The Effects of MiFID II on Sell-Side Analysts, Buy-Side Analysts, and Firms

Bingxu Fang
Rotman School of Management
University of Toronto
bingxu.fang@rotman.utoronto.ca

Ole-Kristian Hope
Rotman School of Management
University of Toronto
olekristian.hope@rotman.utoronto.ca

Zhongwei Huang
Cass Business School
City, University of London
zhongwei.huang@cass.city.ac.uk

Rucsandra Moldovan
John Molson School of Business
Concordia University
rucsandra.moldovan@concordia.ca

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Abstract

This paper provides early but broad empirical evidence on a major new investor protection regulation in Europe, MiFID II, which requires investment firms to unbundle investment research from other costs they charge to clients. We predict that the price separation resulting from unbundling and a hard-dollar system leads to a shrinking of the market for sell-side investment research, manifested in lower quantity of sell-side coverage that is of higher quality than before the regulation. We test our predictions in difference-in-differences matched-sample research designs with firm fixed effects. We find a decrease in the number of sell-side analysts covering European firms after MiFID II implementation, particularly for firms that are less important to the sell-side. However, research quality improves; specifically, individual analyst forecasts are more accurate and stock recommendations garner greater market reactions. In addition, sell-side analysts seem to cater more to the buy-side after MiFID II by providing industry recommendations along with stock recommendations. Importantly, we predict and find evidence that buy-side investment firms turn to more in-house research after MiFID II implementation. Equally interesting, buy-side analysts increase their participation and engagement in earnings conference calls compared to the control group. Finally, we find some evidence that stock-market liquidity decreases post-MiFID II. Our findings have implications beyond Europe, as investors are currently pressuring the U.S. Securities and Exchange Commission to adopt a similar regulation.

Key words: MiFID II, financial services, sell-side analysts, buy-side research, unbundling, hard dollar, Europe

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1. Introduction

The Markets in Financial Instruments Directive II (MiFID II) is a financial services directive that became effective in the European Union (EU) on January 3, 2018.[1] MiFID II applies to the 31 countries of the European Economic Area (EEA), which comprises the 28 EU members plus Iceland, Liechtenstein, and Norway. One of the important changes set forth by MiFID II is the requirement for asset managers and broker-dealers to *unbundle* the cost of investment *research* and advisory services from the cost of trade execution. In other words, the information presented to the client must separately and transparently show all the different costs and charges, including any third-party payments, as well as justify how external research contributes to better investment decisions so that it is not considered an inducement (PwC 2016).

In this study, we provide early—but broad—empirical evidence on the effects of this sweeping new regulation on sell-side analyst research and buy-side research. The requirements to unbundle research costs and justify the usefulness of external research create a unique opportunity to empirically examine a mechanism that, on one hand, addresses trading incentives as a conflict of interest affecting analyst behavior, and on the other hand, may transform sell-side research into a profit center and thus create new incentives for financial analysts. In additional analyses, we also examine the net effect on firm stock-market liquidity.

MiFID II represents a shake-up of traditional business practices whereby brokers bundle research and execution services provided to asset managers, otherwise known as "soft dollars."[2] Soft

[1] A directive is a legislative act that sets out a goal that all EU countries must achieve. Each individual member country devises its own laws on how to reach these goals (https://europa.eu/european-union/eu-law/legal-acts_en). We use Europe, EU, and EEA interchangeably throughout the paper.

[2] Of interest to researchers is also the fact that analyst forecast data in IBES Detail have changed due to MiFID II. Thomson Reuters, the owner of IBES, issued a Product Change Notification on September 12, 2018, announcing that the contributor and analyst names of 88 pre-approval contributors will be *anonymized* for all clients, regardless of individual entitlements. In addition, estimates from UBS Equities will be removed from the IBES Detail History file and they

dollars are a way of paying brokerage firms for their research services indirectly through commission revenues rather than through hard dollars. Instead of paying the service providers with cash (i.e., hard dollars), the asset manager pays by passing on business to the brokerage firm (i.e., soft dollars). Historically, the soft-dollar system emerged to shield broker-dealers from the requirement to register as investment advisers upon receiving payment for advice, a status that comes with additional regulatory oversight and positive fiduciary duty toward clients (Goldstein, Irvine, Kandel, and Wiener 2009). Disclosure of bundled soft-dollar commissions is more opaque than expensing the cost of non-execution services (Erzurumlu and Kotomin 2016). Some argue that the lack of transparency of soft-dollar commissions can exacerbate agency conflicts and result in less efficient fund operations (Edelen, Evans, and Kadlec 2012).

We develop predictions on *sell-side* and *buy-side* consequences of MiFID II and test them, along with *firm* consequences, in difference-in-differences research designs (using North American firms as control firms), with firm and year fixed effects, as well as in propensity-score matched samples.

First, given the public good nature of investment research (Kelly and Ljungqvist 2012) and the MiFID II requirement to justify its usefulness if purchased externally, asset management firms are likely to reduce their demand for sell-side research. Asset managers may also absorb research costs because their clients do not want to pay for equity research given its public good feature (CFA Institute 2017). Therefore, we predict that MiFID II will lead to a shrinking of the market for sell-side investment research, and thus to a reduction in sell-side coverage. Furthermore, because the overall resources available for the sell-side are lower after the implementation of MiFID II, we expect analysts to reduce the coverage for less important firms to maximize the relative benefits of

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explicitly tie this decision with MiFID II implementation (see https://uk.reuters.com/article/uk-ubs-research-memo/ubs-suspends-access-to-research-data-for-some-external-providers-idUKKBN1HG2O3). The IBES Summary History file does not change, and consensus estimates will continue to include all pre-approval brokers (as well as UBS Equities).

their effort. In univariate and multivariate analyses, on the full and matched samples, we find a decrease in sell-side coverage and an increase in the probability of completely losing coverage post-MiFID II for European firms (treatment group) compared to North American firms (control group). Firms that are less important to the sell-side, such as firms that are smaller, have lower institutional ownership, and do not use external financing, and to a lesser extent, firms with lower trading volume appear to suffer more from (complete) losses of sell-side coverage.

Second, the shrinking demand and price pressure exercised by the buy-side may transform sell-side research from a cost center into a profit center. If so, the ability to sell research and the capacity to keep costs down become essential. We expect that in this new world, the sell-side uses research quality as a product-differentiation mechanism to relax price competition and attract buy-side business. We test this prediction in analyst-balanced samples, thereby capturing the change in incentives brought by MiFID II. We find higher individual-level earnings forecast accuracy post-MiFID II in Europe compared to the U.S. and Canada. We further test the unconditional informativeness of stock recommendations. Our results suggest that stock ratings for European firms are incrementally more informative after the implementation of MiFID II. We also show that stock recommendations are more likely to be accompanied by industry recommendations, suggesting that sell-side analysts cater more to the buy-side post-MiFID II.

Next, if investment firms are now required to charge clients for third-party research or pay for it with "hard cash" (i.e., incur an expense in their profit or loss), a natural reaction would be to increase internal investment research efforts so as to minimize purchasing research from the third party. Therefore, we expect that investment firms increase in-house research efforts following MiFID II implementation. Given this prediction and the fact that buy-side data are hard to obtain, it is especially interesting to investigate the response from the buy-side. To gain insight into the buy-side response, we follow a unique approach. Specifically, we obtain data on individuals employed as buy-

side security analysts or associate analysts from Thomson Reuters and sum up the number of individuals employed by each buy-side firm. We find strong evidence that the number of buy-side analysts increases following MiFID II, suggesting that European investment firms turn to more in-house research after the implementation of the new regulation. We further explore a setting in which the activities of buy-side analysts can be observed directly: corporate conference calls. We identify buy-side analysts using conference-call transcripts from FactSet and measure the extent to which they interact with management during the calls. We find that buy-side analysts are more likely to participate in conference calls and have more interactions with management for European firms after MiFID II, relative to North American firms. The evidence further corroborates the finding that investment firms turn to more in-house research in the post-MiFID II world.

Finally, we examine firm stock-market liquidity in the new context created by lower quantity but higher quality sell-side research, and more private buy-side research. We find a decrease in stock liquidity for European firms in the period that follows MiFID II, relative to the control group, and after controlling for corporate disclosure activities and analyst coverage. Given the possibility of confounding factors, we avoid drawing strong conclusions from this test.

Our research makes several contributions. First, we contribute by studying unbundling as a mechanism to address conflicts of interest in the sell-side industry. Specifically, our results speak to the literature on trading incentives as a conflict of interest affecting sell-side analysts' behavior, which is a different type of conflict of interest compared to those generated by employment at investment banks that have attracted significant interest in academic research following the National Association of Securities Dealers (NASD) Rule 2711 and the Global Settlement (GS).[3] Research on

[3] For example, the following studies examine the impact of these regulations: Barniv, Hope, Myring, and Thomas (2009); Kadan, Madureira, Wang, and Zach (2009); Clarke, Khorana, Patel, and Rau (2011); Guan, Lu, and Wong (2012); Corwin, Larocque, and Stegemoller (2017); Hovakimian and Saenyasiri (2010; 2014). As the relationship with investment banking is the "primary aim" of these regulations (Groysberg and Healy 2013), this literature focuses on sell-side independence within investment banks. In comparison, MiFID II aims to address a different type of conflicts of

trading incentives finds that analysts employed at brokerage firms that earn revenues through trading are more optimistic than analysts employed at firms that fund research through both trading and underwriting business (Cowen, Groysberg, and Healy 2006) and in relation to stocks held by mutual fund clients (Firth, Lin, Liu, and Xuan 2013). Jacob, Rock, and Weber (2008) find that analysts working for brokerage firms are on average less accurate and more optimistic compared to analysts working for investment banks, and the higher-quality personnel only partly explains this gap. Our study contributes by providing evidence on the effects of unbundling when used as a mechanism to address the conflict of interest arising from trading incentives. Specifically, we show that unbundling leads to lower quantity but higher quality of sell-side research.

Second, this paper adds to the extant sell-side analyst literature by examining the effects of a new regulation that de facto reduces the supply of analyst research. A large literature focuses on the role sell-side analysts play for the information environment and uses brokerage-house mergers and closures as a quasi-natural experiment (e.g., Hong and Kacperczyk 2010; Kelly and Ljungqvist 2012; Derrien and Kecskes 2013; Merkley, Michaely, and Pacelli 2017). In this literature, the decrease in analyst coverage is a plausibly exogenous event while the demand for sell-side research remains, or is assumed to remain, constant. Fewer sell-side analysts supplying research for a firm or an industry leads to lower competition among analysts, which in turn results in lower quality work, implying that a larger sell-side analyst presence benefits the functioning of capital markets. In contrast, the decrease in analyst coverage due to MiFID II is not exogenous but accompanied by lower demand for sell-side research. Our study shows that unbundling, which leads to lower demand for, and the transformation of sell-side equity research into a profit center (i.e., the need to sell research directly to the buy-side), creates incentives for the sell-side to produce higher quality research.

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interest (i.e., sell-side research used as an inducement to attract buy-side trade execution business), through a different mechanism (i.e., unbundling).

Third, and importantly, relative to the large sell-side literature, there is limited evidence on the buy-side. The research that buy-side analysts produce directly influences the investment firms' decisions (Cheng, Liu, and Qian 2006; Rebello and Wei 2014) and trades induced by the buy-side recommendations have higher returns than trades triggered by sell-side recommendations (Frey and Herbst 2014). We propose and implement new ways of gauging buy-side research activities, specifically by observing the number of buy-side analysts in contact lists compiled by Thomson Reuters.

Fourth, we add to the literature on the dynamics between buy-side institutions and sell-side brokerages. Liu (2011) and Gu, Li, and Yang (2013) provide evidence that decisions taken by sell-side analysts are driven by buy-side demand. We contribute by showing that, at least in part, sell-side coverage decisions are motivated by institutional ownership presence, and that a reduction of buy-side demand for sell-side research leads to sell-side catering more to the buy-side by providing industry ratings along with stock ratings and, in general, lower research quantity of higher quality.

Finally, this study contributes to practice by providing early evidence on a sweeping new regulation, and the unbundling requirement, that is starting to affect firms and investors around the world. Two concurrent studies examine the effects of MiFID II on the sell-side industry (Guo and Mota 2019; Lang, Pinto, and Sul 2019). Our findings on the decrease in sell-side coverage accompanied by an increase in quality post-MiFID II converge with these two papers. The unique contribution of our study is that we also investigate the research activities conducted by the buy-side thereby depicting a more complete picture of the dynamics in the financial services industry upon implementation of the unbundling requirement. Our broad empirical evidence should be of interest to asset managers, brokerage firms, investors, and importantly to regulators who are contemplating similar regulations.

2. Institutional Setting and Empirical Predictions

2.1 Further Background on MiFID II

Under MiFID II, asset management firms can either pass the cost of research on to clients via pre-agreed research-payment accounts (i.e., budgets) or absorb the cost of research themselves against the firm's profit and loss.[4] Sell-side firms need to provide buy-side investment firms (i.e., asset managers) the unbundled costs of trading by separately identifying and charging for execution, research, and other advisory services. Buy-side firms have to make explicit payments for external research and demonstrate that the research contributes to better investment decisions so that it is not considered an inducement (PwC 2016). This means that asset managers and sell-side brokers must put a price on research, which implies renegotiating the contracts between the two sides, which in turn allows the buy-side to exert price pressure on the sell-side.[5]

MiFID II's model of hard dollars contrasts with the U.S. Securities and Exchange Commission's (SEC) model of soft dollars. Under current U.S. rules, brokers who get paid with hard dollars must register as investment advisers, an onerous status that involves increased compliance and oversight. To appease this conflict, on October 26, 2017, the SEC issued three letters giving U.S. investment firms 30 months to abide by MiFID II without violating U.S. regulations.[6] Over the long term, the SEC's stance opens the way for MiFID II to become a global standard as pressure for transparent or lower costs is mounting from investors (Holt 2019; Riding 2019a).[7]

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[4] The relevant articles are 23, 24(4)(c), and 24(7)(b). The new regulations apply directly to financial-market players that are based in any of the EEA member states as well as to a European branch location of any company headquartered outside of the EEA.

[5] While asset managers and stockbrokers usually rely on long-term contracts that specify the overall payment and negotiate commissions infrequently (Goldstein et al. 2009), the separate pricing of research required by MiFID II imposes such a negotiation. Anecdotal evidence from Cenkos Securities Plc shows a 7% decrease in research commissions in 2018 compared to 2017 that is "a direct result of MiFID II" (https://www.cenkos.com/~/media/Files/C/Cenkos-Securities/reports-and-presentations/2018/Cenkos%20Financial%20Report%202018.pdf, page 1). The lack of disaggregated disclosure of research and trading incomes precludes a systematic comparison.

[6] https://www.sec.gov/divisions/investment/noaction/2017/sifma-102617-202a.htm, last accessed November 27, 2019.

