	5.1103	***	4.0183		9.1286	***	-4.2312	***				
Turnover	0.2669	0.5230	0.2983	0.3599	0.2561	***	-0.2247	***	0.0313	***	0.0616	***				
Price Range	1.0209	1.0539	1.0465	1.0383	0.0330	***	-0.0074	***	0.0256	***	-0.0082	***				
Volatility	0.0140	0.0251	0.0427	0.0284	0.0111	***	0.0176	***	0.0286	***	-0.0142	***				

Measure	Control Stocks				Differences between Periods											
	Pre-Crash (1)	Crash (2)	Ban (3)	Post-Ban (4)	(2) - (1)		(3) - (2)		(3) - (1)		(4) - (3)					
Spreads at 10k	7.7642	11.0175	11.5645	9.3463	3.2534	***	0.5470	***	3.8004	***	-2.2183	***				
Turnover	0.2836	0.5767	0.3917	0.3727	0.2931	***	-0.1850	***	0.1081	***	-0.0190	***				
Price Range	1.0190	1.0468	1.0406	1.0318	0.0279	***	-0.0063	***	0.0216	***	-0.0088	***				
Volatility	0.0136	0.0218	0.0385	0.0271	0.0082	***	0.0167	***	0.0248	***	-0.0113	***				

Measure	Difference-in-Differences							
	(2) - (1)		(3) - (2)		(3) - (1)		(4) - (3)	
Spreads at 10k	1.8570	***	3.4713	***	5.3282	***	-2.0130	***
Turnover	-0.0371	***	-0.0397	***	-0.0767	***	0.0806	***
Price Range	0.0051	***	-0.0011		0.0040	***	-0.0005	
Volatility	0.0029	***	0.0009		0.0038	***	-0.0029	***

Notes: This table presents mean values for the measure of market quality for banned and control stocks across four different periods: (1) *Pre-Crash* (January 1 to February 19), (2) *Crash* (February 20 to March 17), (3) *Short-Selling Ban* (March 18 to May 18) and (4) *Post-Ban* (May 19 to June 30). We use daily stock data for the constituents of *major stock indices* from 12 European countries over the period from January 2 to June 30, 2020 (**Table 2**). All variables are defined in **Table 3**. **, *** indicate significance at the 0.05 and 0.01 level, respectively.

Panel B: Largest 800 Stocks

Measure	Stocks from Ban Countries				Differences between Periods											
	Pre-Crash (1)	Crash (2)	Ban (3)	Post-Ban (4)	(2) - (1)		(3) - (2)		(3) - (1)		(4) - (3)					
Spreads at 10k	43.1453	65.9578	72.2600	57.8148	22.8125	***	6.3022	***	29.1147	***	-14.4452	***				
Turnover	0.1989	0.3602	0.2052	0.2581	0.1613	***	-0.1551	***	0.0063	***	0.0529	***				
Price Range	1.0237	1.0561	1.0478	1.0397	0.0324	***	-0.0083	***	0.0241	***	-0.0081	***				
Volatility	0.0158	0.0245	0.0408	0.0283	0.0087	***	0.0163	***	0.0250	***	-0.0125	***				

Measure	Control Stocks				Differences between Periods											
	Pre-Crash (1)	Crash (2)	Ban (3)	Post-Ban (4)	(2) - (1)		(3) - (2)		(3) - (1)		(4) - (3)					
Spreads at 10k	15.0530	21.3691	25.2683	20.3741	6.3161	***	3.8992	***	10.2153	***	-4.8942	***				
Turnover	0.2463	0.4724	0.3510	0.3131	0.2262	***	-0.1214	***	0.1048	**	-0.0380	***				
Price Range	1.0240	1.0540	1.0485	1.0373	0.0300	***	-0.0055	***	0.0245	***	-0.0112	***				
Volatility	0.0165	0.0243	0.0418	0.0285	0.0077	***	0.0175	***	0.0252	***	-0.0133	***				

