

Bender, Micha; Cestonaro, Tino; Clapham, Benjamin; Gomber, Peter

Article — Published Version

A long-term analysis of research unbundling: implications for research provision and market quality

Journal of Business Economics

Provided in Cooperation with:

Springer Nature

Suggested Citation: Bender, Micha; Cestonaro, Tino; Clapham, Benjamin; Gomber, Peter (2024) : A long-term analysis of research unbundling: implications for research provision and market quality, Journal of Business Economics, ISSN 1861-8928, Springer, Berlin, Heidelberg, Vol. 95, Iss. 2, pp. 333-384,
<https://doi.org/10.1007/s11573-024-01205-8>

This Version is available at:

<https://hdl.handle.net/10419/323463>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<http://creativecommons.org/licenses/by/4.0/>



A long-term analysis of research unbundling: implications for research provision and market quality

Micha Bender¹ · Tino Cestonaro¹ · Benjamin Clapham¹ · Peter Gomber¹

Accepted: 16 July 2024 / Published online: 14 October 2024
© The Author(s) 2024

Abstract

This replication study assesses the long-term effects of MiFID II's research unbundling rules on investment research provision and stock market quality. We extend existing studies by utilizing a post-event period exceeding five years, by regional differentiation within Europe, and by incorporating the new option to rebundle payments for order execution and research services for SMEs. In line with existing studies, we find a decrease in analyst coverage after MiFID II, particularly for large caps, while SMEs remain unaffected. These findings are consistent across different European regions but not for the United Kingdom. Market quality experiences a decline, with lower trading volume and increased volatility, offset by liquidity improvements for larger firms. After the introduction of rebundling, which has not been analyzed by existing studies, SME research coverage declines, suggesting that investment firms are not utilizing this option. Our findings offer insights for evidence-based policy-making as regulatory discussions on research unbundling persist in different jurisdictions.

Keywords Research unbundling · Analyst reports · Information efficiency · Stock market quality

We gratefully acknowledge research support from the Frankfurt Institute for Risk Management and Regulation (FIRM) and “efl - the Data Science Institute”.

✉ Peter Gomber
gomber@wiwi.uni-frankfurt.de

Micha Bender
bender@wiwi.uni-frankfurt.de

Tino Cestonaro
cestonaro@wiwi.uni-frankfurt.de

Benjamin Clapham
clapham@wiwi.uni-frankfurt.de

¹ Goethe University Frankfurt, Theodor-W.-Adorno-Platz 4, Frankfurt 60323, Germany

JEL Classification G10 · G14 · G15

1 Introduction

Investment research provided by sell-side analysts, i.e., banks and brokerage houses, is a central source of information in financial markets. Analyst reports about listed companies support informed trading decisions, efficient market prices, and investors' attention towards a company. Until the beginning of 2018, it was common practice for sell-side institutions across the globe to provide investment research bundled with order execution. Thus, execution commissions also covered the costs of analyst research services without separate remuneration by buy-side customers. Consequently, buy-side market participants, such as investment managers, did not directly bear the costs of research services. Instead, they passed on these expenses to fund investors, as order execution fees diminish the overall performance of investors' funds.

Academic research (see, e.g., Bender et al. (2021b) for an overview) and regulatory discussions (e.g., Myners 2001) pointed to several economic problems associated with the bundling of commissions for research and order execution. Research bundling may lead to agency conflicts between fund managers and investors, hidden administrative costs for fund investors, unnecessary rebalancing of portfolios to obtain analyst reports, failure to achieve best execution, and an overproduction of research.

With MiFID II (European Commission 2014), the European legislator banned bundling of order execution and research services to mitigate these problems. Since January 3, 2018, the European financial industry has been required to comply with these “research unbundling” rules. The financial industry raised concerns that the overall research coverage post-MiFID II would decline once investment research has to be paid separately. Critics were concerned that analyst coverage and information production would significantly drop, especially for small and medium-sized enterprises (SMEs), due to investors' limited interest in SMEs and their lower willingness to pay for SME research. Typically, SME research was cross-subsidized by large cap research in the bundled system.

Against this backdrop, several academic studies (Fang et al. 2020; Lang et al. 2024; Guo and Mota 2021; Anselmi and Petrella 2021) used the introduction of MiFID II in January 2018 as a quasi-natural experiment to analyze the effects of research unbundling on research provision, i.e., quantity and quality of analyst reports, and potential further effects on financial markets, such as market liquidity. All studies confirm that after the introduction of MiFID II, research quantity, measured by the number of analysts covering a specific firm, was reduced by 6–10%. Moreover, all studies conclude that research unbundling increased the quality of research indicated by smaller forecast errors. Due to heightened competition, less accurate analysts drop out of the market, and the remaining analysts seem to put significantly more effort in their forecasts to demonstrate their value-add for buy-side institutions.

However, when it comes to differentiating the effects for large companies and SMEs, the studies show contradicting results. Guo and Mota (2021) and Lang et al. (2024) find that the reduction in analyst coverage is mainly observable among firms with high research coverage, i.e., large cap firms. In contrast, Fang et al. (2020) observe that the loss in research coverage is particularly strong for SMEs. The studies also provide different evidence concerning the changes in market liquidity due to MiFID II and its research unbundling, finding either no change (Guo and Mota 2021) or a reduction of liquidity (Fang et al. 2020; Anselmi and Petrella 2021).

As researchers rushed to be the first to publish their results concerning this much-noticed event, the post-event observation period of the aforementioned studies is rather short ranging between one and two years. This short time frame results in (i) time-related limitations. Firstly, the conclusions of existing studies regarding forecasting quality rely solely on one post-observation per firm. This limitation arises because forecast error is measured based on the realization of earnings per share, which are updated on a yearly basis. However, all studies analyzing this variable cover a post-period of less than two years.¹ Secondly, it is possible that more time was needed for sell-side and buy-side institutions to fully adjust their processes and reach a new equilibrium concerning the supply and demand of analyst research in the new unbundling system. The study of Guo and Mota (2021) also explicitly acknowledges the short post-event period as one of its limitations.

Moreover, the existing studies come with (ii) region-related limitations as they consider Europe as a single market and do not investigate whether the impact of research unbundling varies between different regions in Europe. Furthermore, US stocks, which are part of the control group in all studies, suffer from a major disadvantage as several US brokerage firms, which also serve the European buy-side, unbundled research and execution services based on a temporary relief of the SEC. The SEC's "no-action" letter allowed sell-side institutions to receive explicit payments for research services without acting against US law.²

On top of the short post-observation period of existing studies, (iii) significant macroeconomic events in the post-observation period, such as the COVID-19 pandemic, led to major disruptions in European financial markets and potentially also influenced the effects of research unbundling. In addition, (iv) significant regulatory changes were implemented recently in the field of research unbundling: With the European Capital Markets Recovery Package (European Parliament and Council of the European Union 2021), which has to be applied since February 28, 2022, the European regulator partially backtracks on research unbundling rules. This regulatory reform (also called "research rebundling") allows investment firms to rebundle payments for order execution and research services for SMEs with a market capitalization of less than EUR 1 billion. Both events allow the unique opportunity to validate the findings of previous studies

¹ See Tables 8 and 9 in the Appendix.

² The SEC's no-action letter which — in light of MiFID II — permitted brokers to receive separate payments for research without being subjected to regulation as investment advisers expired on July 3, 2023. See, e.g., <https://www.sec.gov/news/statement/uveda-statement-staff-no-action-letter-07-05-2023>.

based on the introduction (January, 3, 2018) and partial withdrawal (February 28, 2022) of the ban of commission bundling. Furthermore, the option to rebundle SME research enables us to be the first study that empirically examines a hybrid solution, so-called mixed bundling, in which research and execution services can be obtained as a bundle but also individually, which optimizes welfare according to theoretical literature (e.g., Inderst and Ottaviani 2012).

The differences in results of existing studies, the mentioned (i) time- and (ii) region-related limitations, the (iii) changing macroeconomic environment, and the (iv) partial withdrawal of unbundling rules that enables us to analyze the impact of mixed bundling, motivate the replication and extension of previous studies. Therefore, we replicate four different studies (Fang et al. 2020; Lang et al. 2024; Guo and Mota 2021; Anselmi and Petrella 2021) that examine the impact of MiFID II's research unbundling rules on research provision and stock market quality. As these four studies are highly comparable in terms of research question, study design, and observation period, we focus on the common main findings of these studies instead of replicating only one of them in detail. We base our study on a long-term post-event period of more than five years. We also exploit the option of commission rebundling for SMEs as an additional quasi-natural experiment to investigate the concept of mixed bundling. Furthermore, we provide robustness concerning the effects of research unbundling in different European countries and use Japanese stocks as an alternative control group that does not suffer from a potential bias due to the SEC's no-action letter. Our analysis is based on daily stock market data and monthly earnings per share (EPS) estimates for more than 6500 stocks (both large caps and SMEs) traded on European, US, Canadian, and Japanese markets from January 1, 2014, to September 30, 2023. We run several difference-in-difference (DiD) regressions exploiting the two main regulatory events in our observation period, i.e., the introduction of research unbundling in 2018 and the option to rebundle research and execution services for SMEs in 2022.

We expect that our results may differ from those of existing studies along three dimensions: First, the consolidation in the market for investment research could have progressed within the longer post-event period analyzed in this study, potentially resulting in the elimination of more redundant research from the market. Therefore, we expect that the reduction in research quantity should be even more pronounced compared to previous findings and that research quality should improve even more or at least similarly. Second, it remains unclear whether the regulation leads to similar outcomes in each region. We know from previous literature that the impact of MiFID I on financial markets differed across EU countries (e.g., Aghanya et al. 2020). Especially, the research market in the United Kingdom (UK) is likely to evolve differently due to changes triggered by Brexit. In light of the planned reversal of the ban of research bundling in the UK (Financial Conduct Authority 2021), the pressure for further consolidation in analyst research might be lower compared to other European regions, resulting in lower reductions in analyst coverage. Third, it remains uncertain whether the rebundling option for European SMEs will affect research provision for SMEs and market quality of their stocks because of two opposing effects: On the one hand, theory suggests that mixed-bundling solutions are optimal from a welfare perspective. On the other hand, industry experts questioned whether brokers will actually make use of the rebundling option due to associated costs that come with process differentiation and the

necessity of tracking firms' categorization as SMEs (or non-SMEs) given their continuously changing market capitalization (Bender et al. 2021a).

Our results support these expectations to a large degree. We confirm the results of previous studies that research quantity decreases after the MiFID II introduction in 2018 while research quality in terms of the average forecast accuracy improves. Our results (reduction in the number of analysts per company by 8.9%) are at the upper boundary of previous results. We find robust evidence that this change in research provision exists for large companies, while research quantity and quality for SMEs remain largely unaffected, except for an increase in forecast dispersion. We also find that these results hold for most European regions. Only for the UK, we do not find a decrease in research quantity, as identified in previous studies, which is in line with our expectations. In fact, we find an increase in the number of analysts for the average SME in the UK. Concerning the effects of commission rebundling for European SMEs in February, 2022, our findings suggest that the average number of analysts does not change. However, SMEs exhibit a significant decrease in overall coverage.

With respect to market quality, our results indicate adverse effects on volatility and trading activity after MiFID II overall. Regarding liquidity, we observe an improvement, especially of larger companies where bid-ask spreads and Amihud measures decrease. This finding contradicts the results of previous studies (Fang et al. 2020; Anselmi and Petrella 2021). We partly attribute the difference in conclusions to the usage of a longer time period in our study.

Overall, our study addresses the time- and region-related limitations of existing research unbundling studies. Our findings are of high value for future evidence-based policy making as the European Commission currently plans to change the rules for research unbundling again.³ In parallel, on the other side of the Atlantic, the SEC is in a heated debate with the market on how to regulate the payment of brokers' research services in the future.⁴

The remainder of the study is organized as follows. Section 2 shortly describes the regulatory background and systematically discusses the existing studies on the impact of MiFID II's research unbundling rules. Data and research methodology are introduced in Sect. 3. Section 4 presents the results of our analysis and compares them to the findings of previous studies. Finally, Sect. 5 concludes.

2 Regulatory background and literature review

The bundling of order execution and supplementary services, such as research, has been a traditional method for brokers to compete for customers.⁵ However, the practice of offering bundled services without explicit payment has given rise to

³ See, e.g., <https://www.ifre.com/story/3660923/eu-plans-to-roll-back-key-mifid-ii-unbundling-reforms-rpp7c9lbzd> for the current discussion on research (un)bundling in Europe.

⁴ See, e.g., <https://www.bestexecution.net/the-secs-unbundling-nightmare-the-most-unpredictable-situation-since-2016/> for the discussions in the US.

⁵ An in-depth exploration of research (un)bundling and soft-commission payments is provided by Bender et al. (2021b).

agency conflicts (e.g., Bogle 2009; Haslem 2011) as investment managers might opt for more expensive brokers and engage in excessive trading to access additional research services. As a result, investment managers do not directly bear the costs of these services but pass them on to end-investors through diminished fund performance. To eliminate the disadvantages of bundling research provision with fees for order execution, research bundling was prohibited by MiFID II in the EU.

Opponents of research unbundling argue that – without cheap research through research bundling – investment managers consume less research than welfare-optimal (Johnsen 1999; Tittsworth and Edelstein 2004) and thereby negatively impact end-investors due to lower fund performance and increased information asymmetry which may harm market quality. Furthermore, especially SME research might suffer, affecting financing conditions of these firms and undermining efforts like the Capital Markets Union (European Commission 2020).

Against this backdrop, various studies analyze the effects of MiFID II's research unbundling. These studies focus on the quantity and quality of research (Fang et al. 2020; Lang et al. 2024; Guo and Mota 2021; Anselmi and Petrella 2021) and consistently find that fewer research analysts cover a firm after application of MiFID II. Lang et al. (2024) argue that this reduction is mainly prevalent for firms that are larger, older, less volatile and with greater coverage and more accurate forecasts. Further analyses support the finding that the decrease in the number of analysts (research quantity) is concentrated in larger firms and is less observable for SMEs (Guo and Mota 2021; Anselmi and Petrella 2021). However, research quality in terms of forecast accuracy improves due to the new unbundling rules (Fang et al. 2020; Lang et al. 2024; Guo and Mota 2021). Guo and Mota (2021) argue that the improvements in research quality are likely due to inaccurate analysts dropping out of the market, whereas those analysts who stay produce more accurate and valuable research. Their analysis does not show differences between SMEs and larger firms with respect to changes in research quality.

