The Impact of Mandatory Closed Periods on Corporate Insider Trading[*]

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Abstract: The Market Abuse Regulation (MAR)—which took effect in July 2016 in the European Union—prohibits corporate insiders from trading within 30 days prior to earnings announcements. Using country-level heterogeneity in pre-MAR regulation on closed periods to distinguish treated from control observations, we examine the effect of the mandate on corporate insider trading patterns and information asymmetry around earnings announcements. In terms of compliance, we find a statistically significant decrease in the incidence, amount, and profitability of insider trades in the 30 days preceding earnings announcements in treated relative to control countries. In terms of capital market effects, while we find an average decrease in bid-ask spread and illiquidity for treated relative to control countries, there is a significant relative *increase* during the 30-day window preceding earnings announcements. The latter effect is driven by firms with less transparent information environments. Hence, the evidence suggests that, while mandated closed periods are effective at curtailing corporate insider trading during information-sensitive windows, they do not reduce market-level information asymmetry. Overall, the evidence does not suggest that one-size-fits-all regulation of close periods achieves better capital market outcomes than firm- or country-specific policies.

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1. Introduction

The regulation of insider trading remains subject to a longstanding debate in law and finance (Carlton and Fischel, 1983). The issue is particularly thorny when it comes to corporate insiders.[1] On one hand, executives and directors have legitimate reasons to trade, such as liquidity and portfolio rebalancing needs. Conversely, their access to nonpublic material information is inevitable. Over time, a consensus has emerged that insiders' information advantage is most severe in the period leading up to earnings announcements. This assumption has led to the widespread adoption of policies preventing corporate insiders from trading during this information-sensitive window (Bettis, Coles, and Lemmon, 2000). Yet, in practice, whether and how insiders are subject to trading restrictions varies substantially across jurisdictions. The variation comes primarily from whether the adoption arises through the regulatory process or voluntarily, and secondarily from the parameters of the restrictions. Because of this high degree of variation and its endogenous evolution, there is no evidence on the relative efficacy of the various approaches to monitoring corporate insider trading around earnings news. We address this gap in the literature by examining the capital market consequences of the adoption of the Market Abuse Regulation (MAR) in the European Union (E.U.).

Effective July 2016, Article 19(11) of MAR requires all E.U.-listed firms to impose a blackout period (a.k.a. closed period) on corporate insider trading over the 30 calendar days preceding an interim or fiscal year-end earnings announcement. Previously, the regulatory landscape on closed periods varied substantially across E.U. member states. Some jurisdictions mandated the same closed periods for all issuers (e.g., in the U.K.), others recommended but did not mandate closed periods (e.g., France), while others did not stipulate any requirements

[1] We use the term "corporate insider" to refer to top-level executives and directors subject to insider trading disclosure requirements. The technical term employed in the E.U. is "person discharging managerial responsibilities" (PDMR).

(e.g., Germany). The passage of MAR raises several questions about the merit of a 'one-size-fits all' regulatory approach to insider trading closed periods.

First, does the distribution of corporate insider trades significantly change around earnings announcements from pre- to post-MAR? Assuming that corporate insiders disclose all their trades—as previously mandated by the Market Abuse Directive (MAD) of 2005—we should observe a significant decrease in the incidence of reported trades within 30 days prior to earnings announcements in countries that previously had either no mandated closed periods or shorter ones. However, this shift may not occur if the voluntary adoption of close periods was already widespread prior to MAR. This is plausible given that, for example, most U.S. firms appear to impose close periods on insider trading despite no regulatory requirement to do so (Guay, Kim, and Tsui, 2021). Hence, we first examine the change in the distribution of insider trades around earnings announcements before and after the passage of MAR to better understand the pre-MAR landscape and post-MAR compliance with respect to close periods.

We obtain detailed insider trading data from Smart Insider (formerly Director Deals), a company that collects disclosed insider transactions around the world. We use open market purchases and sales by insiders from all firms primarily listed in the E.U. from January 2014 to December 2018, i.e., a five-year window centered around the adoption of MAR in July 2016. We merge insider trading data with earnings announcement dates from Bloomberg, and stock price and financial data from Datastream and Worldscope, respectively.

To identify the effect of Article 19(11) of MAR, our research design exploits two data dimensions. First, cross-sectionally, we differentiate treated from control observations by classifying all firms listed in countries whose pre-MAR closed period regime was looser than MAR (i.e., either because there was no mandated period or a shorter one) as treated, and others as controls. Second, in terms of time-series, we slice firm-level observations into 30-day windows and differentiate those immediately preceding earnings announcements from the rest.

Hence, the data allow us to use a standard differences-in-difference (DiD) for treated vs. control observations around the adoption of MAR, with firm and time fixed effects.

To test whether insider trading activity in the 30-day window preceding earnings announcements decreases after MAR, we examine the likelihood and amount (i.e., number of trades and dollar value) of insider trading during 30-day windows up to 90 days before and after earnings announcements. We find a statistically significant decrease in the probability of at least one insider trade being reported as well as the number and total value of reported insider trades in the 30-day window preceding earnings announcements for treated firms after MAR. This result suggests that firms/insiders from treated countries comply with MAR. Economically, the absolute magnitude is modest at 2.6%, although it represents a 29% decrease relative to the incidence of trades during the 30-day window of interest, which is 9%. The low incidence of trades before MAR in the 30-day window preceding earnings announcement is consistent with firms voluntarily adopting close periods in treated countries. Cross-sectionally, we find that the results are statistically significant for annual but not interim announcements. We also find that the results are statistically significant for insider sales but not purchases.

While the decrease in insider trading during newly mandated closed periods in treated countries indicates compliance with MAR, it is only consistent with the regulator's objective if *informed* trading goes down. Prior literature shows that insiders trade profitably ahead of earnings announcements in the U.S. (Jagolinzer, Larcker, and Taylor, 2011), in the U.K. and in Germany (Hillier and Marshall, 2002; Betzer and Theissen, 2009). Therefore, we next examine whether insider trading profitability decreases after the passage of MAR in treated countries. We measure insider trading profitability as the average returns measured over the 20 trading days following an insider trading transaction, separately for insider purchases and sales. We find that insiders from treated countries earn significantly lower returns on their close period trades after the passage of MAR. That is, insider purchases precede lower returns, and sales higher returns. This result is consistent with MAR reducing insiders' ability to trade

profitably ahead of earnings announcements, while allowing non-informed trades to take place. Indeed, while the residual incidence of trades during the mandated closed period suggests that some trades are exempt, those trades largely appear to be uninformed.

Ostensibly, the broader objective of MAR is to increase market participants' confidence in the integrity of financial markets. While corporate insiders have an information advantage about their own firm over outsiders at any point in time, that advantage is exacerbated in the period leading up to earnings announcement – the content of which is known to insiders soon after the fiscal period end. Prior research indicates that voluntarily adopted close periods are associated with lower bid-ask spreads (Bettis et al. 2000), consistent with market participants facing lower information asymmetry when corporate insiders cannot trade. Hence, it stands to reason that if MAR reduces insider trading the month before earnings announcements, market indicators of information asymmetry (e.g., bid-ask spreads, price impact measures) would improve in that sensitive window. However, there are several reasons why mandated close periods may fail to decrease information asymmetry. First, a mandated close period is neither necessary nor sufficient for insider trading not to take place ahead of earnings announcements (Jagolinzer et al., 2011). Absent significant enforcement and penalties, corporate insiders may either not divulge all their trades or share their information privately with acquaintances not subject to disclosure requirements. Second, restrictions on corporate insider trades potentially result in a net loss of information for outsiders since they no longer observe insider trade disclosures. Informed investors may then have more incentives to become privately informed. Furthermore, insiders themselves are liquidity providers and restrictions on their trading activity can reduce liquidity (Kabir and Vermaelen 1996). Therefore, whether information asymmetry ahead of earnings announcements decreases after the passage of MAR is an empirical question.

To test whether information asymmetry changes ahead of earnings announcements post MAR, we examine the monthly median of daily bid-ask spread and illiquidity as dependent

variables using the same regression design as our previous tests. Sample size drops by about 40% due to some firms lacking market data availability. We find that spread and illiquidity are significantly lower for treated countries after MAR on average (i.e., across 30-day windows), suggesting that information asymmetry overall goes down after MAR in treated countries. However, bid-ask spreads and illiquidity are relatively higher during the 30-day window preceding earnings announcements for treated countries after MAR. In other words, the overall decrease in information asymmetry is muted during closed periods. This result calls into question the effectiveness of Article 19(11) with respect to MAR's overarching goal – which is the focus of our inquiry.

Notwithstanding the homogeneity of rulemaking in the E.U., significant differences remain across member countries in terms of capital market development and governance practices. Thus, we next examine whether our results vary with country characteristics that are plausibly associated with the expected effectiveness of MAR. For parsimony, we consider three measures: investor protection against expropriation by directors proxied by anti-self-dealing Index (Djankov et al., 2008), the proportion of non-cash compensation in top executives' pay, and countries' approach to close periods prior to MAR. It is an open question whether Article 19(11) is more effective in countries that have the most room for improvement (i.e., those with lower investor protection, lower incentive alignment via executive compensation, and no recommended close period policy) or those with greater existing investor protection. In terms of insider trading incidence during close periods, we find no statistically different changes after MAR among treated countries based on any of the characteristics above. In contrast, we find that the lower decrease in information asymmetry is driven by countries with weaker shareholder protection against expropriation by insiders and in countries that did not even suggest a close period prior to MAR.

Although the close period mandate applies to every firm, its capital market consequences need not be uniform. Indeed, firms can voluntarily adopt stronger governance

and provide better disclosure to mitigate the moral hazard and adverse selection problems associated with insider trading. Accordingly, we examine whether changes in information asymmetry vary cross-sectionally based on firms' analyst coverage, and voluntary guidance disclosure. Analyst coverage proxies for external monitoring, whereas voluntary guidance disclosure proxies for transparency. We find that the relative increase in information asymmetry for treated firms after MAR is significant for firms with no analyst coverage, and those that issue no guidance, i.e., firms with already weaker incentives to resolve information asymmetry between insiders and outsiders. Combined, the cross-sectional analyses at the country and firm level suggest that the impact of MAR is weaker in firms with low transparency and in countries with a poorer investor protection environment.

We perform robustness tests to further support our main inferences. First, we plot the time-series of insider trading occurrence during the 30-day window preceding earnings announcements by calendar semester from 2014 to 2018. We observe that treated and control firms behave similarly before the passage of MAR and a convergence of treated and control samples afterwards, consistent with the uniform rule taking hold in the post-MAR period. We also re-run our main tests by excluding one treated country at a time and find the results robust.

Our paper informs the unresolved decades-long debate on whether corporate insiders should be prohibited from trading ahead of earnings announcements and, if so, by firms or by regulators. Prior research primarily focuses on U.S. firms (Bettis et al. 2000; Jagolinzer et al. 2011; Lee et al. 2014; Guay et al. 2023), where the adoption of close periods remains purely voluntary.[2] Therefore, most of the insights from that literature are from comparisons between voluntary adopters and non-adopters, across adopters along different parameters (e.g., length

[2] One major challenge with archival research on corporate policies restricting insider trades is the lack of systematic disclosure of such policies (although a new rule may address this issue: https://www.sec.gov/investment/insider-trading-arrangements-and-related-disclosures) Therefore, researchers thus far have either relied on surveys (Bettis et al. 2000), firms' voluntary disclosures (Jagolinzer et al. 2011), or inferred the existence of a policy from the distribution of trades (Roulstone 2003; Lee et al. 2014; Guay et al. 2022).

of the close period), and within firms (e.g., information asymmetry during close and allowed periods). We know of two papers that look at other jurisdictions where mandatory close periods were either introduced or modified. Kabir and Vermaelen (1996) examine changes in market liquidity around the adoption of a mandated close period in the Netherlands. They find a decrease in liquidity as measured by trading volume during the close period after 1986, when insiders are no longer allowed to trade. Chen, Guan, and Ke (2020) examine market reactions to the reversal of a planned lengthening of the mandated close period in Hong Kong. They find that the market reacted positively to the news, especially for lobbying firms. Thus, both Kabir and Vermaelen (1996) and Chen et al. (2020) document evidence suggesting that imposing a close period or a longer one can have adverse market consequences. Our paper differs from and adds to the aforementioned in multiple ways. The E.U. setting is compelling in terms of identification as it allows us to differentiate treated from control observations at the country-level. It also provides a rich institutional setting where timely disclosure of insider trades has been the norm since 2005. We examine compliance in terms of corporate insider trading and capital market consequences in terms of information asymmetry. Our results suggest that, while effective in further reducing informed insider trading ahead of earnings announcements, MAR has no impact on market-level information asymmetry during the mandated close period. Hence, the results highlight the tradeoff between the informational costs and benefits of disclosed insider trades and the difficulty in achieving desirable capital market outcomes via a 'one size fits all' regulatory approach.

