Program on International Financial Systems

PIFS



Impact of Equity Market Regulations in Europe and the Nordic Region

SEPTEMBER 2025



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This report was prepared by Hal Scott, Chairman and President of PIFS, John Gulliver, Executive Director of PIFS, and Brian Johnson, Chief Economist of PIFS.

PIFS would like to thank the Nasdaq Nordic Foundation for supporting this research.

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Introduction

Efficient and transparent equity markets remain vital to the health of modern economies—facilitating capital formation, enabling investor participation, and supporting innovation and economic growth. To ensure these markets function effectively, regulatory frameworks must be carefully designed and regularly evaluated. In the European Union ("**EU**"), two of the most consequential regulatory initiatives over the past decade are the Market Abuse Regulation ("**MAR**"), which took effect in July 2016, and the revised Markets in Financial Instruments Directive ("**MiFID II**"), implemented in January 2018.[1] These reforms aimed to enhance investor protection, curb market abuse, and promote transparency and efficiency across EU capital markets, including the Nordic region. To assess the impact of these regulatory reforms, the Program on International Financial Systems ("**PIFS**") has conducted an empirical study of the impact of both MAR and MiFID II on equity market quality on regulated exchanges both EU-wide and in the Nordic region specifically.

The MAR legislation was passed in April 2014 and became effective in most EU countries in July 2016.[2] MAR replaced the earlier Market Abuse Directive ("**MAD**") and sought to enhance market integrity through stricter prohibitions on insider trading, unlawful disclosures, and market manipulation. The regulation applies not only to financial instruments traded on regulated markets, including exchange-traded equities, but also to those traded on multilateral and organized trading facilities, as well as certain over-the-counter ("**OTC**") instruments. In addition, MAR imposed stringent disclosure and recordkeeping obligations on issuers and market participants.

The policy goals of MAR, as outlined by the European Parliament and the Council of the European Union, were to improve market integrity and increase investor confidence, with the ultimate objective of promoting efficient and transparent financial markets.[3] Increased market integrity and investor confidence should lead to lower transaction costs, higher market participation and more efficient prices. In fact, a prior study on the earlier MAD regulation found positive liquidity impacts in affected markets.[4] Our study examines whether MAR has similarly impacted various metrics of market quality and efficiency for on-exchange equity trading. We therefore consider the impact of MAR on four market quality: bid-ask spread, trading volume, share turnover, and price impact.

The other legislation we examine is MiFID II, passed in 2014 and effective in January 2018.[5] The MiFID II regulation was aimed at increasing transparency, reducing conflicts of interest, and

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[1] While MiFID II formally took effect across the European Union on January 3, 2018, implementation timing varied slightly across the Nordic jurisdictions. Sweden, Finland, and Denmark transposed MiFID II into national law effective on that date, while Norway and Iceland (non-EU members) implemented MiFID II at later dates.
[2] Since MAR was an EU regulation it became directly effective in all EU member states without the need for national implementing legislation. However, Denmark opted out, while Norway adopted in 2017 and Iceland in 2021.
[3] *See* EU Regulation 596/2014.
[4] *See* Hans B. Christensen, Luzi Hail, and Christian Leuz, *Capital-Market Effects of Securities Regulation: Prior Conditions, Implementation, and Enforcement,* 29(11) REVIEW OF FINANCIAL STUDIES 2885 (2016).
[5] *See supra* note 1.

strengthening investor protection. A key reform of MiFID II was a double volume cap on dark pool trading – trading on venues with no pre-trade transparency requirements – which limited total EU-wide dark trading in a stock to 8% across all dark pools and 4% in a single dark pool.[6] In addition, MiFID II mandated the unbundling of research and execution services and imposed tighter trade transparency rules for both trading venues and OTC trading.

The policy objectives behind MiFID II were generally focused on improving transparency and investor protection, while promoting market integrity and efficiency.[7] As with MAR, the measurable impact of these potential improvements should materialize in the same market quality and efficiency metrics discussed above with respect to MAR. As such, our study analyzes the impact of MiFID II on the same four measures of on-exchange market quality: bid-ask spread, trading volume, share turnover, and price impact. While prior studies have focused on MiFID II's impact on analyst coverage and related liquidity impacts,[8] our study directly examines market quality of regulated exchanges, while also including a specific analysis of the Nordic region.

Our study documents key findings about the effect of these regulations on exchange trading. First, MAR's intended improvements to market integrity and investor confidence have had mixed results. While the implementation of MAR is associated with a decline in bid-ask spreads on exchanges across the EU, it has also negatively impacted trading activity through decreased share turnover. In addition, MAR has negatively impacted price efficiency in the Nordic region.