Changes in quality and quantity of research are also likely to influence stock market quality since research helps to reduce information asymmetries and associated costs for liquidity providers (Madureira and Underwood 2008). In this regard, Fang et al. (2020) apply a DiD approach and analyze stock liquidity on firm-level using bid-ask spreads and the Amihud ratio. They find lower liquidity in the European market after the introduction of research unbundling compared to their reference group (US and Canada). Anselmi and Petrella (2021) also analyze market liquidity and control for market capitalization. They find increasing bid-ask spreads for the European market after the introduction of research unbundling. Nevertheless, when splitting up their sample in subsamples of different company size, they do not find any significant changes in bid-ask spreads for all subsamples. Guo and Mota (2021) also find no change in stock market quality after MiFID II.

In order to derive a framework for our replication study on the effect of MiFID II's research unbundling, we structure the four existing studies based on their research design (see Table 8) and findings (see Table 9). Table 9 shows that although the existing studies identify similar effects of MiFID II on research quantity and quality, the effects on stock market quality vary across the studies. Moreover, the studies do not show a consistent picture regarding the effects for firms with

small market capitalization. Therefore, our replication study aims to clarify whether there are economically relevant effects resulting from the MiFID II regulation that influence research provision and stock market quality.

In order to analyze whether the impact of MiFID II and its research unbundling rules differs between larger and smaller firms in terms of market capitalization, we differentiate between SMEs and non-SMEs (in the following the terms “non-SME” and “large caps” are used interchangeably). Moreover, we are the first to consider potential effects of the COVID-19 pandemic and the rebundling option for SMEs introduced by the European Capital Markets Recovery Package. To understand differences in the results of previous studies, we estimate various DiD models varying time- and region-related specifications.

3 Data and methodology

3.1 Data

To analyze the effects of MiFID II’s research unbundling and the rebundling option for SMEs introduced by the Capital Markets Recovery Package (hereinafter referred to as Recovery Package), we collect daily stock market data from Datastream, monthly earnings per share (EPS) estimates from I/B/E/S, and yearly accounting data from Worldscope.⁶ Our sample consists of 19,173 stocks listed and traded on major European, North-American (i.e., US and Canada), and Japanese markets from January 1, 2014, to September 30, 2023. Specifically, our analysis is based on 7875 stocks listed on exchanges in countries of the European Economic Area (EEA) and the UK.⁷ Additionally, we incorporate 7103 stocks from the US and Canada that serve as the control group. As an alternative control group, we further include 4195 Japanese stocks in our sample. We also consider stocks that were delisted or newly listed during our observation period to mitigate a survivorship bias. To simplify our analysis, we convert all variables expressed in non-EUR currencies to EUR using the corresponding exchange rate of the day when the respective variable is measured.⁸

To ensure data quality and to only include relevant stocks in the final sample, we apply several standard and case-specific filtering steps. Similar steps are also applied in previous studies (e.g., Fang et al. 2020; Guo and Mota 2021). First, firms in our sample need to be publicly traded both before and after the introduction of MiFID II

⁶ Due to data restrictions, the Japanese stock market data is only available on a weekly basis.

⁷ The EEA comprises the 27 EU members plus Iceland, Liechtenstein, and Norway. Up to January 2020, the UK was also part of the EEA due to its EU membership. Nevertheless, we include UK stocks in the whole observation period since the MiFID II unbundling rules are still in place in the UK during our entire observation period.

⁸ Currency conversion does not affect our results as the vast majority of analyzed variables are either non-currency denoted (e.g., number of analysts) or based on ratios (e.g., forecast error), where both the nominator and the denominator undergo conversion. This renders ratios insensitive to currency conversion. As a robustness check, we run our analyses without currency conversion and obtain highly similar results.

so that a potential impact of MiFID II can be observed by comparing the pre- and post-event period. Consequently, we exclude all stocks that were delisted prior to January 3, 2018, and all stocks that went public after January 3, 2018. Second, we do not consider firms that were never covered by an analyst during our entire observation period because these companies are not affected by a potential change in research supply. To mitigate the impact of penny stocks and very small firms, whose reported numbers may suffer from poor data quality, we drop firms that once had a stock price below EUR 1 or total assets below EUR 10 million during the sample period.⁹ Moreover, we exclude firms with a negative book value during the sample period which indicates potential data issues.¹⁰ All filtering steps and the corresponding number of dropped companies are displayed in Table 1. After filtering according to these criteria, our sample consists of 2236 European, 2393 North American, and 1963 Japanese firms.

In our analysis, we are interested in the effects of MiFID II and of the Recovery Package on research and market quality, particularly for SMEs. When analyzing the effect of these two events on SMEs, we adhere to the SME definition of the Recovery Package. There, SMEs are defined as those firms whose market capitalization did not exceed EUR 1 billion at the end of the last three previous years (European Parliament and Council of the European Union 2021). As a result, in our analysis of the impact of MiFID II (to be applied since January 2018), we define SMEs as firms whose market capitalization did not exceed EUR 1 billion at the end of the years 2015, 2016, and 2017. When analyzing the impact of the Recovery Package (live from February 2022), we apply the same principle and use 2019, 2020, and 2021 as reference years. Based on the SME definition using the pre-MiFID II years, our sample consists of 3362 SME firms. Thereof are 1248 European, 857 North American and 1257 Japanese SMEs. In detail, Tables 10 and 14 in the Appendix show the distribution of the firms and the share of SMEs across the different countries and regions covered in this study, respectively.

We examine a variety of variables measuring the quantity and quality of research and different aspects of stock market quality such as stock price liquidity, volatility, and trading activity. Table 11 in the Appendix provides a detailed overview on the data sources and the construction of all variables.

As a proxy for research quantity, we rely on the number of unique analysts (#analysts) that provide an EPS forecast for the respective firm and whose forecasts are included in the mean EPS forecast provided by I/B/E/S. In addition, we build a proxy *coverage* that equals one if at least one EPS estimate is available for a specific firm in a given month and zero otherwise. To analyze changes in research quality, we calculate the monthly *forecast error* based on the absolute difference between mean EPS forecast and the actual EPS for the current fiscal year. Moreover, we also

⁹ Note that we use a threshold of EUR 0.1 for firms listed in the UK, since these stocks are priced in pence and the average stock price levels are substantially different from other European equity markets.

¹⁰ There are cases where Worldscope continues to record the information of firms that went into reorganization or stopped trading (see also Guo and Mota 2021). Resulting extreme values could otherwise bias our results if these firms were not dropped from the sample.

rely on the *forecast dispersion*, which is determined by the standard deviation of all EPS estimates.

To analyze whether MiFID II and the Recovery Package led to changes in market quality, we utilize six different measures that capture various aspects of liquidity, volatility, and trading activity. The data is available on a daily basis for European and North American stocks, and on a weekly basis for Japanese stocks. We down-sample all measures to a monthly frequency, aligning them with the frequency of the measures for research quantity and quality. In particular, we analyze changes in liquidity based on the daily *closing spread* and the *Amihud* measure. Both measures are averaged across each month to obtain an end-of-month estimate. Volatility is measured by the standard deviation of daily log returns in a given month (*return volatility*) and by the mean across each month of the daily high price divided by the daily low price (*range volatility*). Finally, we investigate changes in trading activity based on the natural logarithm of the monthly trading volume in EUR (*trading volume*) and the share of zero-trading days in each month (*zero trading days*). As Japanese stock market data is not available on a daily basis, we do not calculate the share of zero-trading days for these stocks.

We winsorize the data at the 1% and 99% level to eliminate outliers.¹¹ The descriptive statistics for each of the dependent variables after winsorizing are shown in Table 12. The means over time for the different variables are also displayed in the Figs. 1 and 2 in the Appendix. The table and figures provide insights about the comparability of the treatment and control group in this study as well as the differences between SMEs and non-SMEs.

As expected, we see that non-SMEs have substantially higher analyst coverage than SMEs. The difference in coverage between EU and North American firms is rather small, while the Japanese firms are covered by fewer analysts on average. Empirically, we find that, on average, European SMEs (non-SMEs) are covered by 2.2 (11.8) analysts, North American SMEs (non-SMEs) by 3.1 (11.0) analysts, and Japanese SMEs (non-SMEs) by 0.9 (7.1) analysts. Moreover, the data indicates that forecast quality is worse for SMEs' earnings relative to non-SMEs' earnings. E.g., in the North American sample, on average the *forecast error* is 2.3% for SMEs and 1.0% for non-SMEs. Regarding market quality, the North American and Japanese markets exhibit higher levels of liquidity than the European markets, especially for SMEs. On average, the *closing spread* for European SMEs (187 bps) is about three to four times larger than the spread for North American SMEs (65 bps) and Japanese SMEs (48 bps). The level of volatility is similar in the three markets. Non-SMEs have a mean *return volatility* of 8.3%, 8.9%, and 7.4%, in European, North American, and Japanese markets, respectively. In terms of trading activity, North American markets dominate European and Japanese markets.

¹¹ We winsorize *closing spread* and *Amihud* at the 2.5 and 97.5 percentile levels because these variables are more often subject to outliers.

Table 1 Filtering steps

Criterion	European firms	North American firms	Japanese firms
Initial data sample	7875	7103	4195
Delisting pre-MiFID II	– 1107	– 1228	– 127
Not listed prior MiFID II	– 537	– 386	– 467
No EPS forecast	– 2309	– 1529	– 1412
Stock price below €1	– 1399	– 1103	– 95
Total assets below €10 mn	– 170	– 117	– 110
Negative book value	– 117	– 347	– 21
Filtered sample	2236	2393	1963

This table shows the number of firms that are removed by each filtering step performed on our initial data sample

3.2 Methodology

In order to analyze the effects of MiFID II and the Recovery Package, we rely on the DiD methodology. The DiD approach is also employed in the studies we replicate (Fang et al. 2020; Anselmi and Petrella 2021; Guo and Mota 2021; Lang et al. 2024). In our study, we specify different DiD models to measure the impacts of both events. In particular, we apply several robustness tests using different subsamples, control groups, and sample periods to test the validity of our results and the findings of previous studies.

The regulatory changes of MiFID II directly affected firms in the EEA prohibiting them to bundle research and execution services, whereas firms outside the EEA still made use of this practice. As a result, all previous studies on MiFID II's research unbundling rules utilized North American stocks in their control group. We follow this procedure and run a pooled OLS regression with firm and time fixed-effects. Only for the dependent variable *coverage*, being either 0 or 1, we estimate a linear probability model. In line with Guo and Mota (2021), we extend the standard DiD setup with an additional (triple) interaction term ($EU \times POST \times SME$) that separates the effects for SMEs from non-SMEs. Consequently, we obtain a more detailed perspective regarding the effect of MiFID II and our results do not depend on the share of SMEs in our sample. As mentioned before, we define SMEs based on the end of year market capitalization values of the previous three years before the introduction of MiFID II. With small variations in the control variables, we run the following regression analysis separately for each of our dependent variables:

$$Y_{i,t} = \beta_1(EU_i \times POST_t) + \beta_2(POST_t \times SME_i) + \beta_3(EU_i \times POST_t \times SME_i) + \delta' \mathbf{X}_{i,t} + \nu_i + \nu_t + \epsilon_{i,t} \quad (1)$$

$Y_{i,t}$ stands for the different dependent variables measuring research quantity, research quality, and stock market quality. Moreover, i denotes the respective firm and t the observed year-month. EU and SME are dummy variables being one if a firm is

European and an SME, respectively. The dummy variable *POST* takes a value of one if the observation is after January 3, 2018, i.e., after the application of MiFID II, and zero otherwise. $\mathbf{X}_{i,t}$ is a vector of control variables consisting of both firm- and country-level controls. Firm-level controls comprise firm profitability measured by return on assets (*ROA*), company size measured by the natural logarithm of market capitalization (*market cap*), the natural logarithm of the book-to-market ratio (*book-to-market ratio*), and the leverage of a firm measured by the debt-equity-ratio (*leverage ratio*). Moreover, we include stock market-related controls including monthly log-returns (*return*), return volatility as the standard deviation of daily log-returns in a specific month (*return volatility*), and trading activity measured by the natural logarithm of the monthly euro trading volume (*trading volume*). Country-level controls include the country's real GDP growth rate (*GDP*) in which a firm is domiciled and the corresponding unemployment rate (*unemployment*). When analyzing research quality, we additionally control for changes in research quantity by adding the number of analyst reports (*#analysts*) as a control variable to ensure that the results for quality are not biased by mere changes in research quantity. In general, our control variables align with the specifications used in the studies we are replicating. Moreover, variables are dropped from the vector of controls if they are the dependent variable.¹² v_i and v_t represent firm and time fixed-effects, respectively.

By design, β_1 is the estimate of the effect of MiFID II on treated non-SMEs, while β_3 captures the relative difference between treated SMEs and non-SMEs. Thus, the overall effect of MiFID II on treated SMEs consists of the aggregate of β_1 and β_3 . To obtain an estimator and standard error for MiFID II's impact on SMEs, we run the same regression setup but reverse the specifications of the SME dummy (i.e., 1 for non-SMEs and 0 for SMEs). Then, β_1^* measures the overall DiD effect for European SMEs relative to the control group whereas any potential differences between treated non-SMEs and SMEs are captured by β_3^* . We refer to β_1^* as *Total SME effect* and report it in each table to provide an estimator with a standard error for the absolute impact of MiFID II for SMEs.

Even though a North American control group is commonly used to estimate MiFID II's impact on research and market quality, this comes with limitations. Some banks and brokerage houses in the US and Canada with a lot of European customers might also have completely switched to commission unbundling to simplify internal processes. The no-action letter issued by the SEC explicitly granted US companies the right to apply research unbundling. Consequently, listed companies in the US might not be a suitable control group as the treatment also partially applies to them. To tackle this limitation, we estimate further models where Japanese equities serve as an alternative control group.¹³

¹² This applies for the regressions explaining *return volatility*, *trading volume*, and the debt-to-equity ratio (*leverage ratio*). Due to the high correlation, *return volatility* is also excluded as control variable when *range volatility* is the dependent variable.