Measure	Difference-in-Differences							
	(2) - (1)		(3) - (2)		(3) - (1)		(4) - (3)	
Spreads at 10k	16.4964	***	2.4030		18.8994	***	-9.5510	***
Turnover	-0.0648	***	-0.0337	***	-0.0985	***	0.0909	***
Price Range	0.0024	***	-0.0028	***	-0.0004		0.0031	***
Volatility	0.0009	***	-0.0012	***	-0.0003		0.0008	***

Notes: This table presents mean values for the measure of market quality for banned and control stocks across four different periods: (1) *Pre-Crash* (January 1 to February 19), (2) *Crash* (February 20 to March 17), (3) *Short-Selling Ban* (March 18 to May 18) and (4) *Post-Ban* (May 19 to June 30). We use daily stock data of the *largest 800 stocks* by year-end 2019 market capitalization from 10 European countries over the period from January 2 to June 30, 2020 (**Table 2**). All variables are defined in **Table 3**. **, *** indicate significance at the 0.05 and 0.01 level, respectively.

Table 7: Effects of Short-Selling Bans on Market Quality – Major Stock Indices

Panel A: Overall Sample

	I	II	III	IV
Dependent variable:	Spread 10k	Turnover	Price Range	Volatility
BAN	**0.1513*** [6.46]**	**-0.2920*** [-7.66]**	**0.0113*** [5.59]**	**0.0183*** [9.71]**
MKTCAP	-0.0000*** [-3.95]	-0.0000*** [-4.50]	-0.0000*** [-7.71]	-0.0000*** [-8.83]
EVOL	0.0000*** [3.91]	0.0000*** [13.61]	0.0000*** [9.44]	0.0000*** [3.38]
VWAP	-0.0011*** [-3.74]	-0.0006* [-1.80]	-0.0001** [-2.43]	-0.0001** [-2.19]
VOLA	14.9598*** [18.74]	11.3323*** [11.18]		
Stock FE	yes	yes	yes	yes
Adjusted R^2	0.9195	0.8015	0.3343	0.4749
Observations	29660	32252	32252	32252

Panel B: Large versus Small Markets

	I	II	III	IV
Dependent variable:	Spread 10k	Turnover	Price Range	Volatility
BAN	**0.2178*** [5.60]**	**-0.1700*** [-3.75]**	**0.0044*** [4.51]**	**0.0029** [2.47]**
SMALL	**0.2510*** [3.58]**	**-0.2625*** [-4.30]**	-0.0008 [-1.00]	-0.0009 [-1.33]
BAN * SMALL	**0.4415*** [5.09]**	**-0.4945*** [-5.92]**	0.0017 [1.20]	0.0023 [1.61]
MKTCAP	-0.0000*** [-3.91]	-0.0000*** [-14.90]	-0.0000*** [-7.94]	-0.0000*** [-7.20]
EVOL	-0.0000*** [-7.26]	0.0000*** [13.12]	0.0000*** [5.20]	0.0000*** [3.36]
VWAP	-0.0001 [-1.87]	0.0001 [1.26]	-0.0000*** [-4.05]	-0.0000*** [-4.60]
VOLA	3.4319 [1.67]	14.9345*** [7.29]		
Time FE	yes	yes	yes	yes
Adjusted R^2	0.5439	0.4672	0.5358	0.6842
Observations	29660	32252	32252	32252

Notes: This table presents the results of fixed-effects panel regressions with measures of market quality as the dependent variables. We use daily data of the *leading stock indices* from 12 European countries over the period from 2 January 2020 to 30 June 2020 (**Table 2**). Panel A reports the results for the baseline model and Panel B controls for the market size based on total market capitalization at the end of 2019. We use the natural logarithm of the dependent variables, except for *Volatility*. All variables are defined in **Table 3**. The panel regressions include stock-fixed effects. We report t-statistics based on robust standard errors clustered at firm-level and time-level in parentheses (Thompson, 2011). **, *** indicate significance at the 0.05 and 0.01 level, respectively.