[7] Large asset managers such as Capital Group ($1.87 trillion) have declared they will absorb the cost of third-party investment research across their *global* business (Riding 2019a). This comes as U.S. clients, having noticed a drop in

MiFID II has polarized practitioners. For instance, Erste Bank CEO Andreas Treichl said that MiFID was treating both banks and clients "like little kids who don't know what they're doing."[8] Others believe that "we may […] see a return to deeper, fundamental research and a focus on longer-term, industry-thematic analysis" (IR Magazine 2018 citing Nicky Stewart, director of institutional marketing at Edison).

The unbundling requirement, that is, the switch from the soft-dollar model where the cost of research was obfuscated by bundling, to the hard-dollar model where the cost of research must be transparent, creates a novel setting where the dynamics between the buy-side and sell-side can be observed.[9]

2.2 Effects on Sell-Side Analysts, Buy-Side Analysts, and Firms

2.2.1 Sell-Side Research Quantity

Kelly and Ljungqvist (2012, p. 1378) note that "the fundamental challenge for equity research is a public goods problem: because research is hard to keep private, clients are reluctant to pay for it, and hence it is provided for free." Brokerage firms have traditionally subsidized research with revenue from bundled services, which would not be viable under MiFID II. Thus, the public good

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European transaction fees and commissions, are becoming concerned that they subsidize European clients (Riding 2019a). As a result, the Council of Institutional Investors has been lobbying the SEC to adopt regulations similar to MiFID II in the U.S. (Riding 2019b).

[8] https://www.cnbc.com/video/2017/11/03/mfid-ii-treats-both-banks-and-clients-like-kids-erste-bank-ceo.html, last accessed April 4, 2019.

[9] The MiFID II requirements to unbundle research costs and justify the usefulness of research address a different type of conflict of interest compared to the NASD Rule 2711 and the GS adopted in the U.S. in 2002–3, which targeted the conflict of interest generated by funding equity research with investment banking revenue. Previously, sell-side analysts in investment banks were incentivized to cater to the investment banking business of their employer through overly optimistic stock recommendations since their compensation was related to, and determined by, their ability to attract investment banking business (e.g., Guan et al. 2012). After these regulations, the investment banking and research departments became physically and financially separated. To a large extent, these regulations applied internationally: the GS had spillover effects internationally as the twelve banks involved adopted the same separation across all their subsidiaries (Hovakimian and Saenyasiri 2014), the International Organization of Securities Commissions (IOSCO) issued guidelines and best practices in the spirit of NASD Rule 2711, and the EU Market Abuse Directive contained similar recommendations. (See the chapter on Foreign Regulatory Initiatives in https://www.finra.org/sites/default/files/Industry/p015803.pdf.)

feature of research would decrease the resources devoted to the sell-side industry.

We build on research from the industrial organization literature to predict the effects of MiFID II on the scope of sell-side research. Focusing on the economics of information goods characterized by high fixed costs and low incremental cost structure, Varian (1995) shows that bundling can increase seller profits by lowering the heterogeneity of the consumers' willingness to pay. This intuition is in line with prior industrial organization literature that argues that bundling products together and charging one price is used to extract consumer surplus (MacAfee, McMillan, and Whinston 1989; Stigler 1968). Conrad, Johnson, and Wahal (2001) provide empirical evidence consistent with Varian's (1995) argument and show that institutional traders pay more for soft-dollar execution than for an equivalent execution-only broker. They argue that the incremental amount is unlikely to be entirely offset by the research provided by the soft-dollar broker. Following this literature, we expect buy-side firms to search for efficiencies in resource allocation under the new unbundling regime, thereby lowering the demand for sell-side research.

Following the intuition discussed above, lack of transparency on the price charged, allows buy-side firms to extract rents from investors (i.e., their clients). Assuming investor rationality, price transparency leads investors to select the lowest priced option among equivalent substitutes (e.g., Fehr and Schmidt 1999; Maxwell 1995) thereby potentially taking their investments elsewhere or renegotiating management fees. To avoid this situation, asset managers can decide to incur the research cost themselves as an expense item that impacts the bottom line. As such, sell-side research becomes an expense to minimize in order to maximize profits. Therefore, asset managers have an additional incentive to purchase research more judiciously, which may reduce the demand for sell-side research.

Another mechanism imposed by MiFID II on asset managers is the requirement to demonstrate that sell-side research contributes to better investment decisions so that it is not

considered an inducement (PwC 2016). In other words, whenever asset managers use sell-side research, they must "jump through an additional hoop" and justify its usefulness, as opposed to it being a source of conflict of interest. However, no such requirement applies to investment research generated internally by the buy-side. Because asset managers may not want to disclose to clients that they buy a public good, or may have a hard time justifying the usefulness of the purchase, we expect that they will increase their internal investment research efforts, at least to some extent, and as a result, decrease the demand for sell-side research.

The effect of MiFID II on sell-side coverage is likely to vary across firms. Analysts are economic agents with limited time and resources. Accordingly, they have incentives to allocate more effort to firms that are more important to the broker's profits or to their own career concerns (Frankel, Kothari, and Weber 2006; Harford, Jiang, Wang, and Xie 2019). To the extent that the overall resources available for the sell-side are lower after the implementation of MiFID II, we expect analysts to reduce the coverage for less important firms to maximize the relative benefits of their effort. The discussion leads to the following empirical predictions:

Prediction 1: Sell-side coverage decreases following the implementation of MiFID II.

Prediction 2: The reduction in sell-side coverage following the implementation of MiFID II is higher for firms that are less important to the sell-side industry.

2.2.2 Sell-Side Research Quality

Prior research argues that fewer analysts as a result of an exogenous shock at constant levels of demand mean lower competition and therefore lower *quality* of their work output (e.g., Hong and Kacperczyk 2010; Merkley et al. 2017). However, that prediction may not hold under MiFID II due to the transformation of equity research from a cost center into a profit center.

Unbundling implies that the sell-side would have to sell research *directly* to the buy-side in a setting in which the buy-side exercises price pressure and must justify the usefulness of external research. This new regime may therefore transform equity research from a cost center into a profit center. If so, the incentives of the sell-side change such that the ability to sell research and the capacity to keep costs down become essential. In other words, post-MiFID II, the sell-side investment research business unit is no longer evaluated only on "input," but on both "input" and "output." Raith (2008) models the optimal incentives of an agent who has specific knowledge depending on input- or output-based performance measurement and shows that only output-based performance measures incentivize the agent to use her knowledge efficiently. As the performance measure for the sell-side research unit is now profit, the analyst has incentives to use her knowledge in efficient ways and deliver high-quality research.

In addition, Liu (2011) and Gu et al. (2013) provide evidence that decisions taken by sell-side analysts are driven by buy-side interest. Therefore, in order to be able to sell research directly, quality becomes a product-differentiation mechanism to relax price competition (Shaked and Sutton 1982) and attract buy-side business.[10] Furthermore, because the buy-side must justify the usefulness of external research to their clients, the sell-side might increase the quality and usefulness of their research in order to facilitate such a justification and, thus, be able to sell their research. It is likely that the MiFID II-induced shake-up of investment firms and sell-side research will create new incentives for sell-side analysts with an increased emphasis on high quality outputs. This leads us to the following empirical prediction:

Prediction 3: Sell-side analysts provide higher quality work outputs following the implementation of MiFID II.

[10] These arguments still hold for independent research firms that have always functioned as profit centers because MiFID II leads to a decrease in overall demand for research.

2.2.3 Buy-Side Response

As discussed, the public good feature of sell-side research (Kelly and Ljungqvist 2012) reduces incentives for buy-side firms to separately pay for it under the new hard dollar regime. Instead, buy-side firms have incentives to shift the resources to increase their internal research capabilities. Considering that most buy-side firms announced that they will absorb the costs themselves rather than pass them on to their clients (Riding 2019a), a natural reaction would be to cut out the third party and to increase the cost efficiency of research expenses by producing research internally (Chen, Kelly, and Wu 2020). The re-orientation toward internal research is likely to be strengthened by the requirement for buy-side managers to justify the usefulness of consumed sell-side research, which does not apply to investment research generated internally. Because buy-side analysts make stock recommendations and forecasts exclusively to the fund manager (Cheng et al. 2006), the information signals they produce can be kept private, which increases the value of internal research as it generates an information advantage (Grossman and Stiglitz 1980). Therefore, we predict that the buy-side will compensate for the endogenous decision to cut the consumption of sell-side research with increased efforts to produce research internally:

Prediction 4: Buy-side increases in-house equity investment research efforts following the implementation of MiFID II.

2.2.4 Firm Information Environment Effects

Further, we consider the overall impact of MiFID II on firms' information environment. Our predictions so far point to conflicting impacts on listed firms. On one hand, considering that sell-side analysts are information intermediaries (Bradshaw, Ertimur, and O'Brien 2017), the decreased provision of sell-side equity research could harm the information environment of listed firms

(Merton 1987; Kelly and Ljungqvist 2007, 2012) through the loss of a public signal.[11] On the other hand, the separate pricing of research strengthens the incentives of sell-side analysts, which would lead to higher quality of research output and could have a positive effect. To the extent that markets infer private buy-side research from the investment firm's trading activities, more buy-side research could also have a positive effect. Therefore, the overall effect of MiFID II on firm-level information asymmetry is an empirical question.

3. Data and Research Design

3.1 Sample Construction

Panel A of Table 1 reports the sample-construction process. We begin with all public firms headquartered in 30 EEA countries, over the period from 2015 to February 2019, with data available in Compustat Global and the IBES Summary History file.[12] If a firm has *never* had analyst coverage during the sample period, it is excluded from the sample. If the firm has had coverage for some periods during the sample period, we include it in the sample after the first time it appears covered.[13] The full (PSM matched) European sample is 11,136 (9,709) firm-year observations, which constitutes the treated sample.

Our reliance on a European sample of corporate issuers rests on the following assumption. MiFID II applies directly to EEA-based investment firms, their third-country subsidiaries, and non-EEA-based investment firms that operate in the EEA. The corporate issuers affected are the ones traded by investment firms that fall under MiFID II. This information is not publicly available; therefore, we assume that EEA investment firms trade in corporate issuers headquartered in Europe.

[11] Less publicly available research might primarily affect retail investors. We thank Richard Sloan for this point.
[12] Iceland did not implement MiFID II so we exclude it.
[13] For example, if a firm has no sell-side coverage for 2015, has coverage for 2016, and no coverage afterwards, we include it in the sample starting in 2016, with zero coverage for 2017 and 2018.

We provide results from pre-post MiFID II for the European sample only, and control-sample and matching-based difference-in-differences (DiD) approaches. The latter controls for time-period specific effects that might confound results. Mirroring the European sample-construction steps, we gather a control group composed of U.S. and Canadian firms over the same period.[14] We employ U.S. and Canadian firms as they tend to be economically similar to European firms, but not directly regulated by the directive we examine (Mulherin 2007). There are 11,605 (7,409) U.S. and 2,560 (1,960) Canadian firm-year observations in the full (PSM matched) sample.

Panel B of Table 1 shows the distribution of the full and matched samples by the Fama-French 12 industry classification. We note that Other industries represent 16% (21%) of the full (PSM) sample, followed by Business Equipment 16% (17%) and Finance 15% (10%).[15] Panel C of Table 1 presents the distribution of firms in the full and matched samples by country in which the firm is headquartered. In line with the size of the country's economy, the U.K. contributes 30% of the European sample, followed by France, Germany, and Sweden.

3.2 Research Design for Sell-Side Research Quantity

We test our first prediction on the impact of MiFID II on sell-side coverage in a DiD research design using the full sample of treated and control firms. *TREAT* equals 1 for companies headquartered in European countries (i.e., treatment sample), and 0 for companies headquartered in Canada and the U.S. (i.e., control sample). *POST* equals 1 if the value of the dependent variable is based on data on or after January 3, 2018 (i.e., post-MiFID II), and 0 otherwise (i.e., pre-MiFID II). Equation (1) specifies the full model.

[14] We use a pre-trend test to provide insight into the parallel-trend assumption by including indicators for the pre-period years interacted with *TREAT* (Angrist and Pischke 2009). Untabulated results show that, before treatment, the treated and control groups are parallel for the sell-side and buy-side dependent variables.

[15] Our tests include firm fixed effects that control for industry. Inferences are unaffected if we exclude Finance.

$$\begin{aligned} Sell\text{-}Side\ Coverage\ Measure \\ = \beta_0 + \beta_1 TREAT \times POST + Firm\ Controls + Country\ Controls \\ + Firm\ FE + Year\ FE + \varepsilon, \end{aligned} \quad (1)$$

where the dependent variable is in turn the number of sell-side analysts covering the firm (*Coverage*) and an indicator variable that takes the value 1 for companies that completely lose their sell-side coverage, and 0 otherwise (*Complete Coverage Loss*). The latter captures situations where analyst coverage for a firm goes from positive to zero *during* our sample period.

Our focus is on *TREAT*×*POST*. β_1 captures the incremental effect associated with implementing MiFID II in Europe relative to the same period in the U.S. and Canada. The firm fixed effects subsume the main effect for *TREAT*, and the year fixed effects subsume the main effect for *POST*, while allowing the pre-MiFID II period to vary. When *Coverage* is the dependent variable, a negative coefficient β_1 would indicate an incremental decrease in sell-side coverage post-MiFID II in Europe relative to the U.S. and Canada and support Prediction 1. When *Complete Coverage Loss* is the dependent variable, a positive coefficient β_1 means that a European firm is on average more likely to lose its entire sell-side following post-MiFID II relative to the control sample over the same period; this would provide further confirmation for Prediction 1.

Equation (1) includes firm-level and country-level variables that could explain the level of analyst following or account for losses of analyst coverage. Firm-level controls follow prior research (e.g., Mola, Rau, and Khorana 2013) and comprise total assets (*Size*), firm profitability (*ROA*), an indicator for loss-making firms (*Loss*), book-to-market ratio (*BTM*), *Firm Age*, *Leverage*, *Tangibility*, *R&D*, *Financing Activities*, and *Earnings Volatility*. We also include two stock market-based variables: the previous six months' stock returns (*Stock Return*) and *Return Volatility*. The country-level variables are Gross Domestic Product (GDP) growth and the natural logarithm of GDP per capita. We winsorize continuous variables at the 1 and 99% to mitigate the effect of outliers. Importantly, all models include *firm fixed effects* to control for time-invariant firm characteristics that

could explain the level of the outcome variables and standard errors are robust, adjusted for heteroskedasticity, and clustered by firm (Petersen 2009). The appendix details variable definitions.

To reduce the concern that the treated and control groups are different prior to the implementation of MiFID II, we implement a DiD research design with Propensity-Score Matching (Rosenbaum and Rubin 1983). We use data prior to the regulation to estimate the first-stage propensity score based on all firm-level control variables. We then match treated firms with the nearest neighbor control firm within the same Fama-French 12 industry group and a caliper distance of 0.05, which is 0.25 standard deviation of the propensity score (Rosenbaum and Rubin 1985), one-to-one with replacement.[16] Panel D of Table 2 shows the sample means before and after matching. We run Equation (1) on the PSM-matched sample and focus on interpreting the coefficient on *TREAT×POST*.