¹³ We chose Japan as an additional control group due to its lesser integration into the world market. Japan's economic distance should facilitate the analysis of the treatment effect without potential dilution from brokerage firms changing their internal processes due to MiFID II, which might be the case for US or Canadian firms that also serve European customers. Additionally, using Japan as another con-

Moreover, the existing studies rely on a limited sample period, with a post-event period ranging from 1 to 2 years. However, the impact of MiFID II and its research unbundling rules might contribute to the consolidation of the market for sell-side research in the long run, given that bank internal processes usually take some time to evolve. Also, substantial events such as the Brexit or the outbreak of COVID-19 may have also impacted the outcomes of research unbundling. Therefore, we make use of a longer time period that lasts until September 2023. In particular, we estimate our models using different time periods where we also take into account the effects of COVID-19 and the Russian invasion of the Ukraine.

In addition, all existing studies consider the EEA as a unified market. However, in reality, equities markets in the EEA differ significantly as they exhibit varying levels of development and are (partially) subject to different regulations. For instance, Aghanya et al. (2020) show that the impact of MiFID I differed across countries due to country-wise differences in regulatory quality. Consequently, we split the EEA market in subgroups and re-estimate our models to identify differences across European regions.

In addition to addressing the above limitations of existing studies, we expand current research by examining the effects of the Recovery Package and its option of rebundling on research provision and market quality. For this second analysis, we again rely on pooled DiD regressions with firm and time fixed-effects. However, as the option only applies to European SMEs (defined as firms whose market cap does not exceed EUR 1 billion), we change our regression design, and employ a DiD analysis without an additional (triple) interaction. In the DiD regression, we use European SMEs as treatment and European non-SMEs as control group. As a result, both treatment and control group belong to the same economic area and are subject to the same regulations except for the rebundling option. To limit the difference in market capitalization between both groups, we restrict the control group to European non-SMEs with a market capitalization of less than EUR 2 billion at the end of the years 2019, 2020 and 2021. Furthermore, we exclude firms listed in the UK from our sample, since the UK left the EEA on December 31, 2020, and did not adopt the rebundling option of the Recovery Package.¹⁴ We estimate the following model based on a sample period that starts after the introduction of MiFID II (January 3, 2018) and ends 19 months after the application of the Recovery Package (September 30, 2023):

$$Y_{i,t} = \beta_1(SME_i \times POST_t) + \delta'X_{i,t} + \nu_i + \nu_t + \epsilon_{i,t} \quad (2)$$

Again, $Y_{i,t}$ stands for the different dependent variables analyzed in this study, while $X_{i,t}$ describes the same vector of control variables as in Eq. (1). The variable $POST_t$ becomes 1 if the observation occurs after the introduction of the Recovery

Footnote 13 (continued)

trol group enables us to assess the robustness of the study by Anselmi and Petrella (2021), as they also employ Japan as a control group.

¹⁴ In March 2022, the UK implemented its own exemption from research unbundling. The rebundling of payments for execution and research was allowed for firms with a market capitalization of less than GBP 200 million (Financial Conduct Authority 2021).

Package, i.e., February 28, 2022, and 0 otherwise. Consequently, the interaction term $SME_i \times POST_t$ isolates the impact of the rebundling option on European SMEs. Firm and time fixed-effects are described by v_i and v_t , respectively.

We run different robustness tests to ensure the validity of our results. We estimate similar models using three alternative control groups, namely, (i) all European large caps in our sample, (ii) US SMEs, and (iii) Japanese SMEs. To evaluate the potential impact of events such as the COVID-19 outbreak and the Russian invasion of Ukraine, we estimate the models on a subsample period, excluding the year 2020 and the period between January and April 2022 (two months before and after the Russian invasion).¹⁵

4 Empirical results

4.1 Replication of previous research results

In the first part of our analysis, we investigate whether the regulatory changes by MiFID II and its research unbundling rules are negatively impacting the quantity and positively impacting the quality of research as shown by previous research (Guo and Mota 2021; Fang et al. 2020; Anselmi and Petrella 2021; Lang et al. 2024). Furthermore, we analyze whether the impact differs for stocks with different market capitalization.

The DiD regression results concerning the effect of MiFID II on the quantity and quality of research are provided in Table 2. We observe that the number of analysts providing EPS forecasts for non-SME firms affected by MiFID II ($EU \times POST$) significantly decreases by more than one analyst (-1.124), which is a relative decrease of 8.9% compared to the average level in the pre-period for non-SMEs. Based on the 95% confidence interval of the estimated coefficient, the relative decrease in the number of analysts ranges between 7.1% and 10.7%. We refer to Table 9 in the Appendix to compare the strength of the estimated effect between all existing studies. Interestingly, our estimated decrease of 8.9% falls within the upper range of estimates from previous studies, which range from 6.1% to 10.7%. Considering the rather short post-event periods of these studies of one or two years, our estimate does not provide strong evidence supporting the hypothesis of further consolidation in the research market after the initial two years following MiFID II. Instead, the result suggests that consolidation reached an equilibrium that still persists at the end of our sample period, spanning four years after the implementation of MiFID II. With respect to the variation across firm sizes, the equally sized but positive significant triple interaction term (1.161) outweighs the MiFID II effect on #analysts for European firms. This finding is also confirmed by the coefficient that measures the overall *Total SME Effect*, which is not significantly different from zero. Consequently,

¹⁵ The Russian invasion of Ukraine is mostly dated to February 24, 2022. To account for leading and lagging effects of the event, we therefore use a time window that starts just approximately two months before and after the event date.

we do not find evidence that MiFID II affects the quantity of SME research measured by the average number of analysts covering a company.

Research quantity in terms of *coverage*, i.e., whether a firm is covered by at least one analyst, increases significantly due to MiFID II for non-SMEs. However, the absolute effect on SMEs *coverage* is insignificant. Therefore, the coverage of larger firms slightly increases after MiFID II, while it remains unchanged for SMEs.

Investigating the quality of research after the introduction of MiFID II, we observe a significant reduction of the forecast error for non-SMEs due to MiFID II and, hence, an improvement in research quality. On average, MiFID II lead to a significant reduction of the forecast error for European non-SMEs by 0.177 percentage points, which is a decrease of 14.1% relative to the pre-event mean of non-SMEs. The magnitude of the effect in research quality is also in line with related studies (see Table 9 in the Appendix). In general, forecast quality for SMEs in North America and Europe has deteriorated in the post-period (increase in *forecast error* by 0.22 percentage points). In total, we do not find a significant effect of MiFID II on the forecast error of SMEs. Moreover, examining *forecast dispersion* as another measure of research quality, our results show that *forecast dispersion* significantly decreases for European and North-American SMEs post-MiFID II. However, MiFID II significantly increases analysts' forecast dispersion for SMEs both relative to European non-SMEs (by 1.980 percentage points) and relative to North American firms (by 2.174 percentage points) indicating a negative effect of MiFID II on research quality for SMEs.

Overall, we can confirm previous findings that MiFID II leads to a reduction in research quantity and to an improvement of research quality for non-SMEs. This indicates that research unbundling of MiFID II achieve its desired results for non-SMEs by improving the efficiency of the research market for these companies. Reasons for these improvements could be that the reduction in analysts leads to higher competition among the remaining analysts (Guo and Mota 2021) or that buy-side institutions might more critically review the quality of research than they did before MiFID II, which was also confirmed in a recent survey (Bender et al. 2021a). Conversely, we find that MiFID II does not significantly change research quantity and research quality (in terms of forecast error) for SMEs. This result is in line with Guo and Mota (2021) and Lang et al. (2024). In contrast, Fang et al. (2020) observe a more distinct drop in research coverage for smaller firms, whereas Anselmi and Petrella (2021) even find an increase in research quantity for the smallest firms in their sample. These discrepancies can be explained by differences in the definition of small firms among the studies.¹⁶

¹⁶ In our study, SMEs are defined as firms whose market capitalization is below EUR 1 billion at the end of the last three previous years according to the European regulatory definition (European Parliament and Council of the European Union 2021). Guo and Mota (2021) define SMEs as firms whose average market capitalization before MiFID II is below the median while Lang et al. (2024) define SMEs as those in the lowest tertile of market capitalization before MiFID II. As firm size is correlated with analyst coverage, Fang et al. (2020) regress firm size on analyst coverage and then determine small firms as those with residual firm sizes in the first tertile by country-year. Anselmi and Petrella (2021) differentiate between firm sizes using four intervals of market capitalization: micro-cap (less than 300 million EUR), small-cap (between 300 million and 1 billion EUR), mid-cap (between 1 billion and 3.5 billion EUR), and large-cap (greater than 3.5 billion EUR).

Table 2 Regression results for changes in research quantity and quality

	Research quantity		Research quality	
	#Analysts	Coverage	Forecast error	Forecast dispersion
<i>EU × POST</i>	− 1.124*** (0.115)	0.013** (0.005)	− 0.177** (0.072)	0.194 (0.574)
<i>POST × SME</i>	0.110 (0.094)	0.033*** (0.010)	0.220** (0.109)	− 4.827*** (0.733)
<i>EU × POST × SME</i>	1.161*** (0.135)	− 0.032** (0.013)	0.079 (0.157)	1.980** (1.010)
ROA	− 0.021*** (0.003)	− 0.001*** (0.000)	− 0.022*** (0.006)	− 0.091*** (0.030)
Market cap	1.384*** (0.078)	0.058*** (0.007)	− 1.180*** (0.098)	1.639*** (0.544)
Book-to-market	2.359*** (0.206)	0.056*** (0.018)	3.206*** (0.323)	8.424*** (1.474)
Leverage ratio	0.063** (0.030)	0.004* (0.002)	0.302*** (0.037)	1.434*** (0.254)
Return	− 0.010*** (0.000)	0.000*** (0.000)	0.017*** (0.001)	− 0.011* (0.006)
Return volatility	− 0.019*** (0.002)	0.000 (0.000)	0.045*** (0.004)	0.213*** (0.021)
Trading volume	0.440*** (0.036)	0.012*** (0.003)	0.174*** (0.039)	0.989*** (0.258)
GDP	− 0.024*** (0.006)	− 0.002** (0.000)	− 0.032** (0.013)	0.381*** (0.055)
Unemployment	− 0.007 (0.017)	0.006*** (0.002)	− 0.039 (0.028)	− 0.199 (0.140)
#Analysts			− 0.014** (0.006)	0.075 (0.052)
Total SME effect	0.036 (0.072)	− 0.019 (0.013)	− 0.098 (0.140)	2.174*** (0.791)
Observations	372,661	372,661	325,202	295,772
Firm fixed effects	Yes	Yes	Yes	Yes
Year-month fixed effects	Yes	Yes	Yes	Yes
R ²	0.934	0.582	0.437	0.628

This table shows the regression results for changes in research quantity and quality based on the DiD-approach with SME dummies described in Eq. (1). The dependent variables are #analysts and *coverage* measuring research quantity and *forecast error* and *forecast dispersion* measuring research quality. Standard errors are clustered by firm and time (year-month) and provided in parentheses. In the row printed in bold, we provide the overall effect of MiFID II on SMEs based on the same regression but with the SME dummy variable being 1 (instead of 0) for companies larger than EUR 1 billion (i.e., non-SMEs). Here, *Total SME Effect* reports the *EU × POST* coefficient of this regression

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

A possible explanation for the different effect of research unbundling on SMEs and non-SMEs is the more intense competition among analysts covering non-SMEs. While non-SMEs are covered by 11.8 analysts on average before MiFID II, the average SME is only covered by 2.2 analysts. For research quality measured by forecast dispersion, we actually observe that MiFID II reduces research quality of European SMEs leading to a higher dispersion of analyst forecasts. The differences in MiFID II's effect on research quality for SMEs and non-SMEs might result from the different effects of research unbundling on research quantity. While non-SMEs face a reduction in research quantity changing the research providers' incentives to provide better research, the quantity of research on SMEs remained unchanged and, hence, did not change research providers' incentives. Consequently, research unbundling in MiFID II does not improve the research market for SMEs. However, contrary to the fears of many market participants, we do not find evidence for a strong deterioration of the SME research market.

In the second part of our analysis, we examine whether MiFID II and its regulatory changes have an impact on stock market quality. We replicate previous studies investigating the liquidity in terms of bid-ask spreads and Amihud ratio. Additionally, we extend these studies by analyzing MiFID II's impact on market quality regarding volatility and trading activity. Both dimensions may also be subject to substantial changes resulting from changes in research quantity and quality. While liquidity provision can be affected through the asymmetric information channel, also trading activity and volatility depend on the availability and accuracy of information. When less or less-accurate research, i.e., information is available, investors are likely to trade less since there are fewer signals they can react upon. Moreover, a worse level of information increases (price) uncertainty in the market, which can lead to an increase in volatility.

Table 3 shows the DiD regression results regarding the impact of MiFID II on stock market quality. Starting with liquidity as one of the most important dimensions of market quality, we find that MiFID II significantly increases the liquidity of larger European stocks as indicated by the negative and significant $EU \times POST$ coefficients for *closing spread* and *Amihud*. Specifically, our results show that closing spreads of European non-SMEs decrease by 12.03 bps due to MiFID II. However, this positive impact of MiFID II on closing spreads does not hold for SME stocks. As shown by the positive but insignificant total SME effect, closing spreads rather increase than decrease. The *Amihud* measure indicates an increase in liquidity for all MiFID II affected stocks, whether non-SME or SME. Specifically, the Amihud ratio decreases by 0.54 bps for non-SMEs and by 0.58 bps for SMEs, relative to North American firms. Analyzing volatility, we find no (*range volatility*) or only a marginal (*return volatility*) effect of MiFID II on non-SME stocks. However, the triple interaction term again shows that the effect differs for SME stocks. Specifically, upon examining the total effect on SMEs, we find a significant increase in *return volatility* by 0.825 percentage points representing a 10.8% rise compared to the pre-event level, attributed to MiFID II. Similar results are obtained for *range volatility*. Lastly, we investigate the effect of MiFID II on trading activity measured by *trading volume* and the share of trading days where no trade occurs (*share zero trading days*). We find a significant reduction in trading volume of

European SMEs due to MiFID II as shown by the negative and significant *total SME effect* coefficient. The negative effect on trading volume for non-SMEs is weaker (-0.029) and only significant at the 10%-level. The results on the number of zero trading days do not show a significant effect of MiFID II on SMEs but a decrease for non-SMEs (again significant at the 10%-level). Consequently, our results show that MiFID II and its research unbundling rules decrease trading activity in terms of trading volume for European large and small firms, while results for the share of zero trading days are rather insignificant.