Second, MiFID II's intended promotion of investor protection and market efficiency has had the unintended consequence of harming several key market quality metrics on regulated exchanges. Across the EU, MiFID II has negatively impacted each of the four measures, leading to increased transaction costs, reduced trading volume, reduced share turnover and diminished price efficiency on exchanges. In the Nordic region, the directive is likewise associated with reduced share turnover and lower price efficiency. We also found that exchange trading of small firms has been disproportionately negatively impacted by both MAR and MiFID II across the EU and in the Nordic region.

While our study contributes meaningfully with respect to the on-exchange effects of MAR and MiFID II, an important caveat to our findings is that we focus exclusively on equity trading on regulated exchanges in the EU and Nordic region. The relative share of on-exchange trading as a percentage of overall equity trading in the EU has fluctuated post-MiFID II, increasing from 53% in 2019 to 70% by 2022,[9] and has averaged between 60-70% over the past two years.[10] Thus, the

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[6] Article 5 of Regulation (EU) No 600/2014. Note that the MiFID II framework is generally treated as consisting of both Directive 2014/65/EU (MiFID II) and Regulation (EU) No 600/214 (MiFIR).
[7] EU Directive 2014/65/EU.
[8] *See e.g.* Mark Lang, Jedson Pinto, and Edward Sul, *MiFID II Unbundling and Sell Side Analyst Research*, 77(1) JOURNAL OF ACCOUNTING AND ECONOMICS (2024).
[9] EUROPEAN SECURITIES AND MARKETS AUTHORITY ("ESMA"), *Evolution of EEA Share Market Structure Since MiFID II* (Oct. 30, 2023), https://www.esma.europa.eu/sites/default/files/2023-10/ESMA50-524821-2954_TRV_Article_EEA_share_market_structure_publication.pdf.
[10] ESMA, *Report on Trends, Risks and Vulnerabilities, No. 2, 2025* (Sept. 9, 2025), https://www.esma.europa.eu/sites/default/files/2025-09/ESMA50-1949966494-3846_TRV_2_2025.pdf.

potential off-exchange effects of each reform should also be considered in an overall assessment of MAR and MiFID II. In certain respects, off-exchange trading may produce positive liquidity benefits that offset the negative impact we find for on-exchange liquidity.

For example, MiFID II significantly increased the market share of systematic internalizers ("**SIs**") in EU equity trading, rising from 2% in 2017 to 20% in 2018.[11] SIs are trading platforms operated by investment firms, authorized under European Securities and Markets Authority ("**ESMA**") rules, that execute client orders against their own equity inventory rather than routing to an exchange. Research shows that trading activity by SIs can improve bid-ask spreads and reduce price impact as compared to on-exchange trading.[12] The off-exchange impacts should therefore be considered along with the on-exchange effects that we document.

The paper proceeds with a brief literature review, followed by a detailed discussion of our study's methodology and data collection. We then present several results from our analysis, followed by a conclusion.

[11] *See e.g.* Fatemeh Aramian and Lars L. Norden, *Costs and Benefits of Trading with Stock Dealers: The Case of Systematic Internalizers*, 30(3) EUROPEAN FINANCIAL MANAGEMENT 1094, 1095 (2024) [citing data collected from ESMA].
[12] *Id*.

I. Literature Review

Prior to the implementation of MAR, academic literature focused on the impact of the previous legislation, the EU's Market Abuse Directive ("**MAD**"). Our study largely follows the empirical methodology employed by Christensen, Hail, and Leuz (2016), which examines the impact of MAD.[13] The study exploits the staggered implementation of MAD across EU member states to assess liquidity outcomes, finding that liquidity improved by roughly 10%. Importantly, the benefits were concentrated in countries with stronger prior regulatory regimes and enforcement capacity.

Other studies also support MAD's positive impact on stock market transparency and quality. Cumming, Johan, and Li (2011) find that MAD enhanced market liquidity by bolstering investor confidence,[14] while Duong et al. (2021) show that MAD successfully targeted market manipulation and reduced IPO underpricing.[15] However, da Silva (2019) finds that MAD weakened price efficiency, particularly in countries lacking the institutional capacity to implement the directive effectively. [16]

Regarding MiFID II, Anselmi and Petrella (2021) examine the effects of research unbundling on European equity markets.[17] They find that analyst coverage declined significantly, particularly for large-cap firms. However, despite this decline bid-ask spreads remained largely unchanged, apart from a slight increase for micro-cap stocks, while price efficiency was also unaffected. The authors therefore conclude that research in the EU had been overproduced prior to MiFID II's implementation. Finally, Fang et al. (2020)[18] and Lang, Pinto, and Sul (2024)[19] both find that MiFID II led to an overall decline in stock market liquidity.