Our paper is also the first that we are aware of to examine the capital market consequences of MAR, one of the most far-reaching E.U.-wide securities market regulations in the last decade, along with its predecessor the Market Abuse Directive (MAD) and the more targeted MiFID II. As such, our paper adds to the broader insider trading regulation and enforcement research stream. In a cross-country setting, Bhattacharya and Daouk (2002) show that the mere passage of insider trading laws does not impact the cost of capital, whereas the

first enforcement case is associated with a significant decrease. However, as capital markets converge globally in terms of investment flows and regulatory frameworks, the incremental benefits of securities regulation can become insignificant (Hail and Leuz, 2006). While our focus is on the close period preceding earnings announcements, our results indicate that information asymmetry, as measured by bid-ask spreads and price impact, goes down after MAR in countries treated by Article 19(11). To the extent that treated countries generally had laxer insider trading regulation pre-MAR, the results suggest that MAR's broader harmonizing goal may have achieved some of its intended benefits.

2. Institutional Background

Effective July 3rd, 2016, the European Union introduced one-size-fits-all trading restrictions by insiders via the Market Abuse Regulation (No 596/2014/E.U.), Article 19. The regulation aims to improve market efficiency and level the playing field for market participants. The restrictions are implemented equally across all E.U. member countries and imply that corporate insiders in listed firms are banned from trading in their firms' stock 30 days prior to any earnings announcement. The idea of close periods is not entirely new in the E.U. and some countries had close periods in place; however, prior to MAR there was no E.U.-wide requirement to regulate insider trading before earnings announcements. In 2016, MAR replaced the Market Abuse Directive (2003/6/EC) (MAD), which included provisions that allowed but did not oblige E.U. member countries to apply closed periods.

Table 1 presents country level details of close periods prior to MAR. Out of 28 E.U. member countries, 16 did not have close periods, three had close periods recommended but not mandated at the firm level (Finland, France, Italy), and ten had existing close periods (Denmark, Estonia, Hungary, Ireland, the Netherlands, Poland, Romania, Slovenia, Sweden, United Kingdom). The cross-section of countries with pre-existing closed periods is a mix of

old member countries with well-established capital markets and new member states from Central and Eastern Europe that joined after transitioning from centrally planned economies to market economies (Poland, Hungary, Estonia, Slovenia, and Romania). On average, the pre-MAR close periods were longer before annual earnings announcements (up to 60 days) and shorter (15-30 days) before interim earnings announcements compared to the MAR one-size-fit all 30 days. Ireland had the most rigorous trading bans, 60 days prior to annual and semi-annual earnings announcements and 30 days prior to quarterly earnings announcements, followed by the U.K. with 60, 30, and 30 days prior to annual, semi-annual, and quarterly earnings announcements, whereas France had the shortest, with a recommended 15-day long close period before any earnings announcements. For an average country with pre-existing close periods, the new regulation is either less or equally restrictive. Figure 1 illustrates graphically the strength of pre-MAR restrictions on insider trading before earnings announcements in the E.U. Green reflects countries with restrictions at least as stringent as the restrictions implemented by MAR, orange reflects countries with restrictions more lenient or only recommended but not mandated, and red denotes countries that did not have any trading restrictions before earnings announcements.

[Figures 1 about here]

[Table 1 about here]

In addition to defining close periods, MAR also covers “inside information”, “insider”, and insider trading reporting requirements. MAR replaces stipulations included in the preceding Market Abuse Directive from 2003 and earlier in the Insider Dealing Directive (89/592/EEC) enacted in 1989. Inside information is defined as a price sensitive information that if released is likely to move stock prices. A corporate insider is defined as a person who has access to inside information and is associated with an issuer either on administrative, managerial, or supervisory body basis. In current regulations, an insider is referred to as a person discharging managerial duties (PDMR) within the issuer and persons closely associated

with them. The new definitions of inside information and of a corporate insider incorporated in MAR are more comprehensive and precise, but their de facto meaning is the same as before. Insiders have up to five working days from the transaction date to make the trading announcement public in line with MAR. However, member countries can impose shorter reporting windows. Member countries are also allowed to set a threshold of EUR 5,000 for the total value of transactions within a calendar year, below which a trading notification is not required or delayed until January 31st of the subsequent year.[3] There is some cross-country variation along those lines. For example, Denmark has the shortest deadline of two working days but only for trades with an aggregate value of more than EUR 5,000 in a calendar year; the U.K.'s reporting deadline is four working days for every transaction regardless of the value, and most countries require insider trading announcement within five days for trades with an aggregate value of more than EUR 5,000 in a year. MAR also covers provisions to allow insiders to trade during close periods in exceptional situations when trading is undertaken for liquidity reasons (e.g., divorce settlement) and in the absence of private information. The heterogeneity of close periods before MAR and homogeneity of insider trading announcements across the whole sample period allow us to perform comprehensive empirical tests of the impact of the new regulations employing a difference-in-difference methodology.

3. Data and Sample Selection

Sample Selection

Our sample consists of firms incorporated and listed on stock exchanges in the E.U. The sample period is from 2014 to 2018, five semesters before and five after the implementation of MAR in July 2016. We focus on E.U. countries because they are all affected by the regulation

[3] Transactions executed by a PDMR and their close associates are not aggregated for the purpose of trading notifications.

establishing close periods, and there are already homogenous regulations regarding reporting insider trading implemented with MAD. We limit the pre and post MAR adoption period to a maximum of five semesters to ensure a balanced sample and avoid confounding effects. Data on insider trading come from Smart Insider (formerly Directors Deal). Smart Insider collects insider transactions for firms around the world and generates a comprehensive dataset of insider transactions.[4] We limit our sample to E.U. countries where we have firms with insider trading information, dates of earnings announcements from Bloomberg, financial accounting information from Worldscope, and price data from Datastream. We winsorize all continuous variables at the 1% and 99% levels to limit the influence of outliers. The overall sample construction and data availability for each country is presented in Table 2.

[Table 2 about here]

There are 28 member countries during our sample period however, our final sample is constrained to 20 due to earnings announcement, accounting, and price data availability. The countries that are excluded from our sample are new E.U. entrants with a small number of companies listed on their stock exchanges and relatively small capital markets. Twelve of the countries that entered our final sample implemented closed periods after the adoption of MAR and correspond to our treated sample. The remaining eight countries that had already adopted closed periods before MAR form our control sample. In both treated and control samples, there is a mix of old E.U. members with well-established capital markets and regulatory infrastructure and countries that joined from 2004 onwards after the collapse of Eastern Block. These newer member countries were, from its onset, aligned with the E.U. regulatory requirements but have relatively emerging capital markets and newly developed regulatory frameworks.

[4] Prior studies on insider trading in Europe (Fidrmuc, Korczak and Korczak, 2013 and Gebka, Korczak, Korczak and Traczykowski, 2017) employ the same data.

To test the effectiveness and market implications of closed periods, i.e., ban on insider trading prior to earnings announcements, we first need to have dates for earnings announcements and then match them with insider trading and the necessary accounting and market data. In our final sample, we have 13,133 earnings announcements split into 4,065 annual and 9,068 interim earnings announcements. The number of earnings announcements with insider trading is larger in the treated than control sample (7,918 versus 5,215); however, the number of annual earnings announcements with insider trading is relatively balanced (2,158 and 1,907 observations for treated and control sample, respectively).

The unit of observation in our empirical analysis is a firm-month, because of the 30-calendar day length of closed periods. This research design choice allows us to investigate changes in insider trading and information asymmetry in the month before earnings announcements relative to other months. Our sample consists of 77,762 firm-month observations split into 46,877 firm-months for the treatment sample and 30,885 firm-months for the control sample.

Cross-Country Characteristics

In our sample, the overall probability and intensity of insider trading is on average higher in the control group (firms in countries with pre-existing closed periods) than in treated firms. However, the opposite holds for the value of insider trades. There is a 21% probability of insider trading taking place in any firm-month in the control group versus 14% in the treated group, with an average of 0.72 trades in any firm-month for treated firms versus 0.34 for control firms. It translates into around one trade every month and a half in the control group and a trade every three months in the treated group. The probability of insider trading is uniform across the majority of countries in the control sample. However, the high number of trades is more heterogenous and concentrated in Hungary, Ireland, Denmark, and United Kingdom. The value of trades in any firm-month is about 2.5 higher for treated countries than control countries

(1,078,227 USD versus 408,678 USD). This difference is driven by Spain, France, and Italy, which have disproportionally high average trade values. Information asymmetry measured by bid-ask spread (*Spread*) is lower in countries with pre-existing close periods (i.e., the control sample) (0.67 versus 0.86). Still, average illiquidity is similar across both treated and control groups.

[Table 3 about here]

We also introduce three country-level measures that we consider for subsequent cross-sectional tests. The *Anti Self-Dealing Index* (Djankov et al., 2008), captures the level of outside investor protection against expropriation from insiders, the average of *Non-Cash Compensation*, and *Pre-MAR Close Periods*, which accounts for whether a country had any pre-existing close periods, mandated or recommended. The *Anti Self-Dealing Index* ranges from zero to one, with higher values correlated with better shareholder protection. The Index is available for most but not all countries in our sample and is missing mainly for small and emerging markets (Cyprus, Czechia, Greece, Hungary, and Romania). The average value of the Index in the treated sample is lower than in the control sample, 0.37 vis-a-vie 0.51, suggesting that, on average, countries in the control sample are characterized by higher levels of investor protection. In the treated (control) sample, the Index varies from 0.21 for Austria (0.21 for the Netherlands) to 0.54 for Belgium (0.93 for the United Kingdom).

Executive compensation policies differ across countries (Fernandes et al., 2013) and can be correlated with insider trading behavior (Denis and Xu, 2013). In countries with a high level of non-cash compensation, the probability of insider sales is higher for liquidity and portfolio diversification purposes, whereas in countries with low level of non-cash compensation, purchases based on foreknowledge of firm's prospects are more likely to take place as executives build their investment portfolios from the cash compensation. As a result, profitability is expected to be lower in countries with high non-cash level compensation and higher in countries with high cash component of compensation. Our sample's average non-cash

compensation is 0.03 and 0.06 for treated and control samples, respectively. In the treated sample, the non-cash compensation is lowest in Belgium, Italy, and Portugal (0.01) and highest in Luxembourg (0.10); in the control sample, it ranges from 0.00 in Hungary to 0.26 in Ireland.

Our analysis also considers the heterogeneity of close periods policies before their harmonization across all E.U. countries (*Pre-MAR Closed Periods*). All countries in the control sample had at least as stringent closed periods as those introduced with MAR, with many countries having more restrictive bans on trading – the Pre-Mar Index takes a value of 1 for those countries. Within the treated sample, countries with an index value of 3 did not have any trading bans pre-MAR, and countries with an index value of 2 are countries with trading bans recommended but not mandated. Overall, countries with the best investor protection are also characterized by pre-MAR closed periods that were stronger than those implemented by MAR (United Kingdom and Ireland) and high non-cash compensations. Therefore, the level of outside investor protection was already high in countries where insiders were most likely to trade in their companies' shares.

4. Research Design

MAR introduced a unified trading ban 30 days before earnings announcement in the E.U. We first test whether the adoption of MAR is associated with a decrease in the probability, intensity, and value of insider trading around earnings announcements. We focus on the 30-calendar day period before earnings announcements that is equivalent to the closed periods. We also investigate whether there are changes in the 30 calendar days following the earnings announcements. We predict that after MAR adoption, insiders of treated firms where the trading band was introduced after MAR, are less likely to engage in insider trading in the closed periods, i.e., pre-earnings announcement period.

We estimate the following difference-in-difference design model to test for changes in the likelihood, intensity, and value of insider trading following MAR adoption:

$$
\begin{aligned}
Insider\ Trading_{it} \quad & (1)\\
&= \alpha_y + \alpha_c + \beta_1 Treatment_i + \beta_2\, Post_{it} + \beta_3 \times Post_{it} \times Treatment_i\\
&+ \delta_1 Pre\_30_{it} \times Treatment_i + \delta_2\, Pre\_30_{it} \times Post_{it}\\
&+ \delta_3\, Pre\_30_{it} \times Post_{it} \times Treatment_i + \delta_4 Pre\_30_{it}\\
&+ \mu_1 Post\_30_{it} \times Treatment_i + \mu_2\, Post\_30_{it} \times Post_{it}\\
&+ \mu_3\, Post\_30_{it} \times Post_{it} \times Treatment_i + \mu_4\, Post\_30_{it}\\
&+ \sum \gamma_m Controls_{it} + \alpha_c + \alpha_y + \varepsilon_{it},
\end{aligned}
$$

where *Insider Trading*$_{it}$ is one of the proxies for insider trading in company i in year t . The first proxy is the likelihood of insider trading. *Probability*$_{it}$ equals to one if there are any insider buys or sells in the month and zero otherwise. *Ln (Number of Trades)*$_{it}$ is the logarithm of one plus the total number of trades in a firm-month. *Ln_trade_value*$_{it}$ is the natural logarithm of one plus the total USD value of buys and sells in a firm-month. *Treatement*$_i$ is an indicator variable that equals one if firm i is incorporated in one of the countries that adopted closed periods for the first time after the adoption of MAR in July of 2016, and zero otherwise. *Post*$_{it}$ is an indicator variable that takes the value of one for insider trading taking place after the adoption of MAR, i.e., from July 3rd, 2016. *Pre_30*$_{it}$ is an indicator variable that equals one for the 30 days before an earnings announcement and zero otherwise. *Post_30*$_{it}$ is an indicator variable that equals one for the 30 days period after the earnings announcement and zero otherwise. *Controls*$_{it}$ is a set of firm (i)-level control variables described below. *Pre_30*$_{it}$ *x Post*$_{it}$ x *Treatment*$_i$ is our main variable of interest and captures the differential effect of closed periods after MAR adoption in countries without closed periods relative to countries that already had closed periods. α_c corresponds to firm or country fixed effects depending on the specification. α_y corresponds to year fixed effects. These fixed effects account for macroeconomic, and

country-specific factors that may affect insider trading. Firm fixed effects control for firm-specific time-invariant unobserved factors. We cluster standard errors at the country level since the regulation is at the country level.

