ESMA Working Paper
No. 3 2021

MiFID II research unbundling: assessing the impact on SMEs

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17 February 2021

ESMA Working Paper
No. 3, 2021
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Authorisation: The Working Paper has been approved for publication by the Selection Committee and reviewed by the Scientific Committee of ESMA

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MiFID II Research Unbundling – impact on EU equity markets

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Abstract

This article analyses the impact of the MiFID II research unbundling provisions on EU sell-side research, following their application on 3 January 2018. The MiFID II provisions require portfolio managers to pay for the research that they obtain, either by paying themselves or by passing on that charge to their clients. Concerns have been raised that the rules could have had detrimental effects, particularly on SMEs, on the availability and quality of research on EU companies, as well as on company financing conditions. We do not find material evidence of these effects: following the introduction of the MiFID II research unbundling provisions, 1) the quantity of research per SME has not declined relative to larger firms; 2) the probability of an SME completely losing coverage has not increased relative to a larger firm; 3) the quality of SME research has not worsened relative to larger firms; and 4) SME liquidity conditions have worsened, relative to larger firms, in terms of tightness (measured by bid-ask spreads), but not in terms of depth (measured by the Amihud illiquidity ratio and the turnover ratio). However, in absolute terms, SMEs continue to be characterised by lower amount of analyst research, higher probability of losing coverage, worse quality of research and limited secondary market liquidity. This situation appears to have been neither improved nor worsened by the MiFID II research unbundling provisions.

JEL Classification: G14, G28, G29

Keywords: MiFID II, Equity markets, analyst coverage, sell-side research, market liquidity

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[1] The views expressed are those of the authors and do not necessarily reflect the views of the European Securities and Markets Authority. Any error or omissions are the responsibility of the authors. The authors would like to thank Barbara Alemanni, Antoine Bouveret, Salvatore Gnoni, Steffen Kern, Giovanni Petrella, Casper Rutting, Christian Winkler, the ESMA Committee of Economic and Market Analysis, the ESMA Committee on Consumer Protection and Financial Innovation, and seminar participants in the ESMA MiFID II Research Unbundling workshop held on 7 October 2020, for useful discussions and comments.
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1. Introduction

As of 3 January 2018, and as part of the Markets in Financial Instruments Directive II (MiFID II)[2], firms that provide portfolio management or investment advice on an independent basis (denoted asset managers) must pay for the research that they obtain, either by paying themselves or by passing on that charge to their clients. As a result, entities that, until that date, provided both research and brokerage and other investment-related services (i.e. investment firms) to asset managers must now separately identify the cost of the research they provide. In other words, the cost of research is now 'unbundled' from the cost of other services provided to the asset manager (to allow that firm to either absorb the costs itself or to pass on those costs to its clients).

These 'research unbundling' provisions aim to reduce the potential conflict of interest for those investment firms offering both execution and research services. As per Article 27 of MiFID II, investment firms are obliged to execute orders on terms that are the most favourable to their clients ('best execution'). These same firms often offer their clients research in addition to (i.e. bundled with) the order execution services that are provided. As a result, it can be challenging for investment firms to honour their best execution requirement when research is being offered at the same time and without being charged separately. Theoretically, this could lead to asset managers paying more for order execution services than they would otherwise have been willing if the cost of research was clearly separated from the cost of order execution services. Alternatively, brokerage firms can bundle research in at no or little additional cost for clients, whereas independent research providers do not have the option of cross-subsidization—which may lead to competition issues in the overall market for research.

The 'research unbundling' provisions also aim to address a second and related topic in the market for financial and economic research: the risk of overproduction of research. The provision of research can generate more business for an investment firm than would otherwise be the case if only brokerage services are provided. As a result, investment firms are economically incentivized to not only bundle research with order execution services, but also to produce more research than would otherwise be needed on particular companies or industries. There are several ways in which this can be manifested, including excessive amounts of research (e.g. multiple research pieces all providing similar recommendations), as well as research that is of lower quality (e.g. poor forecasts). Consequently, the MiFID II research unbundling provisions enable asset managers (and, ultimately, their own clients) to have clarity on the 'cost' aspect of the 'cost vs. benefit' trade-off they face when assessing whether research is useful to them.

To summarize, the MiFID II research unbundling provisions affect three distinct economic actors: research producers (typically investment firms who employ analysts to produce research and who also provide execution/brokerage services), research subjects (companies), and research consumers (asset managers)[3]. As shown in the chart below, these impacts can be self-reinforcing: if a company is less well-researched, then fewer asset managers may consider that company as an investment. In turn, a reduction in investor interest in that company can theoretically lead to less favourable financing conditions, such as higher issuance costs and/or a lower probability of oversubscription. In turn, a higher cost of issuance may also lead to less capital market activity for companies, and a greater reliance on other non market-based sources of financing, such as bank loans, or potentially a reduction in business activity. In either case, a company with less capital market activity is likely to be of less interest for research analysts, thus reinforcing the above-mentioned sequence.

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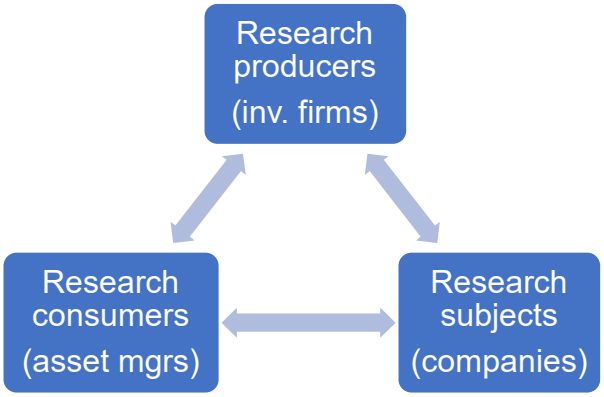
2 See Article 24(7)-(9) of Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 ('MiFID II') and Article 13 of Commission Delegated Directive (EU) 2017/593 of 7 April 2016 ('the MiFID II Delegated Directive').

3 See also Pope et al. (2019) for a discussion of similar efforts in Sweden involving specific pension fund managers. In the case of MiFID II, the provisions apply primarily both to asset managers and collective investment management companies providing the services of portfolio management and independent investment advice in the EU, and also to third-country firms providing these services through the establishment of a branch in the EU.



Since their application, the research unbundling provisions have generated a substantial amount of commentary and discussion and, more recently, academic research based on available data. For example, market participants, frequently quoting survey data, claim that, since the introduction of these provisions, the total amount of research produced has fallen, there are fewer analysts producing research on companies, and the quality of research has worsened (CFA 2019, Hull 2019). Public authorities have also begun investigating the impact of these provisions, also using survey evidence. However, their findings are less clear-cut: FCA (2019) survey results suggest little overall effect, whereas AMF (2020) indicate a more extensive impact of the research unbundling provisions on the quantity and quality of research in their respective jurisdiction.

Market participants have also identified the possibility that the MiFID II research unbundling provisions may have disproportionately affected small and medium-sized enterprises (SMEs) (Société Générale 2019). In addition, on 18 January 2020, the Commission launched a MiFID II-related consultation, wherein it requested feedback on a number of proposals to foster research coverage on SMEs, including "*to increase its production, facilitate its dissemination and improve its quality*". Subsequently, the Commission, on 24 July 2020, issued a consultation on a proposal to introduce a "*narrowly defined exception*" from the research unbundling provisions for small and mid-cap issuers (defined as companies whose market capitalisation has not exceeded EUR 1 billion at any time during the previous twelve months) and for fixed income instruments.

In light of this consultation, the research unbundling rules may further evolve in the future. Indeed, on 15 December 2020, following an earlier legislative proposal from the European Commission on 24 July 2020, the European Council approved the so-called Capital Markets Recovery Package[4]. This includes, among other measures, an exemption to the unbundling provisions for investment research on issuers whose market capitalization did not exceed EUR 1 billion during the preceding 36 months, provided that certain conditions are met. Moreover, a review clause is created, according to which the Commission shall review, amongst others, the rules on investment research, by 31 July 2021 at the latest.

In parallel to survey-based reports, there is a growing body of academic literature that seeks to assess the provisions' impact on various outcomes (e.g. analyst coverage, market liquidity, etc.). The literature has mainly focused on the impact of MiFID II on the number of analysts that research listed companies and on the quality of research.

This research points to a general decline in the number of analysts covering EU firms, following the entry into application of unbundling provisions. For example, Anselmi and Petrella (2020), Fang et al. (2019), and Guo and Mota (2020) find that the MiFID II research unbundling provisions have, since their date of application, led to an overall reduction, in terms of analysts covering a company, of 0.55, 0.44 and 0.67 analysts per company respectively. According to Guo and Mota (2020), this fall is driven by the fact that large companies tend be covered by more analysts. Thus, investment firms seeking to reduce costs have a greater incentive to scale back research on these companies.