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[13] Christensen, Hail, and Leuz (2016), *supra* note 4.
[14] Douglas Cumming, Sofia Johan, and Dan Li, *Exchange Trading Rules and Stock Market Liquidity*, 99 (3) JOURNAL OF FINANCIAL ECONOMICS 651 (2011). *See also* Douglas Cumming and Sofia Johan, *Capital-Market Effects of Securities Regulation: Prior Conditions, Implementation, and Enforcement Revisited*, 31 FINANCE RESEARCH LETTERS (2019) [explaining that their previous study included MAD effects by design, even though not specifically mentioned].
[15] Huu Nhan Duong, Abhinav Goyal, Vasileios Kallinterakis, and Madhu Veeraraghavan, *Market Manipulation Rules and IPO Underpricing*, 67 JOURNAL OF CORPORATE FINANCE (2021).
[16] Paulo Pereira da Silva, *On the Effects of Capital Markets' Regulation on Allocation Efficiency: An Assessment of EU Market Abuse Directive*, SSRN PAPER (2019), https://dx.doi.org/10.2139/ssrn.3307015.
[17] Giulio Anselmi and Giovanni Petrella, *Regulation and Stock Market Quality: The Impact of MiFID II Provision on Research Unbundling*, 76 INTERNATIONAL REVIEW OF FINANCIAL ANALYSIS (2021).
[18] Bingxu Fang, Ole-Kristian Hope, Zhongwei Huang, and Rucsandra Moldovan, *The Effects of MiFID II on Sell-Side Analysts, Buy-Side Analysts, and Firms*, ROTMAN SCHOOL OF MANAGEMENT WORKING PAPER NO. 3422155 (2020), https://ssrn.com/abstract=3422155.
[19] Lang, Pinto, and Sul (2024), *supra* note 8.

II. Data and Methodology

Our study entails a comprehensive analysis of the impacts of MAR and MiFID II on exchange trading across the entire European Union, including a specific analysis of the Nordic region, over a seven-year period. We compiled a dataset covering publicly listed equities across 29 European countries from 2013 through 2019. We also collected U.S. equity data over the same timeframe to serve as a control group in certain regressions, representing firms not covered under the EU legislations.

The seven-year timeframe allows us to capture market quality in the years prior to implementation of both MAR and MiFID II, serving as a robust pre-reform baseline. Our post-reform time period runs through 2019, allowing for an examination of on-exchange market quality two years post-implementation of MiFID II and three and a half years post-implementation of MAR. Since the goal is to evaluate the direct causal effects of discrete policy changes, our examination window should not extend too far beyond the implementation of the legislation. Extending beyond 2019 would weaken our identification strategy, as additional exogenous factors are introduced (e.g., the Covid-19 pandemic), potentially confounding our isolation of MAR or MiFID II's effects.

For each publicly traded firm, we calculated quarterly averages of daily bid-ask spreads, closing price, trading volume, share turnover, and return volatility. In addition, we collected quarterly market capitalization for each firm, as well as macroeconomic data (GDP per capita) for each of the relevant jurisdictions. Consistent with Christensen, Hail, and Leuz (2016),[20] we exclude very small firms, which we define as having a market capitalization of less than $2 million during the sample period. Our aggregate panel dataset consists of 223,226 firm-quarter observations.

Our empirical methodology largely follows Christensen, Hail, and Leuz (2016),[21] which, as noted above, examined the market impact of the prior 2003 MAD. We conducted multiple panel regressions examining the impact of both MAR and MiFID II on four measures of liquidity and market quality, collectively constituting our impact variables.

The first impact variable is the *bid–ask spread*, which captures the difference between the lowest price a seller is willing to accept (the ask) and the highest price a buyer is willing to pay (the bid) for a security. Narrower bid-ask spreads indicate that market participants can transact with lower trading costs, reflecting greater liquidity and market efficiency. Market quality improvement is associated with a decline in bid–ask spreads, while increasing spreads signify a deterioration in liquidity and higher costs of trading.

Our second impact variable is *trading volume*, which reflects the overall number of shares traded daily. Higher trading volume indicates that the market supports a greater degree of trading activity without friction, often signaling investor confidence and lower trading costs. Thus, rising volume

[20] Christensen, Hail, and Leuz (2016), *supra* note 4.
[21] *Id*.

reflects an improvement in market quality, while falling volume can indicate diminished market participation, reduced liquidity, or regulatory frictions that impede trading.

Our third impact variable is *share turnover*, a measure closely related to *trading volume* but normalized by firm size. *Share turnover* is daily trading volume relative to shares outstanding. Unlike trading volume, turnover accounts for the relative size of the firm, allowing for more meaningful comparisons across companies and markets. Higher share turnover suggests that shares can be traded easily without requiring large price concessions, reflecting strong market liquidity. Conversely, declining turnover is indicative of deteriorating liquidity conditions.

Finally, our fourth impact variable is *price impact*, proxied by the Amihud (2002) illiquidity measure.[22] This metric gauges the extent to which trading volume moves prices, with lower values indicating that large trades can be executed with minimal effect on prices, reflecting deep and liquid markets. Conversely, higher Amihud values imply that even modest trading activity causes large price shifts, suggesting a more fragile or illiquid market. Accordingly, a decline in the Amihud measure represents an improvement in market quality, while an increase signals deterioration.