We include a set of control variables measured at the beginning of the fiscal year. *Size* is the natural logarithm of total assets in thousands of U.S. dollars. *Book-to-Market* is the ratio of the book-to-market value of common equity. *Return FYE* is the buy-and-hold return for the fiscal year. *Negative Earnings* is an indicator variable that equals one when the earnings announcement is negative and zero otherwise. *Fiscal Year End* is a dummy that equals one if the earnings announcements correspond to the fiscal year-end and zero otherwise. *GDP* is the real domestic product. *GDP Growth* is the real gross domestic product. Detailed definitions of the variables are provided in the Appendix.

We next focus on the profitability of insider trading. If closed periods instigated by MAR effectively reduce insider opportunistic behavior, trades during close periods should be executed only in exceptional circumstances in the absence of information advantage. Therefore, we should observe a decrease in profitability in the close periods for the treated sample and no change in the control sample. We again employ the model in equation (1). Our first measure of insider trading profitability is the monthly average 20-day return for all transaction in the 30-calendar day window preceding an earnings announcement (*Average Abnormal 20-day return*). The return is calculated as the 20-trading day buy and hold market-adjusted return for each transaction. We examine insider purchases and sales separately, not only because profitable purchases are associated with positive returns whereas profitable sales are associated with negative returns, but also because they tend to be driven by different factors. Control variables include *Size* because profitability of insider trading tends to be higher for smaller firm, growth opportunities (*Book-to-Market)*, past returns (*Return FYE*) to control for insiders' contrarian behavior, and the average value of the trade (*Ln_trade_value*) to control

for larger transactions. Insiders buy (sell) in firms with higher (lower) growth opportunities after price drop (raise). We also control for year- and firm-fixed effects.

In further analyses we test whether close periods are associated with information asymmetry around earnings announcement. MAR was designed and implemented to increase investor protection and to level the playing field for all market participants. If those aims are achieved, we expect to observe an overall decrease in information asymmetry and an improvement in market liquidity in the E.U. In line with Article 19(11), the market consequences should be particularly pronounced during the close periods for treated countries. We repeat our model detailed in equation (1) using measures of information asymmetry and market liquidity as our dependent variables. Our first measure is $Spread_{it}$, which is defined as the median of the bid-ask spread during month *t*, where bid-ask spread corresponds to the difference between the ask and bid prices divided by the midpoint. The second measure, $Illiqidity_{it}$, is based on Amihud (2002) and is defined as the monthly median of the daily ratio of absolute stock return to its dollar volume. For these tests, in addition to all controls included in the first set of tests, we also include controls for the information environment and the information content of the earnings announcement. We include *Volatility* defined as the standard deviation of returns for the period. *Rank SUE*, which is the decile rank of *SUE* rescaled to range from zero to one. *SUE* is the absolute earnings surprise based on the last mean analysts' forecast divided by price if available. If there is no mean analyst forecast available, we use a seasonal random walk model instead to forecast earnings per share. *Price* is price in U.S. dollars at the end of the fiscal year and is included to control for order processing costs. We also include *Turnover* to control for inventory holding costs, which is the monthly average daily turnover. *Ln(Analysts)* is the natural log of one plus the number of analysts, corresponding to the number of analysts providing a forecast for the fiscal quarter before the earnings announcement. Finally, we control for earnings guidance. *Guidance* is an indicator variable equal to 1 if the firm issued earnings guidance during the fiscal year and zero otherwise.

5. Empirical Results

Descriptive Statistics

In Table 4 we compare our key variables of interest across firm-months separately for treated and control samples pre- and post-MAR adoption and test whether insider trading probability, intensity, and profitability, and information asymmetry change at a univariate level after the regulation change. We are particularly interested in the 30-day period prior to either annual or interim earnings announcement to analyze whether the introduction of the close periods, i.e. restrictions on insider trading across all E.U. member countries correlates with changes in insider trading patterns and profitability as well as information asymmetry (Panel A). Separately, we also consider all firm-months (Panel B).

[Table 4 about here]

At the univariate level during close periods (Panel A. Pre 30 days), we find a lower probability of insider trading in countries that implemented close periods after MAR and a decrease in bid-ask spreads (*Median Spread*), which suggests an improvement in the information environment. In countries that already had close periods before MAR's implementation, we do not find any significant changes in the probability or frequency of insider trading, nor is there any change to the information environment (*Spread* and *Illiquidity).* While we find a significant decrease in the value of trades (*Trade Value in USD*), the change is smaller in magnitude than in the treated group.

In terms of the overall effect of MAR (Panel B. All), for countries that adopted close periods (Treated), we observe a significant decrease in the incidence of insider trades during any 30-day window. Furthermore, mean bid-ask spread and illiquidity decrease significantly. The profitability of trades decrease for buy trades and increase for sell trades. However, the difference is not significant in both cases. These effects are in line with the intention of

introducing MAR. To complement the aggregate statistic from Table 4 we present a set of E.U. maps for each country's variables.

[Figures 2-6 about here]

Descriptive statistics for all variables employed across the multivariate analyses are presented in Table 5. We have 77,762 firm-month observations for the main analysis of the association between insider trading and implementation of close periods. Notably, there are fewer observations (8,816) for the analysis of insider trading profitability, which is conditioned on there being at least one trade during the firm-month. For the analysis of market consequences of MAR's adoption (*Spread* and *Illiquidity*) the sample size drops to 46,201 firm-months observations due to price information availability.

[Table 5 about here]

The statistics in Table 5 show that on average there is a 18% probability of insider trading or a transaction every five to six months for any firm-month. The average number of trades is 0.46 per firm-month, that is, in close to half of firm-months there is at least one single transaction taking place. Trade value measure is based on firm-month observations with no trading and therefore for more than half of the observations the value is zero. When we consider the firm-month value for insider trading transactions above zero (not reported), the distribution varies with an average of 1,349,931 USD. The distribution of all other variables does not indicate any anomaly that should affect the multivariate analysis.

Insider Trading Activity

Our first set of regression analyses examines the association between the incidence and intensity of insider trading and the introduction of the new regulations specified in model (1) running three tests for probability (incidence), number of trades (intensity), and value of trades. We expect that the new regulations will result in a decrease in insider trading activity during the 30-day window preceding earnings announcements in treated countries after MAR. Outside

the close periods, we do not expect significant changes in insider trading behavior, unless insiders shift their trades to adjacent windows.

[Table 6 about here]

Table 6 reports the results. Across all specifications, the coefficient on our main variable of interest (*Pre30* × *Post* × *Treatment*) is negative and statistically significant. That is, in line with our expectations, we find a significant reduction in the probability of insider trading, the number of trades, and the value of trades during the 30 days before earnings announcements (i.e., during close periods) in firms from countries that introduced close periods with MAR. The result shows that mandating close periods achieves the intended outcome in countries that did not have such mandate.[5]

Prior to MAR, there was significantly lower (greater) insider trading activity in the 30 days before (after) earnings announcements in the control sample, as per the significantly negative coefficients on *Pre30* (*Post30*), consistent with those countries already having a mandated close period in place. In contrast, firms in treated countries had relatively more (less) insider trading right before (after) earnings announcements, consistent with the absence of a mandated close period. We also note that there is no significant shift of insider trading during less information sensitive windows in treated countries, as per the insignificant coefficients on *Post* × *Treatment* and *Post30* × *Post* × *Treatment*.

In terms of control variables, we observe a lower overall incidence and intensity of insider trading in companies with lower growth opportunities (*Book-to-Market*) and those reporting losses (*Negative Earnings*). We also control for GDP and growth in GDP and find that the heterogeneity in terms of economic development across countries in our sample does

[5] In untabulated analyses, we assess the robustness of our results to excluding one country at a time. Overall, our probability and information asymmetry results are qualitatively similar.

not impact the results. The results are consistent across all specifications, with or without firm, country, and year fixed effects firm and year fixed effects.

Insider Trading Profitability

While insiders trade less during close periods after MAR, they could still trade profitably. The literature on insider trading indicates that significant abnormal profits made by insiders trading their companies' shares is associated with trading on private information that, if made public, would move stock prices (e.g. Seyhun, 1998; Jeng, Metrick and Zeckhauser, 2003, Fidrmuc et al., 2013). Such behavior is also known in the literature as opportunistic trading at the expense of less informed outside investors, where gains made by insiders are dollar for dollar losses made by the outside investors.

The close periods introduced by MAR aim to level the playing field for all market participants and prevent corporate insiders from using privileged information and the foreknowledge of upcoming results from trading for their own benefit. If the introduction of closed periods via MAR is effective, we should not only observe a reduction in insider trading activities as in the previous analysis but also a reduction in profitability, which is related to trading on private information, including both the upcoming accounting results as well as companies' prospects. To analyze the association between the profitability of insider trading and the introduction of MAR, particularly the closed periods, we use equation (1) with *Average 20-day return* as the dependent variable and as a measure of insider trading profitability.

[Table 7 about here]

Table 7 reports the results. In odd- (even-)numbered columns, the sample is limited to insider purchases (sales). In the first (last) two columns, we exclude (include) control variables. For purchase transactions, we find that the coefficients on *Pre30* × *Post* × *Treatment* are negative and significant in columns (1) and (3). Therefore, conditioned upon insiders buying stock ahead of earnings announcements in treated firms, the returns following those purchases

are relatively lower after MAR. Similarly, returns are relatively more positive after insiders sell stocks, as per the positive and significant coefficients on *Pre30* × *Post* × *Treatment* is positive and significant in columns (2) and (4). Thus, overall, while there are still trades that take place during close periods after MAR, they appear to be significantly less profitable in treated countries. However, a mitigating factor is that we observe a relative *increase* in the profitability of insider trades during close periods after MAR in the control group, as per the positive and negative coefficients on *Pre30* × *Post* in columns 3 and 4, respectively, with the former being statistically significant at conventional levels.

Capital Market Effects of Closed Periods

The overall aim behind the introduction of MAR is to improve shareholder protection and increase the attractiveness of the E.U. capital markets for raising capital. Therefore, we analyze the market consequences of MAR that go beyond corporate insider trading. Specifically, we test whether information asymmetry and market liquidity improve after MAR. We employ equation (1), testing separately the association between the introduction of MAR and information asymmetry measured by bid-ask spreads and liquidity (proxied by Amihud's Illiquidity measure). We are primarily interested in the effect of MAR on close periods (*Pre30* × *Post* × *Treatment*), but also the average effect in our treated (*Post* ×*Treatment*) and control (*Post*) groups.

[Table 8 about here]

Table 8 presents the results. On average, once we include fixed effects (columns 2 and 4), we find a significant increase in illiquidity in the control group, as per the coefficient on *Post*. This suggests that MAR has no benefit in terms of market-level information asymmetry in countries that are already compliant. In contrast, we show that bid-ask spread and illiquidity decrease significantly after the introduction of MAR in the treated group. The coefficient of *Post* ×*Treatment* is negative and statistically significant in all four columns, suggesting a

positive effect of MAR on liquidity and a more level playing field for all market participants in those markets. Interestingly, the coefficients on our triple interaction term, *Pre30* × *Post* × *Treatment*, is positive and statistically significant. When we compare the two coefficients, we can conclude that there is an overall improvement in liquidity in treated countries, but it is muted during the close period. Therefore, the results indicate that MAR's capital market benefits are limited to windows that are relatively less information sensitive. By mandating close periods, MAR fails to improve liquidity in the month leading up to earnings announcements for at least two non-mutually exclusive reasons. First, by forcing a pooling equilibrium, it no longer allows firms to signal a commitment to governance best practices via voluntary adoption. Second, it takes away insider trade disclosures as a potentially value relevant signal.

Parallel trend

A potential concern with our research design is that our results are capturing a trend over time, i.e., the parallel trend assumption would be violated. To address this concern, we first plot insider trading activity by quarter for the treatment and control samples separately. For brevity, we focus on our first measure, i.e., the incidence of at least one trade in each 30-day window.

[Figures 7 to 10 about here]

Figure 7 shows the average probability of insider trading for all periods and Figure 8 shows the average probability for the 30 days window before earnings announcements. As shown in the figures, the treatment and control samples move similarly in the pre-adoption period. In Figure 8, the lines start to converge after the adoption of MAR, consistent with treated firms complying with MAR. In contrast, both treatment and control observations continue to move similarly post MAR for the average 30-day window, as per Figure 8.

Next, we plot the average bid-ask spread by quarter for the treatment and control samples separately. Figure 9 shows the average spread for all periods and Figure 10 shows the

average spread for the 30 days window before earnings announcements. In both figures there is no evidence of a pre-treatment trend. After the adoption of MAR, the treatment and control lines converge when looking at all time windows. This figure is consistent with our regression results showing that information asymmetry and illiquidity decreased on average for treated firms after MAR. Figure 10 shows no change for the pre-30 window, consistent with the muted effect document earlier.