Similarly, Anselmi and Petrella (2020) find that the impact of MiFID II depends on company size: larger EU companies (i.e. those with market capitalisation greater than 3.5 billion euros) have experienced a fall of about 1.55 analysts covering them, relative to a pre-MiFID II average of between 18 and 20

[4] See https://www.consilium.europa.eu/media/47469/st13798-ad01-en20.pdf for further details

analysts. In contrast, the authors find that small companies (i.e. those whose market capitalisation is between 300 million and 1 billion euros) experienced a reduction of 0.22 analysts covering them, as a result of the application of MiFID II, from an average of 4 to 5 analysts per company in the several years preceding MiFID II. Lastly, Lang et al. (2019) analyse specific companies' characteristics and find a significant reduction in analyst coverage of about 0.057 analysts for the largest, oldest, and less volatile (in terms of forecast dispersion) companies.

Regarding the quality of research post-MiFID II, recent studies have concluded that the accuracy of analyst forecasts has tended to increase following the implementation of MiFID II (Fang et al. (2020), Guo and Mota (2020), and Lang et al. (2019)). In particular, Guo and Mota (2020) find that analysts employed both before and after MiFID II tend to produce better quality research, while analysts that produce less accurate research are more likely to cease their research activities entirely after MiFID II than analysts whose forecasts are more accurate. Fang et al. (2020) conclude that stock recommendations on EU companies post-MiFID II seem to be more profitable and stimulate greater market reactions.

Elsewhere, research on the impact of MiFID II on market liquidity conditions indicates a moderate negative impact. For example, Lang et al. (2019) find evidence that the MiFID II research unbundling provisions have led to a widening in the bid-ask spread for affected companies. Anselmi and Petrella (2020) find that there might be a positive association between the introduction of MiFID II and the bid-ask spread for both small and mid-cap companies.

This paper contributes to the emerging literature by extensively comparing the impact of the MiFID II research unbundling provisions on SMEs in relation to larger companies. In doing so, we introduce a definition of SMEs that is grounded less by market conventions (which, by definition, are subjective) and more in legal and supervisory frameworks. This is not an arbitrary distinction: whether a firm satisfies the regulatory definition of SMEs has material consequences for the capital requirements faced by any banks providing funds to the company and, therefore, the company's overall strategy for accessing funding from capital markets. In addition, SMEs have fewer disclosure requirements under the Prospectus Regulation and Accounting Directive, which may also (while reducing reporting burdens) imply less investor awareness of these companies at outset, all else being equal. Lastly, SMEs are also clearly identified in various statistical collection exercises (e.g. in Eurostat and in the European Central Bank), which also provides them with a distinct status that can be exploited using a difference-in-difference strategy.[5]

In addition, our paper extends recent efforts (e.g. Anselmi and Petrella 2020) to assess the impact of the MiFID II research unbundling provisions on companies' liquidity and financing conditions. It does so by recognizing that there are various and complementary ways in which market conditions can be measured, for example in terms of tightness, depth, and cost.

Elsewhere, the paper aims to take a longer-term perspective when assessing the impact of research unbundling provisions on sell-side research quantity and quality. In doing so, this paper sheds light on structural developments in the market that may also affect the supply of sell-side research, such as digitalization, industry consolidation and decreasing number of listings.

In this respect, we find that, after the application of the MiFID II research unbundling provisions on 3 January 2018, the quantity of research per SME has not declined relative to larger companies, the probability of an SME completely losing coverage has not increased relative to a larger firm, and the quality of SME research has not declined relative to larger firms. However, SME liquidity and financing conditions have worsened relative to larger firms, in terms of tightness (measured by bid-ask spreads) and cost of debt, but not in terms of depth (measured by the Amihud illiquidity ratio and the turnover ratio). Finally, in absolute terms, SMEs continue to be characterised by relatively less analyst research, higher probability of losing coverage, lower quality of research and limited secondary market liquidity. This situation has not been affected by the MiFID II research unbundling provisions.

Taken together, these findings appear to be more in line with the existing academic literature than with industry surveys.

[5] Other papers (as Fang et al. 2020) group companies by economic measures, as size, liquidity or other features.

The remainder of this paper is organised as follows. Section 2 describes the data used for this analysis. Section 3 presents the data-based empirical evidence on research quantity and research quality in the EU. Section 4 describes the estimation strategy and Section 5 shows the results. Section 6 concludes.

2. Data

Our sample comprises sell-side research (i.e. research provided by either investment firms or independent research providers) data via I/B/E/S Datastream on 8,000 companies headquartered in the 27 European Union (EU) member states and the United Kingdom[6]. This sample represents companies that have been active at any time between January 2006 to December 2019[7]. Table A1 presents our sample by headquarter country and company classification (SME and large)[8].

We focus on the possible impact of MiFID II on sell-side research rather than on buy-side research (i.e. research produced in-house by investment funds) due to data availability considerations[9]: buy-side research is generally not published. In particular, we look at the quantity of research produced by sell-side analysts, the company's probability of losing coverage, the quality of the research produced, as well as companies' liquidity and financing conditions. Company-level data was collected according to all different specifications.

As discussed further in the estimation strategy section below, we focus on the possible differential effects of MiFID II research unbundling provision on SMEs, relative to the effect of the same provisions on large companies. We classify 2,605 firms as SME (3,122 large companies) using the criteria set out by the European Commission (2003)[10], which are:

- Number of employees < 250 and total assets ≤ EUR 43m.
- Number of employees < 250 and turnover ≤ EUR 50m.

All variables are defined in detail in Table A2 of Annex A1, while Table A3 in that same annex presents descriptive statistics and Table A4 displays a correlation matrix for the main variables of interest.

To approximate the *quantity of research* produced by sell-side analysts on a specific company, in line with similar papers, such as Anselmi and Petrella (2020) and Lee and So (2017), we collect and use the variable "*earnings per share total number of estimates*" from Refinitiv on a monthly frequency. Earnings per share (EPS) estimates are the most common research estimates produced by sell-side analysts covering a particular company and, therefore, represent a worthwhile measure for assessing the extent of analysts' coverage of individual companies[11].

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6 The United Kingdom's membership of the European Union ceased on 31 January 2020, and thus it remains as part of the EU during our sample period.

7 Active firms are defined as those listed on one or more European exchanges as at end-2019. In contrast, inactive firms are firms that, as at end-2019, were delisted (due to mergers, bankruptcy, etc.), but were active at some point between January 2006 and December 2019. To allow effective identification of a possible MiFID II impact, we restrict our econometric analysis to a shorter time window: from January 2015 to December 2019, which represents two years either side of the start of the MiFID II provisions of interest. Companies included in this sample must have been active in at least several months both before and after the entry into application of the MiFID II research unbundling provisions. Our sample during this time window comprises 5,727 companies and includes 60% of listed companies considered as 'active' by the end of December 2019 (as reported by the Federation of European Securities Exchanges (FESE)).

8 Similar table but, on the full original sample (2006-2019) is available in Amzallag et al. (2020) "The impact of research unbundling on equity markets" ESMA Report on Trends, Risks and Vulnerabilities, No 2, 2020.

9 See Fang et al. (2020) for an exploration of impacts on buy-side research. Further quantitative assessment of the provisions by research categories such as sponsored compared with unsponsored research, was considered but not further explored due to data availability limitations.

10 Underlying data description and additional information of firms' classification are available in Amzallag et al. (2020) "The impact of research unbundling on equity markets" ESMA Report on Trends, Risks and Vulnerabilities, No 2, 2020. Firms for which the above variables (number of employees, total assets, and turnover) are not available are excluded from the econometric analysis.

11 The variable "*number of analysts covering a firm*" available on Refinitiv Eikon (I/B/E/S Summary Estimates) was downloaded to perform some robustness checks. As shown in Table A3 below, the average number of EPS estimates produced by

Research quality is measured using the "*EPS annual surprise percentage difference*" which represents the difference between the latest outturn EPS and the most recent EPS estimate for the period. This variable is available on I/B/E/S Datastream at a yearly frequency[12] and reflects the extent to which analysts' estimates for a company's annual EPS were different from reality (the "surprise"). In other words, it represents the median surprise across all analysts in the sample. Thus, a zero "*EPS annual surprise percentage difference*" for a company in a given year implies that there has been no surprise and therefore analysts' median forecasts for that company in that year were identical to the result. This variable thus appears to be a reasonable way of measuring the accuracy of an analyst's forecasts and is of a similar nature as the *quantity of research* measure: both variables use the EPS estimate as a basis for their calculation.

We use several indicators to measure the secondary market liquidity conditions faced by the companies in our sample, in line with the existing academic literature in this area (see Diaz and Escribano, 2020). These include the average monthly bid-ask spread and Amihud illiquidity ratio (Amihud 2002) and the turnover ratio (the monthly trading volume divided by the outstanding market capitalisation of a company's shares at the end of the same month). It is possible that any impact of the MiFID II provisions could be felt via companies' financing conditions, in a manner independently of liquidity conditions. To this end, we retrieve, on a monthly frequency, the variable "*weighted cost of debt*"[13] representing the marginal cost to the company of issuing new debt.

Finally, we use (monthly) data on market capitalisation and turnover as company-level control variables throughout the econometric analysis.

3. Empirical evidence

3.1 Impact on research quantity

Figure 1 illustrates trends in the intensity of research, focusing on the yearly range in the number of analysts covering companies in our data sample. In order to ensure that we look at intensity of research, we only analyse companies that were both listed in an EU exchange in late 2019 and have been active at all times between 2006 and 2019.