Table 8: Effects of Short-Selling Bans on Market Quality – Largest 800 Stocks

Panel A: Overall Sample

	I	**II**	**III**	**IV**
Dependent variable:	Spread 10k	Turnover	Price Range	Volatility
BAN	**0.2137*** [8.69]**	**-0.3571*** [-9.20]**	**0.0107*** [4.97]**	**0.0171*** [10.39]**
MKTCAP	-0.0000*** [-3.59]	-0.0000*** [-5.57]	-0.0000*** [-5.56]	-0.0000*** [-6.49]
EVOL	0.0000*** [3.70]	0.0000*** [13.51]	0.0000*** [10.07]	0.0000*** [3.24]
VWAP	-0.0004*** [-4.75]	-0.0003*** [-3.73]	-0.0001*** [-7.46]	-0.0000*** [-6.50]
VOLA	14.1902*** [18.06]	10.5801*** [10.25]		
Stock FE	yes	yes	yes	yes
Adjusted R^2	0.9293	0.800	0.2794	0.4418
Observations	65703	74608	74608	74608

Panel B: Large versus Small Markets

	I	**II**	**III**	**IV**
Dependent variable:	Spread 10k	Turnover	Price Range	Volatility
BAN	**0.5154*** [8.41]**	**-0.3329*** [-4.58]**	0.0000 [-0.02]	-0.0004 [-0.46]
SMALL	0.0044 [0.06]	0.0499 [0.65]	**-0.0032*** [-4.50]**	-0.0004 [-0.68]
BAN * SMALL	**0.2896*** [3.56]**	**-0.3980*** [-4.10]**	-0.0017 [-1.31]	-0.002 [-1.62]
MKTCAP	-0.0000*** [-3.55]	-0.0000*** [-6.05]	-0.0000*** [-5.65]	-0.0000*** [-5.22]
EVOL	-0.0000*** [-7.55]	0.0000*** [10.21]	0.0000*** [3.11]	0.0000** [2.42]
VWAP	-0.0001 [-1.61]	0 [1.49]	-0.0000** [-2.34]	-0.0000* [-1.72]
VOLA	-2.5383 [-1.23]	23.1909*** [9.32]		
Time FE	yes	yes	yes	yes
Adjusted R^2	0.3536	0.2683	0.395	0.5407
Observations	65704	74609	74609	74609

Panel C: Market Cap Quartile Dummies

	I	II	III	IV
Dependent variable:	Spread 10k	Turnover	Price Range	Volatility
BAN	**0.3883*** [6.38]**	0.0131 [0.15]	**0.0032*** [2.73]**	0.0017 [1.43]
Q1	**1.5854*** [16.12]**	-0.1734 [-1.60]	**0.0032*** [2.75]**	**0.0017** [1.99]**
Q2	**0.7732*** [10.15]**	0.138 [1.44]	0.0012 [1.05]	-0.0003 [-0.30]
Q3	**0.3689*** [5.47]**	**0.2101** [2.30]**	0.001 [0.93]	0.0002 [0.21]
BAN * Q1	0.1279 [1.37]	**-0.6749*** [-5.15]**	**-0.0070*** [-4.29]**	**-0.0050*** [-3.50]**
BAN * Q2	**0.2753*** [3.52]**	**-0.5054*** [-4.89]**	-0.0027 [-1.94]	**-0.0031** [-2.34]**
BAN * Q3	**0.1969** [2.59]**	**-0.5680*** [-4.85]**	**-0.0036** [-2.43]**	-0.0018 [-1.34]
Controls	yes	yes	yes	yes
Time FE	yes	yes	yes	yes
Adjusted R^2	0.567	0.2857	0.3934	0.5432
Observations	65704	74609	74609	74609