Table 1 briefly summarizes our four impact variables.

Table 1: Description of Impact Variables

Impact variable	Description
Bid-ask spread	Quarterly average of the daily difference between closing ask price and closing bid price on exchanges as a percentage of midpoint of the closing bid and ask prices.
Trading volume	Quarterly average of the daily number of shares traded (in thousands) on exchanges.
Share turnover	Quarterly average of the daily on-exchange trading volume as a fraction of total shares outstanding.
Price impact (Amihud illiquidity)	Quarterly average of the daily absolute stock return as a percentage of on-exchange dollar trading volume.

[22] Yakov Amihud, *Illiquidity and Stock Returns: Cross-Section and Time-Series Effects*, 5(1) JOURNAL OF FINANCIAL MARKETS 31 (2002).

III. MAR Analysis

Our study first examined the impact of MAR on exchange market quality, as proxied by the four impact variables described above in **Table 1**. Our MAR panel regressions generally take the form:

$$\textit{Impact Variable} = \beta_1 MAR + \Sigma\beta_j Controls_j + \Sigma\beta_i Fixed\ Effects_i + \varepsilon$$

where the dependent variable, *Impact Variable*, consists of the four market quality proxies (bid-ask spread, trading volume, share turnover and price impact). We take the natural logarithm of certain variables to linearize the relationships and ensure stable variances across observations, thus improving the reliability of regression estimates.

Under this model specification, the explanatory variable of interest, *MAR*, is an indicator variable equaling 0 in the quarters prior to MAR implementation and 1 in the quarters subsequent to the MAR regulation taking effect. Importantly, Denmark opted out of MAR implementation and has never adopted the regulation but rather applies its own domestic market-abuse regime. Under this model specification, the coefficient of interest is β_1, which provides the estimated effect of the MAR regulation on the relevant market quality measure.

The model also includes several control variables, *Controls*, which include firm-level controls that capture market quality variations driven by specific firm characteristics, as well as a macroeconomic control, GDP per capita, that captures economy-wide drivers of market quality fluctuations. The firm-level controls used for all regressions are market capitalization and daily return volatility. In addition, the regression models for *bid-ask spread* and *price impact* also include share turnover as a control variable. Share turnover is not included as a control variable in the regression in which *share turnover* was the impact variable, nor is it included as a control variable in the regression model with *trading volume* as the impact variable, given the multicollinearity issues that would arise between trading volume and share turnover. The control variables included in our models are consistent with those employed in the Christensen, Hail, and Leuz (2016)[23] examination of the impact of the 2003 MAD.

Also following Christensen, Hail, and Leuz (2016), we lag our control variables by four quarters to address concerns of simultaneity and reverse causality in the regression design. Many of the firm-level and macroeconomic controls could themselves be influenced by contemporaneous changes in market quality. If we entered them contemporaneously, the regressions might mistakenly attribute part of the effect of MAR to the control variables rather than to the regulation itself. Thus, we lag the control variables to ensure they control for firm characteristics that plausibly affect current market quality but are not themselves the result of the current quarter's liquidity or trading outcomes.

We conducted regression analyses across the full dataset of 29 EU jurisdictions (which includes the non-EU jurisdictions of Norway and Iceland) as well as a more focused examination of the Nordic jurisdictions, which include Denmark, Finland, Iceland, Norway and Sweden. In each

[23] Christensen, Hail, and Leuz (2016), *supra* note 4.

regression, we also include a sample of publicly traded U.S. firms to serve as a control group, representing similar firms unaffected by the MAR reform.

MAR Results

The results of the MAR regressions on the full dataset of EU jurisdictions, as well as the Nordic-only jurisdictions, are illustrated in **Table 2**. As shown, MAR has had mixed results with respect to market quality and efficiency of on-exchange equity trading across the EU generally and in the Nordic region more specifically.

Table 2: Impact of MAR on Equity Market Quality on Regulated Exchanges

Panel A: All EU				
	Dependent variable (impact variable)			
	Bid-ask spread	*Trading volume*	*Share turnover*	*Price impact*
MAR (β_1)	**-0.028****	**0.018**	**-0.058****	**-0.031**
$MarketCap_{t-4}$	-0.549***	0.689***	0.113***	-1.114***
$Turnover_{t-4}$	-0.190***	--	--	-0.867***
$RetVol_{t-4}$	0.295***	1.401***	0.891***	0.584***
$GDPperCap_{t-4}$	0.741***	-0.433***	0.320**	1.272***
Country F.E.	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes
R-squared	0.841	0.891	0.429	0.955
No. observations	170,204	172,219	169,588	166,081
Panel B: Nordic only				
	Dependent variable (impact variable)			
	Bid-ask spread	*Trading volume*	*Share turnover*	*Price impact*
MAR (β_1)	**-0.012**	**-0.009**	**0.102**	**0.176*****
$MarketCap_{t-4}$	-0.566***	0.831***	0.215***	-1.216***
$Turnover_{t-4}$	-0.270***	--	--	-0.890***
$RetVol_{t-4}$	0.306***	1.376***	0.869***	0.448***
$GDPperCap_{t-4}$	1.340***	-0.705***	0.511**	1.090***
Country F.E.	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes
R-squared	0.833	0.883	0.313	0.959
No. observations	94,752	95,201	94,977	94,441