First, it does not appear that the introduction of MiFID II (see the vertical red line) in January 2018 has led to a significant difference in the number of analysts producing EPS estimates per company. This is illustrated both by the median (black horizontal bar) in each box just before and after the vertical red line staying identical (3 analysts per company)[14].

Second, the number of analysts producing EPS estimates for the company at the 75th percentile (the top of the green vertical bars) has declined slightly but, interestingly, this appears to be the continuation of a long-term trend that began as far back as 2012.[15]

Third, as Figure 2 below illustrates, data on SMEs suggests that this sub-market has remained largely stable in terms of research intensity. Indeed, all indicators –the 90th percentile (not shown), 75th percentile, median (50th percentile), and 25th percentile number of analysts covering SME companies – have remained constant since 2010 (standing at 6, 3, 2, and 1 analysts, respectively). This appears to indicate that the long-term slight reduction in research intensity is affecting mainly large companies.

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analysts is 5.162 for the entire sample. Similarly, the average number of analysts following a firm is 5.402. These two estimates, together (as shown in Table A4 below) with the high correlation (0.994) and a similar distribution, suggest an almost one-to-one correspondence between the two variables (i.e. one EPS estimate for a firm corresponds to one analyst covering a firm and vice versa).

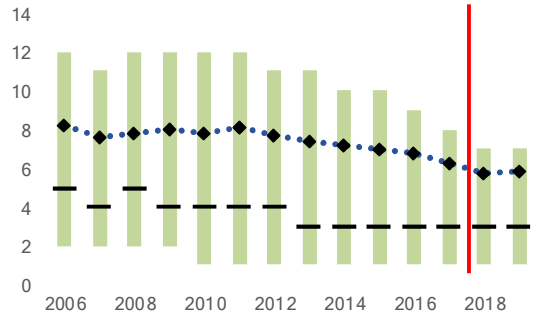
12 Because of the variable construction, the analysis on *research quality* has been conducted on annual data.

13 As defined in Table A2, the variable is calculated by adding weighted cost of short-term debt and weighted cost of long-term debt based on 1-year and 10-year point of an appropriate credit curve.

14 Similar results are found when examining the number of analysts covering a firm, in contrast to the number of analysts producing EPS estimates for a firm.

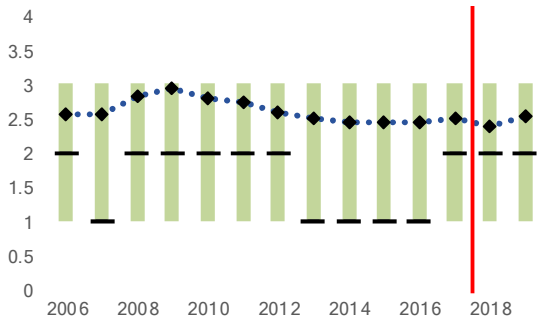
15 A similar picture can be seen when looking at the 90th percentile of the data sample (not shown): among companies with very high number of analyst estimates being produced, there has been a large and steady fall in the number of these estimates per firm after 2011.

Figure 1
Impact of MiFID II on intensity of research for large companies and SMEs
Stable number of analysts covering each company before and after MiFID II



Note: Sample of 4,870 EU firms that have been in operation at all times bet. 2006 and end-2019, and at all times researched (i.e. have EPS estimates produced) by analysts. Black diamonds (horizontal bars) in each box = average (median) across firms in the year. 25th and 75th percentiles = bottom and top edges in each box. MiFID II date of application = vertical red line.
Sources: Refinitiv, I/B/E/S, ESMA calculations

Figure 2
Impact of MiFID II on intensity of research for SMEs only
SMEs: Stable number of analysts covering each company before and after MiFID II



Note: Sample of 2,100 EU firms that have been in operation at all times bet. 2006 and end-2019, and at all times researched (i.e. have EPS estimates produced). Black diamonds (horizontal bars) in each box = average (median) across firms in the year. 25th and 75th percentiles = bottom and top edges in each box. MiFID II date of application = vertical red line. SMEs defined as per European Commission (2003).
Sources: Refinitiv, I/B/E/S, ESMA calculations.

Taken together, these findings suggest that the research industry has undergone a steady process of consolidation in terms of the amount of research coverage being provided on companies in the EU, and that this trend is concentrated on companies rather than SMEs. This is in line with pre-MiFID II market participant observations that there were excess amounts of research being provided on certain (presumably larger) companies (Marriage 2016). For example, one research study estimated that "*well over 40,000 research notes – from comprehensive reports to minor updates linked to corporate announcements – are sent out every week by the top 15 global investment banks, of which less than 5% are opened*" (Kwan and Quinlan 2017). Another potential driver is the steady growth in the past decade in index-tracking funds and passive management, both of which make less use of research than actively-managed investment vehicles (see also Anselmi and Petrella 2020).

The next step is to examine the possible impact of the MiFID II research unbundling provisions on the second measure of research quantity: research coverage, i.e., whether or not companies have any EPS estimates at all produced by analysts during the sample window.

3.2 Loss of coverage

Figure 3 presents the number of companies that were no longer researched (i.e. have EPS estimates produced by analysts), over the period 2006 to end-2019.[16] It appears that the number of companies losing coverage in this way has been increasing[17]. However, this increase began much earlier than the introduction of MiFID II: since 2012 there has been a steady rise in the number of companies that are no longer receiving EPS estimates from any analyst, which suggests a steady rise in the number of companies losing research coverage. It is likely that this trend is driven by reductions in the number of research analysts, for example due to a greater use of technology and 'big data', the steady rise in

[16] Information is presented on a quarterly basis for a total of about 6,800 companies, separated into SMEs (c. 3,200 companies), large companies (c. 2,800 companies), and companies that could not be classified (c. 760). Companies that drop out of the data sample due to bankruptcies, mergers, or delisting are excluded from the sample. Only companies that continue to be listed and are no longer covered on a permanent basis are included in the figure. For firms that lose coverage during 2019, it is challenging to assess whether that loss is temporary or permanent. This is because past data since 2006 indicates that some firms that are no longer covered by analysts in a given time period will subsequently resume to be covered by the same or other analysts in future years. The numbers presented in Figure 3 include a correction for the average number of firms losing coverage on a temporary basis in each year between 2011 and 2018. The total number of firms deemed to lose coverage in 2019 is reduced by this correction, which has been calculated separately for SMEs, non-SMEs, and not classifiable firms.

[17] Roughly 270 EU companies were no longer covered by sell-side research analysts during 2019, in comparison to 140 companies losing coverage in 2017. In both years, the proportion of SMEs losing coverage as a share of total companies losing research coverage was roughly constant (55% of companies losing coverage in a year were SMEs).

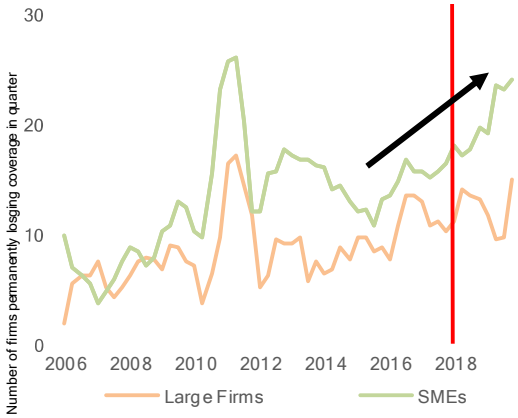
passive alternatives to active asset management, as well as a fall in equity commissions (Noonan 2016, Wigglesworth 2017a, Wigglesworth 2017b, Mayhew 2019).

The number of large companies losing coverage (orange line in Figure 3) actually declined for roughly 1.5 years after the introduction of MiFID II, before sharply increasing at the end of 2019[18]. The sharp increase in loss of coverage (both for large companies and SMEs) has only appeared in recent months and it is difficult to conclude that this is a trend that is driven by MiFID II, also since the research unbundling provisions were widely known in advance, as described in the introduction. Similarly, although there has been a sharp increase in the number of SMEs losing coverage since January 2019 (green line in Figure 3), other sharp jumps have been observed in the past, including from mid-2015 to mid-2016.

In addition, it is important to recall that there are also companies that gain coverage at any point in time, and that have not been covered in earlier years. This fact must also be considered when examining the overall impact of the MiFID II research unbundling provisions on the quantity of research produced on EU companies. Figure 4 below subtracts the number of companies losing research coverage from the number of companies gaining coverage in each quarter (starting from 2009).

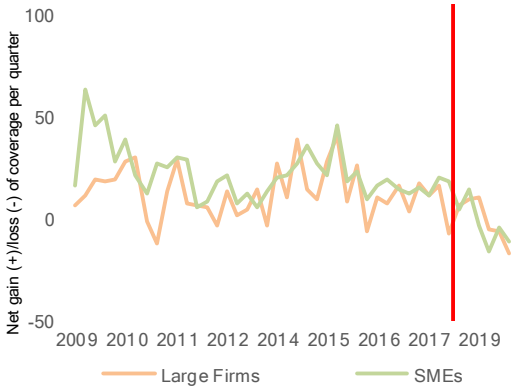
Figure 4 below suggests that both large and SME companies across the EU steadily *gained* analyst coverage until around the end of 2018[19]. However, in early 2019 – i.e. more than one year after the implementation of MiFID II, and for the first time in the sample period, the net growth in SMEs and large companies across the EU being researched began to turn negative. Further investigations are needed before concluding that the MiFID II research unbundling provisions are the reason for this change of situation, and whether this is a consistent trend. For example there is recent evidence that the Covid-19 pandemic and resulting economic uncertainty has led to a surge in research analyst coverage (Clarke 2020).