To further address the parallel trend concern, we next estimate the model after allowing the pre-period to have a quarterly effect *before* the adoption. We include separate interaction variables for each quarter before the adoption of MAR and then estimate the following model:

(2)

$$
\begin{aligned}
&Insider\ Trading_{it}/Liquidity \\
&= \alpha_y + \alpha_c + \beta_1 Treatment_i + \beta_2\, Minus2_{it} + \beta_3\, Minus1_{it} + \beta_4\, Post_{it} \\
&+ \beta_5 \times Mins2_{it} \times Treatment_i + + \beta_6 \times Minus1_{it} \times Treatment_i \\
&+ \beta_7 \times Post_{it} \times Treatment_i + \delta_1 Pre\_30_{it} \times Treatment_i \\
&+ \delta_2\, Pre\_30_{it} \times Minus2_{it} + \delta_3\, Pre\_30_{it} \times Minus1_{it} \\
&+ \delta_4\, Pre\_30_{it} \times Post_{it} + \delta_5\, Pre\_30_{it} \times Minus2_{it} \times Treatment_i \\
&+ \delta_6\, Pre\_30_{it} \times Minus1_{it} \times Treatment_i + \delta_7\, Pre\_30_{it} \times Post_{it} \\
&\times Treatment_i + \delta_8 Pre\_30_{it} + \mu_1 Post\_30_{it} \times Treatment_i \\
&+ \mu_2\, Post\_30_{it} \times Minus2_{it} + \mu_3\, Post\_30_{it} \times Minus1_{it} \\
&+ \mu_4\, Post\_30_{it} \times Post_{it} + \mu_5\, Post\_30_{it} \times Minus2_{it} \times Treatment_i \\
&+ \mu_6\, Post\_30_{it} \times Minus1_{it} \times Treatment_i \\
&+ \mu_7\, Post\_30_{it} \times Post_{it} \times Treatment_i + \mu_8\, Post\_30_{it} \\
&+ \sum \gamma_m Controls_{it} + \alpha_c + \alpha_y + \varepsilon_{it},
\end{aligned}
$$

[Table 9 about here]

where *Minus1, Minus 2* are indicator variables that equal to one if insider trading takes place one or two quarters before MAR, respectively.

The results are presented in Table 9 and show that the coefficients on *Pre30* × *Minus2* × *Treatment* and *Pre30* × *Minus1* × *Treatment* are insignificant in all columns, suggesting that there are no significant pre-treatment trends in insider trading and liquidity. This lack of pre-MAR trend suggests that firms and investors did not anticipate MAR – which would also work against our finding a significant effect after MAR's adoption.

Cross-Sectional Tests at the Country-Level

We analyze the effect across different country-level factors to better understand the changes in insider trading and market liquidity after MAR adoption. Given that E.U. countries exhibit cross-country heterogeneity in the level of investor protection, country-level prevalent executive compensation policies, and pre-existing close periods and that all of those country characteristics are plausibly associated with insider trading and market liquidity, we partition our treatment sample into two groups (*High* and *Low*) based on the sample medians of the anti-self-dealing Index (Djankov et al., 2008) and *Non-cash Compensation* (Fernandes et al., 2013), and on the self-developed *Pre-MAR Closed Period* index, based on which we distinguish between treated countries with (High) and without (Low) a recommended close period prior to MAR. We re-estimate Model (1) by splitting our main variable of interest between *Pre30* × *Post* × *High* and *Pre30* × *Post* × *Low*. These interaction terms capture the effect of close periods introduced with MAR on treated observations that are differentiated based on pre-existing cross-country characteristics that are known to be associated with insider trading behavior.

The Anti-Self-Dealing Index measures the level of minority shareholder protection against situations when managers and controlling shareholders undertake transactions that significantly increase their wealth. The existing literature shows that market reactions to insider

purchases (sales) are more positive (less negative) returns in European countries with a high index (Fidrmuc et al., 2013), which suggests that stronger investor protection increases the trustworthiness of insider transactions. However, given the limited evidence in previous literature, we have no prior expectations for the results.

[Table 10 about here]

Our empirical analysis shows that the probability of insider trading after MAR adoption during close periods is significantly lower in countries with higher levels of minority shareholder protection (Table 10, Panel A, column 1, coefficient on *Pre30* × *Post* × *High*). However, while the coefficient on *Pre30* × *Post* × *Low* is of smaller magnitude and only marginally significant, the two coefficients do not statistically differ from each other (not tabulated). In contrast, in Panel B, the relative increase in bid-ask spread during closed periods after MAR adoption is significant only in countries with low levels of minority investor protection (Table 9, Panel B, column 1, coefficient on *Pre30* × *Post* × *Low*). Furthermore, the coefficient on *Pre30* × *Post* × *High* is insignificantly negative, and the two coefficients statistically differ from each other (not tabulated). This result is consistent with greater private information acquisition in the absence of disclosed insider trades or firms no longer being able to achieve a separating equilibrium by voluntarily adopting governance practices that set them apart from their domestic peers – either of which highlights a limitation of MAR.

The relative amount of cash to equity compensation tends to be similar across firms within countries (Fernandes et al., 2013). The reliance on equity compensation in a firm/country has implications for the importance of insider trading. Higher levels of equity compensation lead to greater insider selling, mainly for liquidity and diversification reasons, whereas a higher cash component may lead to greater insider purchasing to increase incentive alignment. Prior research supports Manne's (1966) contention that insider trading can act as a substitute for executive compensation, both at the firm-level (Roulstone 2003) and country-level (Denis and Xu 2013).

Our results show that the probability of insider trading decreases during close periods after MAR adoption for both *Low* and *High* Non-Cash Compensation countries (Table 9, Panel A, column 2). Yet, the effect of introducing MAR on information asymmetry is significant for firms in *High* Non-Cash Compensation countries only. The positive coefficient indicates an increase in bid-ask spreads in countries with a higher proportion of executive compensation that is not cash. However, while the coefficient is statistically insignificant for countries with low non-cash compensation, it is of comparable magnitude to the high subset, and the difference between high and low countries is not significant (not tabulated). Thus, we conclude that the structure of executive pay measured at the country-level has no first order effect on MAR's adoption in treated countries.

The last country-level characteristic we consider is the Pre-MAR Closed Period Index with *High* being associated with the recommeded closed periods before the adoption of MAR. The pre-existing closed periods do not have an impact on insider trading incidence during closed periods after MAR. Still, information asymmetry worsens during closed periods after MAR adoption in countries that did not have compulsory closed periods.

Cross-Sectional Tests at the Firm-Level

Our analysis thus far suggests that firms from treated countries do not experience any improvement in liquidity during close periods. However, while MAR takes away firms' voluntary choice to set up a close period, firms can also address information asymmetry and its impact on liquidity via voluntary disclosure. If firms can credibly signal their commitment to transparency, it is possible that they can reap benefits from MAR even during close periods. To test that possibility, we replicate the main analysis for *Spread* separately for firms with analyst coverage (*Analysts*) and without analyst coverage (*No Analysts*) to capture the external visibility and information environment and for firms that issue guidance (*Guidance*) and those that do not (*No Guidance*) to capture firms' voluntary disclosure. We expect firms with a poor

information environment, i.e., no analyst coverage (*No Analysts*) and no voluntary managerial disclosure (*No Guidance*) to experience a greater relative decrease in liquidity after MAR during mandated close periods.

[Table 11 about here]

The results presented in Table 11 are in line with those expectations. Firms from treated countries with no analyst coverage (column 2) and no guidance issuance (column 4) experience a significant relative increase in bid-ask spread during close periods after MAR, as per the significantly positive coefficients on *Pre30* × *Post* × *Treatment*. In contrast, firms with analyst coverage (column 1) and those that issue guidance (column 3) experience no significant increase. When considered in combination with the significantly negative coefficients on *Post* × *Treatment* in columns 1 and 3, the results suggest that more transparent firms enjoy a net increase in liquidity after MAR. These results suggest that firms can still obtain capital market benefits from MAR during mandated close periods via greater transparency. We note, though, that analyst coverage and guidance issuance are endogenous before and after MAR, so our results merely describe the interplay between mandated and voluntary mechanisms.

6. Further Tests

Annual versus Interim Earnings Announcements

MAR mandates a close period of 30 days ahead of all earnings announcements. So far, we have treated all earnings announcements equally. However, end-of-year and interim earnings likely differ in terms of information content; therefore, in the next step we repeat our main analysis separately for *Year End* and *Interim* earnings announcements. The results are presented in Table 12. In the first (last) two columns, the dependent variable is the probability of insider trading (bid-ask spread). The sample is limited to annual (interim) observations in odd-(even-)numbered columns. In terms of the incidence of insider trading, we observe a negative and statistically significant coefficient on *Pre30* × *Post* × *Treatment* for end-of-year results but

not interim ones. Conversely, in terms of bid-ask spread, we observe a positive and statistically significant coefficient on *Pre30* × *Post* × *Treatment* only for interim announcements. Combined, the evidence does not point toward major differences between annual and interim announcements.

[Table 12 about here]

Insider Buys versus Sells

Finally, we examine whether the decrease in insider trading activity during mandated close periods is driven by a drop in insider purchases, sales, or both types of transactions. Typically, insider purchases are more likely to be informed, in part because they are less subject to litigation and reputation risk, as investors stand to gain from the subsequent price increase and insiders' incentive alignment increases. In contrast, since insider sales are more likely driven by liquidity needs, their incidence during close periods could be higher if insiders are more likely granted exceptions to trade. Either way, whether the results differ between buys and sells remains an empirical question, which we test by replicating our main results separately for *Buy* and *Sell* transactions. For brevity, we do not tabulate those results. We find that the drop in the incidence of insider trades during close periods after MAR adoption in our treated sample is statistically significant for sales but not buys. However, the coefficients are close in magnitude.

7. Conclusions

In this paper, we analyze the effectiveness of a one-size-fits-all regulation restricting insiders trading before earnings announcements, i.e., close periods. Specifically, we focus on close periods instigated across all European Union member countries and effective from July 3rd, 2016. The close periods are regulated via the Market Abuse Regulation (MAR) and ban insiders from trading their company shares 30 days before any earnings announcement. These close periods replaced any previously established close periods, whether compulsory or

recommended, less or more stringent, or implemented at a company or country level. Some E.U. member countries had established close period, and some did not have any before the E.U.-wide regulations came into force. The heterogeneity with respect to close periods across E.U. countries provides us with a natural experiment to test the effectiveness of the new rules comparing the incidence, intensity, and value of insider trades in the first instance, then profitability, and finally market consequences after the adoption of the close periods. Empirically we apply a difference-in-difference methodology and compare countries that mandated close periods after MAR (Treatment group) with those that mandated close periods beforehand (Control group).

We find that introducing close periods reduces insider trading activity during the 30-day period before earnings announcements in treated countries. We also find that the profitability of trades decreases after the adoption of MAR. These findings show that implementing the close periods effectively curbs trading by directors in their companies' shares when their information advantage is the highest. The implication of the closed periods is significant and in line with the regulators' intention to protect outside investors and level the playing field for all investors by reducing trading by insiders with access to privileged information.

In terms of wider market consequences of the implementation of closed periods, we find an overall improvement in liquidity after the closed periods were established in treated countries. However, the effect does not extend to the mandated close periods. This result is consistent with two non-mutually exclusive explanations. First, firms can no longer achieve a separating equilibrium by voluntarily adopting a close period. Second, disclosed insider trading during the 30-day period before earnings announcements was seen as an additional source of information for the less informed outside investors, especially for firms with poor information environments. Overall, our results suggest that uniform close periods implemented across all

E.U. are not more effective than policies restricting insider trading established at a firm- or country-level.

Our paper has important implications for regulators and standard setters in the European Union by providing direct evidence on the effectiveness and limitations of mandating close periods. For standard-setters outside the E.U., we provide insights into the merit of regulating close periods that contribute to debate about the role and consequences of close periods and insider trading regulation more generally.