We use an augmented version of Equation (1) to test Prediction 2. Specifically, we test whether the sell-side coverage effect of MiFID II is more likely to manifest for firms that are less important to the sell-side by adding an indicator variable and interacting it with *TREAT×POST*. We use four variables to capture a firm's importance to the sell-side industry. *Low Institutional Ownership* is an indicator that takes the value 1 if one-year lagged institutional ownership in the firm is in the first tertile by country-year, and 0 otherwise. *Small Firm* is an indicator that takes the value 1 if the firm is in the first tertile of total assets by country-year, and 0 otherwise. *No Financing Activities* takes the value 1 if the firm does not have an equity or debt offering in the prior, current, or subsequent year, and 0 otherwise. *Low Trading Volume* is 1 if the one-year lagged trading volume in

[16] Panel D of Table 2 shows that the matching process removes the differences in analyst coverage, raising external financing, and the last six months' stock returns between the two samples prior to the treatment and reduces to a large extent the economic differences on other dimensions (i.e., most variables are very close in terms of actual magnitudes). Our inferences are robust to stricter caliper choices such as 0.01, 0.005, or even 0.001. Using a stricter caliper further reduces the differences between the two groups, but also decreases the sample size significantly. For example, using a strict caliper of 0.001 removes the statistical differences between the treated and the control group prior to the treatment for size, coverage, ROA, firm age, leverage, R&D, stock returns, and earnings volatility. But the strict caliper choice reduces sample size to 7,641 observations. Again, our inferences remain the same using this matching choice.

millions of shares is in the bottom tertile by country-year, and 0 otherwise. To address the concern that the cross-sectional effects are mechanically driven by the pre-regulation analyst coverage level (e.g., small firms have lower coverage and are more likely to lose the entire coverage), we first orthogonalize firm size, institutional ownership, and trading volume, respectively, on analyst following and take the residual before defining the *Small Firm*, *Low Institutional Ownership*, and *Low Trading Volume* indicators, respectively.

We expect the reduction in sell-side coverage to be incrementally higher for firms that are less important to the sell-side industry. A negative (positive) coefficient on the triple interaction term when *Coverage* (*Complete Coverage Loss*) is the dependent variable would confirm Prediction 2.

3.3 Research Design for Sell-Side Research Quality

We test Prediction 3 in an analyst-firm balanced setting where the sample contains only those analysts who are present in IBES Detail both before and after MiFID II covering the same firm. In other words, this is a stringent test of the quality of sell-side research delivered by the same analyst but in periods with different incentives. Analysts who follow European firms are the treatment sample, and analysts who follow U.S. or Canadian firms are the control sample. For this test, we rely in turn on analysts' earnings forecasts and stock recommendations. Equation (2) specifies the model.

$$\begin{aligned} Sell\text{-}Side\ Output\ Measure &= \gamma_0 + \gamma_1 TREAT \times POST + Analyst\ Controls + Broker\ Control \\ &+ Firm\ Controls + Country\ Controls + Firm\ FE + Year\ FE \\ &+ Analyst\ FE + \varepsilon. \end{aligned} \tag{2}$$

First, we analyze whether remaining sell-side analysts make more accurate forecasts after MiFID II compared to their own accuracy, for the same firm, before MiFID II, which implies higher quality forecasts. The dependent variable is the earnings forecast error (*Forecast Error*) and the sample is at the forecast level (156,448 full sample, of which 51,603 treatment observations). The term of interest

is *TREAT×POST*; the coefficient γ_1 shows the impact of MiFID II on sell-side analysts' forecast accuracy compared to sell-side analysts who cover U.S. and Canadian firms. A negative coefficient γ_1 means that forecast errors are lower in Europe after MiFID II and would provide support for Prediction 3.

Second, to further substantiate the evidence on sell-side research quality, we test the perceived quality of stock recommendations made by sell-side analysts after MiFID II. To the extent that the sell-side profession under MiFID II competes for limited buy-side research payments and attention, economic intuition suggests that sell-side analysts may seek to increase the usefulness of their final product, that is, their stock recommendations. Following Kadan et al. (2009), we test the unconditional informativeness of stock recommendations issued by analysts present in the sample both before and after MiFID II (62,896 full-sample observations, of which 33,250 are treatment observations). The dependent variable is the absolute cumulative abnormal returns over two days following the release of the stock recommendation, *Abs CAR (0;+1)*. A positive coefficient γ_1 would lend support to Prediction 3 as it shows that the overall informativeness of stock recommendations increases after MiFID II.

Third, because MiFID II forces the buy-side to reassess the sources of research they use, we expect sell-side analysts will want to make themselves useful or indispensable by producing information that the buy-side values. In surveys, buy-side fund managers and analysts consistently rank industry knowledge as the most important sell-side research attribute (Bradshaw 2012; Brown, Call, Clement, and Sharp 2016). Industry recommendations contain information beyond that in stock recommendations and taking them into account increases the profitability of stock recommendations (Kadan, Madureira, Wang, and Zach 2012). Therefore, we also evaluate whether the sell-side caters more to the buy-side by providing information they know the buy-side uses: industry recommendations. We use the IBES Detail Recommendation file and the method described by Kadan

et al. (2012) and test whether stock recommendations for European firms are more likely to be accompanied by industry recommendations after MiFID II (i.e., a positive coefficient γ_1), which would imply that sell-side analysts cater to the buy-side to a greater extent.

Following prior research on analyst output quality (Mikhail, Walther, and Willis 1999; Clement 1999; Jacob, Lys, and Neale 1999; Bradley, Gokkaya, Liu, and Xie 2017; Merkley et al. 2017; Fang and Hope 2020), we include a range of analyst-level controls that may explain our dependent variables. Specifically, we include proxies for an analyst's general sell-side experience and specific experience with the firm for which she provides research. We also include proxies for the analyst's "busyness" measured by the number of firms and different industries covered during the year. To account for analysts employed by larger brokers having more resources available, we control for broker size. For the forecast accuracy test, we additionally control for forecast horizon and analyst effort measured as the number of forecasts issued for the firm during the year. Finally, we also include the firm- and country-level controls, to account for differences in firm characteristics and country institutions.[17]

3.4 Research Design for Buy-Side Response

We predict that the buy-side increases its internal investment research efforts following the implementation of MiFID II (Prediction 4). Unlike sell-side research, buy-side research is proprietary and rarely available to outsiders (Cheng et al. 2006), including to researchers, as the analyst works

[17] We do not tabulate analyst-firm level tests on a PSM sample as this requires a whole new set of variable selections for stage-one model and balance checks. Matching on firm characteristics, analyst experience, number of covered firms, and broker size results in a sample of 95,129 observations. Using *Forecast Error* as dependent variable in the most restrictive research design (with firm-year-analyst fixed effects and standard errors clustered by analyst and firm), the coefficient on *TREAT×POST* is −0.018, marginally significant (*t*-stat −1.85). Using a similar matching procedure, also adding analyst coverage as matching dimension, on the recommendation-level sample yields 43,621 matched observations. When *Abs CAR (0;+1)* is the dependent variable, the coefficient on *TREAT×POST* is not significant at conventional levels. Using *Industry Recommendation* as dependent variable in the same restrictive research design, the coefficient on *TREAT×POST* is 0.026, marginally significant (*t*-stat 1.75). Overall, the PSM results lend further, albeit weaker, support to Prediction 3.

exclusively for the investment firm that hires her.[18] Hence, we cannot directly observe the resources buy-side spend on internal research. We overcome this data limitation by employing indirect proxies for buy-side equity research effort.

First, an increase in buy-side research effort could manifest in the buy-side hiring more analysts. Inspired by Brown et al. (2016), we examine the number of buy-side analysts in European investment firms before and after MiFID II using Thomson Reuters' Thomson One platform. We obtain a list of contact information of all buy-side equity analysts affiliated with investment firms on June 12, 2017 (before MiFID II), and another list on April 3, 2019 (after MiFID II). We keep only investment firms that appear in both lists and operate in either any of the EEA countries (treatment group) or in the U.S. or Canada (control group), and retain only those individuals whose current title is (buy-side) security analyst or associate analyst.[19] We use the number of buy-side analysts employed by each investment firm as the dependent variable in Equation (3). The model includes *POST* and its interaction with *TREAT*, a categorical variable capturing the size of investment firms based on their asset under management, and investment firm fixed effects.

$$\#Buy\text{-}Side = \alpha_0 + \alpha_1 POST + \alpha_2 TREAT \times POST + Asset\ Under\ Management + Investment\ Firm\ FE + \varepsilon. \quad (3)$$

We expect a positive coefficient on α_2, which would indicate an increase in the number of buy-side analysts at European investment firms relative to the control group post-MiFID II.

Second, we consider a setting where buy-side analysts and corporate management interact directly and publicly. In particular, we look at whether buy-side analysts become more active in corporate conference calls, which is part of their fundamental research and due diligence. For instance, Jung, Wong, and Zhang (2018) show that buy-side analysts are more likely to participate in

[18] Groysberg, Healy, and Chapman (2008) and Groysberg, Healy, Serafeim, and Shanthikumar (2013) provide the first insight into buy-side research using proprietary data from a large investment firm between 1997 and 2004. Brown et al. (2016) provide cross-firm evidence on buy-side research using surveys.

[19] We remove 263 investment firms that operate simultaneously in European countries and the U.S. or Canada.

conference calls when a firm's information environment is poor and sell-side coverage is low. However, asking questions can be costly as doing so may reveal analysts' private information (Mayew, Sharp, and Venkatachalam 2013). Nevertheless, given the potential decrease in sell-side coverage due to MiFID II, we expect more buy-side analysts to attend conference calls and to ask more questions in order to acquire information for their own research.

We follow Jung et al. (2018) and Call, Sharp, and Shohfi (2018) and use conference call transcripts to identify the number of buy-side analysts participating in the calls as well as the number of questions they ask. Specifically, we download the annual earnings call transcripts from FactSet, and parse the list of participants to obtain the name, job, and employer of the non-corporate participants.[20] We then generate three variables measuring buy-side analysts' interactions with corporate management. *Buy-Side Attendance* is the number of buy-side analysts attending the call. *Buy-Side Questions* is the number of interactions between buy-side analysts and management during the call; we truncate the count to 10 to eliminate interactions without information content (i.e., the analyst saying, "Good morning," "Thank you," "I see," etc.). When no buy-side analysts participate or the firm does not hold an earnings call in a firm-year, we set these variables to zero such that the sample is the same as the one used to estimate Equation (1).[21] *Buy-Side Engagement* is the average number of interactions with management per buy-side analyst attending the call; this measure is conditional on buy-side attendance, which restricts the full (PSM) sample size to 1,589 (1,337) firm-year observations. Equation (4) specifies the model.

[20] We implement the following procedure to identify the sell-side and buy-side analysts: (1) we match by name and employer the list of non-corporate participants with the list of sell-side analysts obtained from FactSet Contact Screening; (2) we match the remaining participants by name and employer with a list of buy-side managers and analysts obtained from FactSet Contact Screening, Thomson Reuters, and S&P Capital IQ; (3) we match the remaining participants by employer with the list of buy-side and sell-side firms from the same sources; (4) we isolate the remaining non-matched participants and manually code them as sell-side, buy-side, or other by searching for their employment information via LinkedIn, Bloomberg, and corporate websites. We manually coded over 9,000 individuals.

[21] About half of our sample does not hold earnings calls. Inferences remain unchanged if we drop missing firm-years.

$$\begin{aligned} &Buy\text{-}Side\ Participation\ Measure \\ &\quad = \beta_0 + \beta_1 TREAT \times POST + \beta_2 Coverage + Firm\ Controls \\ &\quad + Country\ Controls + Firm\ FE + Year\ FE + \varepsilon, \end{aligned} \tag{4}$$

where buy-side participation is measured, in turn, with *Buy-Side Attendance*, *Buy-Side Questions*, and *Buy-Side Engagement*. In addition to firm- and country-level controls that we include in Equation (1), we further control for sell-side coverage. We expect the coefficient on *TREAT*×*POST* to be positive, indicating an increase in buy-side analyst participation and engagement with management in earnings conference calls in the post-MiFID II period in Europe compared to the control sample.

3.5 Summary Statistics

Panel A of Table 2 reports descriptive statistics for the full sample. The firms in the full sample are followed by an average of 8 analysts, and 1% have completely lost sell-side coverage during our sample period. The average firm has been listed for 15 years, has about $750 million in total assets, book-to-market ratio of 0.66, tangibility ratio of 0.22, and median ROA of 2%. 31% of firm-years have recorded losses and 50% have issued equity or debt financing. The average analyst covers about 17 firms from 4 different industries and publishes about 4 forecasts per firm-year. They work alongside 71 sell-side analysts at the same brokerage, have worked on the sell-side for 46 quarters, and have followed a specific firm for an average of 17 quarters.

Panel B of Table 2 presents the difference in means across the European sample after to before MiFID II. The univariate difference in analyst coverage shows a significant decrease post-MiFID II (i.e., from 7 to 6 analysts, on average), and the percentage of firms completely losing sell-side coverage increases significantly post-MiFID II (i.e., from 1% to 8%). At the analyst level, we note the higher average experience (i.e., from 46 to 50 quarters post-MiFID II since first appearance on IBES), and the increase in the number of firms covered (i.e., from 13 to 14).

One key result from Panel B of Table 2 is the increase in the number of firms that lose sell-side coverage completely after compared to before MiFID II implementation. Panel C explores this result further by comparing the European firms that lose all sell-side coverage (238 firms) with the European firms that remain covered (2,904 firms) in the first year of MiFID II implementation. The 238 firms have at least one analyst following in 2017 and zero analysts following in 2018. Compared to the firms that remain covered, the firms that lose all coverage are smaller, younger, have lower institutional ownership, and are less likely to raise equity or debt. They are also less profitable, have more volatile earnings, and generate lower stock returns. These univariate results support our multivariate inquiry into the role of firm importance for sell-side coverage decisions after MiFID II comes into force. The following sections present the results from empirical analyses on sell-side effects, buy-side effects, as well as additional tests on firm stock-market liquidity.

4. Empirical Results for Sell-Side Effects

4.1 Sell-Side Coverage (Test of Prediction 1)

We report results on our first prediction in Table 3. We first examine the changes in analyst coverage (columns 1 to 5) upon MiFID II implementation for European compared to U.S. and Canadian firms. Column 1 reports results from a simple pre-post specification on the EU sample with no controls. Column 2 reports results from a DiD specification with no controls or fixed effects conducted on the full sample. Columns 3 and 4 subsequently add controls and firm and year fixed effects, and cluster standard errors by firm. Column 5 employs the same specification as in column 4 but using the PSM sample. Overall, the results show a decrease in coverage following MiFID II for European firms, which also experience an incremental decrease in coverage relative to North American firms. The economic significance of the estimated coefficient on *TREAT*×*POST* in column 4 indicates that the incremental decrease in coverage for an average European firm represents 0.44 /

7.19 = 6.12% of the pre-regulation level.