Summarizing this second part of our analysis, we show that MiFID II and research unbundling significantly impact stock market quality. In line with improvements in research quality, we find that liquidity of non-SME stocks increases after MiFID II. Thereby, research unbundling seems to improve the information environment for non-SMEs due to more accurate research forecasts, which translates into lower information asymmetry and smaller spreads in accordance with theory. However, these results differ from those of other studies, which either find no effect (Guo and Mota 2021) or a decrease in liquidity for European stocks after the introduction of research unbundling (Fang et al. 2020; Anselmi and Petrella 2021). These studies analyze a rather short post-period of less than two years suggesting that it took longer than this time period for the improved research environment for non-SMEs and other MiFID II-induced changes to translate into improved liquidity. Additionally, the mentioned studies do not explicitly differentiate between SMEs and non-SMEs in their regression analyses. Differentiating for SMEs and non-SMEs in our analysis, we observe unchanged bid-ask spreads and a decrease in the Amihud ratio for SMEs. The insignificant effect of SME liquidity in terms of bid-ask spreads can be explained by the unchanged research environment. However, regarding volatility and trading activity, we find a deterioration in market quality for SME stocks across all measures encompassing these two dimensions of market quality. Again, differences in the effects of MiFID II on research quantity and quality might be the reason for the disparities between SMEs' and non-SMEs' stock market quality. However, since we do not observe any changes in research quantity for SMEs and only a decrease of research quality in terms of *forecast dispersion* (but not in terms of *forecast error*), the negative effects of MiFID II on SME market quality cannot be fully attributed to the new rules on research unbundling. It seems more plausible that other regulatory changes induced by MiFID II, such as alterations in trading obligations, trade reporting, or the double-volume cap mechanism for dark pools, contribute to the decline in market quality of SME stocks. These changes affect stocks of SMEs more than those of non-SMEs due to the already lower levels of liquidity on regulated and alternative trading venues compared to non-SMEs.

In the third part of our analysis, we delve into the differences in research methodologies and setups employed by previous studies. First, the control group comprising US stocks in these studies encounters a limitation. Since US brokerage firms also serve the European buy-side, these firms can opt to unbundle research and execution services, capitalizing on a temporary relief by the SEC. Hence, we check robustness by using Japanese stocks as control group. In addition, we address differences in the observation periods by running two additional robustness checks: (i) we only consider the rather short post-event

Table 3 Regression results for changes in stock market quality

	Liquidity		Volatility		Trading activity	
	Spread	Amihud	Return volatility	Range volatility	Log trading volume	Zero trading days
<i>EU × POST</i>	− 12.033*** (0.924)	− 0.543*** (0.088)	0.159** (0.068)	− 0.000 (0.000)	− 0.029* (0.016)	− 0.160* (0.091)
<i>POST × SME</i>	− 2.009 (1.317)	− 0.297*** (0.064)	− 0.379*** (0.088)	− 0.001*** (0.000)	0.083*** (0.017)	− 0.533*** (0.104)
<i>EU × POST × SME</i>	16.208*** (2.737)	− 0.036 (0.228)	0.666*** (0.120)	0.003*** (0.000)	− 0.179*** (0.026)	− 0.190 (0.302)
ROA	0.036 (0.067)	0.000 (0.005)	− 0.031*** (0.003)	− 0.000*** (0.000)	0.001** (0.001)	0.007 (0.007)
Market cap	− 11.075*** (1.993)	− 0.617*** (0.162)	− 3.283*** (0.082)	− 0.008*** (0.000)	0.946*** (0.015)	− 0.814*** (0.211)
Book-to-market	18.847*** (5.562)	3.130*** (0.569)	1.569*** (0.210)	0.005*** (0.001)	0.132*** (0.042)	− 0.433 (0.591)
Leverage ratio	0.237 (0.483)	0.088** (0.043)	0.177*** (0.027)	0.001*** (0.000)	0.026*** (0.006)	− 0.013 (0.048)
Return	0.112*** (0.013)	− 0.006*** (0.001)	0.014*** (0.001)	0.000*** (0.000)	− 0.002*** (0.000)	− 0.012*** (0.002)
GDP	− 2.112*** (0.255)	− 0.045** (0.022)	− 0.021** (0.009)	− 0.000*** (0.000)	− 0.001 (0.001)	− 0.004 (0.024)
Unemployment	− 0.072 (0.419)	− 0.083 (0.051)	0.336*** (0.019)	0.001*** (0.000)	0.001 (0.004)	0.137*** (0.052)
Return volatility	1.671*** (0.086)	0.078*** (0.009)			0.043*** (0.000)	− 0.111*** (0.011)
Trading volume	− 19.901*** (0.872)	− 1.278*** (0.074)	2.845*** (0.047)	0.006*** (0.000)		− 0.992*** (0.105)

Table 3 (continued)

	Liquidity		Volatility		Trading activity	
	Spread	Amihud	Return volatility	Range volatility	Log trading volume	Zero trading days
Total SME effect	4.175	- 0.579***	0.825***	0.002***	- 0.208***	- 0.349
	(2.599)	(0.206)	(0.100)	(0.000)	(0.020)	(0.291)
Observations	371,766	372,496	372,661	371,908	372,661	371,817
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.854	0.741	0.584	0.724	0.973	0.745

This table shows the regression results for changes in stock market quality based on the DiD-approach with SME dummies described in Eq. (1). The dependent variables are *closing spread* and *amihud* measuring liquidity, *return volatility* and *range volatility* measuring volatility, and *trading volume* and *zero trading days* measuring trading activity. Standard errors are clustered by firm and time (year-month) and provided in parentheses. In the row printed in bold, we provide the overall effect of MiFID II on SMEs based on the same regression but with the SME dummy variable being 1 (instead of 0) for companies larger than EUR 1 billion (i.e., non-SMEs). Here, *Total SME Effect* reports the $EU \times POST$ coefficient of this regression

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

observation period of previous studies (we include observations until May 2019 like Guo and Mota (2021)), and (ii) we control for the market turbulence during the COVID-19 pandemic by excluding the year 2020.

Table 13 in the Appendix shows the DiD regression results for the variations of the standard model. When we focus on the quantity of research, we see that the variations of the control group and observation period confirm a decline in the number of analysts (*#analysts*) for MiFID II affected firms with larger market capitalization. Excluding the COVID-19 period, we find an increase in the number of analysts for SMEs relative to North American firms. Using Japan as control group, we find a significant decline in *coverage* of 0.051 for SMEs relative to North American firms. While the standard model shows a significant increase in coverage for non-SMEs, the variations confirm these findings only when excluding the COVID-19 period. In terms of research quality, the model variations overall confirm a decline of the *forecast error* for larger MiFID II affected firms and an increase in the *forecast dispersion* for SMEs relative to European non-SMEs, when limiting the observation period or excluding the pandemic year.

In terms of market quality, the robustness analyses confirm an improvement in liquidity for larger European firms after MiFID II in terms of a decrease in *closing spread* and *Amihud*. European SMEs show a decrease in the *Amihud* measure, but their liquidity in terms of *closing spread* tends to decrease. This decrease in liquidity becomes significant when using Japanese firms as control group. Analyzing the effect of MiFID II on volatility, the setup variations show consistently an increase in the *return volatility* and *range volatility* for European SMEs relative to European non-SMEs and Japanese firms. Japanese stocks as control group further reveal a significant negative effect on *return volatility* and *range volatility* for European non-SME stocks, which was only partially significant in the standard setup. Finally, the robustness analyses confirm the negative effect of MiFID II on trading activity in terms of *trading volume* for European SMEs. Using Japan as a control group, however, shows an increase in *trading volume* for European non-SMEs indicating an improved trading activity. For *zero trading days* the setup variations show a significant decrease for non-SMEs and, hence, an improved trading activity. The results for European SMEs are mixed.

Overall, the robustness analyses confirm and strengthen most of the findings of the standard setup. Changing the control group to Japanese stocks shows a significant decrease in *coverage* and increase in *closing spread* for European SMEs relative to the control group, which was insignificant in the standard model (using North American firms). In addition, negative effects for *return volatility* and *range volatility* for European non-SMEs relative to Japanese stocks are highly significant. Varying the observation period and excluding the period of the COVID-19 pandemic leads to highly similar results compared to the standard model.

4.2 Region-specific effects of MiFID II

The existing studies on the impact of MiFID II's research unbundling rules consider all affected European countries as a single market. While the analyzed

countries share the same legal framework defined by MiFID II, the different geographic regions in Europe still exhibit relevant differences concerning the general economic positioning, development of the banking sector, level of analyst research, and (global) investors' interest in listed companies on the national exchanges. The analyzed European countries are also influenced by national company- and capital markets-related laws besides the common European regulations. Therefore, companies listed in different European regions might be impacted differently by the new unbundling rules. Consequently, it is worthwhile to investigate the impact of MiFID II separately for different European regions.

In order to analyze potential regional differences, we split our sample of European stocks into five groups according to the country of their primary listing. Specifically, we allocate each country and the corresponding stocks of the treatment sample to one of the following regions: Northern Europe (452 companies), Southern Europe (280), Western Europe (763), Eastern Europe (162), and the UK (579), see Table 14 in the Appendix.¹⁷ We analyze the effects of MiFID II on companies listed in the UK in a separate sample because of the large size of UK's financial market and its strong position within Europe. Moreover, the UK is special due to its withdrawal from the European Union in January 2020 although the MiFID II rules regarding research unbundling remained applicable until the end of our observation period. We then run our standard regression analyses introduced in the previous subsection separately for each region. In all models, we use stocks from the US and Canada as control group and include the full MiFID II observation period from January 2014 to December 2021 to analyze the impact of research unbundling on stocks in the different regions.¹⁸

Table 4 shows the results of the region-related analysis regarding the impact of research unbundling on the quantity and quality of analyst research. As indicated by the negative $EU \times POST$ interaction term, the reduction in the number of analysts per company holds for all analyzed regions in Europe except for the UK, where the effect is not significant. This might explain why Lang et al. (2024) observed the strongest reduction in analyst coverage among all existing studies, as their sample does not include the UK. In all other European regions, the reduction in the number of analyst reports for larger companies can be observed despite relevant economic and geographical differences. The effect is more pronounced in Eastern Europe and less so in Southern Europe, even when controlling for differences in the mean number of analyst estimates per company. This helps to explain why Lang et al. (2024) find a stronger decrease in analyst reports than Guo and Mota (2021) and Anselmi and Petrella (2021) since the latter have no or only a few Eastern European companies in their sample. Also in line with the whole sample, the reduction in analysts

¹⁷ We follow the United Nations geoscheme (United Nations Statistics Division 2023) for grouping the European countries into regions. Northern Europe includes Denmark, Estonia, Finland, Ireland, Latvia, Lithuania, Norway, and Sweden. Southern Europe consists of Croatia, Cyprus, Greece, Italy, Portugal, and Spain. Western Europe covers Austria, Belgium, France, Germany, the Netherlands, and Luxembourg. Eastern Europe includes Bulgaria, Czech Republic, Hungary, Poland, Romania, and Slovenia.

¹⁸ For robustness, we also run the region-related analysis excluding the COVID-19 period, i.e., observations from the year 2020. The untabulated results are qualitatively the same with only slight variations in the size of the coefficients.

applies predominantly to large companies, whereas the number of analysts covering the average SME remains unchanged in most regions after the introduction of research unbundling. For SMEs listed in Eastern Europe or in the UK, even an increase in the number of analysts can be observed. Thus, the effects of research unbundling in the UK stands in contrast to findings of the existing studies on the impact of research unbundling as the regulation did not decrease the number of analyst reports or even increased it for SMEs.

Concerning coverage, the results for the different regions are relatively similar. For three of the five regions, we find a small but statistically significant positive effect of MiFID II on analyst coverage for larger stocks. Again, research quantity improves in the UK along this dimension. Only for Northern and Western Europe, the effect is not significant. On the contrary, research coverage for SMEs does not change except for the UK, where we see a reduction of SMEs being covered by at least one analyst. Consequently, the increase in the number of analysts for UK SMEs only benefits those companies which are already covered. In sum, there are only marginal differences in the effects of research unbundling on research quantity in the different European regions except from the UK. While region-related specifics can explain the different effect sizes found for larger companies, they cannot explain the opposing effects regarding changes in the quantity of SME research as the UK is included in studies with opposing results in this respect (e.g., Fang et al. 2020; Anselmi and Petrella 2021).

With respect to research quality, however, the results of the region-specific analysis also indicate some regional differences. The decrease in forecast error due to MiFID II identified based on the full model is mainly driven by companies from Northern Europe and the UK as indicated by the negative and significant $EU \times POST$ coefficient. However, this coefficient is also negative and of similar size for the other three regions, yet not statistically significant. Only for the UK, a decreasing forecast error is also observable for SMEs. Even larger regional discrepancies can be observed for the dispersion of analyst forecasts. While forecast dispersion in estimates for larger companies decreases for three regions indicating improvements in research quality, it significantly increases for the Western European sample. For Eastern Europe, no significant change is observable. With respect to SMEs, we find an increase in analyst dispersion due to research unbundling for Western Europe whereas the effect is insignificant for all other analyzed regions. Consequently, although the existing studies find similar improvements in research quality based on their individual samples (e.g. Guo and Mota 2021; Fang et al. 2020), our results suggest that there are regional differences concerning the impact of research unbundling on research quality for European companies. While the drivers of these differences between the regions remain unclear and represent a possibility for future research, one has to note that research quality is mainly determined by the analysts' forecast

error and less so by the dispersion of their estimates,¹⁹ where we find opposing effects in the analyzed regions.