Figure 3
Impact of MiFID II on research coverage
Long-term increase in companies losing coverage



Note: Sample of 6,800 EU firms that have at any time from 2006 to end 2019 permanently ceased to be researched (i.e. have EPS estimates produced) by all analysts. SMEs classified as per European Commission (2003).
Sources: Refinitiv, I/B/E/S, ESMA calculations.

Figure 4
Impact of MiFID II on research coverage
Net loss across the EU of research coverage starting in 2019



Note: Sample of 6,120 EU firms that have at any time from 2006 to end 2019 either begun or permanently ceased to be researched (i.e. have EPS estimates produced) by at least one analyst. Firms that cannot be classified as either SMEs or Large are excluded.
Sources: Refinitiv, I/B/E/S, ESMA calculations.

[18] It is likely that the large jump in firms losing research coverage during 2010 and 2011 is at least in part driven by brokerages and other research providers reducing their number of research analysts, as part of widespread layoffs in the EU financial services sector during 2009, 2010, and 2011 (see for example Eurostat employment data: series code nama_10_a64_e and industry sector "*Financial service activities, except insurance and pension funding*").

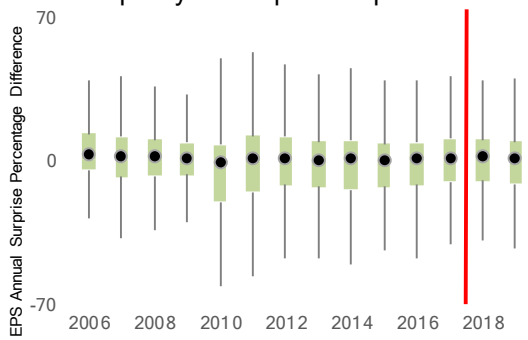
[19] Additionally, further calculations suggest that, although the cumulative number of firms gaining coverage is overall higher than the one of firms losing coverage entirely, the growth rate of the two go in the opposite directions. In other words, it seems that in the data sample, firms are losing coverage faster than firms are gaining coverage.

3.3 Impact on research quality

Figure 5 below provides an initial visualisation of the possible impact of the MiFID II research unbundling on the *quality* of research produced on EU companies. The figure suggests a weak trend towards improved accuracy of EPS forecasts after the implementation of MiFID II. This is illustrated by the median (black dot), in the two bars after the vertical line, approaching zero (i.e. no surprise in terms of EPS forecasts and therefore better quality). At the same time, there appears to be a trend, from 2012 onwards, for the 90th and 10th percentiles in each year to be narrowing[20].

This trend suggests that research quality has been improving in the last years, rather than merely following the application of the MiFID II research unbundling provisions. One reason for this improvement could be that, despite the increase in the number of companies losing coverage, those analysts who continue to follow specific companies tend to be more accurate in terms of EPS estimates—which appears to be in line with the recent academic studies discussed above. At the same time, the low market volatility environment that has largely prevailed since 2012 (Goedhart and Mehta 2016, ECB 2012) also undoubtedly created favourable conditions for an improvement in forecast accuracy.

Figure 5
Impact of MiFID II on research quality
Research quality stable post vs. pre-MiFID II



Note: Sample of 5,200 EU firms that have at any time been in operation at all times bet. 2006 and end-2019, and at all times researched (i.e. have EPs estimates produced) by analysts. Black horizontal bars in each box = median across firms in the year. 25th and 75th percentiles = bottom and top edges in each box. Additional lines ('whiskers') = 10th and 90th percentiles. MiFID II date of application = vertical red line.
Sources: Refinitiv, I/B/E/S, ESMA calculations.

4. Estimation strategy

4.1 Overall strategy

Faced with additional constraints, sell-side research providers may decide to focus on companies that have greater ex ante interest for their clients, in terms of size, liquidity or other features. We focus our econometric analysis on SMEs classified using the criteria set out by the European Commission (2003), as explained in section 2. We follow the regulatory definition of SMEs. because, from a regulatory and supervisory perspective, it has material consequences in other regulatory areas, such as supervisory capital requirements for lenders (under the Capital Requirements Regulation for example). In addition, SMEs have fewer disclosure requirements under the Prospectus Regulation and Accounting Directive, which may also (while reducing reporting burdens) imply less investor awareness, all else being equal. Lastly, SMEs are also clearly identified in various statistical collection exercises (e.g. in Eurostat and in the European Central

[20] Research quality appears to improve slightly for large companies (not shown). Although the median forecast error approaches zero for both SMEs and large companies, dispersion for SMEs (90th and 10th percentiles) tends to expand after the application of MiFID II. However, there may be other confounding factors behind this as well, such as greater data availability for large companies combined with a trend toward using 'big data' techniques to conduct research.

Bank), which also provides them with a distinct status that can be exploited using a difference-in-difference strategy.[21]

We use a difference-in-difference strategy to assess several possible effects of MiFID II on SMEs, in comparison with large companies.

We begin by using equation (1) below when testing the impact of the MiFID II research unbundling provisions. In equation (1), β_1 captures the potential differential effect of the entry into application of the MiFID II research unbundling provisions on SMEs, relative to the effect of the same provisions on large companies. This is represented econometrically by the indicator variable $Post\ MiFID\ II_t$ taking the value of 1 for any month on or after January 2018. Elsewhere, SME is an indicator variable which takes the value of 1 for companies defined as SMEs, 0 as large. Lastly, we introduce various company-level controls, as described in the previous section, as well as month-year and company fixed effects.

$$y_{i,t} = \beta_1 * SME * Post\ MiFID\ II_t + \boldsymbol{\beta} * \boldsymbol{X_{i,t}} + \delta_t + \gamma_i + \varepsilon_{i,t} \quad (1)$$

In formulating this equation (as well as equation (2) further below), we seek to explore whether, since the date of application of the MiFID II unbundling provisions, EU SMEs have been treated differently than larger companies by the research community. This difference in treatment could arise in several ways, which are explored in turn.

4.2 Research quantity and loss of coverage

First, we begin by examining the possible effect of the MiFID II research unbundling provisions on the quantity of research produced by sell-side analysts on SMEs, relative to large companies. A possible mechanism for this effect is the following: the MiFID II research unbundling provisions imply that investment funds have greater clarity on the costs of the research that they consume from sell-side brokers and other research providers. By virtue of greater clarity, investment funds' sensitivity to research costs increases and, compared with the pre-MiFID II research unbundling era, may choose to consume less research. As a result, sell-side research providers may earn lower revenues and feel pressure to rationalize their own resources, whether through reducing the frequency and/or depth of research produced on individual companies (lower research intensity), or by ceasing to cover some companies overall (lower research coverage).

To test the research intensity effect, in equation (1), the dependent variable is the monthly *number of eps estimates* produced by sell-side analysts. Control variables are *market capitalisation* and *turnover* expressed in natural logarithms. In addition, we perform several robustness checks, including allowing for a longer-term trend to affect our results (using a larger sample window starting from 2006), restricting our sample to companies that have never lost coverage between 2015 and 2019 (so as to better isolate the impact of the unbundling provisions purely on the intensity of covering certain firms), and lastly using a different—but related—dependent variable (number of analysts covering a company, rather than number of EPS estimates produced for a company).

Besides reducing the amount of research produced on individual companies, sell-side research providers may take the decision of ceasing to cover some companies overall (lower research coverage). We employ equation (1) again to investigate whether MiFID II research unbundling provision has any effect on SMEs' probability of losing coverage completely (either temporary or permanently), relative to large companies. For this research question, the dependent variable in equation (1) is *loss of coverage*, an indicator which takes the value of 1 if a company loses all coverage at any month between January 2015 and December 2019, and 0 otherwise. Companies that are no longer researched 'because they are no longer listed are excluded. Since *loss of coverage* is binary for construction, we employ the Probit model as estimation strategy. In contrast to regressions elsewhere in this analysis, we only employ year-month fixed effects[22].

[21] Other papers (e.g. Fang et al. 2020) group companies by economic measures, as size, liquidity or other features.

[22] We do not introduce firm fixed effects as unconditional probit fixed effects model are known to be biased, in particular in short panels.

4.3 Research quality

We then examine another possible effect of the MiFID II research unbundling provisions, namely whether, following the introduction of these provisions, the quality of research has changed for SMEs in a different way compared to large companies. The question of the impact of these provisions on research quality across EU companies is a key topic that has been explored in numerous papers mentioned above. However, we choose here to focus on the differential impact on SMEs relative to large companies and, in doing so, seek to test the following mechanism: as mentioned above, the MiFID II research unbundling provisions are likely to increase investment funds' sensitivity to research costs. As a result, it is likely that funds will become more demanding in terms of the quality of research that they are willing to pay for, all else being equal. In this way, sell-side research providers may seek to improve their research quality offering, either by being more aggressive in retaining only the most accurate analysts, or by expending greater efforts to seek out hidden or lesser-known opportunities. By virtue of their smaller size, lower liquidity, and less frequent access to capital markets, SMEs are likely to generally be less well-known than larger companies.