Clearly, the most drastic outcome in terms of sell-side effects for firms would be a complete loss of analyst coverage; thus, to test the likelihood of this outcome, in columns 6 to 10 we replace *Coverage* by *Complete Coverage Loss*. Column 6 reports results based on the EU sample only; columns 7 to 9 report results from linear probability models and DiD designs. In column 7, without controls, the coefficient on *TREAT×POST* is positive and significant, suggesting that European firms have a higher likelihood of completely losing coverage after MiFID II compared to the North American firms used as control sample. Our multivariate DiD results on the full and PSM-matched samples reported in columns 8 to 10 further support this finding. Results in column 9 suggest that European firms, relative to North American firms, are 6% incrementally more likely to completely lose sell-side coverage after the MiFID II implementation. The impact of MiFID II on the loss of sell-side coverage is economically significant considering the mean value of 1% prior to MiFID II, which we view as a potentially serious consequence of the new regulation. Figure 1 allows a visual inspection of the dramatic increase in the percentage of firms that lose coverage entirely following the implementation of MiFID II in 2018 in Europe compared to North America.

Taken together, the results in Table 3 provide support for our prediction that the unbundling requirements lead to a shrinking of the market for sell-side coverage. Therefore, these results provide supporting evidence for the concerns expressed by managers and the investment community (CFA Institute 2017; IR Magazine 2019) that firms will suffer a loss, and sometimes a complete loss, of sell-side coverage following the implementation of MiFID II. However, coverage loss is not universally undesirable. Brown, Call, Clement, and Sharp (2019) find that, while 46% would prefer a higher analyst coverage, about 15% of the 610 investor relations officers surveyed would prefer a lower coverage of their firm. In the next section, we examine for which firms sell-side coverage decreases and which firms are more likely to completely lose coverage.

4.2 Cross-Sectional Variations in Sell-Side Coverage (Test of Prediction 2)

The effect of MiFID II on sell-side coverage is likely dependent on the firm's importance to the sell-side. To test Prediction 2, in Table 4 we redo the analyses in Table 3 and interact the *TREAT×POST* with *Low Institutional Ownership*, *Small Firm*, *No Financing Activities*, and *Low Trading Volume*, four indicator variables that proxy for less important firms. The models include firm fixed effects to capture time-invariant differences across firms and year fixed effects to control for general time trends. The triple interaction terms then capture cross-sectional variation in the DiD estimates. In other words, the triple interactions quantify the incremental strength of the effect of MiFID II implementation on sell-side coverage in Europe relative to North America across different groups of firms.

In columns 1 to 4 of Table 4, the dependent variable is *Coverage*. In column 1, the coefficient on the triple interaction *TREAT×POST×Low Institutional Ownership* is negative and significant at the 10% level. In the presence of firm and year fixed effects, this significant coefficient suggests that the DiD estimate of the effect of MiFID II on analyst coverage is statistically stronger for the firms in the *Low Institutional Ownership* group than for other firms. The difference is also economically meaningful, representing a 0.258 / 0.366 = 70% larger decrease in analyst coverage for *Low Institutional Ownership* firms compared to other firms. In columns 2 to 4, the coefficients on *TREAT×POST×Small Firm, TREAT×POST×No Financing Activities*, and *TREAT×POST×Low Trading Volume*, respectively, are negative and significant at the 10% level or better, suggesting that less important European firms suffer greater losses in coverage post-MiFID II compared to North American counterparts. Economically, the effect is 143%, 102%, and 122% stronger for *Small Firm*, *No Financing Activities*, and *Low Trading Volume* firms, respectively, compared to other firms.

Overall, the results suggest that the effects of MiFID II on analyst coverage are significantly stronger for firms that are less important to the sell-side.

In columns 5 to 8 of Table 4, we refine the analysis by using *Complete Coverage Loss* as the dependent variable. In the presence of firm and year fixed effects, the triple interaction terms capture the cross-sectional variation in the effect of MiFID II on losing analyst coverage completely across groups of firms. The coefficient on *TREAT×POST×Low Institutional Ownership* is positive and significant at the 1% level and the coefficients on *TREAT×POST×Small Firm* and *TREAT×POST×No Financing Activities* are positive and significant at the 5% level. The coefficient on *TREAT×POST×Low Trading Volume* is positive but not statistically significant. These results suggest that European firms that are less important to the sell-side are incrementally more likely to lose coverage entirely following MiFID II compared to North American firms.

To better interpret the triple interaction terms in Table 4 and further illustrate the economic significance of these results, Figure 2 plots the percentage of firms losing coverage completely before and after MiFID II in Europe compared to North America by the four proxies of firm importance for the sell-side. Consistent with the findings in Table 4, Figure 2 shows that the effect of MiFID II on the loss of entire analyst coverage is stronger for firms that are less important to the sell-side. Panel A shows that, among European (North American) firms, the percentage of firms with low institutional ownership that lose all sell-side coverage jumps from 0.5% (0.4%) before to 13.8% (1.5%) after MiFID II implementation, whereas for the other European (North American) firms, the percentage of firms that lose sell-side coverage increases from 0.5% (0.03%) to 4.2% (0.2%). In terms of firm size, Panel B indicates that about 10.4% (6.2%) of small (large) European firms lose sell-side coverage after MiFID II implementation, compared to 1.3% (0.5%) for the control group. Panel C shows that, among the European firms that have (do not have) financing activities, 5.4% (9.7%) lose sell-side coverage entirely after MiFID II compared to 0.6% (0.5%) before MiFID II. In Panel D, we consider

the split into low and high trading volume. After MiFID II implementation, the percentage of European (North American) firms with low trading volume that loses sell-side coverage is 10.5% (0.8%), compared to 7.5% (0.7%) among the rest of the firms. These graphs are consistent with the findings in Table 4 that the DiD estimates of MiFID II implementation are significantly stronger for firms that have lower institutional ownership, are smaller, do not have financing activities, or have lower trading volume.

Taken together, the evidence in Table 4 and Figure 2 indicates that sell-side analysts re-allocate their limited resources after MiFID II based on the importance of the covered firms. That being said, an intended objective of MiFID II is to improve sell-side independence, which prior literature suggests benefits firms in terms of higher quality forecasts and less biased analyst behavior (e.g., Chen and Chen 2009; Kadan et al. 2009). In the next section, we examine changes in analyst forecast characteristics following MiFID II to provide further insight into the costs and benefits debate around the unbundling mechanism.

4.3 Sell-Side Research Quality (Test of Prediction 3)

The fact that sell-side analysts need to separately price research and to the extent that the sell-side profession under MiFID II competes for limited buy-side research payments and attention, economic intuition suggests that sell-side analysts may seek to *increase the quality* of their research. Panel A of Table 5 reports results from regressions that test individual analyst forecast errors in the post-MiFID II period. In column 1, the coefficient on *POST* is negative and significant, suggesting in a univariate specification that the magnitude of earnings forecast errors decreases in Europe after MiFID II. Column 2 reports results from a specification of Equation (2) without fixed effects on the full sample of treated and control observations. The coefficient on *TREAT*×*POST* is negative and significant suggesting that forecast errors of analysts covering European firms after MiFID II

decreased compared to analysts covering U.S. or Canadian firms. We also provide results with different sets of fixed effects. Regardless of specification, we find that forecast errors have decreased for the analysts who remain after MiFID II, consistent with higher-quality work being conducted in the post-MiFID II period.

Next, we assess the informativeness of analyst stock recommendations to provide insight into the structural changes induced by the MiFID II implementation to sell-side research. Following Kadan et al. (2009), we use the absolute value of abnormal returns to stock recommendations as a measure of unconditional informativeness. In Panel B of Table 5, columns 1 through 4, the dependent variable is the absolute value of two-day market-adjusted returns. The coefficient on *POST* is positive and significant in column 1 where we use only European firms, suggesting the average absolute two-day abnormal market reaction has increased by about 0.3% from about 2.8%, a moderate increase of about 11% in the overall informativeness of stock recommendations. We introduce control firms, analyst-level, and firm-level controls, fixed effects, and double clustering gradually from columns 2 to 4. *TREAT×POST* captures the incremental abnormal market reaction to stock recommendations for European firms relative to control firms following the implementation of MiFID II, and is positive and significant, as predicted. In general, the results in columns 1 to 4 indicate an increase in overall informativeness of stock recommendations for European firms in the MiFID II era.

In Panel B of Table 5, columns 5 to 8 report results where the dependent variable, *Industry Recommendation*, equals 1 if a stock recommendation is accompanied by an industry recommendation, and 0 otherwise. In column 5 where the sample is limited to European firms, the coefficient on *POST* is positive and significant at the 5% level. We gradually introduce controls, fixed effects, and standard error clustering in columns 6 to 8. In the most restrictive specification, the coefficient on *TREAT×POST* is positive and significant at 5%. Relative to North American firms,

stock recommendations for European firms are more likely to be accompanied by industry recommendations after MiFID II implementation. Overall, the evidence is consistent with sell-side analysts increasingly providing industry recommendations, which are incrementally informative relative to stock recommendations (Kadan et al. 2012), after MiFID II.

Overall, the results in Table 5 provide support for our Prediction 3. The decrease in the public signals provided by sell-side coverage we document previously could imply a mechanical increase in stock-recommendation informativeness post-MiFID II. However, taken together with the increase in forecast accuracy and provision of industry recommendations, the effect we capture is likely that of an overall increase in sell-side research quality. In addition, recall that the analysts included in this test issued forecasts or stock recommendations both before and after MiFID II, and that the tests control for the level of experience on the sell-side. Therefore, these results indicate that the unbundling mechanism in MiFID II triggered a change in sell-side incentives, which in turn leads to higher sell-side research quality.

5. Empirical Results for Buy-Side Effects (Test of Prediction 4)

Due to buy-side research data unavailability, we test Prediction 4 indirectly using the number of buy-side analysts and buy-side participation in, and engagement with managers, during conference calls as proxies for research effort. Table 6 reports the results of estimating Equation (3) on the sample of investment firms at two points in time before and after MiFID II. The dependent variable (*#Buy-Side*) is the number of buy-side analysts. In column 1 that is based solely on the EU sample, we find a positive coefficient on *POST*, which indicates an *increase* in the *number of buy-side analysts* employed by European investment firms post-MiFID II. In column 2, we run the regression using the full sample that includes both European and North American investment firms. The coefficient on *TREAT*×*POST* is positive and marginally significant, consistent with the prediction of

an increase in the number of buy-side analysts affiliated with European investment firms relative to North American investment firms under the MiFID II regime.

To account for size differences, we assign investment firms into five groups based on their assets under management and match a European firm randomly with a control firm in the same asset group. Based on the matched sample, in column 3, we find similar evidence of an increase in the number of buy-side analysts in European investment firms relative to North American firms post-MiFID II. We additionally control for *Assets Under Management* in column 4, and inferences remain similar. Overall, the findings in Table 6 provide indirect evidence that European investment firms turn to more in-house research after MiFID II. These are new findings to the literature and suggest an approach to measuring buy-side interest that can be applied in other settings.

Next, we provide evidence on the buy-side analyst participation in conference calls after MiFID II. Figure 3 provides a visualization of the increase in *Buy-Side Engagement* (i.e., average number of questions by buy-side analyst, conditional on participation) in conference calls post-MiFID II in Europe (242 observations); the increase is of about 1 additional question per buy-side participating in the call (simple *t*-test of difference in means is significant at 10% two-tailed). Buy-side engagement with North American firms (1,347 observations) does not exhibit the same change.

Table 7 reports the DiD results from tests of buy-side analyst participation in conference calls following MiFID II implementation. In columns 1 and 2, the dependent variable is *Buy-Side Attendance*. The coefficient on *TREAT×POST* is positive and significant, consistent with an increase in the number of buy-side analysts participating in earnings conference calls of EU firms relative to North American firms after MiFID II comes into force. In terms of economic significance, the incremental increase of buy-side analyst participation for EU firms relative to North American firms is 2.3%, which is comparable to the pre-regulation level of 2.26%. In an untabulated test, we find some marginally significant evidence suggesting that buy-side attendance is higher for firms that

completely lose sell-side coverage. We replace, in column 3, *Buy-Side Attendance* with *Buy-Side Questions*, and find evidence suggesting that buy-side analysts ask more questions in earnings conference calls of EU firms after MiFID II implementation. In column 5, we restrict the sample to only those earnings conference calls with buy-side participation and use *Buy-Side Engagement* as the dependent variable. The results show an increase in the average number of interactions between buy-side analysts and management. Using a PSM-matched sample in columns 2, 4, and 6 produces findings similar to those reported in columns 1, 3, and 5, respectively.

Overall, the results in Table 7 provide evidence that buy-side analysts increase their interaction with corporate management in earnings calls post-MiFID II in Europe compared to North America. In other words, this test provides further indirect evidence of increased research effort after MiFID II. Together with the results in Table 6, these findings support our prediction that the European buy-side increases in-house research efforts as a response to MiFID II research unbundling.

Improvements in sell-side research quality and increases in buy-side research after MiFID II implementation are both possible, and thus internally consistent. Even though the quality of sell-side research is higher after MiFID II, the buy-side's incentive to purchase research decreases given its public good nature and the requirement to justify its usefulness for providing investment advice. The effect is further enhanced by most buy-side firms deciding to absorb research costs using their *own* resources, instead of passing them on to clients, and being therefore more careful with external spending on research (see anecdotal evidence in Section 2.1). Nevertheless, our setting may be too specific to provide a complete answer to the still open question on the co-existence of buy-side and sell-side research when sell-side research is of high quality (see Groysberg et al. 2008; 2013).[22]

[22] We thank Andrew Call, our *RAST* conference discussant, for leading us to this discussion.

6. Empirical Results for Firm Stock Liquidity

Despite MiFID II research unbundling targeting brokerages and investment firms, the equity research produced by the sell-side and consumed by the buy-side is, ultimately, about listed firms. In this section, we test the net effect of MiFID II on listed firms by examining changes in stock liquidity.

Table 8 reports the results of our stock liquidity test conducted on the full (PSM) sample of 21,409 (17,088) firm-year observations. Sample size decreases compared to the one used to estimate Equation (1) due to stock-market data availability. We control for the number of presentations at broker-hosted conferences during the year as firm's disclosure activities influence stock liquidity (Bushee, Jung, and Miller 2011; Green, Jame, Markov, and Subasi 2014), as well as analyst following in addition to the firm- and country-level controls used in previous analyses.

In columns 1 to 5 of Table 8, a larger bid-ask spread indicates lower liquidity. The coefficient on *TREAT×POST* is positive and significant across all columns, suggesting that European firms experience an incremental decrease in liquidity relative to control firms following MiFID II. In columns 6 to 10, we alternatively use Amihud's (2002) illiquidity ratio as an inverse proxy for liquidity and continue to find similar evidence. These results provide some evidence on the *negative* net effect of MiFID II on the information environment for European firms, at least in the short term, and echo the concern raised in various professional surveys that MiFID II could present a net cost to European companies.[23] We caution, however, that other contemporaneous changes, such as those imposed by MiFID II in transaction reporting and high-frequency trading, could contribute to this result. Given the confounding factors, we refrain from interpreting the lower stock liquidity we

[23] The U.K. makes up a third of our European sample (Panel B of Table 1). Consequently, one might argue that our findings could be affected by Brexit. Results based on continental European firms as the treated sample provide similar inferences as those reported throughout the prior tables. Hence, it is unlikely that our findings are solely driven by U.K. firms.

observe in the short-term post-MiFID II as being driven solely by the unbundling requirement and the dynamics it leads to in the financial services industry.