We also run the region-specific analysis with respect to MiFID II's impact on stock market quality. The results are provided in Table 5. For larger companies in all regions, we find evidence for an increase in liquidity as shown by a decrease in spreads, which is significant for four out of the five regions. Again, this effect is partially reverted for SME stocks except for those in Northern Europe. Here, SME stocks benefit from increased liquidity, whereas SMEs in the UK and also from Eastern Europe suffer from significantly increased spreads. Consequently, region-related differences do not explain why we find a decrease in closing spreads at least for larger companies after MiFID II while previous studies document an increase in spreads (Fang et al. 2020; Anselmi and Petrella 2021). Based on the liquidity proxy Amihud, the effect is less clear and some variations across the regions are visible. While we find improvements in the Amihud ratio of large companies listed in Northern Europe, Western Europe, and in the UK (in line with Fang et al. 2020), we find no effect for Southern and even a worsening effect for Eastern European companies. We also only document a worsening of liquidity according to the Amihud measure for Eastern European SMEs.

Regarding MiFID II's effect on volatility, we find an increase in return volatility across regions and firm sizes except for UK and Northern European large caps, which is again amplified for SME stocks. The effect on SMEs is less pronounced when looking at the range volatility, where most of the coefficients nevertheless hint into the same direction. Concerning trading activity, we find evidence for a reduction in trading volume across all regions, which is particularly pronounced for large stocks listed in Eastern European countries and SMEs. This is also underscored by the share of trading days with zero volume, which only rises for Eastern European stocks but decreases or remains unaffected in the other regions. All in all, the region-specific analysis shows that there are variations across regions and measurement proxies, which also partially explains differences in the results of existing studies. The UK notably stands out, particularly regarding its deviation from the well-documented effect of research unbundling on the number of analysts for both large companies and SMEs. From a broader perspective, our results highlight the importance of conducting region-specific analyses when assessing financial market regulations with enforcement across multiple countries, such as MiFID II, as these regulations may yield varying impacts in each country or region.

4.3 Impact of the European Capital Markets Recovery Package

With the European Capital Markets Recovery Package (European Parliament and Council of the European Union 2021), effective since February 28, 2022, the

¹⁹ Analyst dispersion decreases when all analysts come to similar estimations (indicating a higher quality/confidence of this signal), but it can also decrease when analysts start copying each other agreeing on potentially completely wrong forecasts (which does not improve the quality and informativeness of the research).

Table 4 Region-specific effects of MiFID II on research provision

Variable	Region	EU x POST	POST x SME	EU x POST x SME	Total SME Effect
#Analysts	Northern Europe	− 1.330***	0.117	1.192***	− 0.138
	Southern Europe	− 0.814***	0.119	0.811***	− 0.003
	Western Europe	− 1.489***	0.109	1.567***	0.078
	Eastern Europe	− 2.315***	0.119	2.523***	0.208*
	United Kingdom	− 0.224	0.123	0.423**	0.199**
<i>Coverage</i>	Northern Europe	0.014	0.033***	− 0.004	0.011
	Southern Europe	0.031**	0.032***	0.002	0.033
	Western Europe	0.000	0.032***	− 0.012	− 0.012
	Eastern Europe	0.072***	0.032***	− 0.121***	− 0.049
	United Kingdom	0.015***	0.032***	− 0.048***	− 0.034**
<i>Forecast error</i>	Northern Europe	− 0.225**	0.214*	0.387	0.163
	Southern Europe	− 0.169	0.217**	0.295	0.125
	Western Europe	− 0.049	0.216**	0.121	0.072
	Eastern Europe	− 0.116	0.215**	0.110	− 0.006
	United Kingdom	− 0.215**	0.216**	− 0.261	− 0.476***
<i>Forecast dispersion</i>	Northern Europe	− 2.543***	− 4.886***	3.452***	0.909
	Southern Europe	− 3.578**	− 4.853***	5.801***	2.223
	Western Europe	4.429***	− 4.794***	− 0.016	4.413***
	Eastern Europe	0.156	− 4.832***	1.837	1.993
	United Kingdom	− 2.235***	− 4.884***	3.093***	0.858

This table shows the results of the region-specific analysis concerning the impact of MiFID II on research quantity and quality based on the regression model shown in Eq. (1). For each analysis, the treatment group only consists of stocks with a primary listing in one of the five regions: Northern Europe, Southern Europe, Western Europe, Eastern Europe, and the United Kingdom. The control group always consists of US and Canadian stocks. The observation period is January 2014 to December 2021. The table only reports the coefficients of interest, i.e., the interaction terms of DiD-analysis, and drops the coefficients of the control variables. The last column provides the overall effect of MiFID II on SMEs based on the same regression but with the SME dummy variable being 1 (instead of 0) for companies larger than EUR 1 billion (i.e., non-SMEs). Here, *Total SME Effect* reports the $EU \times POST$ coefficient of this regression

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

European regulator aims to stimulate the European economy after the COVID-19 crisis. The package includes amendments to MiFID II that are supposed to facilitate the recapitalisation of EU companies, particularly of SMEs. Part of the package is the rebundling of payments for order execution and research services for SMEs with a market capitalization of less than EUR 1 billion.

According to the European Commission, this regulatory reform aims to help increase research on SMEs and improve their access to funding. The regulatory action to rebundle SME research is also supported by theory that argues in favor of an environment where clients can purchase each service separately or bundle order execution and research (Inderst and Ottaviani 2012; Dassiou and Glycopantis 2006).

Table 5 Region-specific effects of MiFID II on stock market quality

Variable	Region	EU x POST	POST x SME	EU x POST x SME	Total SME effect
<i>Closing spread</i>	Northern Europe	- 11.990***	- 3.568**	- 12.568***	- 24.558***
	Southern Europe	- 6.666***	- 2.410*	12.791**	10.195
	Western Europe	- 9.281***	- 2.126	13.638***	5.139
	Eastern Europe	- 3.085	- 2.325*	16.135**	15.526*
	United Kingdom	- 25.482***	- 3.288*	53.125***	27.643***
<i>Amihud</i>	Northern Europe	- 0.367***	- 0.624***	- 1.778***	- 2.145***
	Southern Europe	0.081	- 0.359***	- 1.051	- 1.221
	Western Europe	- 0.571***	- 0.339***	0.582	- 0.447
	Eastern Europe	0.780*	- 0.341***	2.255*	6.163***
	United Kingdom	- 0.901***	- 0.614***	0.168	- 0.732
<i>Return volatility</i>	Northern Europe	- 0.235**	- 0.397***	0.638***	0.403***
	Southern Europe	0.327*	- 0.394***	0.034	0.361*
	Western Europe	0.515***	- 0.395***	1.052***	1.567***
	Eastern Europe	1.033***	- 0.391***	0.014	1.048***
	United Kingdom	- 0.018	- 0.384***	0.728***	0.711***
<i>Range volatility</i>	Northern Europe	- 0.002***	- 0.001***	0.003***	0.001**
	Southern Europe	- 0.001*	- 0.001***	0.000	- 0.001
	Western Europe	0.000	- 0.001***	0.003***	0.003***
	Eastern Europe	0.002**	- 0.001***	0.000	0.001*
	United Kingdom	0.000	- 0.001**	0.004***	0.004***
<i>Trading volume</i>	Northern Europe	0.029	0.083***	- 0.218***	- 0.188***
	Southern Europe	- 0.111***	0.082***	0.006	- 0.104**
	Western Europe	- 0.065**	0.082***	- 0.287***	- 0.352***
	Eastern Europe	- 0.195***	0.081***	0.028	- 0.167***
	United Kingdom	- 0.002	0.082***	- 0.140***	- 0.141***
<i>Zero trading days</i>	Northern Europe	- 0.235**	- 0.558***	- 1.484***	- 1.719***
	Southern Europe	- 0.103	- 0.535***	- 1.400*	- 1.503**
	Western Europe	- 0.033	- 0.521***	1.416***	1.383***
	Eastern Europe	2.221***	- 0.527***	- 0.271	1.950*
	United Kingdom	- 0.242***	- 0.558***	- 0.834	- 1.076**

This table shows the results of the region-specific analysis concerning the impact of MiFID II liquidity, volatility, and trading activity based on the regression model shown in Eq. (1). For each analysis, the treatment group only consists of stocks with a primary listing in one of the five regions: Northern Europe, Southern Europe, Western Europe, Eastern Europe, and the United Kingdom. The control group always consists of US and Canadian stocks. The observation period is January 2014 to December 2021. The table only reports the coefficients of interest, i.e., the interaction terms of DiD-analysis, and drops the coefficients of the control variables. The last column provides the overall effect of MiFID II on SMEs based on the same regression but with the SME dummy variable being 1 (instead of 0) for companies larger than EUR 1 billion (i.e., non-SMEs). Here, *Total SME Effect* reports the $EU \times POST$ coefficient of this regression

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

The option of rebundling for SMEs embedded in the European Capital Markets Recovery Package provides a unique opportunity to test the option of mixed bundling. However, our analyses and previous studies provide evidence that there was not a significant decrease of SME research quantity and quality due to the initial research unbundling rules in MiFID II. Moreover, several experts raised the question whether financial institutions will actually make use of the rebundling option because it implies costs such as process differentiation and the need to keep track of firm's SME status (Bender et al. 2021a). Consequently, it is questionable whether the rebundling option is likely to impact SME research provision.

To shed light on these questions, we will subsequently analyze whether the (re-) introduction of research bundling for SMEs impacts research quantity and quality for SMEs. Moreover, we examine whether the Recovery Package has a significant effect on stock market quality for SMEs. We proceed in a similar way as before and apply DiD regressions where the treatment is the introduction of the Recovery Package (February 28, 2022) that may impact our treatment group of European SMEs. Note that we define SMEs according to the definition in the Recovery Package that states that companies are considered as SMEs if their market capitalization does not exceed EUR 1 billion (expressed by the end-year quotes for the 36 months preceding the provision of the research) (European Parliament and Council of the European Union 2021). As described in the methodology section, we define European large caps as control group whose market capitalization does not exceed EUR 2 billion at the same points in time. Consequently, both treatment and control group are subject to the identical regulatory framework and only systematically differ in terms of market capitalization and, thus, whether the rebundling option is applicable. In this analysis, our sample period starts after the introduction of MiFID II (January 3, 2018) and ends 19 months after the application of the Recovery Package, on September 30, 2023.

The results of our DiD models regarding the impact of the Recovery Package on research quantity and quality are shown in Table 6. We find a positive but insignificant effect on the number of analysts following an SME firm. However, in contrast to the fundamental idea of the Recovery Package of promoting SME research, we find a significant reduction in coverage of SMEs. Combining both findings suggests that the majority of investment firms do not make use of the rebundling option for SMEs to increase research quantity and that some SMEs even completely lose analyst coverage. Regarding research quality, we do not find evidence that the Recovery Package has a significant impact on the accuracy or dispersion of analysts' forecasts for SME firms. If anything, research quality rather decreases as indicated by the positive but insignificant increase in forecast error.

To test the robustness of these results, we estimate the same (or similar) regression models with different control groups or observation periods.²⁰ In particular, we use (i) all European large caps in our sample, (ii) US SMEs, and (iii) Japanese SMEs as alternative control groups. In an alternative specification, we exclude the year 2020 and the period between January and April 2022 to mitigate the effects of COVID-19 and the Russian invasion of Ukraine on the estimated coefficients. The

²⁰ Note that we alter the interaction term to $POST \times EU$ if non-European SMEs are used as control group.

latter period roughly covers two months before and after the Russian invasion.²¹ The results of these robustness results are provided in Table 15.

When using all European large caps as control group, the model suggests that the rebundling option actually increases the number of analysts for SMEs. However, this increase only applies to SMEs that are already covered by at least one analyst, since coverage significantly decreases. Based on this sample, the results also show that the variation among analysts' forecasts of EPS is significantly reduced. Apart from these differences, the results of the alternative models align with our baseline estimation when we consider all European large caps or exclude time periods associated with COVID-19 and the Russian invasion. However, the coefficients are more sensitive with respect to non-European control groups. Using the control groups North American or Japanese SMEs, some coefficients become insignificant or reverse signs. The most notable difference is in the number of analysts following European SMEs, which significantly decreases relative to the number of analysts following Japanese SMEs. However, it is important to note that when using a non-European control group, we measure the overall impact of the Recovery Package, capturing not only the effect of the rebundling option.

In sum, our results indicate that the option of rebundling for SMEs does not help to increase SME research quantity, particularly not for SMEs which are not covered by analysts at all. In fact, SME firms that are followed by a small number of analysts are more likely to lose research coverage after the application of the Recovery Package. In line with the marginal effect of the Recovery Package on research quantity, we also do not observe a robust effect on research quality. Overall, our findings indicate that the rebundling option is not used by the majority of investment firms and if so, it is rather used to sell more redundant SME research. New analysts reports are issued for SMEs that are already covered, and these reports tend to be of poorer accuracy and align with the already existing reports as indicated by the increase in the forecast error and a decline in forecast dispersion, which are, however, only significant when using all European non-SMEs as control group (see Table 15).

Since the Recovery Package and the option of rebundling do not appear to improve information production regarding SMEs, we do not expect a positive impact of the Recovery Package on related stock market quality dimensions such as liquidity. The results of our regressions regarding the impact on market quality are presented in Table 7. Our results suggest a reduction in the liquidity of SMEs due to the introduction of the Recovery Package. Specifically, the quoted spreads of SMEs increase by approximately 16.8 bps, and the Amihud measure by 1.7 bps relative to the control group. Both effects are significant and economically meaningful as they represent an increase of 9.0% and 17.5% of the overall mean, respectively. This is also highlighted by the time series of both measures in Fig. 2 in the Appendix. With respect to volatility, we find that SME volatility is reduced by the introduction of the Recovery Package, although the effect is only significant when using range volatility as a measure.

²¹ The Russian invasion of Ukraine is mostly dated to February 24, 2022. To account for leading and lagging effects of the event, we therefore use a time window that starts just approximately two months before and after the event date.

Lastly, we find that trading activity is significantly reduced. While the trading volume decreases by about 2%, the number of zero trading days increases by 1.5 days.

We estimate the same alternative model specifications for our market quality measures. The estimated coefficients can be found in Table 15. The results concerning market quality demonstrate a high level of robustness, with the significant negative impact on liquidity and trading activity remaining evident across all four alternative specifications. However, our findings regarding the effect on volatility vary dependent on the chosen control group. When using US or Japanese SMEs as control group, the results indicate a relative increase in the volatility of European SMEs following the introduction of the Recovery Package.

Overall, our results indicate that the Recovery Package and the option of rebundling do not help to facilitate the recapitalisation of SME firms. In fact, the amendments to the MiFID II rules seem to have a negative impact on SMEs' stock market quality, i.e., they reduce liquidity and trading activity in these stocks.