We employ equation (1) as well to measure *research quality*, where the dependent variable is the median forecast inaccuracy, defined as the absolute value of the difference between the latest interim EPS and the most recent prior estimate, for the same future horizon.[23] For this analysis we employ an annual dataset. Controls are the same as for research quantity and loss of coverage, and we perform similar robustness checks.

4.4 Exploring whether research quantity or research quality impacts dominate

It is important to recall that the above-mentioned effects are unlikely to operate in isolation. In other words, changes in the quantity of sell-side research and the relative effort placed by sell-side analysts in producing higher-quality research can counterbalance each other. Indeed, sell-side research companies can cover fewer companies, but may at some point find it profitable to cover lesser-known companies that are therefore offering greater profit-making opportunities for clients and to ensure that they improve the quality of their research as well.

As explained in 4.1 above, SMEs are almost by definition less well-known than their larger peers. It is thus possible to explore which effect mentioned in the previous two sub-sections ultimately dominates (quantity vs. quality). This is because a reduction in research on companies may well lead to less investor interest (i.e. if investors are less aware of a company, all else being equal, they may invest less in that company). On the other hand, if there is a reduction in research, but this is counterbalanced by improved quality of the remaining research even on an industry as a whole, rather than on individual companies – this may instead build confidence in the company or its overall industry and attract investors to explore opportunities.

4.5 Companies' liquidity and financing conditions

Finally, we focus on the impact of research unbundling provisions on the market conditions experienced by the companies in our sample: their costs of financing (debt) and secondary market liquidity conditions.[24] Even if there is less research for companies, it is possible that their financing conditions may improve if the remaining research is of higher quality. Indeed, as shown by Fang et al. (2020), the reactivity of investors to analyst announcements appears to have increased following the introduction of the MiFID II research unbundling provisions.

First, we check whether SMEs, relative to larger companies, have witnessed significant changes in their secondary market liquidity conditions following the introduction of MiFID II. As is well known,

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[23] Strictly-speaking, we thus measure the forecast *in*accuracy insofar as an increase in the absolute value of the difference between the latest interim EPS and the most recent prior estimate would imply less accuracy.

[24] It is challenging to isolate the effect of the MiFID II research unbundling provisions from the effect of the other simultaneous reforms adopted by MiFID II on companies' liquidity and financing conditions. We attempt to insert some measure of research intensity in our regressions by use of the number of eps estimates per firm. Nevertheless, this section can also be viewed as an assessment of the overall MiFID II package's possible differential impact on SME liquidity and financing conditions relative to large companies' similar conditions over the sample time window.

market liquidity is a complex concept and comprises multiple dimensions (Diaz and Escribano 2020). In our econometric exercise we analyse market liquidity from the angle of market tightness and market breadth:

- Market tightness is proxied by bid-ask spreads. Tighter markets are those in which market participants face large transaction costs when buy or sell an asset.

- Market breadth is proxied by the Amihud illiquidity ratio and the Turnover ratio. A market is said to be broad when there are numerous buyer and seller orders for large volumes.

We employ year-month and firm-level fixed effects in all specifications when possible[25].

In addition, we analyse the impact on financing conditions of companies – measured by the weighted cost of debt — following the introduction of MiFID II. The dependent variable is *weighted cost of debt*. We use year-month and firm-level fixed effects and control for market capitalisation and number of EPS estimates in different specifications to avoid multicollinearity[26].

The effect on companies' liquidity and financing conditions are assessed using a modified version of equation (1), presented below as equation (2), which introduces the notion of 'permanent loss of coverage'. In doing so, we test, first, whether losing coverage permanently has any effect on companies' liquidity or financing conditions. Second, we test if this effect is stronger for SMEs or large companies. These separate effects are shown in equation (2), where β_2 captures the potential differential effect of permanent coverage loss on SMEs' liquidity or financing conditions, relative to the effect on large companies' liquidity or financing conditions (SME*permanent-loss is an indicator variable which takes the value of one when no EPS estimate is produced at any time between January 2015 and December 2019 for SMEs).

$$y_{i,t} = \beta_1 * SME * Post\ MiFID\ II_t + \beta_2 * SME * permanentloss_{it} + \boldsymbol{\beta} * \boldsymbol{X_{i,t}} + \delta_t + \gamma_i + \varepsilon_{i,t} \qquad (2)$$

Moreover, in equation (2) we test specifically whether the *quantity* of research affects companies' secondary market liquidity and financing conditions. We do this by adding the number of EPS per company as a control variable. This control variable is particularly relevant because more analyst eps estimates per company may help publicise that company and, as a result, lead to greater market activity on that entity[27]. As before, we introduce other various company-level controls, as described in the previous data section, as well as year-month and company-level fixed effects.

5. Results

5.1 Research quantity and loss of coverage

Table B1 in Annex B1 assesses the correlation between the introduction of MiFID II research unbundling provision and the quantity of research produced by sell-side analysts for SMEs, relative to large companies, within Europe.[28] As shown in Table B1, the quantity of research produced by sell-side analysts has generally declined following the application of MiFID II, by around 1 analyst per company. This reduction may be interpreted as increased efficiency in the production of research, when considering, as shown in Fang et al. (2020) that, in conjunction with these per-company analyst reductions, recommendations issued by the remaining analysts on EU companies

[25] Depending on the dependent variable we use different estimation models, OLS for bid-ask spread and turnover ratio, and Tobit for Amihud illiquidity ratio.

[26] Ideally, we would have controlled both for market capitalisation and for number of eps estimates per company but, as shown in Table B2 in Annex B1, these two variables are highly correlated among each other leading to risks of multicollinearity. We do not use trading volume as a control variable because this forms part of the Amihud Illiquidity ratio.

[27] We do not include the number of eps estimates per company as a control variable when using the turnover ratio as a dependent variable, as (see Table B2 in Annex B1) there is a high positive correlation between the number of eps estimates and the market capitalisation of a company (which is the denominator of the turnover ratio). Any effect of the number of eps estimates per company on that company's turnover of shares is likely to be confounded by the impact of the number of eps estimates on market capitalisation.

[28] The table presents the Difference-in-Difference model introduced in Eq. (1) where the dependent variable is quantity of research, measured as the total number of estimates on EPS published by analysts for a given stock in any month over the timeframe considered. All variables are defined in Annex A1.

post-MiFID II appear to be more profitable and to stimulate greater market activity.

SMEs do not appear to have been disproportionately affected by the implementation of research unbundling provisions, in terms of the number of analysts following each company. The overall decline in analyst coverage per company across all companies (-1 analyst per company) is counterbalanced by the positive interaction term *sme x mifid_II* (+1 analyst per company). As a result, the overall amount of the analyst coverage for SMEs is unchanged—or at most only slightly reduced— following the entry into application of MiFID II. These results continue to hold under robustness checks performed on a larger time window (2015-2019), on a different dependent variable (number of analysts covering a company) and on a restricted sample based on companies that have never ceased being covered by sell-side analysts between January 2015 and December 2019. These robustness checks are shown in columns (5), (6) and (7), respectively. The results on the impact of research unbundling on the quantity of research are consistent with the evidence described in Section 3, with Amzallag et al. (2020) and with recent academic studies on the topic as Anselmi and Petrella (2020).

Table B2 in Annex B1 examines the correlation between the introduction of MiFID II research unbundling provision and the probability of losing coverage (either temporarily or permanently) for SMEs, relative to large companies. The results suggest that all companies in the sample are more likely to cease being researched by analysts after the implementation of MiFID II, as indicated by the positive and significant coefficient of the *mifid_II* dummy variable.

Moreover, at first glance, the positive and significant coefficient of the *sme* dummy variable in columns 1 to 3 of Table B2 suggests that, compared with larger firms, SMEs are more likely to completely cease being researched. Although this is worrisome for SMEs over all, it is important to note that the MiFID II research unbundling provisions do not appear to have contributed to this situation. This is shown by the interaction term *sme x mifid_II* in Table B2, which is negative and unstable with respect to its magnitude and significance (see columns 1 to 3 of Table B2).

Lastly, column (4) in Table B2 explores how quickly any impact of the research unbundling provisions on the probability of firms losing coverage takes effect. This is performed by restricting the time window of the sample to 2016 (inclusive) to 2018 (inclusive), compared with the 2015 to 2019 in the previous regressions for this table. Indeed, the *sme x mifid_II* interaction term is statistically insignificant, in contrast to columns (1) to (3) in the same table. This suggests that the MiFID II research unbundling provisions began to affect the probability of firms losing research coverage during 2019. This lagged effect may be due to outside factors not related to MiFID II, such as the duration of contracts signed between research providers and their clients. If contracts are renegotiated only once per year or, in any case, much later than 3 January 2018, it is likely that the impact of MiFID II may be delayed. These results also support the rise in firms losing coverage observed in late 2018 and 2019 in Figure 3 above.