Panel D: Quartile Subsamples based on Year-End 2019 Market Cap

Short Selling Ban (BAN) Coefficients					
		I	**II**	**III**	**IV**
Dependent variable:	*n*	Spread 10k	Turnover	Price Range	Volatility
Quartile 4	16,697	**0.1874*** [5.22]**	**-0.2561*** [-6.31]**	**0.0117*** [5.10]**	**0.0168*** [8.55]**
Quartile 3	18,881	**0.1813*** [5.29]**	**-0.2837*** [-5.93]**	**0.0083*** [3.71]**	**0.0153*** [8.72]**
Quartile 2	20,017	**0.2760*** [9.05]**	**-0.3574*** [-7.20]**	**0.0106*** [4.88]**	**0.0158*** [9.83]**
Quartile 1	19,013	**0.2010*** [6.66]**	**-0.3862*** [-6.38]**	**0.0080*** [3.74]**	**0.0158*** [9.53]**
Controls		yes	yes	yes	yes
Stock FE		yes	yes	yes	yes

Notes: This table presents the results of fixed-effects panel regressions with measures of market quality as the dependent variables. We use daily data of the *largest 800 stocks* from 10 European countries over the period from 2 January to 30 June 2020 (**Table 2**). Panel A reports the results for the baseline model, Panel B controls for the market size (*SMALL*), Panel C incorporates the quartiles dummies for firm size (*Q1-Q3*) with the largest quartile as reference, and Panel D uses subsamples for each quartile. The market and quartile dummies are based on total market capitalization at the end of 2019. We use the natural logarithm of the dependent variables, except for *Volatility*. All variables are defined in **Table 3**. The regressions are estimated using stock-fixed effects in Panel A and D and calendar day dummies to avoid perfect collinearity with the size dummies in Panel B and C. We report t-statistics based on robust standard errors clustered at firm-level and time-level in parentheses (Thompson, 2011). **, *** indicate significance at the 0.05 and 0.01 level, respectively.

Table 9: Determinants of the Short-Selling Ban Decision

Panel A: Annual Data, 2004-2019

	I	II	III	IV	V
Dependent variable:	BAN	BAN	BAN	BAN	BAN
GDP Growth (ln)	-0.1729	-0.5009	-0.3033	0.6544*	-0.3517
	[-0.30]	[-1.40]	[-0.83]	[1.70]	[-1.00]
Inflation	**4.0901*** **	**1.4826*** **	**1.0635*** **	**4.2974*** **	**1.5888*** **
	[3.14]	**[3.05]**	**[3.02]**	**[2.94]**	**[3.04]**
Unemployment	**0.9960*** **	**0.2509*** **	0.1289*	**0.9536*** **	0.1526*
	[3.90]	**[3.71]**	[1.72]	**[3.63]**	[1.95]
Current Account		0.0424			0.1008*
		[0.77]			[1.70]
Government Debt		**0.0506*** **			**0.0342** **
		[4.13]			**[2.11]**
Stock Market Turnover	**-0.0416*** **			**-0.0608*** **	
	[-3.35]			**[-2.86]**	
Private Credit	**-0.1335*** **			**-0.1467*** **	
	[-3.23]			**[-2.87]**	
Institutional Quality			**-3.1151*** **	**-4.8328** **	-2.3931*
			[-3.03]	**[-2.19]**	
Time FE	*yes*	*yes*	*yes*	*yes*	*yes*
Obs.	117	157	146	112	145