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Appendix A. Variable Definitions

Variable	Definition	Source
Probability	An indicator variable to one if there is any insider buy or sell in a month and zero otherwise	Smart Insider
Number of trades	The total number of trades in a firm-month.	Smart Insider
Ln (Number of trades)	The natural logarithm of one plus Number of trades	
Ln_trade_value	Natural logarithm of one plus the total USD value of buys and sells in a firm-month.	Smart Insider
Average Abnormal 20-day return	For each transaction we calculate 20 trading days buy and hold market adjusted return and multiply by minus one if the transaction is a sale.	Datastream
Spread	the median of the bid-ask spread during month t, where bid-ask spread corresponds to the difference between the ask and bid prices divided by the midpoint	Datastream
Illiquidity	the monthly median of the daily ratio of absolute stock return to its dollar volume Amihud (2002)	Datastream
Treatment	an indicator variable that equals one if firm i is incorporated in one of the countries that adopted closed periods for the first time after the adoption of MAR in July of 2016, and zero otherwise	
Post	an indicator variable that takes value of one for insider trading taking place after the adoption of MAR, i.e. from 3 July 2016.	
Pre_30	an indicator variable that equals one for the 30 days before an earnings announcement and zero otherwise	
Post_30	an indicator variable that equals one for the 30 days period after the earnings announcement and zero otherwise	
Size	the natural logarithm of total assets in thousands of U.S. dollars at the beginning of fiscal year	Worldscope
Book-to-Market	ratio of the book to market value of common equity at the beginning of fiscal year	Worldscope
Return FYE	Buy and hold return for the fiscal year.	Worldscope
Negative Earnings	Dummy that equals to one when the earnings announcement earnings is negative and zero otherwise.	Worldscope
Fiscal Year End	a dummy that equals one if the earnings announcements corresponds to the fiscal year end and zero otherwise	Worldscope
Volatility	Standard deviation of daily returns.	Datastream
Rank SUE	the decile rank of SUE rescaled to range from zero to one. SUE is the absolute earnings surprise based on the last mean analysts forecast divided by price if available. If there is no mean analyst forecast available, we use a seasonal random walk model instead to forecast earnings per share	I/B/E/S, Datastream
Price	Price in U.S. dollars at the end of the fiscal year	Datastream
Turnover	Monthly average daily volume divided by number of shares.	Datastream
Ln (Analysts)	natural log of one plus the number of analysts, which corresponds to the number of analysts providing a forecast for the fiscal quarter prior to the earnings announcement	I/B/E/S
Guidance	an indicator variable equal to 1 if the firm issued earnings guidance during the fiscal year and zero otherwise	Capital IQ
GDP	Real gross domestic product (constant 2010 US$).	World Bank
GDP Growth	Percentage change of real gross domestic product.	World Bank

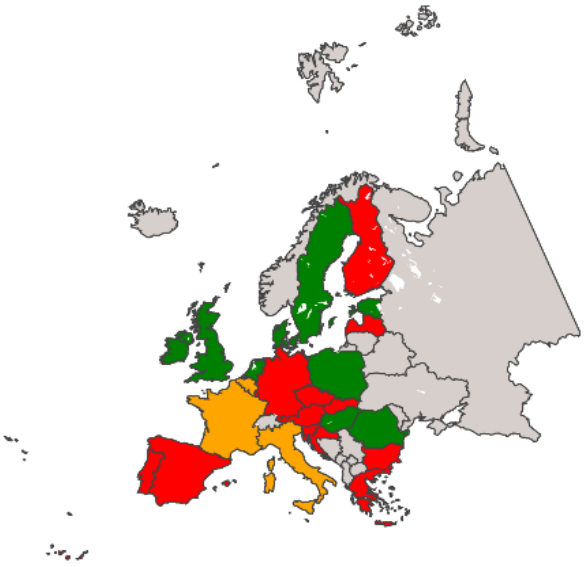

Figure 1. Pre-MAR insider trading restrictions across E.U. member countries as of 2016

This figure illustrates graphically the strength of pre-MAR restrictions on insider trading before earnings announcements in the E.U. Green color reflects countries with restrictions at least as stringent as the restrictions implemented by MAR, orange reflects countries with restrictions more lenient or only recommended but not mandated, and red denotes countries that did not have any trading restrictions before earnings announcements.

Pre- MAR Post-MAR

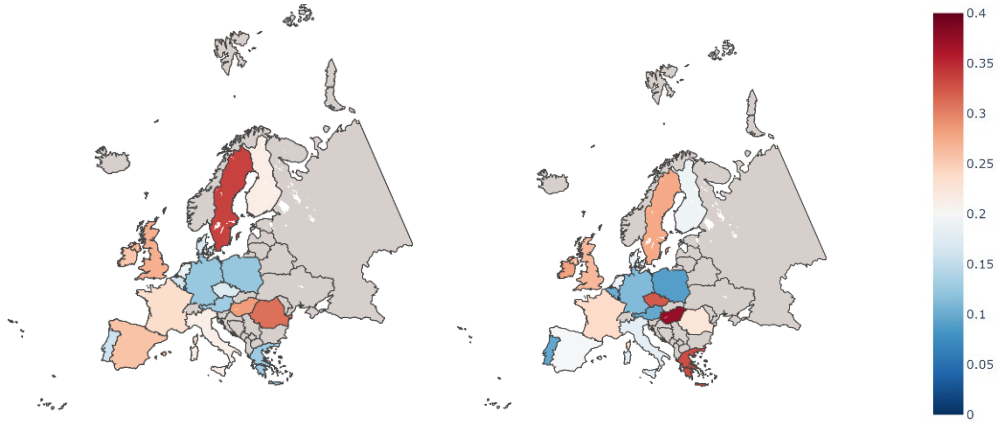

Figure 2. Probability of insider trading 30 days prior to earnings announcement - Pre vs. Post MAR adoption

This figure illustrates the probability of an insider trade taking place within 30 days prior to earnings announcement before closed periods were mandated across E.U. (Pre- MAR) and after the introduction of mandatory closed-periods across all E.U. member countries (Post-MAR).

Pre- MAR Post-MAR

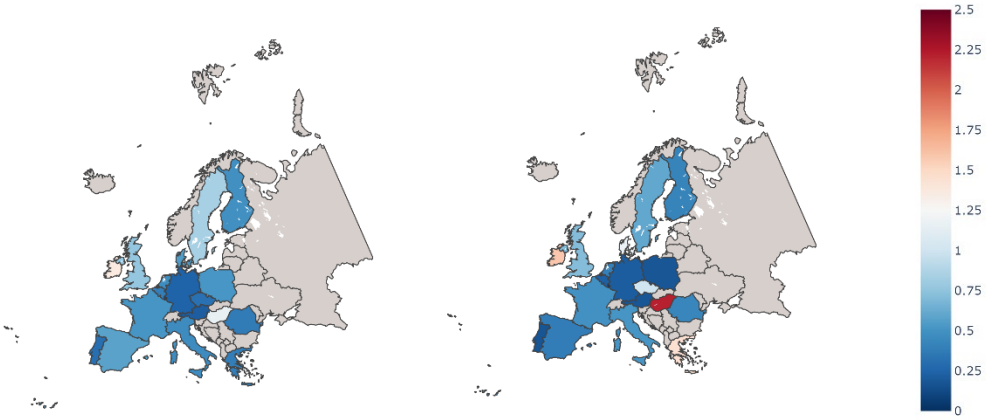

Figure 3. Number of trades 30 days prior to earnings announcement - Pre vs. Post MAR adoption

This figure illustrates the number of insider trades within 30 days prior to earnings announcement before closed periods were mandated across E.U. (Pre- MAR) and after the introduction of mandatory closed-periods across all E.U. member countries (Post-MAR).

Pre- MAR Post-MAR

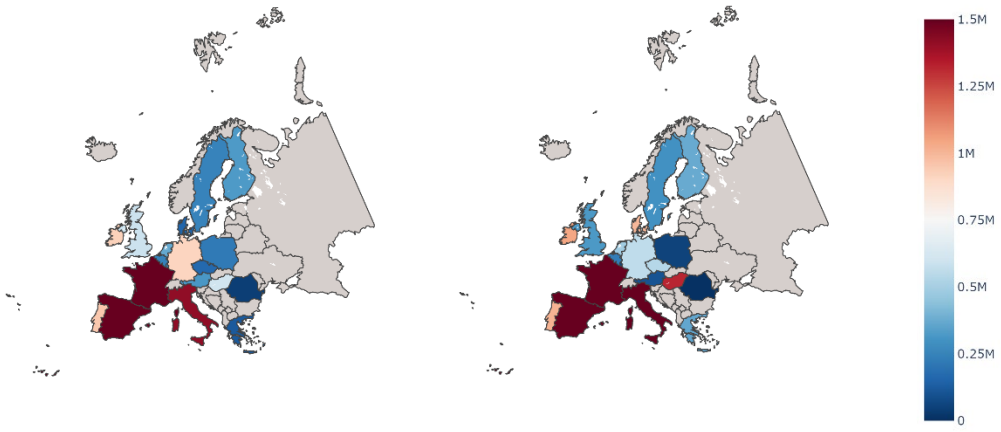

Figure 4. Value of trades in USD 30 days prior to earnings announcement - Pre vs. Post MAR adoption

This figure illustrates the average value of insider trades within 30 days prior to earnings announcement before closed periods were mandated across E.U. (Pre- MAR) and after the introduction of mandatory closed-periods across all E.U. member countries (Post-MAR).

Pre- MAR Post-MAR

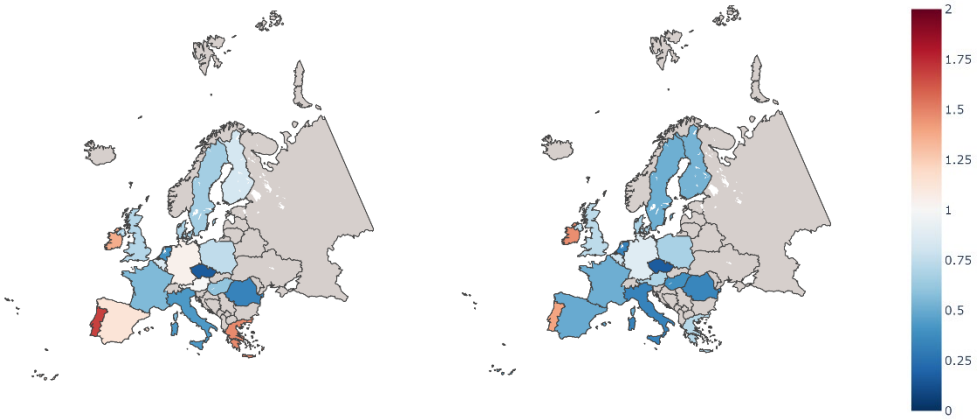

Figure 5. Spread 30 days prior to earnings announcement - Pre vs. Post MAR adoption

This figure illustrates the average spread within 30 days prior to earnings announcement before closed periods were mandated across E.U. (Pre- MAR) and after the introduction of mandatory closed-periods across all E.U. member countries (Post-MAR).

Pre- MAR Post-MAR

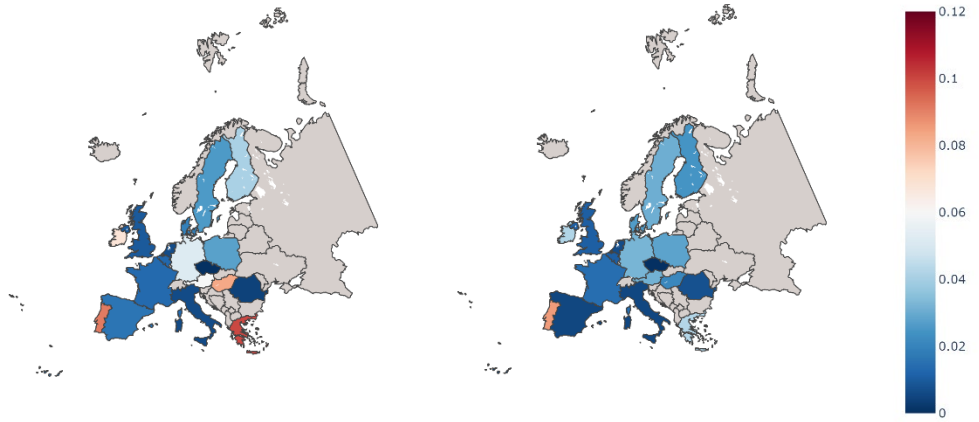

Figure 6. Illiquidity 30 days prior to earnings announcement - Pre vs. Post MAR adoption

This figure illustrates the average illiquidity within 30 days prior to earnings announcement before closed periods were mandated across E.U. (Pre- MAR) and after the introduction of mandatory closed-periods across all E.U. member countries (Post-MAR).

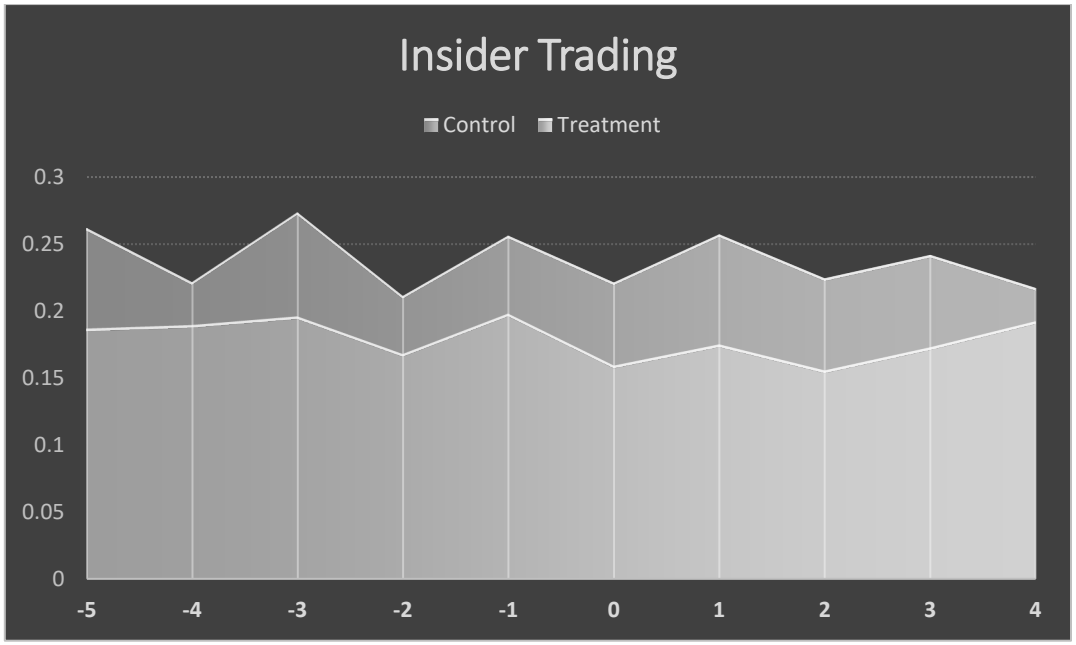

Figure 7. Probability of insider trading by quarter
This figure plots the mean probability of an insider trade taking place during a firm-month by calendar quarter during our sample period, where time zero corresponds to the adoption of MAR in July 2016.