***99%, **95%, and *90% significance levels

As indicated in **Table 2**, MAR implementation has reduced bid-ask spreads overall in the EU, indicating decreased on-exchange trading costs across EU markets. However, while MAR conferred positive benefits with respect to bid-ask spreads in the EU generally, the Nordic region did not share in the beneficial impact. In the Nordic region, MAR has had no statistically significant impact on spreads.

On-exchange trading activity as proxied by trading volume was unaffected by MAR with both the EU and Nordic regions' results showing no statistical significance for MAR's effect on the trading volume variable. However, relative trading activity, as proxied by share turnover, was *negatively* affected across the EU, indicating that MAR is associated with decreased trading activity relative to total shares outstanding. In the Nordic region, share turnover was unaffected by MAR, mirroring the lack of statistical significance found with respect to trading volume.

Finally, price impact on regulated exchanges deteriorated in the Nordic region as a result of MAR, with a statistically significant increase in the Amihud illiquidity variable. This finding indicates that MAR has led to a *decrease* in price efficiency (since lower Amihud translates to higher price efficiency) on exchanges in the Nordic jurisdictions. However, this negative price impact result is isolated to the Nordic region, as the price impact measure across the EU generally showed no statistically significant effect.

Overall, while MAR's reduction of market abuse and promotion of investor confidence have translated into lower on-exchange trading costs in the EU, these benefits have not extended to gains in trading activity levels or price efficiency. In addition, as we highlight in further analysis below, small firms in the EU have been particularly harmed by MAR.

IV. MiFID II Analysis

Our study then examined the impact of MiFID II on exchange market quality, focusing on the same four impact variables described above: *bid-ask spread*, *trading volume*, *share turnover*, and *price impact*. Similar to the MAR specification, our MiFID II panel regressions generally take the form:

$$\textit{Impact Variable} = \beta_1 \textit{MiFID} + \Sigma\beta_j \textit{Controls}_j + \Sigma\beta_i \textit{Fixed Effects}_i + \varepsilon$$

where the dependent variable, *Impact Variable*, again consists of the four market quality proxies (bid-ask spread, trading volume, share turnover and price impact). We again apply natural log-transformations to both the impact variables and the control variables. In this model, the explanatory variable of interest is *MiFID*, an indicator variable equaling 0 in the quarters prior to MiFID II implementation and 1 in the quarters subsequent to the MiFID II regulation taking effect in a jurisdiction. Under this model specification, the coefficient of interest is β_1, which provides the estimated effect of MiFID II on the relevant market quality measure.

As with the MAR specification, the MiFID II model includes the same control variables, *Controls*, which include firm-level controls and a macroeconomic control, GDP per capita. The firm-level controls used for all regressions are market capitalization and daily return volatility, while the regression models for *bid-ask spread* and *price impact* also include share turnover as a control variable.

We conducted regression analyses across the full dataset of EU jurisdictions as well as a more focused examination of the Nordic jurisdictions, which include Denmark, Finland, Iceland, Norway, and Sweden. In each regression, we also included a sample of publicly traded U.S. firms to serve as a control group, representing similar firms unaffected by MiFID II.

MiFID II Results

The results of the MiFID II regressions on the full dataset of EU jurisdictions as well as the Nordic-only jurisdictions are illustrated in **Table 3**. As shown, MiFID II has had a significantly worse impact on market quality and efficiency of on-exchange equity trading across the EU with moderate harms in the Nordic region.

Table 3: Impact of MiFID II on Equity Market Quality on Regulated Exchanges

Panel A: All EU				
	Dependent variable (impact variable)			
	Bid-ask spread	*Trading volume*	*Share turnover*	*Price impact*
MiFID (β_1)	**0.031*****	**-0.135*****	**-0.208*****	**0.216*****
$MarketCap_{t-4}$	-0.549***	0.689***	0.113***	-1.113***
$Turnover_{t-4}$	-0.190***	--	--	-0.866***
$RetVol_{t-4}$	0.296***	1.399***	0.890***	0.587***
$GDPperCap_{t-4}$	0.862***	-0.697***	0.122	1.712***
Country F.E.	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes
R-squared	0.841	0.891	0.429	0.955
No. observations	170,204	172,219	169,588	166,081
Panel B: Nordic only				
	Dependent variable (impact variable)			
	Bid-ask spread	*Trading volume*	*Share turnover*	*Price impact*
MiFID (β_1)	**-0.021**	**-0.037**	**-0.090*****	**0.222*****
$MarketCap_{t-4}$	-0.566***	0.831***	0.215***	-1.216***
$Turnover_{t-4}$	-0.270***	--	--	-0.890***
$RetVol_{t-4}$	0.306***	1.376***	0.867***	0.448***
$GDPperCap_{t-4}$	1.323***	-0.756***	0.172	1.177***
Country F.E.	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes
R-squared	0.833	0.883	0.313	0.959
No. observations	94,752	95,201	94,977	94,441