Panel B: Daily Data, 1 January 2020 to 17 March 2020

	I	II	III	IV	V
Dependent variable:	BAN	BAN	BAN	BAN	BAN
Sovereign 5Y CDS Spread	**0.0469*** **	**0.0474*** **	**0.0323*** **	**0.0553*** **	**0.0481*** **
	[11.44]	**[11.89]**	**[6.00]**	**[12.44]**	**[7.15]**
Stringency Index	**0.0925*** **	**0.0917*** **	**0.0570*** **	**0.1100*** **	**0.0655*** **
	[6.81]	**[6.82]**	**[4.06]**	**[7.18]**	**[3.02]**
VIX	-0.0485				
	[-0.75]				
TED Spread	-0.064				
	[-1.28]				
Oil Price	0.0105	-2.436			-4.0254
	[0.11]	[-1.47]			[-1.37]
VSTOXX		-1.4482			-2.2766
		[-1.54]			[-1.35]
Eurozone TED Spread		1.3981*			2.0227
		[1.66]			[1.49]
Systemic Stress Indicator			**-12.9087*** **		**-14.5110** **
			[-3.09]		**[-2.46]**
Covid-19 Death (% pop)				**5.9490*** **	8.0786*
				[2.72]	[1.85]
Time FE	*yes*	*yes*	*yes*	*yes*	*yes*
Obs.	624	660	495	614	451

Notes: This table presents the results of logit regressions on imposing a short-selling ban in 2020 as dependent variable. We use data from 12 European countries (**Table 2**). All variables are defined in **Table 3**.The regressions include time fixed effects and t-statistics based on robust standard errors in parentheses. *, **, *** indicate significance at the 0.10, 0.05 and 0.01 level, respectively.

Table 10: Exchange Trading Rules and Enforcement Indices

Indices	**Insider Trading Rules**		**Market Manipulation Rules**		**Private Enforcement**		**Public Enforcement**		**Rule of Law**		**Efficiency of the Judiciary**	
Countries	Ban	No-Ban	Ban	No-Ban	Ban	No-Ban	Ban	No-Ban	Ban	No-Ban	Ban	No-Ban
Mean	2.8	3.5	12.2	12.3	3.00	3.33	0.58	0.63	1.02	1.66	7.83	9.08
Standard deviation	0.8	1.0	0.4	0.5	1.14	0.93	0.38	0.49	0.67	0.29	1.41	1.80
Median	3.0	3.0	12.0	12.0	2.75	3.25	0.50	0.88	1.17	1.71	7.50	10.00
Minimum	2.0	3.0	12.0	12.0	2.00	2.50	0.00	0.00	0.20	1.14	6.25	5.50
Maximum	4.0	5.0	13.0	13.0	5.00	5.00	1.00	1.00	1.88	1.91	9.50	10.00
Ban versus No-Ban												
Diff. in means	-0.70		-0.05		-0.33		-0.04		**-0.64****		-1.25	
Diff. in medians	0.00		0.00		-0.50		-0.38		**-0.54***		-2.50	
No. of countries	5	4	5	4	6	6	6	6	6	6	6	6

Notes: This table presents the index values for the trading rules, enforcement, rule of law and efficiency of the judiciary. We use data from 12 European countries (**Table 2**). All variables are defined in **Table 3**.. *, **, *** indicate significance at the 0.10, 0.05 and 0.01 level, respectively.

Table 11: Reported Net Short Positions in Europe

Country	Pre-Crash		Crash		Ban		Post-Ban	
	#	%	#	%	#	%	#	%
Ban Countries								
Austria	0.7	0.91	2.9	0.84	0.4	0.83	0.7	1.03
Belgium	1.7	0.94	2.3	0.81	0.4	1.36	1.3	0.90
France	12.9	0.96	26.9	0.85	5.8	0.77	3.9	0.88
Greece	0.2	1.13	0.1	1.47	0.1	1.34	0.2	1.34
Italy	6.0	0.96	11.1	0.78	3.2	0.76	6.6	0.81
Spain	2.8	0.77	5.0	0.71	1.1	0.72	2.3	0.69
No-Ban Countries								
Denmark	2.9	0.98	5.2	1.00	3.4	1.07	1.8	0.88
Finland	4.3	0.88	4.9	1.10	5.9	0.96	4.8	1.10
Germany	18.4	1.09	31.2	1.06	21.0	1.05	19.3	1.04
Ireland	0.0	0.60	0.3	0.58	0.6	0.77	0.5	0.90
Netherlands	12.1	1.02	20.3	0.95	13.2	1.04	9.8	1.06
Norway	0.1	0.00	0.1	0.00	0.2	0.39	0.9	1.09
Poland	0.2	0.61	0.6	0.65	0.7	0.76	0.5	0.65
Sweden	9.7	0.87	20.3	0.97	15.5	0.91	13.4	0.88
UK	33.1	0.98	65.9	0.91	54.0	0.90	38.3	0.92
All Countries	105.2	0.98	197.3	0.93	125.6	0.94	104.3	0.94
Ban Countries	24.3	0.94	48.4	0.82	11.1	0.80	15.0	0.84
No-Ban Countries	80.9	0.99	148.9	0.96	114.6	0.95	89.3	0.96