5.2 Research Quality

Table B3 in Annex B1 assesses whether the introduction of MiFID II research unbundling provisions have affected the quality of research produced by sell-side analysts on EU companies. The results suggest that the quality of research, as measured by forecast accuracy, has remained broadly stable after MIFID II, as indicated by the insignificant coefficient of the *mifid_II* dummy variable. This result, which is not surprising in light of Figure 5 above, appears to hold specifically for SMEs relative to larger firms, as indicated by the statistically insignificant *sme x mifid_II* interaction term. In other words, the quality of research produced by sell-side analysts on SMEs does not appear to have significantly changed following the introduction of the MiFID II research unbundling provisions. In a similar manner to the quantity of research estimates discussed above, robustness checks performed on a larger time window (2006-2019) and on a restricted sample of companies are shown in columns (5) and (6) and confirm these results.

Interestingly, the accuracy of research on SMEs appears to be lower relative to larger firms in general. This can be seen in models (1) and (2) of Table B3, which indicate that the range in EPS estimates is much wider across SMEs relative to large companies (positive coefficient on the *sme* dummy variable with forecast *in*accuracy as the dependent variable). Understanding better why there appear to exist consistent divergences in research accuracy between SMEs and large

companies (for example, due to less readily available information on which to base research) would be an interesting avenue for future research[29].

5.3 Liquidity and financing conditions

Table B4 in Annex B1 presents the results of our regressions to test the impact of the MiFID II research unbundling provisions on secondary market liquidity and financing conditions.

As discussed further in section 4.5 above, we consider several measures of market liquidity. In columns (1) and (2) of Table B4 in Annex B1 suggests worsened secondary market liquidity conditions; in columns (3) and (4) higher Amihud illiquidity ratio indicates lower market liquidity; and, in columns (4) and (5) a larger turnover ratio points to higher market liquidity.

With reference to columns (1) and (2), the coefficient on *mifid_II* is positive and statistically significant, which indicates a larger bid-ask spread, i.e. worse liquidity conditions for all EU companies in our sample after the entry into force of MiFID II[30]. At the same time, SMEs appear to have encountered higher bid-ask spreads, relative to larger firms, following the introduction of MiFID II, as indicated by the positive and statistically significant coefficient on the *sme x mifid_II* interaction term (although this effect weakens in column (2) relative to column (1)). Despite this, SMEs that permanently cease being covered by sell-side research analysts, at any time in our sample window, do not appear to suffer particularly in terms of widening bid-ask spreads (as evidenced by the statistically insignificant term on *sme x permanent_loss*). Finally, the amount of research available per company appears relevant for market liquidity conditions: more abundant research appears to be associated with smaller bid-ask spreads, as indicated by the negative and statistically significant coefficient of *# eps estimates* in columns (1) and (2).

However, the picture changes when liquidity is examined from the perspective of market breadth. Indeed, in columns (3) and (4) the coefficients on the *mifid_II* dummy variable and on the *sme x mifid II* interaction term are both not statistically significant. This suggests that MiFID II has not significantly affected market liquidity conditions, as measured by the Amihud illiquidity ratio, either for all firms or for SMEs relative to large firms. Elsewhere, and not surprisingly, the positive and significant coefficient on the *permanent loss* dummy variable in columns (3) and (4) indicates that companies that permanently cease being covered by sell-side research analysts appear to subsequently suffer from worse liquidity conditions, as measured by the Amihud illiquidity ratio. Lastly, the negative and statistically significant coefficient of *# eps estimates* in columns (3) and (4) appears to indicate that more abundant research on a company is associated with improved liquidity conditions for that entity (i.e. a lower Amihud illiquidity ratio).

In columns (5) and (6), the introduction of MiFID II is associated with a general improvement in share trading turnover (turnover ratio), as indicated by the positive and statistically significant coefficient of *mifid_II*. SMEs appear to have particularly benefited from this, relative to larger firms, as evidenced by the positive and significant coefficient on the *sme x mifid_II* interaction term.[31]

In summary, results appear to be inconclusive: market liquidity conditions seem to have worsened in terms of tightness, measured by bid-ask spreads, but not in terms of depth, measured by Amihud illiquidity ratio and turnover ratio, following the MiFID research unbundling provisions.

Finally, Table B5 in Annex B1 examines the extent to which firms' cost of capital, here proxied by the weighted cost of debt, has been affected after the entry into application of MiFID II. The negative and statistically significant coefficient of *mifid_II* indicates that financing conditions appear to have improved. However, SMEs appear to have benefited from this reduction by less than larger firms,

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[29] We also explored an additional time-series measure of research quality, using the standard deviation (i.e. range of disagreement) on EPS forecasts across analysts researching each company. This measure could also capture additional information on the diversity of opinions in the market, in a complementary manner to the accuracy of analysts' forecasts. Regression models using this variable were consistently not significant (i.e. F statistic below a 95% critical value) and thus this was not pursued further—results are available from the authors upon request.

[30] It is very important to stress that many other provisions related to MiFID II began to apply on 3 January 2018 and it is challenging to isolate the impact of research unbundling from other measures introduced at the same time, such as those related to transaction reporting, +tick size and high-frequency trading.

[31] The number of EPS estimates is not included as a regressor in columns (5) and (6) because of the strong positive association between this variable and the market capitalisation of firms (as shown in Table B1 in Annex B1), and the fact that the market capitalisation enters in the denominator of the turnover ratio.

as illustrated by the positive and statistically significant coefficient on the *sme x mifid II* interaction term. Nevertheless, in net terms, SMEs appear to have experienced a reduction in the marginal cost of debt issuance. Whether an SME permanently ceases to be covered by research analysts (columns 3 and 4 in Table B5) does not appear to significantly affect its cost of issuing debt.

6. Discussion and conclusions

This paper has assessed several ways in which EU sell-side research could have been impacted by the MiFID II research unbundling provisions. These provisions began to apply on 3 January 2018 and require portfolio managers to pay for the research that they obtain.

The econometric analysis presented in this paper suggests that, after the introduction of the MiFID II research unbundling provisions: 1) the quantity of research per SME is overall unchanged—or at most has only slightly declined—relative to larger firms; 2) the probability of an SME completely losing coverage has not increased relative to the probability faced by a larger firm; 3) the quality of SME research has not worsened relative to larger firms; and 4) SME liquidity conditions have worsened, relative to larger firms, in terms of tightness (measured by bid-ask spreads), but not in terms of depth (measured by the Amihud illiquidity ratio and the turnover ratio). However, in absolute terms, SMEs continue to be characterised by lower amount of analyst research, higher probability of losing coverage, worse quality of research and limited market liquidity. Although regrettable, this situation does not appear to have been worsened by the MiFID II research unbundling provisions.

As mentioned above, both academic data-based studies and industry surveys tend to agree that the introduction of the MiFID II research unbundling provisions has led to a general reduction in the number of analysts producing research per company. Data-based research studies have noted, however, that this reduction appears to be oriented towards larger companies, in contrast to smaller companies, and more precisely towards companies that are older and more 'predictable'.

On the other hand, perhaps the greatest contrast between the academic literature and feedback on the MiFID II research unbundling provisions obtained via industry surveys relates to divergences in research quality. For example, and in contrast to the literature cited above, according to CFA (2019), "*Buy-side professionals mostly believe that research quality is unchanged, but sell-side respondents are generally more pessimistic, with 44% believing that research quality has decreased overall... Less than 10% of both buy-side and sell-side respondents believe research quality has increased.*"

In this regard, the aggregate results presented in this paper appear to be closer to the academic literature than to survey-based studies.

The MiFID II research unbundling provisions may also have had differential impacts on subsets of the EU market for research, such as on buy-side analysts in contrast to sell-side analysts, as well as on different types of research like unsolicited research versus sponsored research, as well as independent research providers. These areas, in particular the possible impact on sponsored research and on independent research providers, were not considered in this article due to limitations in data availability. However, they are noted here as interesting avenues for further research. It is also important to note that studies to date have tended to focus on the impact of the MiFID II provisions on firms already listed on EU exchanges. However, it would be interesting to explore whether the provisions have had an impact on firms' decisions to list on exchanges in the first place. A final possible area for future research concerns an evaluation of the actual price of research, with a view to examine whether any 'dumping' of research prices is taking place. Data limitations make this a challenging area to investigate, but material on this perspective would also contribute another element to this rich area for future study.

The research unbundling rules are also likely to evolve in the coming months. On 15 December 2020, following an earlier legislative proposal from the European Commission on 24 July 2020, the European Council approved the so-called Capital Markets Recovery Package[32]. This includes,

[32] https://www.consilium.europa.eu/media/47469/st13798-ad01-en20.pdf

among other measures, an exemption to the unbundling provisions for investment research on issuers whose market capitalization did not exceed EUR 1 billion during the preceding 36 months, provided that certain conditions are met. Moreover, a review clause is created, according to which the Commission shall review, amongst others, the rules on investment research, by 31 July 2021 at the latest.

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Annex A : Sample Description

Table A1.Breakdown of companies per EU country and size classification.

This table presents the sample composition by country and size classification. The sample is based on data of 5,727 companies, divided into SMEs (2,605) and large companies (3,122), headquartered in the 27 European Union (EU) and United Kingdom from 2015 to 2019.