*** 99%, **95%, and *90% significance levels

As illustrated in **Table 3,** MiFID II is associated with widespread negative effects on market quality and efficiency on regulated exchanges across the EU. Bid-ask spreads have widened with strong statistical significance, indicating higher on-exchange transaction costs for equity market participants. Trading activity has also deteriorated on exchanges, both in absolute terms (lower trading volume) and relative terms (lower share turnover), each with strong statistical significance. In addition, price efficiency of exchange trading has declined, as reflected by an increase in price impact following MiFID II. Taken together, these findings indicate that the directive has raised on-exchange trading costs, reduced trading activity, and weakened price efficiency on EU equity exchanges.

The impact of MiFID II on Nordic equity markets differed from that observed across the EU as a whole. Whereas the EU experienced wider bid-ask spreads, spreads in the Nordic region remained unchanged. On-exchange trading volume in the Nordic region did not exhibit a statistically significant change, but share turnover declined with strong statistical significance, indicating that relative trading activity was adversely affected. Finally, price efficiency in the Nordic markets also deteriorated under MiFID II, as reflected in a statistically significant increase in price impact for on-exchange trading.

V. Joint MAR and MiFID II Analysis

While our MAR and MiFID II analyses each produced compelling results regarding the impact of each on market quality in regulated exchange trading, it is also important to examine the joint impact to ensure that the estimated effects of each regulation are not confounded by the presence of the other. Therefore, we also estimate a regression model that includes both MAR and MiFID II indicator variables simultaneously. Our regression model with both MAR and MiFID II generally takes the form:

$$Impact\ Variable = \beta_1 MAR + \beta_2 MiFID + \Sigma\beta_j Controls_j + \Sigma\beta_i Fixed\ Effects_i + \varepsilon$$

whereby the *MAR* and *MiFID* variables continue to be indicator variables equaling 0 in the quarters prior to implementation and 1 in the quarters subsequent to the legislation taking effect. Under this model specification, the coefficients of interest are β_1, which provides the estimated effect of MAR, and β_2, which provides the estimated effect of MiFID II. The sum of the two coefficients, $\beta_1 + \beta_2$, gives the combined effect of each reform.

This model specification accounts for the fact that MiFID II was implemented after MAR and thus coincides with a period in which MAR was already in effect across most EU jurisdictions. By including both indicators in the same model, we more clearly isolate the incremental impact of MiFID II conditional on the earlier implementation of MAR and assess the independent effect of MAR net of any subsequent regulatory reforms introduced by MiFID II. This joint specification improves the robustness of the analysis by controlling for overlapping regulatory regimes and allows us to test whether the observed effects attributed to either regulation are sensitive to the inclusion of the other. We continue to include the control variables and fixed effects described in the separate MAR and MiFID II regressions above.

Joint MAR and MiFID II Results

Table 4 illustrates our results for the joint MAR and MiFID II regressions. As indicated, the negative impact of MiFID II is even more pronounced in the EU after controlling for the impact of MAR.

Table 4: Joint Impact of MAR and MiFID II on Equity Market Quality on Regulated Exchanges

Panel A: All EU				
	Dependent variable (impact variable)			
	Bid-ask spread	*Trading volume*	*Share turnover*	*Price impact*
MAR (β_1)	**-0.052*** **	**0.097*** **	**0.045**	**-0.157*** **
MiFID (β_2)	**0.052*** **	**-0.174*** **	**-0.226*** **	**0.278*** **
Combined $\beta_1 + \beta_2$	**-0.001**	**-0.077*** **	**-0.181*** **	**0.121*** **
$MarketCap_{t-4}$	-0.550***	0.689***	0.113***	-1.114***
$Turnover_{t-4}$	-0.190***	--	--	-0.866***
$RetVol_{t-4}$	0.295***	1.401***	0.891***	0.585***
$GDPperCap_{t-4}$	0.766***	-0.520***	0.205***	1.420***
Country F.E.	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes
R-squared	0.841	0.891	0.429	0.955
No. observations	170,204	172,219	169,588	166,081
Panel B: Nordic only				
	Dependent variable (impact variable)			
	Bid-ask spread	*Trading volume*	*Share turnover*	*Price impact*
MAR (β_1)	**-0.005**	**0.004**	**0.144** **	**0.108** **
MiFID (β_2)	**-0.019**	**-0.038**	**-0.123*** **	**0.198*** **
Combined $\beta_1 + \beta_2$	**-0.025**	**-0.034**	**0.021**	**0.306*** **
$MarketCap_{t-4}$	-0.570***	0.831***	0.215***	-1.216***
$Turnover_{t-4}$	-0.270***	--	--	-0.890***
$RetVol_{t-4}$	0.306***	1.376***	0.868***	0.449***
$GDPperCap_{t-4}$	1.316***	-0.750***	0.366*	1.326***
Country F.E.	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes
R-squared	0.833	0.883	0.313	0.959
No. observations	94,752	95,201	94,977	94,441