7. Conclusion

MiFID II is a sweeping new regulation that affects Europe and has the potential to expand through the rest of the world. Due to this new regulation, equity research is no longer bundled with brokerage firms' other services. The unbundling requirement is a transparency-based mechanism meant to address the potential conflicts of interest in the financial services industry due to the use of research as inducement for trading. We test the implications of the unbundling requirement in MiFID II on sell-side analysts, buy-side firms, and firms.

Regarding the sell-side, we provide results of a significant reduction in sell-side coverage and an increased likelihood of complete loss of coverage. Small firms, those having less institutional ownership, those not issuing financing, and those with lower trading volume are less important for the sell-side, and therefore more likely to suffer coverage losses. On the positive side, we show evidence consistent with the idea that MiFID II has changed the incentives of sell-side analysts who remain employed. Specifically, their research is higher quality: forecasts are more accurate, stock recommendations have greater information content, and industry recommendations are more frequent after MiFID II implementation.

It is difficult for researchers to measure buy-side research activity and coverage of firms. We develop a new approach to gauge the buy-side effects by counting the number of individuals employed as buy-side analysts before and after the regulation. We find a significant increase in the number of buy-side analysts, suggesting that there is a substitution effect between loss of sell-side coverage and increased buy-side research effort. Furthermore, we document that buy-side analysts

increase their attendance and active participation in earnings conference calls of European firms after MiFID II implementation compared to North American firms.

Whereas firms are hurt by losing analyst coverage, sell-side research quality increases. Also, the buy-side picks up some of the slack by investing more in in-house research.[24,25] In other words, separate pricing for research reduces the scope of the sell-side industry but strengthens the incentives of remaining analysts and drives asset managers to reduce their spending on external research and generate more private research internally. Lastly, we show that stock-market liquidity has decreased, at least in the short term (i.e., within one year following MiFID II implementation).

Beyond the practical implications of our findings, we contribute to the broad literature on conflicts of interest in the sell-side industry and to the specific literature on conflicts of interest generated by trading incentives. We examine the effects of, and responses to, a specific mechanism to address these conflicts of interest—unbundling. Importantly, we contribute to the scant literature on the buy-side industry by providing indirect evidence on the investment firms' response to this mechanism. Considering the novelty of MiFID II as regulation, the wide ramifications of the unbundling requirement in the buy-side and sell-side industries should be informative to academics and practitioners, alike.

[24] Whether the newly hired buy-side analysts are former sell-side analysts is an interesting question. However, the costly data collection necessary to answer this question places it beyond the scope of this paper.
[25] It is possible that a new equilibrium will emerge in the long-term once the various market participants have adjusted to the new regulation. We leave this to future research.

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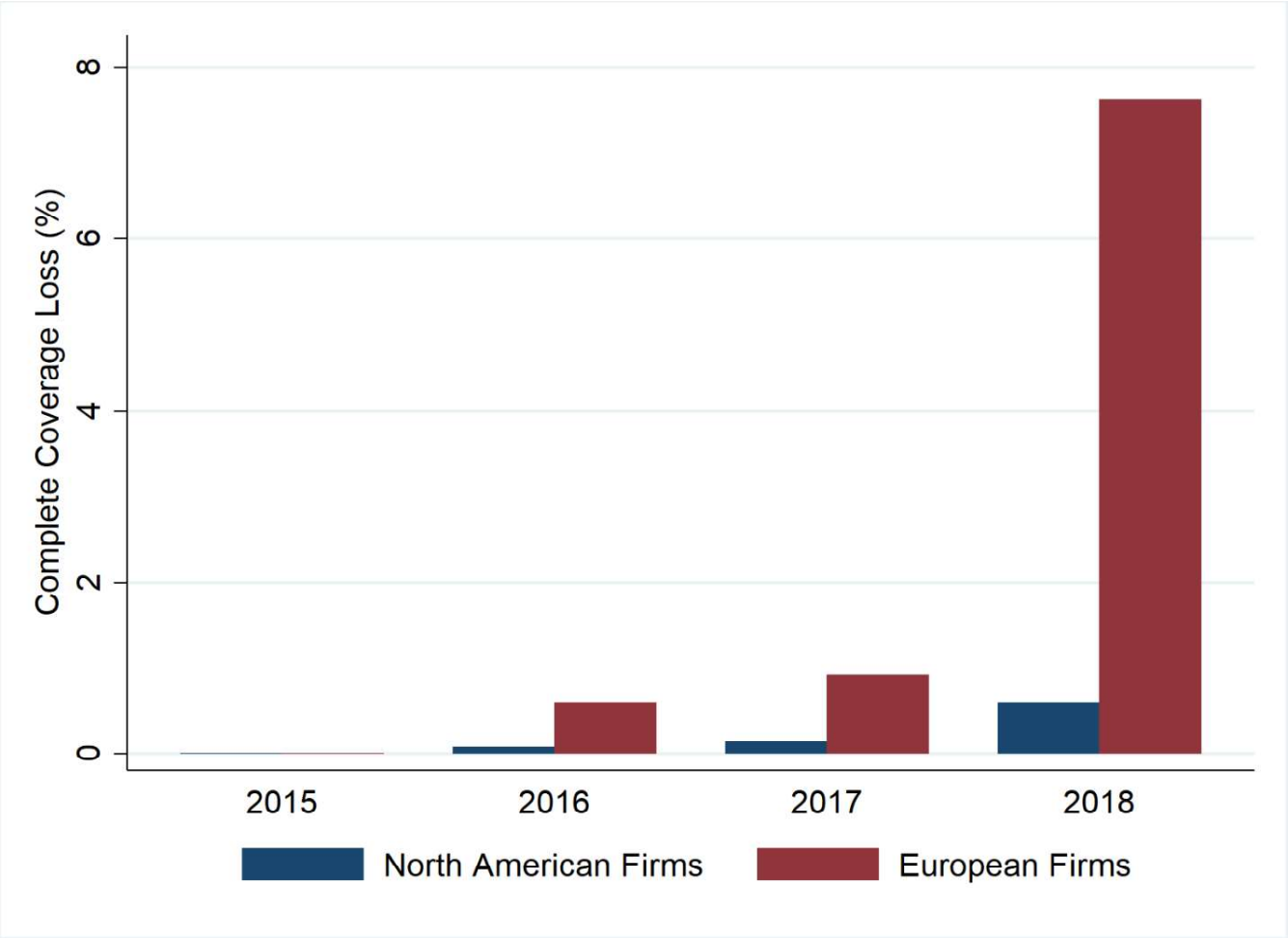
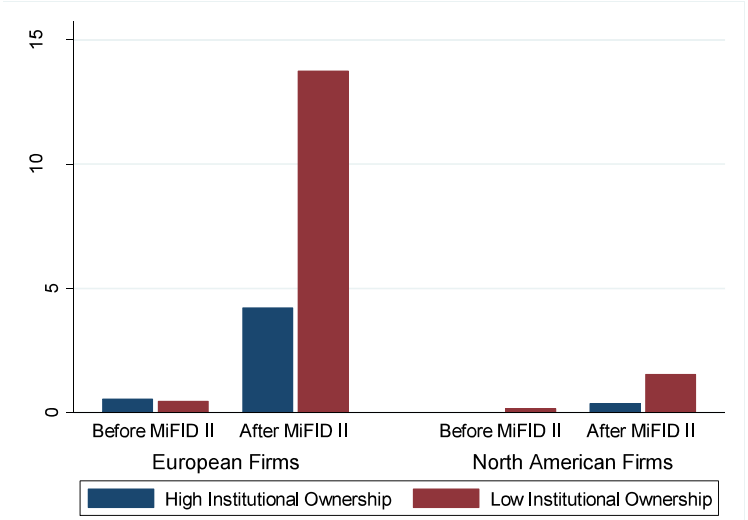
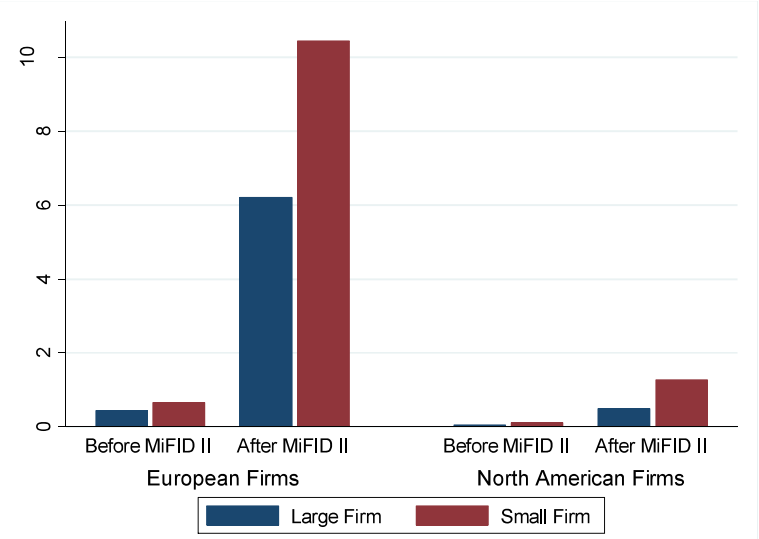


Fig. 1 Percentage of European and North American firms that lose coverage completely in the years leading up to the MiFID II implementation and the first year of MiFID II implementation. Over this period, firms enter the sample in the first year when they are covered by at least one analyst. Data is from IBES Summary File

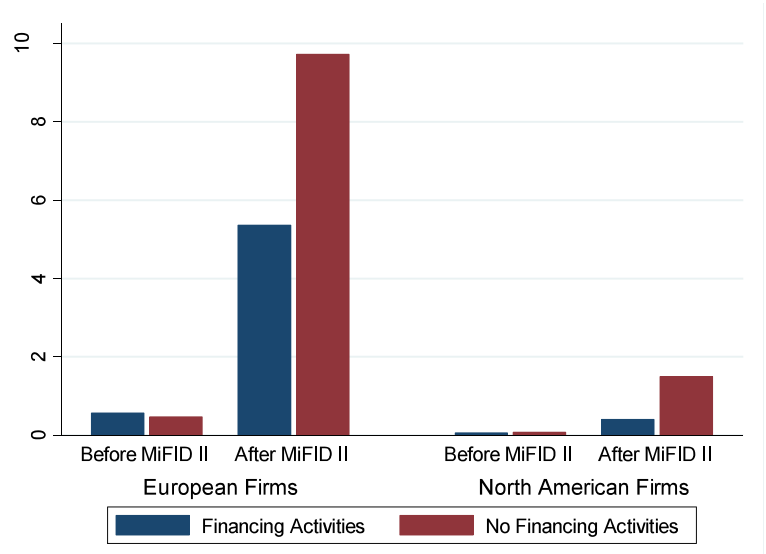
a *Firms with low versus high institutional ownership*



b *Small versus large firms*



c *Firms with versus without financing activities*



d *Firms with low versus high trading volume*

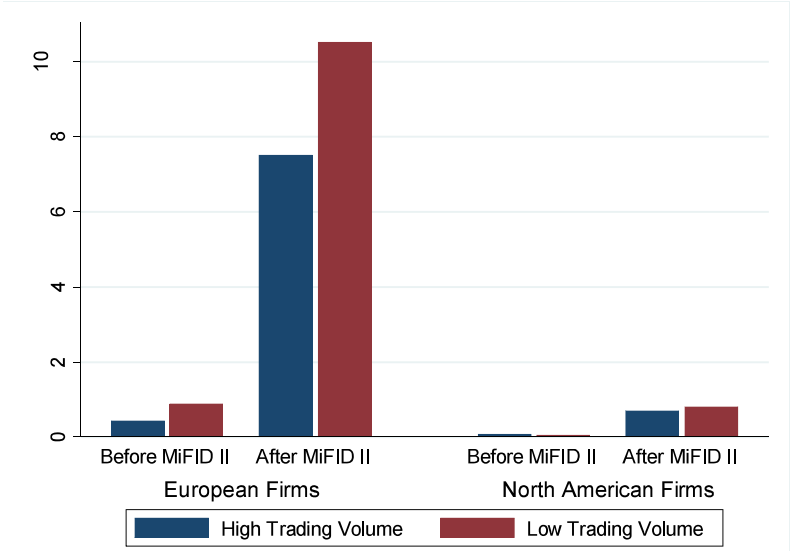


Fig. 2 Cross-sectional variation in complete coverage loss. This figure depicts the variation along four dimensions—institutional ownership (Panel A), firm size (Panel B), financing activities (Panel C), and trading volume (Panel D)—in the percentage of firms that lose all sell-side coverage before and after MiFID II implementation across European and North American firms. We orthogonalize institutional ownership, firm size, and trading volume, respectively, to the number of analysts covering a firm in order to remove the mechanical relation between these variables. We then create the indicator variables *Low (High) Institutional Ownership*, *Small (Large) Firm*, and *Low (High) Trading Volume* by assigning the value 1 (0) to observations with the residual in the bottom tertile (top two tertiles) by country-year, and 0 (1) otherwise. The variable *Financing Activities (No Financing Activities)* takes the value 1 (0) if the firm has (does not have) equity or debt offering in the prior, current, or subsequent year, and 0 (1) otherwise. All variables are defined in the Appendix. Panel A of Table 1 describes the sample construction. Data is from IBES Summary File, Datastream, CRSP, and Compustat