Country	SMEs	Large Companies	Total
Austria	11	52	63
Belgium	52	62	114
Denmark	33	73	106
Finland	53	115	168
France	312	352	664
Germany	366	366	732
Greece	37	82	119
Ireland	21	33	54
Italy	121	222	343
Netherlands	33	108	141
Poland	145	177	322
Spain	60	348	408
Sweden	416	254	670
United Kingdom	890	664	1,554
Others*	55	214	269
Total	2,605	3,122	5,727

Notes: Countries with fewer than 50 companies in total have been grouped into 'Other', and include Bulgaria (27), Croatia (21), Cyprus (16), Czech Republic (10), Estonia (18), Hungary (19), Latvia (7), Lithuania (18), Luxembourg (20), Malta (7), Portugal (44), Romania (46), Slovak Republic (1), and Slovenia (1)
Sources: Refinitiv I/B/E/S, ESMA calculations.

Table A2.Variable Definitions

Variable	Description
# analysts	Number of analysts covering a company available in Refinitiv Eikon (I/B/E/S Summary Estimates). This variable is at monthly frequency.
# eps estimates	Total number of earnings-per-share (EPS) estimates provided by sell-side analysts and available in I/B/E/S Datastream. The EPS1NET varies monthly. Estimates are updated by a contributing analyst sending a confirmation of their estimate. When an analyst has not updated their estimate in the last 105 days, such estimate is filtered and excluded from the overall number of estimates.
amihud illiquidity ratio	Ratio of the absolute return to the trading volume in that month, as defined in Amihud (2002). Underlying variables of this ratio are sourced from Refinitiv Eikon and Datastream, resp.
bid-ask spread	Average monthly bid-ask spread for stock *i* in month *t* in bps. Ask price and bid price available in Datastream.
loss of coverage	Indicator that takes the value of 1 if a company loses all coverage (i.e. no EPS estimate is produced) at any month between January 2015 and December 2019, 0 otherwise. Companies' loss of coverage can be either temporary or permanent. Loss of coverage due to delistings is excluded.
market cap	Natural logarithm of market capitalisation expressed in millions of euros. Market capitalisation, available in Datastream, is the share price multiplied by the number of ordinary shares in issue.
median forecast inaccuracy	Absolute value of the difference between the latest interim EPS and the last estimated estimate for the period. The earning-per-share surprise percentage difference is available in I/B/E/S Datastream at yearly frequency.
mifid II	Indicator variable that takes the value of 1 for reporting periods after the implementation of MiFID II, i.e. after January 1, 2018, 0 otherwise.
permanent loss	Indicator variable that takes the value of 1 when a company permanently ceases to be covered by research analysts (i.e. no EPS estimate produced) at any time between January 2015 and December 2019, 0 otherwise. This indicator is time-varying. Loss of coverage due to delistings are excluded.
sme	Indicator variable that takes value of 1 for companies defined as SMEs, 0 for companies defined as 'large companies'. Companies are classified as SMEs and large companies according to the criteria set out by the European Commission (2003).
turnover	Natural logarithm of the number of shares traded for a company on a particular month. Turnover by volume is available in Datastream and is expressed in thousands.
turnover ratio	Ratio of the monthly trading volume to the market capitalisation in the month, both of which are available in Refinitiv Eikon and Datastream.
weighted cost of debt	Cost of debt represents the marginal cost to the company of issuing new debt and it is available in Refinitiv Eikon. The variable is calculated by adding the weighted cost of short-term debt and weighted cost of long-term debt based on 1-year and 10-year point of an appropriate credit curve. It varies monthly and it is expressed in percentage.

Table A3.Descriptive statistics for the full sample (2015-2019)

The sample is based on 297,095 monthly observations for 5,727 European companies from 2015 to 2019. Number of earnings-per-share estimates and number of analysts following a company are expressed in units. Median forecast inaccuracy is the earnings-per-share annual surprise percentage difference expressed in absolute value; the relatively low number of observations is driven by the fact that this variable is at yearly frequency. Bid-ask spread represents the average bid-ask spread quoted during that month in bps and, together with the amihud Illiquidity ratio, were multiplied by 100. Weighted cost of debt is expressed in percentage, and is available in Refinitiv Eikon starting from December 2015. Turnover and market capitalisation are in natural logarithms and, prior to being transformed, are expressed in thousands and millions of euros, respectively. All variables are defined in Table A2 above.

	N	Mean	St. Dev	min	max
amihud illiquidity ratio	247,082	.02	.10	0	1.19
bid-ask spread (bps)	247,469	3.53	11.97	-147.04	200
loss of coverage	297,095	.30	.46	0	1
(ln) market cap	264,128	5.17	2.44	-4.61	12.25
median forecast inaccuracy	15,107	73.26	658.24	0	35,233.33
mifid II	434,580	.38	.49	0	1
# analysts	284,159	5.40	7.85	0	42
# eps estimates	297,095	5.16	7.71	0	43
permanent loss	313,569	.20	.40	0	1
sme	434,580	.46	.50	0	1
(ln) turnover	252,637	6.34	3.08	-2.30	17.18
turnover ratio	248,736	.11	.61	0	10.39
weighted cost of debt	222,094	1.90	2.45	-50.67	55.64

Table A4.Correlation for main variables (2015-2019)

The sample is based on 297,095 monthly observations for 5,727 European companies from 2015 to 2019. Number of earnings-per-share estimates and number of analysts following a company are expressed in units. Median forecast inaccuracy is the earnings-per-share annual surprise percentage difference taken in absolute value. Bid-ask spread represents the average bid-ask spread quoted during that month in bps and, together with the Amihud illiquidity ratio, were multiplied by 100. Weighted cost of debt is expressed in percentage. Turnover and market capitalisation are in natural logarithms and they expressed in thousands and millions of euros, respectively. All variables are defined in the Variable ***Definitions***. Sample size changes due to market data availability. See Table A2 for a description of each variable.

Variables	# eps estimates	# analysts	loss of coverage	median forecast inaccuracy	bid-ask spread	amihud illiquidity ratio	turnover ratio	weighted cost of debt	sme	mifid	(ln) turnover	(ln) market cap	permanent loss
# eps estimates	1.000												
# analysts	0.994	1.000											
loss of coverage	-0.158	-0.152	1.000										
median forecast inaccuracy	-0.053	-0.053	0.046	1.000									
bid-ask spread	-0.227	-0.228	0.112	0.046	1.000								
amihud illiquidity ratio	-0.046	-0.045	0.023	0.010	0.079	1.000							
turnover ratio	-0.008	-0.008	0.009	0.001	0.005	-0.001	1.000						
weighted cost of debt	0.007	0.004	0.033	0.033	0.083	-0.024	0.016	1.000					
sme	-0.410	-0.409	0.099	0.061	0.245	0.022	0.013	0.034	1.000				
mifid_II	-0.039	-0.040	0.002	-0.011	0.012	0.032	0.006	0.009	0.019	1.000			
(ln) turnover	0.434	0.435	-0.088	-0.012	-0.149	-0.219	0.017	0.208	-0.186	-0.027	1.000		
(ln) market cap	0.790	0.792	-0.192	-0.069	-0.376	-0.054	-0.036	-0.070	-0.548	0.003	0.414	1.000	
permanent loss	-0.108	-0.108	0.683	0.053	0.096	0.027	0.012	0.022	0.061	0.020	-0.075	-0.143	1.000

Annex B : Econometric results

Table B1: Impact of research unbundling on quantity of sell-side analyst research

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All companies	*All companies*	*All companies*	*All companies*	*All companies*	*All companies*	*Only companies that never lose coverage*
VARIABLES	# eps est. (2015-2019)	# eps est. (2015-2019)	# eps est. (2015-2019)	# eps est. (2015-2019)	# eps est. (2006-2019)	# analysts (2015-2019)	# eps est. (2015-2019)
sme x mifid_II	**1.051*** (0.0535)**	**1.046*** (0.0532)**	**1.046*** (0.0532)**	**0.771*** (0.0484)**	**1.036*** (0.0668)**	**0.819*** (0.0499)**	**1.062*** (0.0780)**
mifid_II	-1.004*** (0.0495)	-1.198*** (0.0669)	-1.198*** (0.0670)	-0.860*** (0.0611)	-0.663*** (0.105)	-1.006*** (0.0631)	-1.098*** (0.0863)
turnover				0.0570*** (0.0106)	0.0939*** (0.0151)	0.0568*** (0.0115)	0.161*** (0.0261)
market_cap				0.321*** (0.0249)	0.821*** (0.0386)	0.380*** (0.0271)	0.608*** (0.0529)
sme	-6.708*** (0.169)	-6.703*** (0.169)					
Constant	8.163*** (0.163)	8.433*** (0.170)	5.658*** (0.0300)	3.156*** (0.144)	0.109 (0.220)	3.020*** (0.160)	3.468*** (0.390)
Observations	297,095	297,095	297,095	241,433	626,208	232,671	135,091
Fixed Effects	NO	Year-Month	Firm & Year-Month	Firm & Year-Month	Firm & Year-Month	Firm & Year-Month	Firm & Year-Month
Clustering of errors at company level	YES	YES	YES	YES	YES	YES	YES
R-squared	0.187	0.187	0.070	0.064	0.103	0.073	0.089
Estimation Model	OLS	OLS	OLS	OLS	OLS	OLS	OLS

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: The sample is based on a dataset of company-year-month observations for companies that have been researched by at least one analyst at any time in the considered time-window. Only Model 7 makes the exception to be built on a sample constituted by companies that never lose coverage between 2015 and 2019. More accurate details on the sample construction are available in Section 2. Standard errors are always clustered at the company level and fixed effects are as indicated in each model. Models 5, 6 and 7 report the results of some robustness checks performed on a larger sample time-window (2006-2019), on a different dependent variable (number of analysts following a company). All models are OLS estimates and report the Adjusted R-squared. Statistical significance is based on two-tailed tests and is indicated as follows: ***p-value < 0.01, **p-value < 0.05, *p-value < 0.1.