*** 99%, **95%, and *90% significance levels

The results from our joint regressions of MAR and MiFID II illustrate several key takeaways. First, the incremental effect of MiFID II on EU markets is negative across *all* measures of on-exchange market quality and efficiency with strong statistical significance in each case. In this case, MiFID II is associated with a 5.2% increase in bid-ask spreads, when the impact of MAR is also captured

jointly, which is significantly worse than the 3.1% increase found in the MiFID II-only regressions. This suggests that MAR may have mitigated some of the negative impact of MiFID II, as MAR is associated with a 5.2% decrease in bid-ask spreads, completely offsetting MiFID II's negative impact in this joint specification. The combined impact of MAR and MiFID II is approximately zero.

MiFID II has also led to a more substantial deterioration in on-exchange trading activity, both in absolute terms (lower trading volume) and in relative terms (lower share turnover), when the impact of MAR is also factored. Consistent with the MiFID II regression results in **Table 3**, the joint MAR and MiFID II regressions illustrate a statistically significant negative effect on price impact due to MiFID II.

We also see under this joint model improved results from MAR in EU markets with respect to on-exchange trading costs, as MAR is associated with a greater decrease in bid-ask spreads than was the case when MAR was considered in isolation. Price efficiency on exchanges also improves under MAR when we control for the impact of MiFID II, as illustrated by the negative coefficient on the price impact variable, differing from the MAR-only regression that showed no statistically significant effect. Finally, on-exchange trading activity is also shown to improve as a result of MAR with trading volume increasing with strong statistical significance after controlling for the impact of MiFID II, unlike the prior MAR-only regression that showed no statistically significant effect.

In the Nordic region, MiFID II continues to show a negative impact on both share turnover and price efficiency on exchanges, similar to the results found in the MiFID-only regressions. The effect of MAR in the Nordic region also continues to be negative with respect to price impact but shows a positive effect on share turnover when the effect of MiFID II is also factored, differing from the lack of statistically significant effect found in the MAR-only regression. Thus, it appears that the benefits of MAR on trading activity were subsumed by the negative effect imposed by MiFID II when only MAR is considered.

Overall, our extended model that considers the impacts of MAR and MiFID II simultaneously highlights even further the damaging impact of MiFID II across several metrics of equity market quality and efficiency on regulated exchanges. MAR, however, demonstrates more mixed effects as bid-ask spreads decreased in the EU and share turnover increased in the Nordic region.

VI. Firm-size Analysis of MAR and MiFID II

While our above analyses show several impacts of MAR and MiFID II across the EU and in the Nordic region specifically, it may be that each impacted firms differently depending on firm size. For example, MAR's disclosure and reporting mandates entail certain fixed costs – such as legal costs and personnel costs – that do not scale down for smaller firms and thus, represent a larger proportion of firm resources. Therefore, as a robustness check on our main results, we disaggregate the effects of MAR and MiFID II based on firm size and test whether the observed effects are driven by firms of a particular size.

To conduct our analyses based on firm size, we divided our firm dataset into three subgroups based on market capitalization. This methodological approach allows us to examine whether small, medium, and large firms have been impacted differently by the relevant legislation. By disaggregating the analysis in this way, we assess whether the regulatory impact is uniform across the market or concentrated within specific size segments.

To conduct these size-based regressions, we divide the sample into terciles based on average market capitalization in the pre-regulation period and run separate panel regressions for each tercile. Our regression models, including control variables and fixed effects, remain unchanged from the full regressions discussed above, with the exception of market capitalization no longer serving as a control variable.

Size-based MAR and MiFID II Results

Table 5 illustrates the results from these tercile regressions, reporting the relevant coefficients for the *MAR* and *MiFID II* indicator variables for each market quality measure across each of the three size subgroups.