Notes: These tables present the average number of reported net short positions and their average value for different countries and periods in Europe. The value of the short position is defined as number of shorted stocks divided by the issuer's total shares outstanding. We distinguish between countries with and without a short-selling ban in 2020. The sample period spans from 1 January 2020 to 30 June 2020. The individual market phases comprise the following periods: (1) *Pre-Crash* (1 January to 19 February), (2) *Crash* (20 February to 17 March), (3) *Short-Selling Ban* (18 March to 18 May), and (4) *Post-Ban* (19 May to 30 June).

Table 12: Systemic Stress during the Covid-19 Crisis

Composite Indicator of Systemic Stress (CISS) around the Crash and Short-Selling Ban

Country	Stocks from Ban Countries				Differences between Periods			
	Pre-Crash (1)	Crash (2)	Ban (3)	Post-Ban (4)	(2) - (1)	(3) - (2)	(3) - (1)	(4) - (3)
Austria	0.01	0.20	0.43	0.24	0.19 ***	0.23 ***	0.42 ***	-0.19 ***
Belgium	0.01	0.15	0.40	0.17	0.14 ***	0.25 ***	0.39 ***	-0.23 ***
France	0.00	0.14	0.34	0.13	0.13 ***	0.21 ***	0.34 ***	-0.22 ***
Greece	-	-	-	-	-	-	-	-
Italy	0.01	0.22	0.49	0.26	0.22 ***	0.26 ***	0.48 ***	-0.23 ***
Spain	0.00	0.13	0.44	0.22	0.13 ***	0.30 ***	0.44 ***	-0.22 ***
Ban Countries	0.01	0.17	0.42	0.20	0.16 ***	0.25 ***	0.41 ***	-0.22 ***

Country	Control Stocks				Differences between Periods			
	Pre-Crash (1)	Crash (2)	Ban (3)	Post-Ban (4)	(2) - (1)	(3) - (2)	(3) - (1)	(4) - (3)
Germany	0.00	0.19	0.53	0.22	0.18 ***	0.34 ***	0.52 ***	-0.31 ***
Netherlands	0.02	0.19	0.30	0.12	0.16 ***	0.11 ***	0.27 ***	-0.17 ***
Portugal	0.00	0.15	0.42	0.20	0.14 ***	0.28 ***	0.42 ***	-0.22 ***
Sweden	-	-	-	-	-	-	-	-
Switzerland	-	-	-	-	-	-	-	-
United Kingdom	0.01	0.22	0.48	0.27	0.21 ***	0.25 ***	0.46 ***	-0.21 ***
No-Ban Countries	0.01	0.19	0.43	0.20	0.18 ***	0.24 ***	0.42 ***	-0.23 ***
Difference-in-Differences					*-0.014*	*0.006*	*-0.008*	*0.011*

Notes: This table presents the results for analyses on financial stability. It reports the mean values for the Composite Indicator of Systemic Stress (CISS) for banned and control stocks across four different periods: (1) *Pre-Crash* (1 January to 19 February), (2) *Crash* (20 February to 17 March), (3) *Short-Selling Ban* (18 March to 18 May) and (4) *Post-Ban* (19 May to 30 June). We use data from 12 European countries (Table 2). All variables are defined in Table 3. *, **, *** indicate significance at the 0.10, 0.05 and 0.01 level, respectively.