To shed more light into the determinants of the adverse market quality effects despite the marginal changes in research provision, we analyze the impact of the Recovery Package with respect to the different European regions and different size-related subgroups of SMEs. For analyzing different subgroups, we split our treatment group into quintiles based on the average market capitalization of the firms. The first quintile corresponds to the 20% smallest SMEs in our sample, while the fifth quintile covers the 20% largest SMEs, respectively. The results of both analyses are provided in Tables 16 and 17 in the Appendix. The region-related analysis shows that the results are very similar across the regions and are comparable to the results of the standard analysis. The analysis of SME subgroups, however, reveals interesting differences. On the one hand, we see that for some subgroups, the Recovery Package indeed led to an increase in the number of analysts along with reductions in research quality, i.e., higher forecast errors. This result is consistent with the hypothesis of Guo and Mota (2021) that research unbundling consolidates the research market forcing less accurate research out of the market. On the other hand, the results show that the adverse market quality effects after the Recovery Package drastically differ for various SME sizes despite the same treatment. While the largest SME quintile shows no effects concerning market quality except from a minor reduction in trading volume, the smaller SME quintiles in our sample suffer from monotonically increasing spreads. Therefore, the results suggest that the adverse effects on market quality might rather stem from other effects such as increased uncertainty and costs due to the Russian-Ukraine conflict, extreme inflation levels, and rising interest rates that coincide with the introduction of the Recovery Package and which are likely to affect the smallest firms the most.

5 Discussion and conclusion

For decades, a debate has persisted among researchers, practitioners, and regulators regarding the bundling of research and execution services, primarily due to its potential for conflicts of interest. In response to the prohibition of research bundling introduced by MiFID II in Europe, several academic studies utilize the implementation of MiFID II to examine the impact of unbundling research from

Table 6 Regression results for changes in research quantity and quality after the introduction of the Capital Markets Recovery Package

	Research quantity		Research quality	
	#Analysts	Coverage	Forecast error	Forecast dispersion
<i>POST</i> × <i>SME</i>	0.133 (0.124)	− 0.041*** (0.013)	0.389 (0.271)	− 2.314 (1.751)
ROA	− 0.013*** (0.004)	− 0.003*** (0.000)	− 0.008 (0.034)	− 0.095 (0.088)
Market cap	0.570*** (0.088)	0.072*** (0.022)	− 1.668*** (0.511)	− 0.194 (1.797)
Book-to-market	0.626*** (0.228)	0.084* (0.050)	6.082*** (1.364)	8.091* (4.477)
Leverage ratio	0.008 (0.061)	0.010 (0.007)	0.894*** (0.146)	3.214*** (0.836)
Return	− 0.007*** (0.000)	0.000** (0.000)	0.022*** (0.003)	− 0.010 (0.016)
Return volatility	− 0.008*** (0.002)	0.000 (0.000)	0.068*** (0.011)	0.124** (0.058)
Trading volume	0.274*** (0.049)	0.008 (0.006)	0.185 (0.128)	1.296** (0.549)
GDP	− 0.003 (0.008)	0.002 (0.002)	− 0.128*** (0.039)	− 0.205 (0.154)
Unemployment	− 0.103*** (0.036)	− 0.007 (0.007)	− 0.066 (0.128)	− 1.125** (0.513)
#Analysts			0.013 (0.050)	0.551** (0.255)
Observations	55,643	55,643	40,336	32,400
Firm fixed effects	Yes	Yes	Yes	Yes
Year-month fixed effects	Yes	Yes	Yes	Yes
R ²	0.891	0.663	0.464	0.580

This table shows the regression results for changes in research quantity and quality based on the DiD-approach with *SME* dummies defining European stocks whose market capitalization does not exceed EUR 1 billion at the end of year 2019, 2020, and 2021. The *POST* dummy becomes one if the observations is dated after the application of the Capital Markets Recovery Package and zero otherwise. The dependent variables are *#analysts* and *coverage* measuring research quantity and *forecast error* and *forecast dispersion* measuring research quality. Standard errors are clustered by firm and time (year-month) and provided in parentheses

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

execution services (Fang et al. 2020; Lang et al. 2024; Anselmi and Petrella 2021; Guo and Mota 2021). However, these existing studies come to different findings concerning the consequences for research quantity and stock liquidity, particularly with respect to smaller firms. Amid the rush to publish findings on MiFID II's research unbundling, researchers faced time-related constraints, such as being limited to examining just one post-observation per firm concerning shifts in

Table 7 Regression results for changes in research quantity and quality after the introduction of the Capital Markets Recovery Package

	Liquidity		Volatility		Trading activity	
	Spread	Amihud	Return volatility	Range volatility	Log trading volume	Zero trading days
<i>POST</i> × <i>SME</i>	16.831*** (2.440)	1.733*** (0.310)	− 0.197 (0.154)	− 0.001** (0.000)	− 0.133*** (0.034)	1.556*** (0.328)
ROA	0.049 (0.142)	− 0.003 (0.018)	− 0.006 (0.006)	0.000 (0.000)	0.005*** (0.002)	− 0.005 (0.020)
Market cap	− 14.693*** (3.687)	− 1.661*** (0.492)	− 2.272*** (0.192)	− 0.004*** (0.000)	0.790*** (0.046)	− 1.296** (0.633)
Book-to-market	− 14.975 (10.217)	2.080 (1.439)	1.138** (0.456)	0.004** (0.002)	0.079 (0.107)	− 3.850** (1.504)
Leverage ratio	− 0.973 (1.329)	0.145 (0.202)	0.221*** (0.082)	0.000*** (0.000)	0.032** (0.016)	0.041 (0.161)
Return	0.082*** (0.032)	− 0.016*** (0.004)	0.034*** (0.002)	0.000*** (0.000)	0.000** (0.000)	− 0.013*** (0.004)
GDP	− 0.801** (0.357)	0.054 (0.041)	− 0.108*** (0.016)	0.000*** (0.000)	0.012*** (0.003)	0.037 (0.043)
Unemployment	− 1.370 (1.013)	0.007 (0.141)	0.279*** (0.052)	0.000*** (0.000)	− 0.007 (0.010)	0.515*** (0.147)
Return volatility	4.221*** (0.244)	0.332*** (0.029)			0.040*** (0.001)	− 0.218*** (0.029)
Trading volume	− 33.878*** (1.401)	− 3.489*** (0.218)	2.963*** (0.099)	0.007*** (0.000)		− 1.310*** (0.222)
Observations	55,601	55,541	55,643	55,643	55,643	55,625
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.796	0.770	0.537	0.691	0.915	0.797

This table shows the regression results for changes in research quantity and quality based on the DiD-approach with SME dummies defining European stocks whose market capitalization does not exceed EUR 1 billion at the end of year 2019, 2020, and 2021. The *POST* dummy becomes one if the observations is dated after the application of the Capital Markets Recovery Package and zero otherwise. The dependent variables are *closing spread* and *amihud* measuring liquidity, *return volatility* and *range volatility* measuring volatility, and *trading volume* and *zero trading days* measuring trading activity. Standard errors are clustered by firm and time (year-month) and provided in parentheses

forecasting quality, which might not be sufficient to observe the permanent effects of the new rules. Moreover, these studies suffer from region-related constraints, treating the heterogeneous European equity markets as a single entity and using US stocks as counterfactual, despite several US brokerage firms also adopting the practice of research unbundling to continue business with European clients.

To address the discrepancies in previous studies and their time- and regional-related drawbacks, we replicate and extend the analyses regarding the impact of research unbundling on research provision and stock market quality. Moreover, we take into account several major socioeconomic events like COVID-19 and recent regulatory changes, notably the Recovery Package, which provides the unique opportunity to study the impact of mixed-bundling empirically.

We provide evidence that MiFID II led to a reduction in research quantity and to an improvement in analysts' forecasting accuracy for large companies, but did not affect these measures for SMEs. In contrast to our expectations, the long-term analysis does not reveal a more substantial reduction in analysts compared to other studies (Fang et al. 2020; Guo and Mota 2021) although the research market has had more time to consolidate. Nevertheless, our results provide evidence for the effect falling in the upper range of estimates from previous studies, i.e., a decrease in the number of analysts by 8.9%.

Aligned with improvements in research quality and resulting better information landscape for large companies, our findings suggest an increase in the liquidity of non-SME stocks while bid-ask spreads of SMEs remain unaffected. This contrasts studies observing reductions (Fang et al. 2020; Anselmi and Petrella 2021) or no-changes (Guo and Mota 2021) in liquidity also for large-cap stocks, suggesting that the improved research environment for large-cap stocks and other MiFID II-induced changes required more time to translate into enhanced liquidity. Extending the existing studies, we also find adverse effects on market quality for both larger and smaller European firms after MiFID II, manifested in a consistent increase in volatility and a decline in trading volume.

Analyzing the heterogeneity across European regions, we observe distinct trends in the research market, particularly in the UK. In fact, we do not find evidence for a reduction in analysts covering larger companies and observe an increase in the number of analysts covering the average SME in the UK. This difference is potentially driven by the requirement of firms listed in London's SME market (AIM) to retain a corporate advisor, who often provides research (Fu et al. 2024). Additionally, the lower consolidation of the research market in the UK might be attributable to investment firms' anticipation of the reintroduction of bundling after Brexit, preventing them from making significant personnel changes in their analyst teams.

With respect to the well-documented increase in research quality (Lang et al. 2024; Fang et al. 2020; Guo and Mota 2021), we find that this effect is driven by reports for larger companies listed in Northern Europe or the UK while this improvement is not evident in other European regions. Dispersion of analyst

forecasts even increases for Western European companies contradicting the general findings of Guo and Mota (2021). Analyzing stock market quality, MiFID II has similar effects on liquidity, volatility, and trading volume across regions. Larger companies in all regions experience an increase in liquidity. However, SME stocks suffer from increased spreads in some regions, particularly in the UK and Eastern Europe.

Regarding the Recovery Package, the DiD regressions show no significant changes in research quantity and quality after its application. One explanation is that the option of rebundling research and execution costs for SME firms was not used by the majority of investment firms which is supported by a previous survey (Bender et al. 2021a). If there is an increase in the number of analysts following SMEs, as indicated by some of the robustness tests, this holds true only for stocks that are already covered. SMEs with a limited number of analysts are more likely to lose coverage after the implementation of the Recovery Package. Concerning market quality, our results suggest that liquidity and trading activity are significantly reduced in SME stocks, contradicting the aim of the Recovery Package to facilitate SME firm recapitalization after the COVID-19 pandemic. In summary, our empirical findings suggest that despite theoretical welfare improvements (Dassiou and Glycopantis 2006), the bundling option for SMEs in the European Recovery Package did not achieve the desired goals of increasing research provision and stock market quality for SMEs as anticipated.

Although we extensively analyze the effects of research (un)bundling in Europe, our study exhibits some limitations. The analyses concerning the impact of the Recovery Package are limited to a post-period of 19 months, which covers a relatively short period and may consequently face similar time-related constraints as the replicated studies regarding the post-MiFID II period. Furthermore, our DiD approach requires counterfactual entities that are equivalent to the treated entities except for the treatment. This assumption may not always be fulfilled, as the US stocks exhibit partial treatment, and the time trends in Europe, North America, and Japan may not be parallel for all the dependent variables. Given the absence of better alternatives for control groups, the estimated models still provide valuable insights into the impact of the treatment on our variables of interest. Moreover, we alleviate this issue by using multiple control groups for robustness.

Overall, our study has important implications for research and practice. By comparing the results of existing studies and our own findings, we empirically demonstrate that substantial variations among study outcomes may exist, even when utilizing the same data source and examining the same research question.²² While this variation partially may result from region- and time-related differences

²² Both our study and all the previous studies on MiFID II's research unbundling rely on the I/B/E/S database.

in the underlying data samples, it can also be attributed to the researchers' decisions regarding data pre-processing and methodology. The latter aspect is also known as "non-standard errors" and is demonstrated in other studies (Menkveld et al. 2024). In sum, the variation across study results emphasize the importance of replication studies, especially when it comes to regulatory impact assessment. To identify whether the regulatory goals are met or if unintended consequences arise, regulators should take into account multiple-confirmed findings rather than focusing on a single study. Furthermore, we also highlight that it is important to consider time- and regional-related factors since the regulatory impact can change over time and differ between regions. In addition, we add to the ongoing discussions in Europe regarding the introduction of a rebundling option for all stocks (European Council 2024). Our findings show that the rebundling option for SMEs if anything results in more redundant research without enhancing the overall information environment. This unintended effect may be exacerbated with an increase in the threshold.

Future research could provide further evidence on research unbundling and its effects by analyzing the proposed reversal of the ban on research bundling in the UK. Additionally, investigating the implications of the expiry of the no-action letter in the US on research provision and the number of firms being registered as broker and/or investment advisors could provide valuable insights.

Appendix

See below Tables 8, 9, 10, 11 and 12, Figs 1 and 2; Tables 13, 14, 15, 16 and 17.