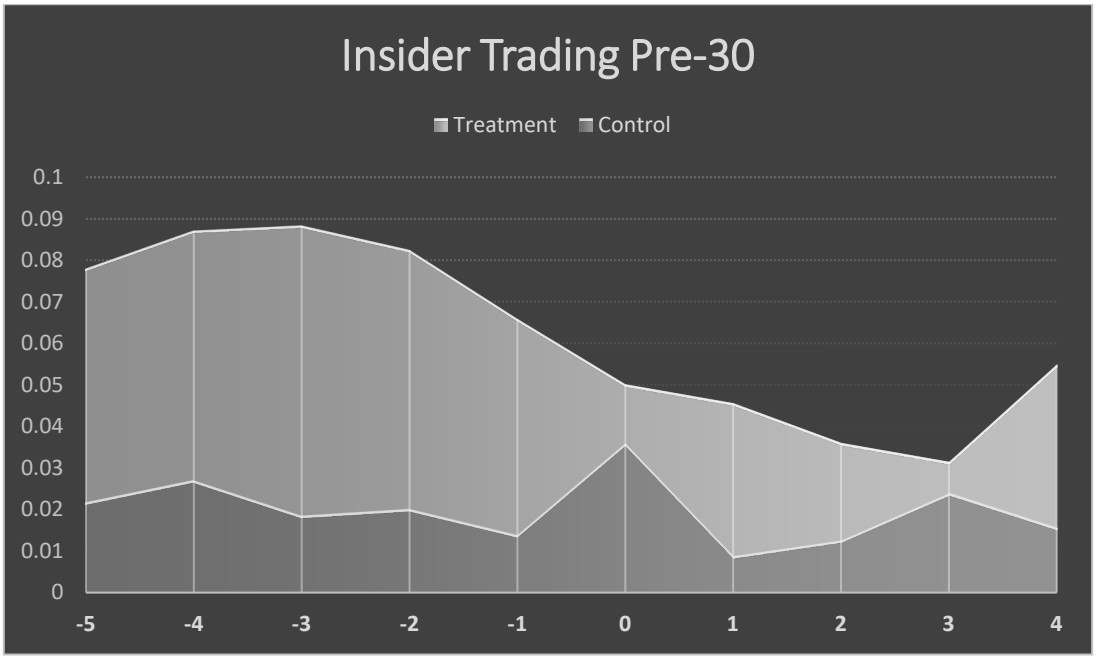

Figure 8. Probability of insider trading by quarter
This figure plots the mean probability of an insider trade taking place during the 30-day window preceding an earnings announcement by calendar quarter during our sample period, where time zero corresponds to the adoption of MAR in July 2016.

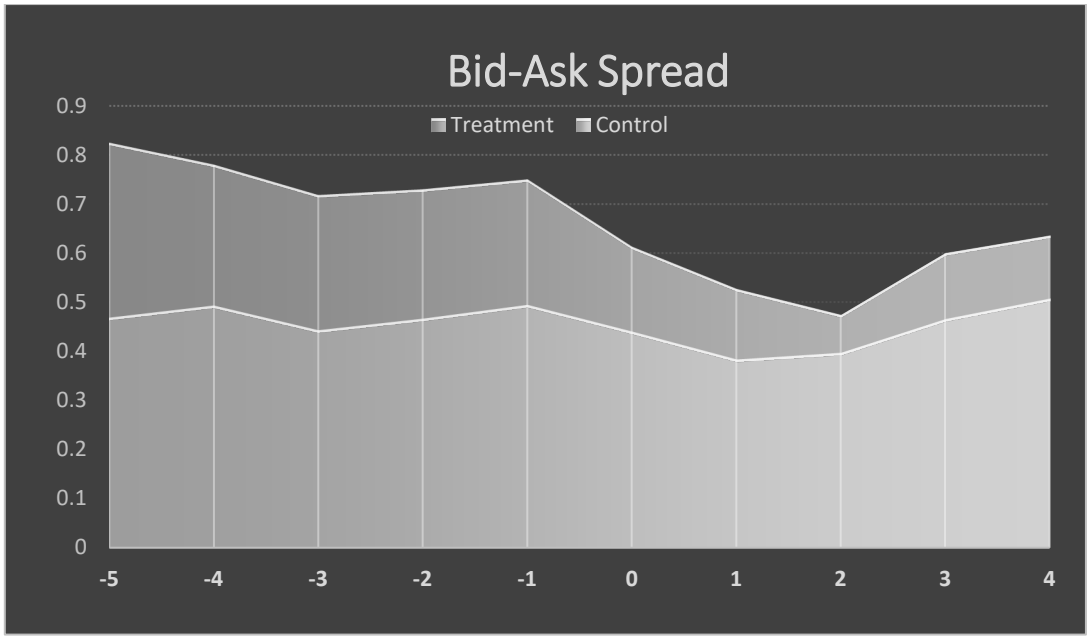

Figure 9. Bid-Ask Spread by quarter
This figure plots the mean daily bid-ask spread averaged across firm-months by calendar quarter during our sample period, where time zero corresponds to the adoption of MAR in July 2016.

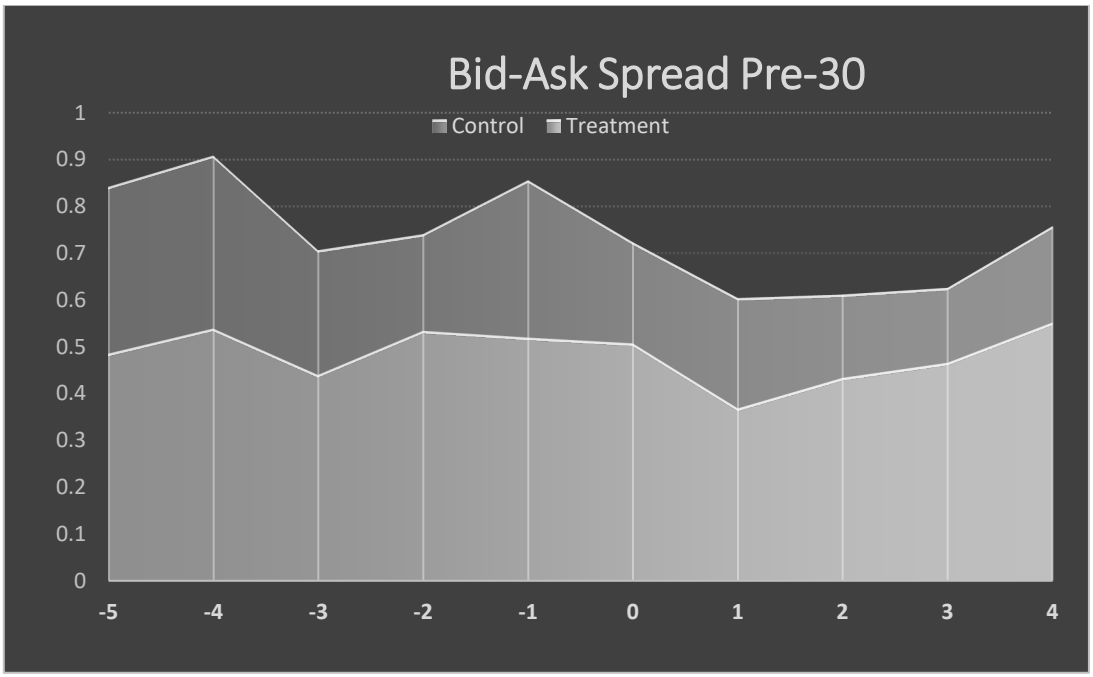

Figure 10. Bid-Ask Spread by quarter
This figure plots the mean daily bid-ask spread averaged across 30-day windows preceding an earnings announcement by calendar quarter during our sample period, where time zero corresponds to the adoption of MAR in July 2016.

Table 1. Closed Periods before MAR

	Length of closed periods before earnings announcement		
Country	**Annual**	**Semi-annual**	**Quarterly**
Countries with closed period recommended at country level before MAR			
Denmark	Each issuer's internal rules shall contain a period within which directors are permitted to trade. The maximum length of this period is six weeks after each published interim report or preliminary announcement of annual results.		
Estonia	1wk before to 1 day after disclosure	1wk before to 1 day after disclosure	1wk before to 1 day after disclosure
Hungary	FYE to EA	30 days	15 days
Ireland	60 days	60 days	30 days
Netherlands	60 days	21 days	21 days
Poland	2 months	1 month	14 days
Romania	2 months	2 months	2 months
Slovenia	30 days	30 days	30 days
Sweden	30 days	30 days	30 days
United Kingdom	60 days	30 days	30 days
Countries with closed period recommended at firm level before MAR			
Finland	No mandated non-trading period, set only by the issuer.		
France	15 day long closed period recommended but not mandated		
Italy	On a discretionary basis, many listed companies have adopted specific rules on internal dealing, specifying "blackout periods" which usually prohibit any transactions by directors or their related persons in the 15-day period prior to the approval of annual results.		
Countries with no closed period before MAR			
Austria			
Belgium			
Bulgaria			
Croatia			
Cyprus			
Czechia			
Germany			
Greece			
Latvia			
Lithuania			
Luxembourg			
Malta			
Portugal			
Slovakia			
Spain			
Slovenia			

Table 2. Sample construction and data availability

Country	Number of Earnings Announcements	Missing Accounting or Price Data	Final Sample		
			Total	Annual with Insider Trading	Interim with Insider Trading
Panel A. Treated					
Austria	851	447	404	109	295
Belgium	1,126	731	395	131	264
Bulgaria	0	0	0	0	0
Croatia	0	0	0	0	0
Cyprus	48	22	26	8	18
Czechia	73	41	32	8	24
Finland	2,239	1,479	760	197	563
France	4,365	2,213	2,152	586	1,566
Germany	4,939	2,960	1,979	544	1,435
Greece	419	243	176	48	128
Italy	2,182	1,293	889	239	650
Latvia	0	0	0	0	0
Luxembourg	190	117	73	21	52
Malta	0	0	0	0	0
Portugal	539	311	228	60	168
Slovakia	0	0	0	0	0
Spain	1,546	742	804	207	597
Slovenia	0	0	0	0	0
Total	18,517	10,599	7,918	2,158	5,760
Panel B. Control					
Denmark	979	586	393	106	287
Estonia	0	0	0	0	0
Hungary	92	50	42	12	30
Ireland	555	315	240	97	143
Netherlands	761	361	400	124	276
Romania	91	59	32	10	22
Poland	1,129	533	596	152	444
Sweden	2,725	2,080	645	168	477
United Kingdom	5,746	2,879	2,867	1,238	1,629
Total	12,078	6,863	5,215	1,907	3,308

This table presents the sample selection process and includes the number of firm-earnings announcement observations between 2014 and 2018, separately for countries in a Treated (Panel A) and a *Control (Panel B)* group. The *Treated* group includes countries where closed periods were introduced either for the first time with the adoption of MAR or where MAR increased trading restrictions, The *Control* group includes countries with existing and at least equally stringent closed periods prior to MAR. Earnings announcement dates are downloaded from Bloomberg, accounting data from Worlscope and price data from Datastream. Insider trading data are from Smart Insider. All variables are defined in Appendix A.

Table 3. Descriptive Statistics –Country level

		Insider Trading			Information Asymmetry		Corporate Governance		
Country	Probability	Number of trades	Trade value in USD	Average 20-Day Return	Spread	Illiquidity	Self-Dealing	Non-Cash Compensation	Pre-MAR Closed Period
Panel A. Treated									
Austria	0.10	0.17	181,056	0.0%	0.86	0.04	0.21	0.02	3
Belgium	0.11	0.26	244,069	0.0%	0.84	0.01	0.54	0.01	2
Cyprus	0.05	0.09	26,330	-1.7%	1.50	0.02		0.02	3
Czechia	0.21	0.51	272,935	-1.0%	0.16	0.00			3
Finland	0.18	0.39	296,410	0.8%	0.70	0.03	0.46	0.02	3
France	0.22	0.45	4,145,701	0.3%	0.54	0.01	0.38	0.03	2
Germany	0.10	0.19	669,959	0.1%	0.97	0.04	0.28	0.05	3
Greece	0.21	0.82	210,249	1.7%	1.17	0.07		0.00	3
Italy	0.18	0.44	1,399,299	-0.2%	0.38	0.01	0.39	0.01	2
Luxembourg	0.03	0.05	149,057				0.25	0.10	3
Portugal	0.12	0.22	829,734	0.7%	1.55	0.09	0.49	0.01	3
Spain	0.21	0.44	4,513,926	0.2%	0.82	0.01	0.37	0.02	3
All Treated	0.14	0.34	1,078,227	0.3%	0.86	0.03	0.37	0.03	
Panel B. Control									
Denmark	0.15	0.82	479,142	0.2%	0.69	0.02	0.47	0.03	1
Hungary	0.29	1.38	784,864	-0.9%	0.49	0.05		0.00	1
Ireland	0.23	1.23	814,479	-0.5%	1.43	0.06	0.79	0.26	1
Netherlands	0.17	0.39	412,146	-0.1%	0.37	0.01	0.21	0.09	1
Poland	0.10	0.32	123,339	0.0%	0.72	0.03	0.30	0.00	1
Romania	0.24	0.36	16,932	0.1%	0.34	0.01		0.02	1
Sweden	0.26	0.61	225,028	0.3%	0.60	0.03	0.34	0.01	1
United Kingdom	0.23	0.62	413,493	-0.1%	0.73	0.01	0.93	0.06	1
All Control	0.21	0.72	408,678	0.0%	0.67	0.03	0.51	0.06	

This table presents descriptive statistics of dependent variables used in the main regressions, separately for countries in a *Treated (Panel A)* and in a *Control (Panel B)* group. The sample includes all European countries subject to MAR for which insider trading and earnings announcement data are available in the period 2014-2018. *Treated* group includes countries where closed periods were introduced either for the first time with the adoption of MAR or where MAR increased trading restrictions. *Control* group includes countries with existing and at least equally stringent closed periods prior to MAR.