Table 5: Impacts of MAR and MiFID II Based on Firm Size

	Bid-Ask Spread		
	Small firms	Medium firms	Large firms
MAR (EU)	**0.125*** **	**-0.178*** **	**0.032**
MiFID II (EU)	**0.063** **	**-0.084*** **	**0.081*** **
MAR (Nordic)	**-0.016**	**-0.186*** **	**0.102*** **
MiFID II (Nordic)	**-0.082*** **	**-0.161*** **	**-0.006**
	Trading volume		
	Small firms	Medium firms	Large firms
MAR	**-0.297*** **	**0.037**	**-0.021**
MiFID II	**-0.417*** **	**-0.084** **	**-0.001**
MAR (Nordic)	**-0.143**	**0.148**	**0.180***
MiFID II (Nordic)	**-0.193*** **	**0.164** **	**0.203*** **
	Share Turnover		
	Small firms	Medium firms	Large firms
MAR	**-0.370*** **	**0.028**	**0.044**
MiFID II	**-0.529*** **	**-0.131*** **	**0.016**
MAR (Nordic)	**-0.083**	**0.423*** **	**0.182***
MiFID II (Nordic)	**-0.309*** **	**0.192*** **	**0.160** **
	Price Impact		
	Small firms	Medium firms	Large firms
MAR	**0.378*** **	**-0.145*** **	**-0.115*** **
MiFID II	**0.311*** **	**0.132*** **	**0.207*** **
MAR (Nordic)	**0.365*** **	**-0.098**	**-0.098**
MiFID II (Nordic)	**0.171** **	**0.038**	**0.070**

***99%, **95%, and *90% significance levels

Several results emerge from the tercile regressions based on firm size, as shown in **Table 5**. First, small firms were disproportionately negatively impacted by MAR. Across the entire EU region, MAR implementation is associated with an increase in bid-ask spreads, a decrease in trading volume, a decrease in share turnover, and an increase in price impact on exchanges for the smallest firms, all with strong statistical significance. In the Nordic region, the effect on small firms is less pronounced, as price impact deteriorated for small firms with strong statistical significance, while the other market quality measures were not statistically significant.

Conversely, medium and large firms were generally positively impacted by MAR. Across the EU, medium firms experienced a decrease in bid-ask spreads and a decrease in price impact on

exchanges, each with strong statistical significance. Large firms also saw a decrease in price impact with strong statistical significance. Overall, the EU results highlight improved market efficiency (i.e., lower price impact) of on-exchange trading for medium- and large-sized firms.

In the Nordic region, the impacts of MAR are mixed among medium and large firms. While medium firms in the Nordic region saw a decrease in bid-ask spreads, large firms experienced an increase as a result of MAR. Share turnover, however, improved for both medium and large firms, with strong statistical significance for medium firms (99%) and weaker statistical significance for large firms (90%).

Another key finding from our size-based regressions is that MiFID II similarly impacted small firms more significantly than larger firms. Across the EU, MiFID II is associated with an increase in bid-ask spreads, a decrease in trading volume and share turnover, and an increase in price impact for small firms, each with strong statistical significance. In fact, MiFID II led to a deterioration in price impact across all firms, as medium and large firms also saw an increase in the price impact measure. Moreover, while MiFID II improved bid-ask spreads for medium firms, large firms saw higher spreads.

On-exchange trading costs fared better in the Nordic region, however, as MiFID II led to lower bid-ask spreads across small and medium firms – statistically significant at the 99% level. However, small firms in the Nordic region were harmed in other respects, as trading volume and share turnover decreased, while price impact increased as a result of MiFID II. Medium and large firms fared better regarding trading activity, as both types of firms experienced higher trading volumes and share turnover.

Conclusion

Our study yields several results regarding the impact of MAR and MiFID II on equity market quality on regulated exchanges. MAR's intended improvements to market integrity and investor confidence have produced mixed outcomes: bid-ask spreads improved across the EU, but on-exchange trading activity declined, and price efficiency on exchanges weakened in the Nordic region. By contrast, MiFID II has had more consistently adverse effects across key market quality metrics on regulated exchanges. The directive increased on-exchange transaction costs across the EU, reduced trading activity, and diminished price efficiency on exchanges both in the EU overall and in the Nordic region. Finally, small firms have been disproportionately negatively impacted by both MAR and MiFID II across the EU and in the Nordic region.

Our findings have multiple policy implications. Our MAR results show a measurable positive impact on on-exchange trading costs across the EU, supporting the view that rules directly addressing information asymmetries—such as enhanced insider trading prohibitions and disclosure mandates—can improve market quality. However, the positive impact has not been noted in the Nordic region specifically, highlighting that broad-based regulation across multiple jurisdictions has had disparate impacts on affected markets. Moreover, we find that MAR has potentially had a chilling effect on trading activity on regulated exchanges, including activity that contributes to price discovery, as it has led to diminished on-exchange price efficiency in the Nordic region.

With respect to MiFID II, our results strongly suggest that broad-based, complex structural reforms may fail to yield observable benefits in already mature and liquid markets. This highlights the need for cost-benefit analysis not only ex-ante but also ex-post, especially when reforms entail significant compliance burdens and structural changes to market operations. Our MiFID II findings illustrate a universal decline in market quality and efficiency on regulated exchanges across the EU. While the negative impacts are less severe in the Nordic region, on-exchange trading activity that contributes to price discovery has also been chilled there, as price efficiency on exchanges has been reduced.

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134 Mount Auburn Street, Cambridge, MA 02138

www.pifsinternational.org