Table 8 Research design in studies on MiFID II's research unbundling

Authors	Lang et al. (2024)	Fang et al. (2020)	Guo and Mota (2021)	Anselmi and Petrella (2021)
Research design	Diff-in-Diff	Diff-in-Diff	Diff-in-Diff	Diff-in-Diff
Sample period	Q1 2015–Q4 2018	Jan. 15–Feb. 19	Jan. 14–May 19	Jan. 15–Dec. 19
Data	I/B/E/S, Compustat Global, CRSP	I/B/E/S, Datastream, Compustat Global, CRSP, Factset, Thomson Reuters	I/B/E/S, Datastream, Worldscope	I/B/E/S, Bloomberg, Thomson Reuters
Data frequency	Quarterly	Annual	Annual	Monthly
No. stocks after filtering	Only reports firm-quarter observations	9709 (EU), 9369 (non-EU)	2163 (EU), 2261 (non-EU)	2352 (EU), 6648 (non-EU)
Treatment group	25 Countries Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovenia, Spain, Sweden	27 Countries Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, United Kingdom	15 Countries Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom	17 Countries Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Slovenia, Spain, Sweden, United Kingdom
Control group	US	US & Canada	US	US & Japan

This table shows the research design of the four empirical studies that analyzed the effects of research unbundling as introduced by MiFID II. The table shows the research design of the studies, the sample period, the data sources, the data frequency, the number of stocks investigated, and the treatment and control groups

Table 9 Summary of research results of empirical studies on research unbundling

Category	Focus	Lang et al. (2024)	Fang et al. (2020)	Guo and Mota (2021)	Anselmi and Petrella (2021)
Research quantity	<i>European Companies</i>	10% decrease in number of analysts for EU firms	6.1% decrease in number of analysts for EU firms; EU firms 6% more likely to fully lose coverage	7.7% decrease in number of analysts for EU firms	8.9% decrease in number of analysts for EU firms (– 0.575 analysts per firm)
	<i>Small vs. Large Companies</i>	No significant change for small firms; Large, old, and less volatile firms most affected by analyst reduction	Small firms are more affected by analyst reduction and complete coverage loss	Large firms more affected by analyst reduction (10.74%) than small firms; Small firms are more likely to lose coverage completely (US small included)	Decrease in number of analysts only for large- (– 9%) and mid-cap (– 7%) firms; No effect on small caps and increase in number of analysts for micro caps (+5%)
Research quality	<i>European Companies</i>	Increase in research quality (higher number of forecast items and decrease in forecast error)	16% decrease in forecast error	18% decrease in forecast error and 20% decrease in forecast dispersion	–
	<i>Small vs. Large Companies</i>	–	–	No evidence that the research quality of small and large firms is affected differently	–

Table 9 (continued)

Category	Focus	Lang et al. (2024)	Fang et al. (2020)	Guo and Mota (2021)	Anselmi and Petrella (2021)
Stock market quality	<i>European Companies</i>		Decrease in stock liquidity (increased bid-ask spread (30%) and Amihud ratio (48%))	No change in stock market quality (abnormal returns around earnings announcement dates and bid-ask spreads are not statistically different from zero)	Decrease in stock liquidity (increased spread by 8.5 bps (+8.9%))
	<i>Small vs. Large Companies</i>		–		Effect is not significant when sample is split up according to subsamples of different company size

This table shows the results of the empirical studies that analyzed the effects of research unbundling as introduced by MiFID II. The results of the studies are sorted according to the categories Research Quality, Research Quantity, Stock Market Quality, Financing, and Additional Findings. Within the categories the results are split showing the effect for European firms in general and differences between large and small European firms

Table 10 Country-wise distribution

Country	Number of firms	SME share (pre-MiFID II)	SME share (pre-Recovery Package)
Austria	38	0.263	0.316
Belgium	74	0.514	0.486
Bulgaria	12	1.000	1.000
Canada	283	0.463	0.389
Croatia	1	1.000	1.000
Czech Republic	9	0.333	0.222
Denmark	56	0.375	0.357
Estonia	5	1.000	1.000
Finland	82	0.610	0.549
France	311	0.588	0.572
Germany	270	0.544	0.496
Greece	25	0.680	0.520
Hungary	5	0.400	0.400
Ireland	16	0.438	0.562
Italy	154	0.539	0.519
Japan	1963	0.640	0.642
Latvia	3	1.000	1.000
Lithuania	1	1.000	1.000
Luxembourg	3	0.000	0.000
Netherlands	67	0.343	0.418
Norway	89	0.629	0.506
Poland	121	0.760	0.785
Portugal	15	0.333	0.400
Romania	8	0.625	0.625

Table 10 (continued)

Country	Number of firms	SME share (pre-MiFID II)	SME share (pre-Recovery Package)
Slovenia	7	0.857	0.857
Spain	85	0.306	0.318
Sweden	200	0.590	0.485
United Kingdom	579	0.577	0.553
United States	2110	0.344	0.296
Total	6592	0.510	0.482

This table shows the number of firms and the share of SMEs per country for the filtered data sample. SMEs are defined as firms whose market capitalization did not exceed EUR 1 billion at the end of the years 2015, 2016, and 2017 (pre-MiFID II) or at the end of the years 2020, 2021, and 2022 (pre-Recovery Package)

Table 11 Variable definitions

Variable	Definition	Source	Unit
Variables of interest			
<i>EU</i>	Dummy variable that takes a value of 1 for observations in the treatment group (firms domiciled in the European Economic Area) and 0 otherwise	Datastream	Dummy
<i>POST</i>	Dummy variable that takes a value of 1 if an observation occurs in the post-period and 0 otherwise. Depending on the analysis, the post-period starts either after the application of MiFID II (January 3, 2018) or after the application of the Capital Markets Recovery Package (February 28, 2022)		Dummy
Research quantity and quality			
<i>#Analysts</i>	Number of all monthly FY1 EPS estimates included in the monthly mean forecast for a given firm (EPSINE)	I/B/E/S	–
<i>Coverage</i>	Dummy variable that takes a value of 1 if a firm has at least one FY1 EPS estimate in a given month (i.e., is covered by at least one analyst) and 0 otherwise	I/B/E/S	Dummy
<i>Forecast error</i>	Absolute difference between the mean FY1 EPS forecast and the actual FY1 EPS in a given month scaled by the firm's previous month-end stock price	I/B/E/S	%
<i>Forecast dispersion</i>	Standard deviation of all monthly FY1 EPS estimates of all analysts following the same firm (EPS1SD)	I/B/E/S	%
Stock market quality			
<i>Closing spread</i>	Difference between the close ask and close bid price scaled by the end-of-day mid price	Datastream	bps

Table 11 (continued)

Variable	Definition	Source	Unit
<i>Amihud</i>	Absolute close-to-close log return on day t divided by trading volume in euro on day t in basis points	Datastream	bps
<i>Return volatility</i>	Standard deviation of daily log returns in a rolling window over the previous 21 trading days (i.e., one month)	Datastream	%
<i>Range volatility</i>	Firm's highest price on day t divided by the lowest price on day t	Datastream	–
<i>Trading volume</i>	Log of a firm's daily total euro trading volume	Datastream	EUR mn
<i>Zero trading days</i>	Number of zero-trading days (days without trades) for a given firm divided by 21 trading days (i.e., per month)	Datastream	%
Control variables			
<i>ROA</i>	Return on assets (WC08326)	Worldscope	%
<i>Market cap</i>	Market capitalization in million euro (MV)	Worldscope	EUR mn
<i>book-to-market</i>	Book value per share divided by the close price	Worldscope	–
<i>Leverage ratio</i>	Ratio of total debt to total shareholders equity	Worldscope	–
<i>Return</i>	Monthly log returns	Worldscope	%
<i>GDP</i>	GDP growth rate per country	IMF	%
<i>Unemployment</i>	Unemployment rate per country	IMF	%

This table presents detailed descriptions for the variables used in this study. If available, we provide the respective identifier from the respective data source in parentheses

Table 12 (continued)

Variable	Unit	Non-SME										
		SME										
		N	Mean	Std	Min	25%	50%	75%	Max	N	Mean	Std
<i>Return volatility</i>	%	86,305	10.736	6.370	1.133	6.524	9.086	13.046	37.511	164,891	8.925	4.960
												1.261
												7.671
												10.564
												31.394
<i>Range volatility</i>	%	85,703	1.034	0.018	1.000	1.022	1.031	1.043	1.148	163,923	1.027	0.013
												1.006
												1.024
												1.032
												1.106
<i>Trading volume</i>	EUR	86,379	53.589	87.225	0.002	5.867	21.727	62.197	691.462	165,017	1,773.179	3,135.355
	mm											0.797
												216.339
												603.536
												1,847.018
												22,975.050
<i>Zero trading days</i>	%	84,970	0.747	3.951	0.000	0.000	0.000	0.000	30.000	164,704	0.000	0.000
												0.000
												0.000
												0.000
												0.000
Panel C: Japanese firms												
<i># Analysts</i>		140,710	0.916	1.364	0.000	0.000	0.000	1.000	17,000	80,772	7.144	5.422
												0.000
												0.000
												0.000
												0.000
<i>Coverage</i>		140,710	0.480	0.500	0.000	0.000	0.000	1.000	1,000	80,772	0.938	0.242
												0.000
												0.000
												0.000
												0.000
<i>Forecast error</i>	%	49,520	2.341	4.122	0.012	0.366	0.999	2.450	28.489	65,906	1.865	3.805
												0.007
												0.223
												0.635
												1.727
												26.582
<i>Forecast dispersion</i>	%	30,964	9.464	14.131	0.000	2.011	4.840	10.771	93.400	69,208	17.651	37.233
												0.306
												7.661
												15.958
												289.055
<i>Closing spread</i>	bps	140,610	47.698	32.641	10.209	25.744	36.918	58.242	192.263	80,710	23.267	10.697
												6.347
												14.984
												21.247
												29.543
												60.150
<i>Amihud</i>	bps	140,350	0.330	0.520	0.002	0.046	0.123	0.344	2.910	80,708	0.011	0.015
												0.000
												0.002
												0.006
												0.014
												0.080
<i>Return volatility</i>	%	138,263	8.661	4.916	1.869	5.194	7.447	10.783	27.656	79,301	7.447	3.246
												1.994
												5.151
												6.846
												9.025
												19.401
<i>Range volatility</i>	%	140,731	1.026	0.014	1.001	1.016	1.023	1.032	1.108	80,710	1.022	0.009
												1.006
												1.021
												1.026
												1.073
<i>Trading volume</i>	EUR	140,552	25.917	44.731	0.036	3.268	10.023	28.322	389.318	80,710	453.288	746.547
	mm											3.931
												77.259
												190.089
												468.462
												5,989.211
<i>Zero trading days</i>	%	0	-	-	-	-	-	-	-	-	-	-
												-
												-
												-
												-

This table shows the descriptive statistics for each dependent variable. The statistics are divided into three panels: Europe, North America and Japan. Within the panels statistics are presented separately for large caps (non-SMEs) and SMEs

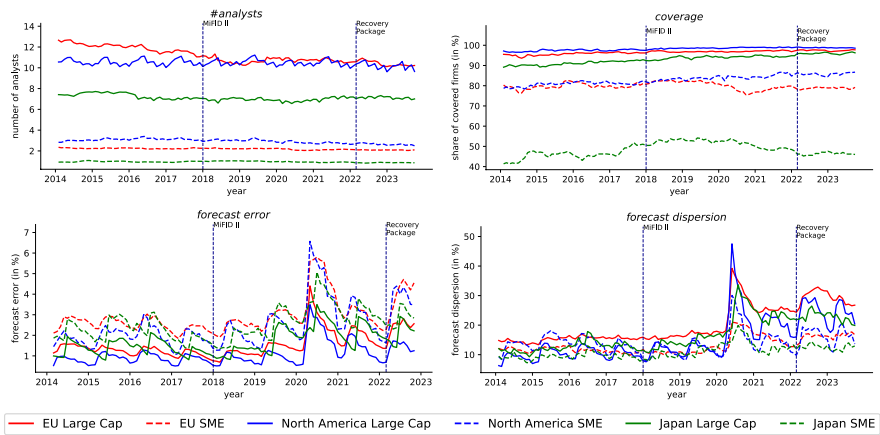


Fig. 1 Averages of research quantity and quality measures over time. The figure shows the averages of *#analysts*, *coverage*, *forecast error* and *forecast dispersion* over time. Each variable is measured on an end-of-month basis from January 2014 until September 2023. The dotted vertical lines mark the point in time when MiFID II and the Capital Markets Recovery Package entered into force, respectively. Labels on the horizontal axis denote the first day of the respective year

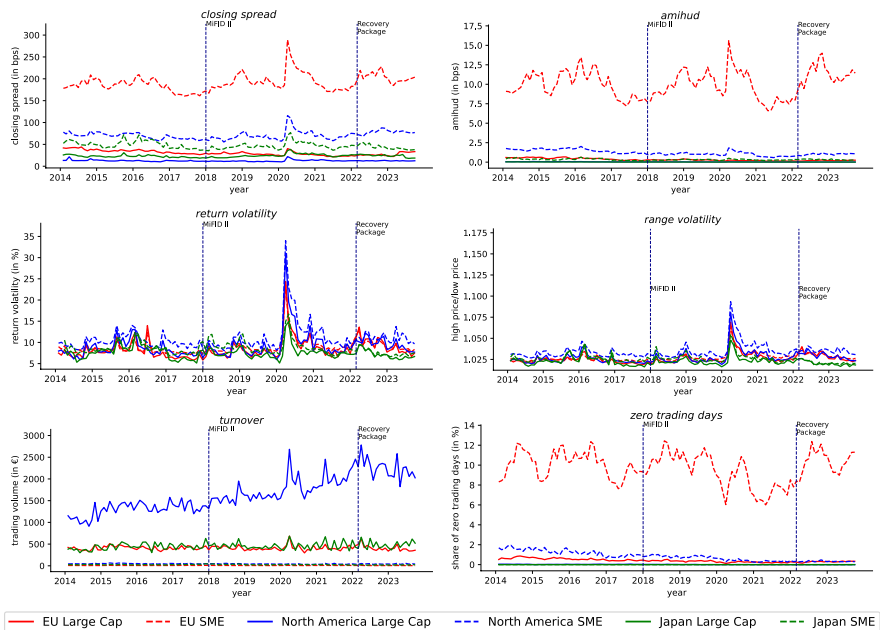


Fig. 2 Averages of market quality measures over time. The figure shows the averages of *closing spread*, *amihud*, *return volatility*, *range volatility*, *trading volume* and *zero trading days* over time. Each variable is measured on an end-of-month basis from January 2014 until September 2023. The dotted vertical lines mark the point in time when MiFID II and the Capital Markets Recovery Package entered into force, respectively. Labels on the horizontal axis denote the first day of the respective year

Table 13 Variations of the standard model according to control group and observation period