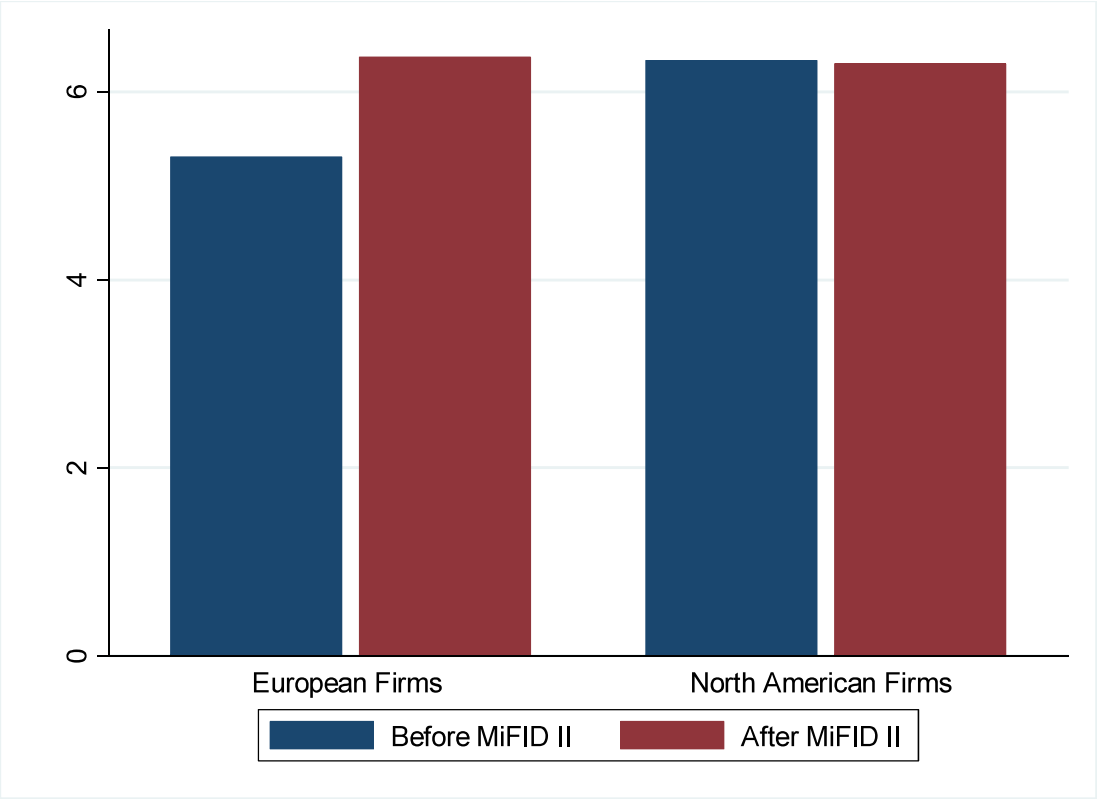


Fig. 3 Buy-side engagement with management. This figure plots the average number of interactions that buy-side analysts have with management during earnings conference calls (*Buy-Side Engagement*) for European and North American firms, before and after MiFID II implementation, conditional on buy-side participation in the call. Panel A of Table 1 describes the sample construction. Data is from FactSet conference call transcripts

Appendix: Variable Definitions

Variable	Definition	Source
Variables of interest		
TREAT	Indicator variable that takes the value 1 for observations in the treatment group, and 0 otherwise (i.e., the control group). The control group includes U.S. and Canadian observations.	Compustat and Thomson Reuters
POST	Indicator variable that takes the value 1 if the value of the dependent variable is based on data on or after January 3, 2018, and 0 for otherwise.	Compustat, IBES and Thomson Reuters
Dependent variables used for sell-side coverage tests		
Coverage	Number of analysts forecasting EPS for a firm's reporting period-end (*numest*).	IBES
Complete Coverage Loss	Indicator variable that takes the value 1 if a firm loses all coverage for the fiscal reporting period, and 0 otherwise.	IBES
Dependent variables used for sell-side work output quality tests		
Forecast Error	Absolute value of actual EPS (*actual*) minus individual EPS forecast (*forecast*) scaled by absolute actual EPS.	IBES
Abs CAR (0;+1)	Absolute value of cumulative abnormal returns two days around stock recommendations. Stock returns are adjusted using the main market index in each economy (i.e., S&P 500 for the U.S., TSX60 for Canada, STOXX Europe 600 for Europe).	Datastream
Industry Recommendation	Indicator variable equal to 1 if a stock recommendation is accompanied by an industry recommendation, and 0 otherwise.	IBES
Dependent variables used for buy-side tests		
#Buy-Side	Number of buy-side analysts employed by investment firms.	Thomson Reuters
Buy-Side Attendance	Number of buy-side analysts attending the annual earnings conference call. If missing, the variable is set to 0.	FactSet
Buy-Side Questions	Number of interactions between buy-side analysts and management during the annual earnings conference call. The variable is truncated at 10 to ensure that it captures meaningful interactions. If missing, the variable is set to 0.	FactSet
Buy-Side Engagement	Average number of interactions between buy-side analysts and management during the annual earnings conference call, conditional on buy-side analyst attendance.	FactSet
Dependent variables used for stock liquidity tests		
Amihud Ratio	Annual mean of the daily absolute return to the monetary unit trading volume on that day, as defined by Amihud (2002).	CRSP and Datastream
Bid-Ask Spread	Annual mean of daily bid-ask spread scaled by stock price.	CRSP and Datastream
Control variables		
Assets Under Management	Categorical variable for the investment firm's asset size, with the following five categories: 1 = below $100 mil, 2 = $100 to $1,000 mil, 3 = $1,000 to $5,000 mil, 4 = $5,000 to $50,000 mil, 5 = beyond $50,000 mil.	Thomson Reuters
Broker Size	Natural logarithm of the number of unique analysts at a brokerage firm in a year.	IBES
#Broker Conferences	Number of broker-hosted conferences during a year; if missing, the variable is set to 0.	FactSet
BTM	Book-to-market ratio computed as total common equity divided by market capitalization.	Compustat and CRSP
Effort	Number of forecasts issued by the analyst for the covered firm in a year.	IBES
Firm Age	Number of years between the first fiscal year that the firm appears in Compustat and the current fiscal year.	Compustat

Firm Experience	Number of quarters since the analyst-firm pair first appeared in IBES.	IBES
#Firms Covered	Number of unique firms covered by the analyst in the current year.	IBES
GDP Growth	Percentage change in GDP per capita.	World Bank
General Experience	Number of quarters since the analyst first appeared in IBES.	IBES
Horizon	Number of days between the forecast announcement date and the earnings announcement date.	IBES
#Industries Covered	Number of unique two-digit SIC industries covered by the analyst in the current year.	IBES
Institutional Ownership	The percentage of shares in firm *i* owned by institutions in year *t*.	Thomson Reuters and FactSet
Financing Activities (No Financing Activities)	Indicator variable that takes the value 1 (0) if the firm has (does not have) a seasoned equity offering or debt offering in the prior, current, or subsequent year, and 0 (1) otherwise.	Compustat, CRSP, Compustat Security, and SDC
Stock Return	Buy-and-hold stock return over the six months prior to the fiscal year end.	CRSP and Compustat
Leverage	Total liabilities (*dlc+dltt*) divided by total assets (*at*).	Compustat
Log (GDP per capita)	Natural logarithm of the GDP per capita in current U.S. dollars.	World Bank
Loss	Indicator variable that takes the value 1 if income before extraordinary items (*ib*) is lower than 0, and 0 otherwise.	Compustat
Low (High) Institutional Ownership	Indicator variable that takes the value 1 (0) if the residual from the following regression is in the bottom tertile (top two tertiles) by country-year, and 0 (1) otherwise. $$Institutional\ Ownership_{i,t-1} = \beta_0 + \beta_1 Coverage_{i,t} + \varepsilon,$$ where one-year lagged institutional ownership in firm *i* is regressed over year *t* sell-side coverage.	Thomson Reuters, FactSet and IBES
Low (High) Trading Volume	Indicator variable that takes the value 1 (0) if the residual from the following regression is in the bottom tertile (top two tertiles) by country-year, and 0 (1) otherwise. $$Trading\ Volume_{i,t-1} = \beta_0 + \beta_1 Coverage_{i,t} + \varepsilon,$$ where one-year lagged trading volume in firm *i* is regressed over year *t* sell-side coverage.	CRSP, Datastream and IBES
R&D	Research and development spending (*xrd*) scaled by total assets (*at*).	Compustat
Return Volatility	Standard deviation of monthly stock returns over the last 24 months.	CRSP and Compustat
ROA	Income before extraordinary items (*ib*) divided by total assets at reporting period-end (*at*).	Compustat
Size	Natural logarithm of total assets at reporting period-end (*at*).	Compustat
Small (Large) Firm	Indicator variable that takes the value 1 (0) if the residual from the following regression is in the bottom tertile (top two tertiles) by country-year, and 0 (1) otherwise. $$Size_{i,t} = \beta_0 + \beta_1 Coverage_{i,t} + \varepsilon,$$ where the firm size is regressed over sell-side coverage. Size is measured as total assets (*at*).	Compustat and IBES
Tangibility	Tangible assets (*ppent*) scaled by total assets (*at*).	Compustat
Trading Volume	Total number of firm *i* shares traded in a year, in millions of shares.	CRSP and Compustat

Table 1: Sample

Panel A: Sample construction

Sample	Treated sample	Control sample		Total observations
	Europe	U.S.	Canada	
Compustat firms with at least one analyst forecast during 2015–February 2019	14,780	12,806	3,038	31,624
Less missing accounting and stock price data	(2,174)	(1,120)	(301)	
Keep firm-years after the first available forecast	(1,470)	(81)	(177)	
Full sample	**11,136**	**11,605**	**2,560**	**25,301**
PSM sample	**9,709**	**7,409**	**1,960**	**19,078**
Forecast-level sample	51,603	95,278	9,567	156,448
Number of unique firms	2,752	3,665	721	6,838
Number of unique brokers	308	270	116	588
Number of unique analysts	3,266	3,273	761	6,562
Recommendation-level sample	33,250	25,065	4,581	62,896
Liquidity sample	9,099	10,984	1,326	21,409

Panel B: Distribution of sample firm-year observations by industry

Fama-French 12 Industry Code	Full Sample		PSM Sample	
	Freq.	Percent	Freq.	Percent
Consumer Non-Durables	1,417	5.60%	1,303	6.83%
Consumer Durables	557	2.20%	436	2.29%
Manufacturing	2,589	10.24%	2,366	12.40%
Oil, Gas, and Coal Extraction and Products	1,301	5.16%	678	3.55%
Chemicals and Allied Products	630	2.49%	476	2.50%
Business Equipment	3,982	15.73%	3,184	16.69%
Telephone and Television Transmission	659	2.61%	510	2.67%
Utilities	586	2.31%	332	1.74%
Wholesale, Retail, and Some Services	2,296	9.07%	1,784	9.35%
Healthcare, Medical Equipment, and Drugs	3,316	13.10%	2,084	10.92%
Finance	3,800	15.01%	1,848	9.69%
Other	4,168	16.48%	4,077	21.37%
Total	**25,301**	**100.00%**	**19,078**	**100.00%**

This table shows the sample distribution by industry, defined using the Fama and French (1997) 12-industry classification (https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_12_ind_port.html)

Panel C: Distribution of sample firm-year observations by country

Country	Full Sample		PSM Sample	
	Frequency	Percent	Frequency	Percent
European Economic Area				
Austria	139	0.55%	136	0.71%
Belgium	229	0.91%	205	1.07%
Bulgaria	51	0.20%	33	0.17%
Croatia	40	0.16%	31	0.16%
Cyprus	53	0.21%	43	0.23%
Czech Republic	26	0.10%	6	0.03%
Denmark	220	0.87%	182	0.95%
Estonia	37	0.15%	29	0.15%
Finland	407	1.61%	351	1.84%
France	1,466	5.79%	1,339	7.02%
Germany	1,255	4.96%	1,116	5.85%
Greece	101	0.40%	90	0.47%
Hungary	20	0.08%	16	0.08%
Ireland	140	0.55%	122	0.64%
Italy	695	2.75%	631	3.31%
Latvia	11	0.04%	6	0.03%
Lithuania	19	0.08%	14	0.07%
Luxembourg	79	0.31%	51	0.27%
Malta	11	0.04%	11	0.06%
Netherlands	312	1.23%	280	1.47%
Norway	503	1.99%	434	2.27%
Poland	696	2.75%	557	2.92%
Portugal	82	0.32%	75	0.39%
Slovenia	28	0.11%	23	0.12%
Spain	337	1.33%	306	1.60%
Sweden	884	3.49%	774	4.06%
United Kingdom	3,295	13.02%	2,848	14.93%
Sub-total treated group	11,136	44.01%	9,709	50.89%
Control group				
Canada	2,560	10.12%	1,960	10.27%
United States	11,605	45.87%	7,409	38.84%
Sub-total control group	14,165	55.99%	9,369	49.11%
Total	**25,301**	**100.00%**	**19,078**	**100.00%**

This table shows the firm-year sample distribution by country for the full and PSM matched samples

Table 2: Summary Statistics

Panel A: Full-sample descriptive statistics over the period 2015 to 2019

Variable	N	Mean	SD	P25	Median	P75
Firm-year observations						
Coverage	25,301	8.14	7.76	2.00	5.00	11.00
Complete Coverage Loss	25,301	0.01	0.11	0.00	0.00	0.00
Size	25,301	6.61	2.91	4.79	6.77	8.47
ROA	25,301	−0.04	0.25	−0.02	0.02	0.06
Loss	25,301	0.31	0.46	0.00	0.00	1.00
BTM	25,301	0.66	0.72	0.25	0.49	0.85
Firm Age	25,301	14.71	13.59	4.00	11.00	20.00
Leverage	25,301	0.24	0.22	0.06	0.20	0.36
Tangibility	25,301	0.22	0.25	0.02	0.11	0.32
R&D	25,301	0.05	0.12	0.00	0.00	0.03
Financing Activities	25,301	0.50	0.50	0.00	0.00	1.00
Stock Return	25,301	0.20	0.77	−0.00	0.08	0.21
Earnings Volatility	25,301	0.03	0.05	0.00	0.01	0.02
Return Volatility	25,301	0.34	0.88	0.07	0.11	0.21
Institutional Ownership	25,301	51.28	54.45	1.30	53.35	87.09
Trading Volume	23,572	169.07	315.58	8.43	41.73	160.98
GDP Growth	25,301	2.26	1.17	1.57	2.22	2.86
Log (GDP per Capita)	25,301	10.79	0.33	10.66	10.95	11.00
Buy-side Attendance	25,301	0.07	0.32	0.00	0.00	0.00
Buy-side Questions	25,301	0.38	1.64	0.00	0.00	0.00
Buy-side Engagement	1,589	6.21	3.79	4.00	5.00	8.00
Bid-Ask Spread	21,409	0.92	1.68	0.07	0.27	1.00
Amihud Ratio	21,409	0.26	0.78	0.00	0.00	0.06
#Broker Conferences	21,409	2.14	2.90	0.00	1.00	3.00
Earnings forecast-level observations						
Forecast Error	156,448	0.20	0.41	0.01	0.05	0.16
Effort	156,448	4.20	2.32	3.00	4.00	5.00
Horizon	156,448	3.80	2.26	2.60	3.30	4.00
Firm Experience	156,448	16.97	18.25	4.00	12.00	24.00
General Experience	156,448	46.33	35.41	17.00	36.00	71.00
#Firms Covered	156,448	16.95	8.99	11.00	16.00	21.00
#Industries Covered	156,448	4.06	2.82	2.00	3.00	6.00
Broker Size (raw)	156,448	71.22	65.53	22.00	49.00	102.00
Stock recommendation-level observations						
Abs CAR (0;+1)	62,896	0.03	0.04	0.01	0.02	0.04
Industry Recommendation	62,896	0.06	0.25	0.00	0.00	0.00

All variables are defined in the Appendix. Continuous variables are winsorized at 1 and 99%. Panel A of Table 1 describes the sample. Sample size decreases for *Trading Volume*, *Amihud Ratio* and *Bid-Ask Spread* due to data availability. *Buy-side Engagement* is conditional on buy-side analyst participation in the earnings conference call