Probability is an average probability of insider trading taking place in any firm-month.

Number of trades is equal to an average number of insider trades executed in any firm-month.

Trade value is an average value of all insider trading transactions in a firm-month in USD.

Average 20-Day Return: For each transaction we calculate 20 trading days market adjusted buy and hold return and multiply by minus one if the transaction is a sale.

Spread is calculated as the difference between the ask and bid prices divided by the midpoint for all firm-months.

Illiquidity is calculated as the monthly median of the daily ratio of absolute stock return to its dollar volume (Amihud 2002).

All variables are defined in Appendix A.

Table 4. Descriptive Statistics – dependent variables pre vs. post MAR adoption

	Insider Trading					Information Asymmetry	
	Probability	Number of trades	Trade value in USD	Average 20-Day Return Buy	Average 20-Day Return Sell	Median Spread	Median Illiquidity
Panel A. Pre 30 days							
Treated							
Pre MAR	0.09***	0.18***	1,014,181*	0.64%*	-1.01%	0.87***	0.03***
Post MAR	0.06**	0.13**	762,686***	0.32%	0.13%	0.69***	0.03***
Difference Pre vs Post	-0.04**	-0.05	-251,495	-0.32%	1.15%	-0.18**	0.00
Control							
Pre MAR	0.04	0.13	233,638**	-0.59%	-0.26%	0.74***	0.02***
Post MAR	0.03	0.15	38,960***	1.21%*	-0.19%	0.74***	0.02***
Difference Pre vs Post	-0.01	0.02	-194,678**	1.80%*	0.07%	0.01	0.00
Panel B. All							
Treated							
Pre MAR	0.17***	0.36***	2,201,067*	0.44%**	-0.25%	0.85***	0.03***
Post MAR	0.15***	0.34***	1,754,628**	0.10%	0.39%	0.65***	0.02**
Difference Pre vs Post	-0.02*	-0.03	-446,439	-0.34%	0.64%	-0.20**	-0.01*
Control							
Pre MAR	0.21***	0.63***	426,729***	0.13%	-1.08%**	0.71***	0.02**
Post MAR	0.20***	0.60***	328,574***	0.11%	0.17%	0.70***	0.02***
Difference Pre vs Post	-0.01	-0.03	-98,155	-0.02%	1.25%*	-0.01	0.00

This table presents descriptive statistics of dependent variables used in the main regressions before and after MAR adoption, i.e. introduction of compulsory closed periods (*Panel A)* and 30 days prior to an earnings announcement (*Panel B*) separately for Treated and Control groups. The sample includes all European countries subject to MAR for which insider trading and earnings announcement data are available in the period 2014-2018. The treatment group includes countries where closed periods were introduced either for the first time with the adoption of MAR or where MAR increased trading restrictions. The Control group includes countries with existing and at least equally stringent closed periods prior to MAR. All variables are defined in Appendix A.

Table 5. Descriptive Statistics

	N	Mean	SD	P1	P10	Median	P90	Min	Max
Probability	77,762	0.18	0.39	0.00	0.00	0.00	1.00	0.00	1.00
Number of trades	77,762	0.46	1.66	0.00	0.00	0.00	1.00	0.00	54.00
Trade value (Million USD)	77,762	1.35	34.6	0.00	0.00	0.00	0.17	0.00	4,495
Average 20-day return Buy	7,096	0.20%	6.50%	-17.30%	-7.00%	0.10%	7.50%	-26.50%	75.80%
Average 20-day return Sell	1,766	-0.20%	6.80%	-22.00%	-7.00%	0.20%	6.70%	-39.00%	23.80%
Spread	46,201	0.56	0.95	0.02	0.05	0.21	1.41	0.02	11.46
Illiquidity	46,201	0.01	0.07	0.00	0.00	0.00	0.02	0.00	1.17
Size	77,762	21.44	2.08	16.85	18.69	21.36	24.44	13.40	25.20
Book-to-Market	77,762	0.74	0.69	0.07	0.19	0.57	1.40	0.00	8.18
Return FYE	77,762	0.09	0.38	-0.61	-0.30	0.05	0.50	-0.88	3.63
Negative Earnings	77,762	0.16	0.36	0.00	0.00	0.00	1.00	0.00	1.00
Fiscal year end	77,762	0.02	0.01	0.00	0.01	0.02	0.03	0.00	0.08
Volatility	77,762	0.31	0.46	0.00	0.00	0.00	1.00	0.00	1.00
Rank SUE	77,762	5.23	2.72	1.00	2.00	5.00	9.00	1.00	10.00
Price	77,762	84.99	626.97	0.13	1.38	13.02	95.25	0.00	12,370
Turnover	46,201	0.21	0.21	0.00	0.02	0.16	0.45	0.00	1.30
Ln (Analysts)	77,762	0.91	1.04	0.00	0.00	0.69	2.56	0.00	3.64
Guidance	77,762	0.51	0.50	0.00	0.00	1.00	1.00	0.00	1.00
GDP	77,762	2.0	1.3	0.2	0.3	2.7	3.7	0.0	3.9
GDP Growth	77,762	2.06	1.89	-0.90	0.78	1.79	3.19	-6.55	25.18

This table presents descriptive statistics of dependent and independent variables used in the main regressions. The sample includes all European countries subject to MAR for which insider trading and earnings announcement data are available in the period 2014-2018. All variables are defined in Appendix A.

Table 6. Insider trading around MAR adoption – trading behavior

	Probability		Ln (Number of trades)		Ln (Trade value)	
Post ×Treatment	0.004	-0.003	0.003	-0.001	0.019	-0.049
	(0.263)	(-0.211)	(0.128)	(-0.029)	(0.090)	(-0.276)
Post	-0.021*	-0.011	-0.019	-0.004	-0.263**	-0.081
	(-2.023)	(-1.235)	(-1.216)	(-0.311)	(-2.357)	(-0.831)
Treatment	-0.042		-0.053*		-0.403	
	(-1.458)		(-1.845)		(-1.110)	
Pre30 × Post × Treatment	**-0.026***	**-0.026***	**-0.025***	**-0.025***	**-0.327***	**-0.327***
	(-2.023)	**(-2.014)**	**(-1.995)**	**(-1.980)**	**(-2.088)**	**(-2.078)**
Post30 × Post × Treatment	-0.013	-0.013	0.008	0.008	-0.095	-0.095
	(-1.090)	(-1.082)	(0.710)	(0.711)	(-0.702)	(-0.696)
Post30 × Treatment	-0.111***	-0.112***	-0.185***	-0.185***	-1.509***	-1.509***
	(-3.607)	(-3.623)	(-3.931)	(-3.950)	(-3.548)	(-3.563)
Pre30 × Treatment	0.088***	0.088***	0.096***	0.096***	1.027**	1.027**
	(2.926)	(2.916)	(3.227)	(3.211)	(2.767)	(2.756)
Pre30 × Post	0.003	0.003	0.006	0.006	0.052	0.055
	(0.314)	(0.334)	(0.641)	(0.658)	(0.456)	(0.477)
Post30 × Post	0.013	0.013	-0.014	-0.013	0.089	0.092
	(1.517)	(1.542)	(-1.549)	(-1.515)	(1.022)	(1.059)
Pre30	-0.168***	-0.168***	-0.181***	-0.181***	-2.058***	-2.062***
	(-5.991)	(-5.987)	(-6.483)	(-6.470)	(-6.047)	(-6.033)
Post30	0.174***	0.174***	0.263***	0.263***	2.318***	2.314***
	(5.910)	(5.931)	(5.715)	(5.735)	(5.694)	(5.713)
Size	0.020***	0.001	0.026***	-0.001	0.305***	0.086
	(4.633)	(0.039)	(4.656)	(-0.049)	(5.141)	(0.434)
Book-to-Market	-0.032***	-0.018*	-0.039***	-0.024*	-0.463***	-0.269**
	(-4.229)	(-1.978)	(-4.879)	(-1.961)	(-4.763)	(-2.148)
Return FYE	-0.009	-0.013	-0.008	-0.018*	-0.079	-0.128
	(-1.001)	(-1.542)	(-0.744)	(-1.742)	(-0.773)	(-1.215)
Negative Earnings	-0.029***	-0.018**	-0.032***	-0.017*	-0.371***	-0.233***
	(-3.106)	(-2.525)	(-2.875)	(-2.020)	(-3.695)	(-2.962)
Fiscal year end	0.012	0.018**	0.025	0.030*	0.189	0.242**
	(1.366)	(2.121)	(1.515)	(1.747)	(1.613)	(2.118)
GDP	-0.000	0.000	-0.000	0.000	-0.000	0.000
	(-0.227)	(1.045)	(-0.594)	(0.013)	(-0.015)	(0.525)
GDP Growth	-0.005	-0.001	-0.003	-0.001	-0.045	-0.009
	(-1.023)	(-0.923)	(-0.486)	(-0.719)	(-0.731)	(-0.813)
Observations	77,762	77,762	77,762	77,762	77,762	77,762
R-squared	0.0579	0.1850	0.0612	0.2137	0.0625	0.1941
Cluster	Country	Country	Country	Country	Country	Country
Year FE	No	Yes	No	Yes	No	Yes
Firm FE	No	Yes	No	Yes	No	Yes
Country FE	No	No	No	No	No	No

This table presents regression results for difference-in-difference tests for *Probability*, intensity (*Number of trades*) and value (*Ln(Trade value))* of insider trading around adoption of Market Abuse Regulation (MAR) adoption. MAR took effect in July 2016 in the European Union and prohibits corporate insiders from trading within 30 days prior to earnings announcements. Our unit of observation is firm-month. For the probability results the dependent variable is equal to 1 if there is at least one insider trade in a firm-month and zero otherwise. Ln(*Number of trades)* is equal to the logarithm of one plus the number of insider trades executed in a firm-month. *Ln (Trade value)* is a natural logarithm of the sum of all insider trading transactions in a firm-month. *Post* is a dummy variable equal to one for firm-months after the adoption of MAR (i.e. 06/07/2016 – 31/12/2018) and zero before (01/2014 – 05/07/2016). *Treatment* is a dummy variable equal to one for firm-months in countries where closed periods were introduced either for the first time with the adoption of MAR or where MAR increased trading restrictions and zero for firm-months in a control group that includes countries with existing and at least equally stringent closed periods prior to MAR. *Pre30* is a dummy variable equal to one for a period of 30 days prior to earnings announcement and zero for any other firm-month. *Post30* is a dummy variable equal to one for a period of 30 days subsequent to earnings announcement and zero for any other firm-month. The sample includes all European countries subject to MAR for which insider trading and earnings announcement data are available in the period 2014-2018. All variables are defined in Appendix A. T-statistics are reported in parentheses. *, **, *** denote significance at the 10%, 5% and 1% level, respectively. Standard errors are clustered at the country level.