Variable	Control	Period	$EU \times POST$	$POST \times SME$	$EU \times POST \times SME$	Total SME Effect
#Analysts	Japan	01/14–12/21	– 0.823***	0.451***	0.816***	– 0.007
	US & Canada	01/14–05/19	– 1.079***	0.014	1.140***	0.061
	US & Canada	01/14–12/21 [excl. 2020]	– 1.095***	0.061	1.238***	0.143**
<i>Coverage</i>	Japan	01/14–12/21	0.001	0.052***	– 0.052***	– 0.051***
	US & Canada	01/14–05/19	0.003	0.018*	0.012	0.015
	US & Canada	01/14–12/21 [excl. 2020]	0.009*	0.030***	– 0.022*	– 0.013
<i>Forecast error</i>	Japan	01/14–12/21	– 0.476***	– 0.165	0.507***	0.031
	US & Canada	01/14–05/19	– 0.228***	– 0.050	0.413**	0.185
	US & Canada	01/14–12/21 [excl. 2020]	– 0.118*	0.096	0.107	– 0.010
<i>Forecast dispersion</i>	Japan	01/14–12/21	– 1.315	– 3.743***	0.942	– 0.373
	US & Canada	01/14–05/19	0.466	– 2.894***	1.960**	2.426***
	US & Canada	01/14–12/21 [excl. 2020]	0.153	– 3.960***	1.815**	1.968***
<i>Closing spread</i>	Japan	01/14–12/21	– 5.467***	– 3.551***	18.343***	12.876***
	US & Canada	01/14–05/19	– 5.265***	– 2.629***	8.299***	3.034
	US & Canada	01/14–12/21 [excl. 2020]	– 7.667***	– 2.914**	10.402***	2.736
<i>Amihud</i>	Japan	01/14–12/21	– 0.090	0.200***	– 0.479**	– 0.569***
	US & Canada	01/14–05/19	– 0.176***	– 0.206***	– 0.393**	0.568***
	US & Canada	01/14–12/21 [excl. 2020]	– 0.311***	– 0.281***	– 0.441**	– 0.752***

Table 13 (continued)

Variable	Control	Period	$EU \times POST$	POST \times SME	$EU \times POST \times SME$	Total SME Effect
<i>Return volatility</i>	Japan	01/14–12/21	0.755***	– 0.034	0.299***	1.054***
	US & Canada	01/14–05/19	0.06	– 0.495***	1.082***	1.142***
	US & Canada	01/14–12/21 [excl. 2020]	0.076	– 0.565***	1.003***	1.078***
<i>Range volatility</i>	Japan	01/14–12/21	0.003***	0.000*	0.002***	0.004***
	US & Canada	01/14–05/19	– 0.001***	– 0.001***	0.003***	0.002***
	US & Canada	01/14–12/21 [excl. 2020]	0.000	– 0.001***	0.004***	0.003***
<i>Trading volume</i>	Japan	01/14–12/21	0.104***	0.081***	– 0.179***	– 0.075***
	US & Canada	01/14 - 05/19	– 0.015	0.004	– 0.189***	– 0.205***
	US & Canada	01/14 - 12/21 [excl. 2020]	– 0.023	0.086***	– 0.194***	– 0.216***
<i>Zero trading days</i>	Japan	01/14 - 12/21	–	–	–	–
	US & Canada	01/14 - 05/19	– 0.161**	– 0.486***	0.686**	0.525*
	US & Canada	01/14 - 12/21 [excl. 2020]	– 0.277***	– 0.512***	– 0.008	– 0.285

This table shows the results of the variations of the standard model based on the regression model shown in Equation (1). We apply different control groups and sample periods in the presented settings below. We vary our control group and use stocks from (1) US & Canada and (2) Japan. Moreover, we vary the observation period of the post-event period. First, we analyze a shorter observation period until May 2019 replicating previous studies. Second, we drop the year 2020 to exclude the effects of COVID-19. The table only reports the coefficients of interest, i.e., the interaction terms of DiD-analysis, and drops the coefficients of the control variables. The last column provides the overall effect of MiFID II on SMEs based on the same regression but with the SME dummy variable being 1 (instead of 0) for companies larger than EUR 1 billion (i.e., non-SMEs). Here, *Total SME Effect* reports the $EU \times POST$ coefficient of this regression

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 14 Region-wise distribution

Region	Number of firms	SME share (pre-MiFID II)	SME share (pre-Recovery Package)
Northern Europe	452	0.577	0.498
Southern Europe	280	0.471	0.454
Western Europe	763	0.526	0.509
Eastern Europe	162	0.741	0.753
United Kingdom	579	0.577	0.553
Europe (full sample)	2236	0.558	0.529
US & Canada	2393	0.358	0.307
Japan	1963	0.640	0.642

This table shows the number of firms and the share of SMEs per region analyzed in the different treatment and control samples. SMEs are defined as those firms whose market capitalization did not exceed EUR 1 billion at the end of the years 2015, 2016, and 2017 (pre-MiFID II) or at the end of the years 2020, 2021, and 2022 (pre-Recovery Package)

Table 15 Robustness results of the analysis of the impact of the Capital Markets Recovery Package

Variable	Control group	Excluded period	POST x SME	POST x EU
#Analysts	All EU large caps		0.356***	
	EU large caps < 2 billion	2020, Jan–Apr 2022	0.169	
	North American SMEs			0.085
	Japanese SMEs			− 0.176***
<i>Coverage</i>	All EU large caps		− 0.031***	
	EU large caps < 2 billion	2020, Jan–Apr 2022	− 0.043***	
	North American SMEs			− 0.055***
	Japanese SMEs			− 0.004
<i>Forecast error</i>	All EU large caps		0.162	
	EU large caps < 2 billion	2020, Jan–Apr 2022	1.007***	
	North American SMEs			− 0.012
	Japanese SMEs			0.877***
<i>Forecast dispersion</i>	All EU large caps		− 6.641***	
	EU large caps < 2 billion	2020, Jan–Apr 2022	− 2.831	
	North American SMEs			1.716
	Japanese SMEs			0.820
<i>Closing spread</i>	All EU large caps		22.197***	
	EU large caps < 2 billion	2020, Jan–Apr 2022	25.819***	
	North American SMEs			8.928***
	Japanese SMEs			20.711***
<i>Amihud</i>	All EU large caps		2.269***	
	EU large caps < 2 billion	2020, Jan–Apr 2022	2.982***	
	North American SMEs			1.948***
	Japanese SMEs			2.453***

Table 15 (continued)

Variable	Control group	Excluded period	POST x SME	POST x EU
<i>Return volatility</i>	All EU large caps		− 0.496***	
	EU large caps < 2 billion	2020, Jan–Apr 2022	− 0.443**	
	North American SMEs			0.949***
	Japanese SMEs			2.205***
<i>Range volatility</i>	All EU large caps		− 0.002***	
	EU large caps < 2 billion	2020, Jan–Apr 2022	− 0.002***	
	North American SMEs			0.002***
	Japanese SMEs			0.008***
<i>Trading volume</i>	All EU large caps		− 0.100***	
	EU large caps < 2 billion	2020, Jan–Apr 2022	− 0.099***	
	North American SMEs			− 0.166***
	Japanese SMEs			− 0.238***
<i>Zero trading days</i>	All EU large caps		1.769***	
	EU large caps < 2 billion	2020, Jan–Apr 2022	2.207***	
	North American SMEs			1.868***
	Japanese SMEs			–

This table shows the robustness of our regression results for changes in research provision and market quality after the introduction of the Capital Markets Recovery Package. We apply different control groups and sample periods in the presented settings below. We vary our control group from all EU large caps with a market capitalization below EUR 2 billion to: (1) all EU large caps, (2) all North American SMEs, and (3) all Japanese SMEs. Moreover, we exclude two major events from our data sample. First, we drop the year 2020 to exclude the effects of COVID-19. Second, we drop the period from January 2022 to April 2022 due to the effects of the invasion of Ukraine occurred at the end of February 2022

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 16 Region-specific effects of the Capital Markets Recovery Package

	Southern Europe	Western Europe	Eastern Europe	Northern Europe
Research quantity				
#Analysts	0.032	0.304	0.381	0.016
Coverage	-0.001	-0.040**	-0.164***	-0.011
Research quality				
Forecast error	0.109	0.047	1.784	0.904**
Forecast dispersion	-5.601*	-4.470	-10.139	3.060*
Market quality				
Closing spread	15.551***	19.456***	12.200	23.051***
Amihud	1.236**	2.349***	2.949**	1.091**
Return volatility	0.160	-0.017	-0.540	-0.121
Range volatility	-0.001	-0.001**	-0.002	0.000
Trading volume	-0.165**	-0.138**	0.002	-0.171***
Zero trading days	1.235**	2.921***	2.267*	-0.339

This table shows the results of the region-specific analysis concerning the impact of the Capital Markets Recovery Package on research quantity and quality and market quality based on the regression model shown in Equation (2). For each analysis, the treatment group only consists of stocks with a primary listing in one of the five regions: Northern Europe, Southern Europe, Western Europe, Eastern Europe, and the United Kingdom. The control group always consists of large caps of each region with a market capitalization below EUR 2 billion. The observation period is January 2018 to September 2023. The table only reports the coefficients of interest, i.e., the interaction term of the DiD-analysis

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Table 17 Impact of the Capital Markets Recovery Package for different SME sizes

SME					
	1st quintile	2nd quintile	3rd quintile	4th quintile	5th quintile
Research quantity					
#Analysts	0.230*	0.168	0.255*	0.257*	− 0.057
Coverage	− 0.052*	− 0.055**	− 0.030	− 0.031	− 0.050***
Research quality					
Forecast error	− 0.880	0.066	1.133**	0.758*	0.334
Forecast dispersion	− 1.697	− 2.039	− 0.809	− 3.698	− 1.659
Market quality					
Closing spread	47.790***	17.725***	16.966***	10.486**	3.628
Amihud	5.677***	3.020***	1.948***	0.644*	0.237
Return volatility	− 0.793***	− 0.253	− 0.386*	0.090	− 0.179
Range volatility	− 0.004***	− 0.001*	− 0.001**	− 0.001	0.000
Trading volume	− 0.055	− 0.076*	− 0.122***	− 0.164***	− 0.144***
Zero trading days	6.452***	1.110	0.611	0.333	0.414

This table shows the results of the analysis concerning the impact of the Capital Markets Recovery Package on research quantity and quality and market quality based on the regression model shown in Eq. (2). In this analysis, we split the treatment group of European SMEs into quintiles by sorting them according to their average market capitalization at the end of 2019, 2020, and 2021. I.e., in this analysis, the 1st quintile represents the European SMEs in our sample that have the lowest market capitalization. In turn, the 5th quintile represents the SMEs with the highest market capitalization in our sample. The control group always consists of European large caps (excluding the United Kingdom) with a market capitalization below EUR 2 billion. The observation period is January 2018 to September 2023. The table only reports the coefficients of interest, i.e., the interaction term of the DiD-analysis

Funding Open Access funding enabled and organized by Projekt DEAL. We gratefully acknowledge research support from the Frankfurt Institute for Risk Management and Regulation (FIRM) and “eff - the Data Science Institute”.

Data availability The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Conflict of interest The authors have no relevant financial or non-financial interests to disclose.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Aghanya D, Agarwal V, Poshakwale S (2020) Market in Financial Instruments Directive (MiFID), stock price informativeness and liquidity. *J Bank Finance* 113:105730
- Anselmi G, Petrella G (2021) Regulation and stock market quality: the impact of MiFID II provision on research unbundling. *Int Rev Finance Anal* 76:101788
- Bender M, Cestonaro T, Gomber P, Koch J-A (2021) Research unbundling and COVID-19: will Europe's Capital Markets Recovery Package help? *J Invest* 31(1):96–107
- Bender M, Clapham B, Gomber P, Koch J-A (2021) To bundle or not to bundle? A review of soft commissions and research unbundling. *Finance Anal J* 77(3):69–92
- Bogle JC (2009) The end of “soft dollars”? *Finance Anal J* 65(2):48–53
- Dassiou X, Glycopantis D (2006) The economic theory of price discrimination via transactions bundling: an assessment of the policy implications. *Rev Law Econ* 2(2):323–348
- European Commission (2014) Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on Markets in Financial Instruments and Amending Directive 2002/92/EC and Directive 2011/61/EU Text with EEA Relevance: MiFID II
- European Commission (2020) Capital markets union 2020 action plan: a capital markets union for people and businesses, https://ec.europa.eu/info/business-economy-euro/growth-and-investment/capital-markets-union/capital-markets-union-2020-action-plan_en
- European Council (2024) Proposal for a Directive of the European Parliament and of the Council amending Directive 2014/65/EU to make public capital markets in the Union more attractive for companies and to facilitate access to capital for small and medium-sized enterprises and repealing Directive 2001/34/EC
- European Parliament and Council of the European Union (2021) Directive (EU) 2021/338 of the European Parliament and of the Council of 16 February 2021 amending Directive 2014/65/EU as regards information requirements, product governance and position limits, and Directives 2013/36/EU and (EU) 2019/878 as regards their application to investment firms, to help the recovery from the COVID-19 crisis
- Fang B, Hope O-K, Huang Z, Moldovan R (2020) The effects of MiFID II on sell-side analysts, buy-side analysts, and firms. *Rev Account Stud* 25(3):855–902
- Financial Conduct Authority (2021) Changes to UK MiFID's conduct and organisational requirements. Policy Statement, 21/20
- Fu A, Jenkinson T, Newton D, Xie R (2024) Research unbundling and market liquidity: evidence from MiFID II. *Eur Finance Manag* 30(4):1759–1786

- Guo Y, Mota L (2021) Should information be sold separately? Evidence from MiFID II. *J Finance Econ* 142(1):97–126
- Haslem JA (2011) Issues in mutual fund soft-dollar trades. *J Index Invest* 2(2):76–85
- Inderst R, Ottaviani M (2012) Competition through commissions and kickbacks. *Am Econ Rev* 102(2):780–809
- Johnsen DB (1999) The economics and ethics of soft dollar brokerage. *Bus Soc Rev* 104(1):21–28
- Lang M, Pinto J, Sul E (2024) MiFID II unbundling and sell-side analyst research. *J Account Econ* 77(1):101617
- Madureira L, Underwood S (2008) Information, sell-side research, and market making. *J Finance Econ* 90(2):105–126
- Menkveld A, Dreber A, Taylor NJ, Tonks I et al (2024) Nonstandard errors. *J Finance* 79(3):2339–2390
- Myners P (2001) Institutional investment in the United Kingdom: A review, <https://uksif.org/wp-content/uploads/2012/12/myners-p.-2001.-institutional-investment-in-the-united-kingdom-a-review.pdf>
- Tittsworth DG, Edelstein GI (2004) The great soft dollar debate. *J Invest Compl* 5(2):44–52
- United Nations Statistics Division (2023) Geographic regions, <https://unstats.un.org/unsd/methodology/m49/>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.