Panel B: Comparison of European firms after to before MiFID II implementation

	Before		After		Change	*t*-value	p>|t|
	N	Mean	N	Mean			
Coverage	7,994	7.19	3,142	6.16	−1.02	−6.44	0.00
Complete Coverage Loss	7,994	0.01	3,142	0.08	0.07	21.92	0.00
Size	7,994	6.14	3,142	6.14	0.01	0.06	0.95
ROA	7,994	−0.01	3,142	−0.02	−0.01	−2.50	0.01
Loss	7,994	0.26	3,142	0.28	0.02	2.03	0.04
BTM	7,994	0.73	3,142	0.79	0.06	3.11	0.00
Firm Age	7,994	10.17	3,142	11.20	1.06	6.65	0.00
Leverage	7,994	0.21	3,142	0.21	0.00	0.76	0.45
Tangibility	7,994	0.20	3,142	0.19	−0.01	−1.01	0.31
R&D	7,994	0.03	3,142	0.04	0.01	2.12	0.03
Financing Activities	7,994	0.37	3,142	0.49	0.12	11.93	0.00
Stock Return	7,994	0.48	3,142	0.46	−0.02	−1.10	0.27
Earnings Volatility	7,994	0.02	3,142	0.02	0.00	0.41	0.68
Return Volatility	7,994	0.53	3,142	0.50	−0.03	−0.87	0.39
Institutional Ownership	7,994	35.69	3,142	40.69	5.00	5.34	0.00
Trading Volume	6,960	99.73	2,786	103.88	4.15	0.74	0.46
GDP Growth	7,994	2.30	3,142	2.03	−0.27	−7.94	0.00
Log (GDP per Capita)	7,994	10.55	3,142	10.63	0.08	10.29	0.00
General Experience	34,319	45.58	17,284	49.89	4.31	12.69	0.00
Firm Experience	34,319	16.50	17,284	16.53	0.03	0.14	0.89
Broker Size (raw)	34,319	95.91	17,284	83.42	−12.49	−15.27	0.00
#Industries Covered	34,319	4.20	17,284	4.60	0.4	14.16	0.00
#Firms Covered	34,319	12.67	17,284	13.96	1.29	16.15	0.00

This table provides difference in means statistics comparing the sample of European firms after to before MiFID II implementation (i.e., 2018–2019 compared to 2015–2017). Panel A of Table 1 describes the sample construction. Sample size varies based on the unit of observation (firm-year or firm-year-analyst). Continuous variables are winsorized at 1 and 99%. All variables are defined in the Appendix

Panel C: Comparison between European firms that lose sell-side coverage completely after MiFID II implementation and European firms that remain covered

	Firms that Lose Coverage Completely		Firms that Remain Covered		Difference in means	*t*-value	p>|t|
	N	Mean	N	Mean			
Size	238	3.36	2,904	6.37	−3.01	−18.07	0.00
ROA	238	−0.11	2,904	−0.01	−0.10	−4.59	0.00
Loss	238	0.47	2,904	0.26	0.21	6.44	0.00
BTM	238	1.18	2,904	0.76	0.42	5.06	0.00
Firm Age	238	8.77	2,904	11.39	−2.62	−6.32	0.00
Leverage	238	0.22	2,904	0.21	0.01	0.51	0.61
Tangibility	238	0.23	2,904	0.19	0.04	2.25	0.03
R&D	238	0.03	2,904	0.04	−0.01	−0.66	0.51
Financing Activities	238	0.35	2,904	0.50	−0.15	−4.82	0.00
Stock Return	238	0.18	2,904	0.48	−0.30	−8.31	0.00
Earnings Volatility	238	0.04	2,904	0.02	0.02	4.87	0.00
Returns Volatility	238	0.21	2,904	0.53	−0.32	−7.34	0.00
Institutional Ownership	238	21.86	2,904	42.23	−20.37	−2.92	0.00
Trading Volume	236	96.14	2,550	104.6	−8.46	−0.46	0.65
GDP Growth	238	2.58	2,904	1.98	0.60	5.52	0.00
Log (GDP per Capita)	238	10.38	2,904	10.65	−0.27	−7.48	0.00

The table compares the cross-section of European firms that lose sell-side coverage completely after MiFID II implementation with the European firms that remain covered. In the year prior to MiFID II implementation, all firms in this sample were covered by the sell-side. Continuous variables are winsorized at 1 and 99%. All variables are defined in the Appendix

Panel D: Balance check for treated and control samples before and after PSM matching

	Before PSM Matching					After PSM Matching				
	Mean		%bias	*t*-test		Mean		%bias	*t*-test	
Variable	Treated	Control		*t*-value	p>|t|	Treated	Control		*t*-value	p>|t|
Coverage	7.06	9.07	−26.40	−10.27	0.00	6.76	6.69	0.90	0.37	0.71
Size	6.00	7.02	−35.10	−14.11	0.00	5.95	6.12	−5.50	−2.13	0.03
ROA	−0.01	−0.06	21.20	8.10	0.00	−0.01	−0.04	9.90	3.97	0.00
Loss	0.26	0.34	−18.60	−7.21	0.00	0.26	0.33	−13.80	−4.96	0.00
BTM	0.66	0.51	23.70	9.40	0.00	0.65	0.57	12.00	4.00	0.00
Firm Age	10.56	18.27	−60.60	−22.67	0.00	10.46	9.42	8.20	4.45	0.00
Leverage	0.20	0.27	−29.50	−11.31	0.00	0.20	0.21	−5.30	−1.99	0.05
Tangibility	0.19	0.23	−13.00	−4.99	0.00	0.19	0.24	−18.40	−6.69	0.00
R&D	0.03	0.06	−24.60	−9.36	0.00	0.03	0.04	−7.10	−3.20	0.00
Financing Activities	0.45	0.64	−38.90	−15.21	0.00	0.44	0.46	−3.40	−1.20	0.23
Stock Return	0.48	0.06	54.90	22.58	0.00	0.37	0.37	−0.80	−0.31	0.75
Earnings Volatility	0.02	0.03	−23.40	−8.84	0.00	0.02	0.03	−11.30	−4.74	0.00
Return Volatility	0.53	0.19	37.00	15.16	0.00	0.41	0.28	13.90	5.87	0.00

This table shows the balance check between the treated (European) and control (North American) group before and after PSM matching. The sample includes 25,301 firm-year observations before matching, and 19,078 firm-year observations after matching. Continuous variables are winsorized at 1 and 99%. All variables are defined in the Appendix

Table 3: The Impact of MiFID II on Sell-side Analyst Coverage

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Coverage					*Complete Coverage Loss*				
	Pre-Post	Difference-in-Differences				Pre-Post	Difference-in-Differences			
Variables	EU Sample	Full Sample	Full Sample	Full Sample	PSM Sample	EU Sample	Full Sample	Full Sample	Full Sample	PSM Sample
TREAT×POST		**−0.902*** **	**−0.440*** **	**−0.440*** **	**−0.631*** **		**0.064*** **	**0.060*** **	**0.060*** **	**0.012** **
		(−4.06)	**(−8.62)**	**(−6.36)**	**(−4.42)**		**(20.50)**	**(19.29)**	**(10.62)**	**(2.47)**
TREAT		−1.948***					0.004***			
		(−17.21)					(2.76)			
POST	**−1.028*** **	−0.126				**0.071*** **	0.007***			
	(−6.44)	(−0.83)				**(21.92)**	(3.17)			
Size			0.642***	0.642***	0.840***			−0.026***	−0.026***	−0.005**
			(17.08)	(6.67)	(3.24)			(−11.41)	(−5.46)	(−2.26)
ROA			−0.748***	−0.748***	−0.580**			0.030***	0.030*	0.010
			(−6.28)	(−3.41)	(−2.06)			(4.13)	(1.82)	(0.92)
Loss			−0.086*	−0.086	−0.143			−0.002	−0.002	−0.001
			(−1.90)	(−1.42)	(−1.26)			(−0.77)	(−0.50)	(−0.18)
BTM			0.045	0.045	0.015			−0.004*	−0.004	−0.004
			(1.25)	(0.70)	(0.19)			(−1.86)	(−0.74)	(−1.29)
Firm Age			0.580	−0.246	−0.095			0.008	−0.054	−0.029
			(1.13)	(−0.49)	(−0.26)			(0.26)	(−1.29)	(−0.80)
Leverage			0.708***	0.708**	−0.136			0.016	0.016	0.001
			(4.38)	(2.50)	(−0.20)			(1.64)	(0.85)	(0.11)
Tangibility			0.809***	0.809*	0.822			−0.011	−0.011	0.024
			(2.70)	(1.83)	(1.26)			(−0.59)	(−0.28)	(0.73)
R&D			0.261	0.261	1.118			0.008	0.008	−0.001
			(0.82)	(0.60)	(1.31)			(0.43)	(0.27)	(−0.07)
Financing Activities			0.426***	0.426***	0.337***			−0.011***	−0.011***	−0.001
			(8.80)	(6.27)	(2.73)			(−3.81)	(−3.43)	(−0.35)
Stock Return			−0.364***	−0.364***	−0.146			−0.009***	−0.009***	−0.006***
			(−8.87)	(−4.73)	(−0.92)			(−3.61)	(−2.96)	(−2.60)

Earnings Volatility			−4.371***	−4.371***	−3.020**			−0.045*	−0.045	0.007
			(−10.38)	(−6.11)	(−2.46)			(−1.74)	(−0.87)	(0.23)
Return Volatility			0.184***	0.184*	0.019			0.006**	0.006*	0.004*
			(4.43)	(1.82)	(0.14)			(2.41)	(1.68)	(1.84)
GDP Growth			−0.009	−0.009	0.028			0.004***	0.004***	0.002**
			(−0.63)	(−0.55)	(1.07)			(4.88)	(3.51)	(2.27)
Log (GDP per Capita)			−4.553***	−4.553***	−6.926***			0.212***	0.212***	0.080***
			(−10.75)	(−6.29)	(−4.34)			(8.16)	(3.76)	(2.70)
Constant	7.189***	9.137***	46.421***	56.592***	78.151***	0.005***	0.001	−2.096***	−1.333	−0.606
	(84.77)	(123.85)	(5.97)	(5.25)	(4.80)	(3.00)	(0.71)	(−4.39)	(−1.59)	(−1.37)
Observations	11,136	25,301	25,301	25,301	19,078	11,136	25,301	25,301	25,301	19,078
Fixed Effects	NO	NO	Firm & Year	Firm & Year	Firm & Year	NO	NO	Firm & Year	Firm & Year	Firm & Year
Clustering	NO	NO	NO	Firm	Firm	NO	NO	NO	Firm	Firm
Adj. R^2	0.004	0.021	0.957	0.957	0.950	0.041	0.047	0.203	0.203	0.212

The table presents results on the impact of MiFID II on firms' sell-side coverage from pre-post models on the EU sample and DiD models on the full sample and PSM sample. The control group includes U.S. and Canadian firms. Panel A of Table 1 describes the sample construction. The dependent variable in columns (1)–(5) is *Coverage*. The dependent variable in columns (6)–(10) is the indicator *Complete Coverage Loss* and results are estimated using linear probability models. All continuous variables are winsorized at 1 and 99%. All variables are defined in the Appendix. Fixed effects and standard error clustering are as indicated in each column. 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 4: Cross-Sectional Variation in the Impact of MiFID II on Sell-Side Analyst Coverage

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Coverage				*Complete Coverage Loss*			
TREAT×POST×Low Institutional Ownership	**−0.258***				**0.084*****			
	(−1.71)				**(6.25)**			
TREAT×POST×Small Firm		**−0.374*****				**0.033****		
		(−2.69)				**(2.56)**		
TREAT×POST×No Financing Activities			**−0.661*****				**0.033****	
			(−5.05)				**(2.56)**	
TREAT×POST×Low Trading Volume				**−0.221***				**0.018**
				(−1.66)				**(1.36)**
TREAT×POST	−0.366***	−0.262***	−0.648***	−0.181**	0.033***	0.048***	0.054***	0.061***
	(−4.54)	(−3.37)	(−7.31)	(−2.15)	(6.26)	(7.86)	(5.18)	(8.44)
Control variables	YES	YES	YES	YES	YES	YES	YES	YES
Observations	25,301	25,301	25,301	23,572	25,301	25,301	25,301	23,572
Fixed Effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Clustering	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Adj. R^2	0.957	0.960	0.957	0.958	0.216	0.197	0.203	0.219

The table presents results on cross-sectional variation in the impact of MiFID II on sell-side coverage. All models are DiD using the full sample containing European (treated) and U.S. and Canadian (control) firm-year observations as described in Panel A of Table 1. Sample size decreases in columns (4) and (8) due to missing trading volume data. The dependent variable for columns (1)–(4) is *Coverage*. The dependent variable for columns (5)–(8) is the indicator *Complete Coverage Loss* and results are estimated using linear probability models. All columns include firm and year fixed effects. Robust standard errors are clustered by firm. All continuous variables are winsorized at 1 and 99%. All variables are defined in the Appendix. 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 5: The Impact of MiFID II on Sell-Side Analysts' Work Output

Panel A: Forecast accuracy in the analyst-firm sample balanced before and after MiFID II implementation

	(1)	(2)	(3)	(4)
	Forecast Error			
	Pre-Post	Difference-in-Differences		
Variables	EU Sample	Full Sample	Full Sample	Full Sample
TREAT×POST		**−0.032*** **	**−0.029*** **	**−0.027** **
		(−7.13)	**(−2.73)**	**(−2.53)**
POST	**−0.011*** **	0.009***		
	(−2.81)	(3.39)		
TREAT		0.090***		
		(26.48)		
Effort		0.000	−0.002***	−0.001*
		(0.41)	(−4.04)	(−1.92)
Horizon		0.012***	0.012***	0.011***
		(24.31)	(19.82)	(18.52)
Firm Experience		−0.000***	−0.000***	−0.000*
		(−5.10)	(−3.04)	(−1.68)
General Experience		−0.000***	−0.000	0.000
		(−3.29)	(−0.47)	(1.52)
#Firms Covered		−0.000	−0.000	−0.000
		(−0.54)	(−0.46)	(−0.98)
#Industries Covered		−0.000	0.000	−0.000
		(−0.22)	(0.60)	(−0.00)
Broker Size		−0.008***	−0.000	−0.002
		(−8.23)	(−0.54)	(−0.52)
Size		−0.008***	−0.023***	−0.023***
		(−21.36)	(−2.59)	(−2.64)
ROA		0.191***	0.057	0.053
		(21.70)	(1.13)	(1.05)
Loss		0.346***	0.208***	0.207***
		(116.09)	(11.52)	(11.54)
BTM		0.075***	0.073***	0.073***
		(44.56)	(4.28)	(4.24)
Firm Age		−0.001***	0.014	0.004
		(−18.07)	(0.29)	(0.09)
Leverage		0.069***	0.133***	0.128**
		(13.76)	(2.63)	(2.56)
Tangibility		0.127***	−0.070	−0.073
		(31.37)	(−0.66)	(−0.69)
R&D		−0.309***	−0.048	−0.048
		(−20.90)	(−0.43)	(−0.43)
Financing Activities		0.000	−0.006	−0.005
		(0.11)	(−0.54)	(−0.52)
Stock Return		−0.019***	0.032***	0.032***
		(−8.40)	(2.62)	(2.71)
Earnings Volatility		0.889***	0.626***	0.639***
		(25.93)	(3.93)	(4.02)
Return Volatility		0.018***	−0.003	−0.004
		(9.61)	(−0.17)	(−0.24)
GDP Growth		−0.007***	−0.004	−0.004