Table B2: Impact of research unbundling on companies' probability of losing coverage

	(1)	(2)	(3)	(4)
	All companies	*All companies*	*All companies*	*All companies*
VARIABLES	loss of coverage (2015-2019)	loss of coverage (2015-2019)	loss of coverage (2015-2019)	loss of coverage (2016-2018)
sme x mifid_II	**-0.393*** (0.0717)**	**-0.392*** (0.0719)**	**-0.163** (0.0809)**	**-0.123 (0.0828)**
mifid_II	0.556*** (0.0587)	0.430*** (0.0735)	0.144* (0.0834)	0.158* (0.0849)
sme	2.273*** (0.149)	2.037*** (0.126)	1.096*** (0.173)	1.270*** (0.240)
market_cap			-0.466*** (0.0284)	-0.532*** (0.0377)
turnover			-0.0166 (0.0112)	-0.0121 (0.0145)
Constant	-4.227*** (0.151)	-3.714*** (0.121)	-1.204*** (0.245)	-1.304*** (0.325)
Observations	297,095	297,095	241,433	145,428
Fixed Effects	NO	Year-Month	Year-Month	Year-Month
Clustering of errors at company level	YES	YES	YES	YES
R-squared	0.025	0.025	0.050	0.041
Estimation Model	Probit	Probit	Probit	Probit

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: The sample is based on a dataset of company-year-month observations for companies that have been researched by at least one analyst at any time in the considered time-window. We do not introduce firm fixed effects as unconditional probit fixed effects model are known to be biased (Greene 2002), in particular in short panels. More accurate details on the sample construction are available in Section 2. Standard errors are always clustered at the company level and fixed effects are as indicated in each model. Model 4 reports the results of a robustness check performed on a shorter sample time-window (2016-2018). Since loss of coverage is a binary variable, all models are Probit estimations and report the Pseudo R-squared. Statistical significance is based on two-tailed tests and is indicated as follows: ***p-value < 0.01, **p-value < 0.05, *p-value < 0.1.

Table B3: Impact of research unbundling on quality of sell-side analyst research

	(1)	(2)	(3)	(4)	(5)	(6)
	All companies	*All companies*	*All companies*	*All companies*	*All companies*	*Only companies that never lose coverage*
VARIABLES	median forecast inaccuracy (2015-2019)	median forecast inaccuracy (2015-2019)	median forecast inaccuracy (2015-2019)	median forecast inaccuracy (2015-2019)	median forecast inaccuracy (2006-2019)	median forecast inaccuracy (2015-2019)
sme x mifid_II	**0.469**	**0.304**	**-5.636**	**17.09**	**26.09**	**-7.383**
	(33.75)	**(33.78)**	**(42.67)**	**(45.35)**	**(38.58)**	**(40.43)**
mifid_II	-10.78*	-4.111	2.097	23.98	11.39	27.00
	(6.038)	(14.03)	(14.98)	(18.78)	(20.31)	(18.70)
turnover				-35.44**	1.294	-30.28*
				(17.08)	(7.418)	(17.34)
market_cap				-22.13	-32.61**	-25.79
				(21.46)	(12.75)	(22.12)
sme	90.63***	90.45***				
	(23.45)	(23.47)				
Constant	49.31***	50.56***	77.82***	328.3**	275.6***	332.9**
	(4.482)	(11.24)	(13.34)	(128.7)	(86.70)	(137.2)
Observations	15,107	15,107	15,107	10,349	29,926	9,814
Fixed Effects	NO	Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Clustering of errors at company level	YES	YES	YES	YES	YES	YES
R-squared	0.004	0.005	0.002	0.003	0.001	0.002
Estimation Model	OLS	OLS	OLS	OLS	OLS	OLS

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: Median forecast inaccuracy is defined as the absolute value of the difference between the latest interim EPS and the most recent prior estimate for that period—a positive coefficient on an explanatory term thus implies an association with forecast inaccuracy. The sample is based on a dataset of company-year observations for companies that have been researched by at least one analyst at any time in the considered time-window. Only Model 6 makes the exception to be built on a sample constituted by companies that never lose coverage between 2015 and 2019. More accurate details on the sample construction are available in Section 2. Standard errors are always clustered at the company level and fixed effects are as indicated in each model. Models 5 reports the results of a robustness check performed on a larger sample time-window (2006-2019). All models are OLS estimates and report the Adjusted R-squared. Statistical significance is based on two-tailed tests and is indicated as follows: ***p-value < 0.01, **p-value < 0.05, *p-value < 0.1.

Table B4: Impact of research unbundling on companies' liquidity conditions

	(1)	(2)	(3)	(5)	(7)	(8)
	All companies	*All companies*	*All companies*	*All companies*	*All companies*	*All companies*
VARIABLES	bid-ask spread (2015-2019)	bid-ask spread (2015-2019)	amihud illiquidity ratio (2015-2019)	amihud illiquidity ratio (2015-2019)	turnover ratio (2015-2019)	turnover ratio (2015-2019)
sme x mifid_II	**0.590*** (0.220)**	**0.334* (0.187)**	**-0.000982 (0.000625)**	**-0.000986 (0.000636)**	**0.0485*** (0.0109)**	**0.0432*** (0.0107)**
sme x permanent_loss		1.223 (0.883)		-0.00366* (0.00206)		0.0440 (0.0602)
mifid_II	0.733*** (0.232)	0.445** (0.220)	0.000179 (0.00163)	0.000365 (0.00163)	0.0897*** (0.0115)	0.0734*** (0.0112)
permanent_loss		1.165* (0.610)		0.00774*** (0.00164)		0.0649 (0.0423)
# eps estimates	-0.0823*** (0.0146)	-0.0612*** (0.0124)	-0.000431*** (9.94e-05)	-0.000351*** (9.91e-05)		
sme			0.00709*** (0.00228)	0.00658*** (0.00227)		
Constant	3.403*** (0.165)	3.079*** (0.179)	0.0286*** (0.00202)	0.0262*** (0.00201)	0.0542*** (0.00757)	0.0412*** (0.00971)
Observations	236,859	234,746	236,652	234,566	248,736	235,661
Fixed Effects	Firm & Year-Month	Firm & Year-Month	Year-Month	Year-Month	Firm & Year-Month	Firm & Year-Month
Clustering of errors at company level	YES	YES	YES	YES	YES	YES
R-squared	0.004	0.004	0.016	0.015	0.005	0.006
Estimation Model	OLS	OLS	Tobit	Tobit	OLS	OLS

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: The sample is based on a dataset of company-year-month observations for companies that have been researched by at least one analyst at any time in the considered time-window. More accurate details on the sample construction are available in Section 2. Standard errors are always clustered at the company level and fixed effects are as indicated in each model. R-squared measures differ according to the underlying estimation model (Adj. R-squared for OLS and Pseudo R-squared for Tobit). Statistical significance is based on two-tailed tests and is indicated as follows: ***p-value < 0.01, **p-value < 0.05, *p-value < 0.1.

Table B5: Impact of research unbundling on companies' financing conditions

	(1)	(2)	(3)	(4)
	All companies	*All companies*	*All companies*	*All companies*
VARIABLES	weighted cost of debt (2015-2019)	weighted cost of debt (2015-2019)	weighted cost of debt (2015-2019)	weighted cost of debt (2015-2019)
sme x mifid_II	**0.170*** (0.0552)**	**0.208*** (0.0590)**	**0.149*** (0.0552)**	**0.179*** (0.0599)**
sme x permanent_loss			0.421* (0.215)	0.357 (0.218)
mifid_II	-0.661*** (0.0433)	-0.611*** (0.0466)	-0.662*** (0.0430)	-0.599*** (0.0465)
permanent_loss			-0.116 (0.149)	-0.138 (0.145)
n_eps_est	0.00793 (0.00918)		0.0103 (0.00910)	
market_cap		-0.363*** (0.0445)		-0.390*** (0.0478)
Constant	2.417*** (0.0633)	4.389*** (0.236)	2.372*** (0.0662)	4.518*** (0.257)
Observations	215,660	196,341	214,055	189,633
Fixed Effects	Firm & Year-Month	Firm & Year-Month	Firm & Year-Month	Firm & Year-Month
Clustering of errors at company level	YES	YES	YES	YES
R-squared	0.045	0.053	0.045	0.055
Estimation Model	OLS	OLS	OLS	OLS

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: The sample is based on a dataset of company-year-month observations for companies that have been researched by at least one analyst at any time in the considered time-window. More accurate details on the sample construction are available in Section 2. Standard errors are always clustered at the company level and fixed effects are as indicated in each model. All models are OLS estimates and report the Adjusted R-squared. Statistical significance is based on two-tailed tests and is indicated as follows: ***p-value < 0.01, **p-value < 0.05, *p-value < 0.1.

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