		(−7.36)	(−1.28)	(−1.27)
Log (GDP per Capita)		−0.012**	0.055	0.059
		(−2.27)	(0.51)	(0.55)
Constant	0.242***	0.232***	−0.581	−0.449
	(106.38)	(4.06)	(−0.43)	(−0.34)
Observations	51,603	156,448	156,448	156,448
Fixed Effects	NO	NO	Firm & Year	Firm & Year & Analyst
Clustering	NO	NO	Analyst & Firm	Analyst & Firm
Adj. R^2	0.0001	0.177	0.486	0.488

The table presents results from pre-post and DiD models on the impact of MiFID II implementation on analysts' earnings forecast errors (*Forecast Error*). European firms constitute the treated group, and U.S. and Canadian firms constitute the control group. The sample includes only sell-side analysts publishing earnings forecasts both before and after MiFID II for the same firm (i.e., sample is balanced on analyst-firm). Fixed effects and standard error clustering are as indicated in each column. Continuous variables are winsorized at 1 and 99%. All variables are defined in the Appendix. 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

Panel B: The impact of MiFID II on unconditional informativeness of stock recommendations and on providing industry recommendations alongside stock recommendations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Abs CAR (0;+1)				*Industry Recommendation*			
	Pre-Post	Difference-in-Differences			Pre-Post	Difference-in-Differences		
Variables	EU sample	Full sample	Full sample	Full sample	EU Sample	Full Sample	Full Sample	Full Sample
TREAT×POST		**0.0033*** **	**0.0026*** **	**0.0026*** **		**0.0024*** **	**0.0037*** **	**0.0037** **
		(4.19)	**(3.39)**	**(2.65)**		**(2.80)**	**(3.56)**	**(2.08)**
POST	**0.0030*** **	−0.0011			**0.0052** **	0.0010		
	(6.70)	(−1.41)			**(2.07)**	(1.52)		
TREAT		−0.0048**				−0.0011***		
		(−2.52)				(−3.24)		
General Experience		0.0001**	0.0009***	0.0009***		−0.0006***	−0.0002	−0.0002
		(2.43)	(6.52)	(5.26)		(−6.97)	(−1.20)	(−1.15)
Firm Experience		−0.0002***	0.0000	0.0000		−0.0000	0.0000	0.0000
		(−11.96)	(0.44)	(0.45)		(−0.75)	(0.13)	(0.15)
Broker Size		0.0004	−0.0002	−0.0002		0.0030**	0.0035***	0.0035**
		(0.29)	(−0.14)	(−0.13)		(2.47)	(2.81)	(2.25)
#Industries Covered		0.0005**	0.0003	0.0003		−0.0005	−0.0005	−0.0005
		(2.16)	(1.47)	(1.16)		(−1.21)	(−1.13)	(−0.52)
#Firms Covered		−0.0004***	−0.0003***	−0.0003***		−0.0004***	−0.0004***	−0.0004**
		(−6.55)	(−5.11)	(−3.42)		(−4.94)	(−4.99)	(−2.47)
Size			0.0002	0.0002			−0.0031***	−0.0031*
			(0.36)	(0.28)			(−3.95)	(−1.92)
ROA			−0.0023	−0.0023			0.0064	0.0064
			(−0.47)	(−0.41)			(1.55)	(1.27)
Loss			0.0008	0.0008			−0.0007	−0.0007
			(0.92)	(0.74)			(−0.61)	(−0.39)
BTM			0.0018**	0.0018*			0.0012	0.0012
			(2.14)	(1.71)			(1.11)	(0.97)
Firm Age			−0.0004	−0.0004			0.0002	0.0002
			(−0.43)	(−0.36)			(0.17)	(0.15)
Leverage			0.0014	0.0014			−0.0014	−0.0014
			(0.35)	(0.28)			(−0.26)	(−0.30)
Tangibility			−0.0227***	−0.0227***			−0.0338***	−0.0338

			(−3.92)	(−3.20)			(−3.20)	(−1.59)
Financing Activities			0.0008	0.0008			−0.0014	−0.0014
			(1.00)	(0.83)			(−1.17)	(−1.10)
R&D			−0.0253	−0.0253			0.0391**	0.0391*
			(−1.08)	(−0.93)			(2.27)	(1.72)
Stock Return			−0.0006	−0.0006			0.0012	0.0012
			(−0.71)	(−0.52)			(1.02)	(0.67)
Earnings Volatility			−0.0150	−0.0150			0.0225	0.0225
			(−0.67)	(−0.51)			(1.34)	(1.31)
Return Volatility			−0.0008	−0.0008			−0.0011	−0.0011
			(−1.16)	(−0.73)			(−0.93)	(−0.68)
GDP Growth			0.0005**	0.0005			0.0047***	0.0047**
			(1.96)	(1.61)			(6.97)	(2.51)
Log (GDP per Capita)			0.0077	0.0077			0.0772***	0.0772**
			(1.47)	(1.15)			(6.84)	(2.36)
Constant	0.0275***	0.0359***	−0.0703	−0.0703	0.0404***	0.0823***	−0.7416***	−0.7416**
	(127.79)	(6.03)	(−1.26)	(−0.97)	(31.74)	(14.51)	(−6.55)	(−2.22)
Observations	33,250	62,896	62,896	62,896	33,250	62,896	62,896	62,896
Adjusted R^2	0.002	0.170	0.305	0.305	0.0001	0.960	0.960	0.960
Fixed Effects	NO	Analyst	Analyst & Firm & Year	Analyst & Firm & Year	NO	Analyst	Analyst & Firm & Year	Analyst & Firm & Year
Clustering	NO	NO	NO	Analyst & Firm	NO	NO	NO	Analyst & Firm

The table presents results on the market reaction to sell-side analyst stock recommendation revisions (columns 1 to 4) and the likelihood of accompanying stock recommendations with industry recommendations (columns 5 to 8), for European relative to U.S. and Canadian firms before and after MiFID II implementation. The dependent variable in columns (1)–(4) is *Abs CAR (0;+1)*, the absolute value of the two-day cumulative abnormal return around the stock recommendation. The dependent variable in columns (5)–(8) is the indicator *Industry Recommendation* and results are estimated using linear probability models. The sample includes only sell-side analysts who issue stock recommendations both before and after MiFID II implementation for the same firm (i.e., sample is balanced on analyst-firms). Observations are at the stock recommendation level. Fixed effects and standard error clustering are as indicated in each column. Continuous variables are winsorized at 1 and 99%. All variables are defined in the Appendix. 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 6: The Impact of MiFID II on the Number of In-House Analysts Employed by the Buy-Side

	(1)	(2)	(3)	(4)
	#Buy-Side			
	Pre-Post	Difference-in-Differences		
Variables	EU sample	Full sample	Matched on pre-MiFID II investment firm assets group	Matched on pre-MiFID II investment firm assets group
TREAT×POST		**0.1245***	**0.2432*****	**0.2185****
		(1.67)	**(2.60)**	**(2.34)**
POST	**0.1371****	0.0127	−0.1061	−0.1056
	(2.57)	(0.24)	(−1.38)	(−1.38)
Assets Under Management				0.3472***
				(3.52)
Constant	3.8551***	4.4848***	4.4405***	3.6554***
	(144.77)	(220.16)	(189.61)	(16.51)
Observations	1,546	5,652	3,092	3,092
Adjusted R^2	0.970	0.954	0.969	0.969
Fixed Effects	Investment Firm	Investment Firm	Investment Firm	Investment Firm
Clustering	Investment Firm	Investment Firm	Investment Firm	Investment Firm

This table reports the results of comparing the number of buy-side analysts in European investment firms before and after the implementation of MiFID II, relative to U.S. and Canadian investment firms. The dependent variable is *#Buy-Side*, the number of buy-side analysts. All variables are defined in the Appendix. Robust standard errors are clustered by investment firms. 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 7: The Impact of MiFID II on Buy-Side Participation in Earnings Conference Calls

	(1)	(2)	(3)	(4)	(5)	(6)
	Buy-Side Attendance		*Buy-Side Questions*		*Buy-Side Engagement*	
Variables	Full Sample	PSM Sample	Full Sample	PSM Sample	Full Sample	PSM Sample
TREAT×POST	**0.023****	**0.053****	**0.102****	**0.243****	**2.453****	**2.811***
	(2.32)	**(2.50)**	**(2.04)**	**(2.05)**	**(2.00)**	**(1.86)**
Coverage	−0.002	−0.003	−0.010	−0.013	−0.062	0.163
	(−1.21)	(−1.01)	(−1.47)	(−0.88)	(−0.61)	(1.06)
Size	−0.004	−0.030	−0.052*	−0.199	0.534	0.291
	(−0.67)	(−1.45)	(−1.74)	(−1.61)	(1.25)	(0.36)
ROA	−0.004	−0.096	0.005	−0.138	−0.555	2.428
	(−0.17)	(−0.58)	(0.04)	(−0.23)	(−0.40)	(0.54)
Loss	−0.004	−0.025	−0.020	−0.072	0.210	0.085
	(−0.40)	(−0.74)	(−0.38)	(−.43)	(0.52)	(0.09)
BTM	0.011	−0.017	0.027	−0.136	−0.569	−0.923
	(1.27)	(−0.79)	(0.74)	(−1.25)	(−1.15)	(−0.59)
Firm Age	−0.026	0.033	−0.132	−0.133	−3.263***	−3.094*
	(−1.48)	(0.64)	(−1.39)	(−1.19)	(−5.44)	(−1.87)
Leverage	0.016	0.266	0.125	0.907	−1.377	−4.342
	(0.46)	(1.01)	(0.74)	(0.96)	(−0.62)	(−0.63)
Tangibility	−0.053	−0.122	−0.380	−1.049	−4.593	2.309
	(−0.81)	(−0.74)	(−1.36)	(−0.94)	(−1.38)	(0.33)
R&D	−0.010	−0.195	−0.099	−0.490	6.092*	25.253
	(−0.27)	(−0.66)	(−0.46)	(−0.47)	(1.65)	(0.58)
Financing Activities	0.000	0.009	−0.003	−0.075	0.097	−0.376
	(0.02)	(0.38)	(−0.05)	(−0.56)	(0.17)	(−0.38)
Stock Return	−0.003	0.006	0.011	0.034	0.113	−0.417
	(−0.30)	(0.27)	(0.24)	(0.31)	(0.49)	(−0.77)
Earnings Volatility	−0.032	−0.393	0.082	−1.100	7.129	15.921
	(−0.49)	(−0.83)	(0.21)	(−0.58)	(1.16)	(0.59)
Return Volatility	0.002	0.012	0.002	0.088	0.679	−1.028
	(0.28)	(0.75)	(0.05)	(0.82)	(0.49)	(−0.94)
GDP Growth	0.009***	0.017**	0.052***	0.086**	−0.071	−1.372**
	(3.75)	(2.45)	(4.05)	(2.22)	(−0.21)	(−2.40)
Log (GDP per Capita)	−0.067	0.100	−0.203	0.170	−7.098	3.880
	(−1.03)	(0.84)	(−0.63)	(0.28)	(−0.57)	(0.21)
Constant	1.315*	−1.003	5.389	1.600	144.849	−1.248
	(1.70)	(−0.79)	(1.39)	(0.25)	(1.14)	(−0.01)
Observations	25,301	19,078	25,301	19,078	1,589	1,337
Fixed Effects	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year	Firm & Year
Clustering	Firm	Firm	Firm	Firm	Firm	Firm
Adj. R^2	0.274	0.322	0.297	0.383	0.365	0.727

The table presents results from DiD models that test the extent of buy-side analyst participation in earnings-conference calls. The dependent variable is *Buy-Side Attendance* in columns (1)–(2), *Buy-Side Questions* in columns (3)–(4), and *Buy-Side Engagement* in columns (5)–(6). The conference call date is matched with the annual firm variables using the IBES earnings announcement date (plus or minus one day). All columns include firm and year fixed effects. Robust standard errors are clustered by firm. Continuous variables are winsorized at 1 and 99%. All variables are defined in the Appendix. 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 8: The Impact of MiFID II on Firm-Level Stock Liquidity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Bid-Ask Spread					*Amihud Ratio*				
	Pre-Post	Difference-in-Differences				Pre-Post	Difference-in-Differences			
Variables	EU Sample	Full Sample	Full Sample	Full Sample	PSM Sample	EU Sample	Full Sample	Full Sample	Full Sample	PSM Sample
TREAT×POST		**0.276*** **	**0.139*** **	**0.139*** **	**0.151*** **		**0.126*** **	**0.123*** **	**0.123*** **	**0.167*** **
		(5.62)	**(6.29)**	**(4.53)**	**(3.51)**		**(5.45)**	**(11.16)**	**(7.30)**	**(6.16)**
TREAT		0.996***					0.368***			
		(38.35)					(30.08)			
POST	**0.272*** **	−0.005				**0.105*** **	−0.021			
	(5.58)	(−0.15)				**(4.30)**	(−1.38)			
Coverage			−0.029***	−0.029***	−0.048***			−0.011***	−0.011***	−0.021**
			(−8.51)	(−4.66)	(−2.95)			(−6.46)	(−4.42)	(−2.31)
#Broker Conferences			−0.006*	−0.006	−0.007			0.001	0.001	0.002
			(−1.65)	(−1.56)	(−0.47)			(0.28)	(0.29)	(0.31)
Controls	NO	NO	YES	YES	YES	NO	NO	YES	YES	YES
Observations	9,099	21,409	21,409	21,409	17,088	9,099	21,409	21,409	21,409	17,088
Fixed Effects	NO	NO	Firm & Year	Firm & Year	Firm & Year	NO	NO	Firm & Year	Firm & Year	Firm & Year
Clustering	NO	NO	NO	Firm	Firm	NO	NO	NO	Firm	Firm
Adj. R^2	0.003	0.102	0.847	0.847	0.855	0.002	0.0676	0.820	0.820	0.821

The table presents results on the impact of MiFID II on firm stock liquidity from pre-post and DiD models on the full and PSM samples. Panel A of Table 1 describes the sample construction. Sample size decreases due to stock-market data availability. The dependent variable is *Bid-Ask Spread* in columns (1)–(5) and *Amihud Ratio* in columns (6)–(10). Fixed effects and standard error clustering are as indicated in each column. Continuous variables are winsorized at 1 and 99%. All variables are defined in the Appendix. 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