Table 7. Insider trading around MAR adoption – profitability

	Average Abnormal 20-day return			
	Buy	Buy	Sell	Sell
Post ×Treatment	0.000	0.000	-0.008	-0.004
	(0.027)	(0.113)	(-1.044)	(-0.299)
Post	-0.001	0.001	0.015**	0.018
	(-0.320)	(0.313)	(2.233)	(1.416)
Treatment	0.003		0.011*	
	(0.933)		(2.050)	
Pre30 × Post × Treatment	**-0.021***	**-0.032*****	**0.019**	**0.039***
	(-1.740)	**(-3.054)**	**(0.921)**	**(1.922)**
Post30 × Post × Treatment	-0.010*	-0.011**	0.002	0.009
	(-1.803)	(-2.224)	(0.164)	(0.728)
Post30 × Treatment	-0.001	0.001	-0.006	-0.011
	(-0.301)	(0.300)	(-0.932)	(-1.167)
Pre30 × Treatment	0.009	0.015**	-0.019	-0.035*
	(1.378)	(2.234)	(-1.118)	(-1.942)
Pre30 × Post	0.019	0.028***	-0.014	-0.029
	(1.685)	(3.263)	(-0.845)	(-1.602)
Post30 × Post	0.002	0.001	-0.006	-0.014
	(0.360)	(0.240)	(-0.830)	(-1.330)
Pre30	-0.007	-0.010	0.010	0.030*
	(-1.074)	(-1.497)	(0.710)	(2.044)
Post30	0.002	0.002	0.004	0.009
	(1.009)	(1.181)	(1.213)	(1.129)
Size		-0.009**		-0.003
		(-2.256)		(-0.229)
Book-to-Market		0.010*		0.012
		(1.973)		(0.716)
Return FYE		-0.000		0.004
		(-0.034)		(0.555)
Ln (Trade value)		-0.001*		0.001
		(-1.895)		(0.657)
Observations	7,096	7,096	1,766	1,766
R-squared	0.0016	0.1658	0.0078	0.4598
Cluster	Country	Country	Country	Country
Year FE	No	Yes	Yes	Yes
Firm FE	No	Yes	Yes	Yes
Country FE	No	No	No	No

This table presents regression results for the profitability of insider trading around Market Abuse Regulation (MAR) adoption. MAR took effect in July 2016 in the European Union and prohibits corporate insiders from trading within 30 days prior to earnings announcements. Our unit of observation is firm-month. *Average 20-day return* is calculated as the monthly average of the net cumulative 20 trading days abnormal returns following an insider trading transaction. *Post* is a dummy variable equal to one for firm-months after the adoption of MAR (i.e. 06/07/2016 – 31/12/2018) and zero before (01/2014 – 05/07/2016). *Treatment* is a dummy variable equal to one for firm-months in countries where closed periods were introduced either for the first time with the adoption of MAR or where MAR increased trading restrictions and zero for firm-months in a control group that includes countries with existing and at least equally stringent closed periods prior to MAR. *Pre30* is a dummy variable equal to one for a period of 30 days prior to earnings announcement and zero for any other firm-month. *Post30* is a dummy variable equal to one for a period of 30 days subsequent to earnings announcement and zero for any other firm-month. The sample includes all European countries subject to MAR for which insider trading and earnings announcement data are available in the period 2014-2018. All variables are defined in Appendix A. T-statistics are reported in parentheses. *, **, *** denote significance at the 10%, 5% and 1% level, respectively. Standard errors are clustered at the country level.

Table 8. Economic consequences of MAR adoption – information asymmetry and liquidity

	Spread		Illiquidity	
Post ×Treatment	-0.167**	-0.068*	-0.008**	-0.006**
	(-2.523)	(-1.910)	(-2.315)	(-2.248)
Post	0.066**	0.008	0.005***	0.003*
	(2.768)	(0.312)	(3.393)	(1.955)
Treatment	0.245***		0.012**	
	(2.965)		(2.408)	
Pre30 × Post × Treatment	**0.058****	**0.038***	**0.009****	**0.006***
	(2.203)	**(1.838)**	**(2.199)**	**(1.798)**
Post30 × Post × Treatment	0.005	0.005	-0.001	-0.002
	(0.256)	(0.291)	(-0.880)	(-1.198)
Post30 × Treatment	-0.007	0.004	0.001	0.002**
	(-0.483)	(0.304)	(0.795)	(2.294)
Pre30 × Treatment	-0.018	-0.020	-0.001	-0.001
	(-0.875)	(-1.028)	(-0.372)	(-0.567)
Pre30 × Post	-0.002	-0.007	-0.001	-0.001
	(-0.279)	(-0.798)	(-0.947)	(-1.705)
Post30 × Post	0.005	0.009	-0.000	-0.000
	(0.334)	(0.639)	(-0.215)	(-0.396)
Pre30	0.014*	0.017*	0.000	0.001
	(1.996)	(1.851)	(0.436)	(1.435)
Post30	-0.000	-0.015	0.000	-0.001
	(-0.016)	(-1.494)	(0.351)	(-1.241)
Size	-0.155***	-0.139	-0.006***	-0.019***
	(-11.085)	(-1.547)	(-4.446)	(-3.516)
Book-to-Market	0.235***	0.109**	0.010**	0.003
	(4.415)	(2.782)	(2.407)	(0.806)
Return FYE	0.041	-0.011	-0.001	-0.005**
	(1.009)	(-0.428)	(-0.365)	(-2.831)
Negative Earnings	0.127**	0.066**	0.007*	0.002
	(2.332)	(2.850)	(1.838)	(1.124)
Volatility	17.329***	12.400***	1.133***	1.079***
	(5.189)	(5.802)	(3.424)	(3.784)
Fiscal year end	0.213***	-0.016*	0.007**	-0.004*
	(6.277)	(-2.086)	(2.536)	(-1.927)
Rank SUE	0.014*	0.002	0.001*	0.000
	(1.880)	(0.812)	(1.818)	(0.393)
Price	0.000**	0.000	0.000	0.000
	(2.650)	(1.699)	(1.282)	(0.128)
Turnover	-101.436***	-62.878***	-5.032***	-5.397***
	(-11.666)	(-8.442)	(-5.245)	(-4.616)
Ln (Analysts)	-0.111***	0.011	-0.003*	0.002*
	(-5.576)	(1.654)	(-1.997)	(1.856)
Guidance	-0.138***	0.006	-0.006	-0.001
	(-3.293)	(0.654)	(-1.457)	(-1.698)
GDP	0.000	0.000	0.000	-0.000
	(0.821)	(0.601)	(0.715)	(-1.170)
GDP Growth	0.019	-0.019	0.001	0.001
	(1.496)	(-1.004)	(1.270)	(1.146)
Observations	46,201	46,201	46,201	46,201
R-squared	0.3640	0.7594	0.1231	0.5141
Cluster	Country	Country	Country	Country
Year FE	No	Yes	No	Yes
Firm FE	No	Yes	No	Yes
Country FE	No	No	No	No

This table presents regression results testing the effect of the introduction of insider trading closed periods via Market Abuse Regulation (MAR) on information asymmetry (*Spread*) and market liquidity (*Illiquidity*). MAR took effect in July 2016 in the European Union and prohibits corporate insiders from trading within 30 days prior to earnings announcements. Our unit of observation is firm-month. *Spread* is calculated as the difference between the ask and bid prices divided by the midpoint. *Illiquidity* is calculated as the monthly median of the daily ratio of absolute stock return to its dollar volume (Amihud 2002).

Post is a dummy variable equal to one for firm-months after the adoption of MAR (i.e. 06/07/2016 – 31/12/2018) and zero before (01/2014 – 05/07/2016). *Treatment* is a dummy variable equal to one for firm-months in countries where closed periods were introduced either for the first time with the adoption of MAR or where MAR increased trading restrictions, and zero for firm-months in a control group that includes countries with existing and at least equally stringent closed periods prior to MAR. *Pre30* is a dummy variable equal to one for a period of 30 days prior to earnings announcement and zero for any other firm-month. *Post30* is a dummy variable equal to one for a period of 30 days subsequent to earnings announcement and zero for any other firm-month. The sample includes all European countries subject to MAR for which insider trading and earnings announcement data are available in the period 2014-2018. All variables are defined in Appendix A. T-statistics are reported in parentheses. *, **, *** denote significance at the 10%, 5% and 1% level, respectively. Standard errors are clustered at the country level.

Table 9. The effect of MAR adoption – Parallel trend

	Probability	Number of trades	Ln (Trade value)	Spread	Illiquidity
Post × Treatment	-0.004	-0.002	-0.055	-0.075*	-0.005*
	(-0.232)	(-0.079)	(-0.283)	(-1.811)	(-1.814)
Pre30 × Minus2 × Treatment	0.010	0.007	0.073	0.057	-0.006
	(0.379)	(0.236)	(0.215)	(1.329)	(-1.163)
Pre30 × Minus1 × Treatment	0.028	0.040	0.408	0.018	-0.009
	(0.865)	(1.017)	(0.912)	(0.201)	(-0.634)
Pre30 × Post × Treatment	**-0.022***	**-0.021**	**-0.276***	**0.046***	**0.005**
	(-1.735)	**(-1.580)**	**(-1.763)**	**(2.010)**	**(1.282)**
Post30 × Minus2 × Treatment	-0.001	-0.070	-0.072	0.007	0.001
	(-0.016)	(-1.555)	(-0.165)	(0.206)	(0.201)
Post30 × Minus1 × Treatment	-0.013	0.026	-0.091	-0.003	0.012**
	(-0.312)	(0.405)	(-0.173)	(-0.052)	(2.127)
Post30 × Post × Treatment	-0.015	0.001	-0.119	0.005	-0.001
	(-1.164)	(0.117)	(-0.808)	(0.387)	(-0.436)
Post30 × Treatment	-0.110***	-0.178***	-1.484***	0.004	0.001
	(-3.715)	(-3.912)	(-3.615)	(0.288)	(1.407)
Pre30 × Treatment	0.083***	0.091***	0.976**	-0.028	-0.000
	(2.911)	(3.265)	(2.720)	(-1.271)	(-0.080)
Pre30 × Minus2	-0.037***	-0.027*	-0.387***	-0.046**	0.000
	(-4.183)	(-1.916)	(-4.132)	(-2.784)	(0.083)
Pre30 × Minus1	0.006	-0.009	0.048	0.056***	0.002
	(0.242)	(-0.284)	(0.184)	(3.900)	(0.951)
Pre30 × Post	-0.000	0.003	0.017	-0.010	-0.001
	(-0.037)	(0.271)	(0.154)	(-1.160)	(-1.206)
Post30 × Minus2	0.016	0.097**	0.302	-0.026	-0.005
	(0.479)	(2.337)	(0.740)	(-0.719)	(-0.870)
Post30 × Minus1	-0.018	-0.073	-0.357	-0.009	0.002
	(-0.446)	(-1.174)	(-0.699)	(-0.196)	(0.859)
Post30 × Post	0.014	-0.009	0.096	0.006	-0.001
	(1.532)	(-0.891)	(1.049)	(0.436)	(-0.755)
Minus1	0.027**	0.041***	0.330**	0.003	-0.007*
	(2.676)	(3.276)	(2.806)	(0.094)	(-1.996)
Minus2	-0.001	-0.024*	-0.108	0.016	-0.002
	(-0.075)	(-2.020)	(-0.911)	(0.431)	(-0.766)
Pre30	-0.165***	-0.178***	-0.055	0.021**	0.001
	(-6.135)	(-6.794)	(-0.283)	(2.106)	(1.144)
Post30	0.174***	0.259***	0.073	-0.012	-0.000
	(6.172)	(5.763)	(0.215)	(-1.504)	(-0.585)
Minus2 × Treatment	-0.002	0.000	0.408	-0.036	0.001
	(-0.160)	(0.026)	(0.912)	(-0.528)	(0.258)
Minus1 × Treatment	-0.006	-0.017	-0.276*	-0.035	0.002
	(-0.315)	(-0.688)	(-1.763)	(-1.135)	(0.790)
Observations	77,762	77,762	77,762	46,201	46,201
R-squared	0.1853	0.2142	0.1944	0.7594	0.5143
Controls	Included	Included	Included	Included	Included
Cluster	Country	Country	Country	Country	Country
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Country FE	No	No	No	No	No

This table presents regression results testing the effect of introduction of insider trading closed periods via Market Abuse Regulation (MAR) on probability (*Probability*), intensity (*Number of trades*) and volume (*Ln(Trade value))* of insider trading as well as information asymmetry (*Spread*) and liquidity (*Illiquidity*) including pre-period dummies. *Minus1, Minus 2* are

indicator variables that equal to one if insider trading takes place prior to the first or second quarter before MAR, respectively. MAR took effect in July 2016 in the European Union and prohibits corporate insiders from trading within 30 days prior to earnings announcements. Our unit of observation is firm-month. For the probability results the dependent variable is equal to 1 if there is at least one insider in a firm-month and zero otherwise. *Number of trades* is equal to a number of insider trades executed in a firm-month. *Ln (Trade value)* is a natural logarithm of the sum of all insider trading transactions in a firm-month. *Spread* is calculated as the difference between the ask and bid prices divided by the midpoint. *Illiquidity* is calculated as the monthly median of the daily ratio of absolute stock return to its dollar volume (Amihud 2002). *Minus1 (Minus2)* is equal to one if the period is the quarter (two quarters) before the adoption of MAR. *Post* is a dummy variable equal to one for firm-months after the adoption of MAR (i.e. 06/07/2016 – 31/12/2018) and zero before (01/2014 – 05/07/2016). *Treatment* is a dummy variable equal to one for firm-months in countries where closed periods were introduced either for the first time with the adoption of MAR or where MAR increased trading restrictions and zero for firm-months in a control group that includes countries with existing and at least equally stringent closed periods prior to MAR. *Pre30* is a dummy variable equal to one for a period of 30 days prior to earnings announcement and zero for any other firm-month. *Post30* is a dummy variable equal to one for a period of 30 days subsequent to earnings announcement and zero for any other firm-month. The sample includes all European countries subject to MAR for which insider trading and earnings announcement data are available in the period 2014-2018. All variables are defined in Appendix A. T-statistics are reported in parentheses. *, **, *** denote significance at the 10%, 5% and 1% level, respectively. Standard errors are clustered at the country level.

Table 10. Insider trading around MAR adoption – cross-country characteristics

Panel A.	Probability		
	Self-Dealing	Non-Cash Compensation	Pre-MAR closed period
Post	-0.011	-0.011	-0.010
	(-1.268)	(-1.271)	(-1.293)
Pre30 × Post × High	**-0.039***	**-0.023***	**-0.023**
	(-1.854)	**(-2.092)**	**(-1.681)**
Pre30 × Post × Low	**-0.020**	**-0.027***	**-0.025**
	(-1.688)	**(-1.818)**	**(-1.577)**
Post30 × Post × High	-0.020*	-0.027**	-0.010
	(-1.792)	(-2.436)	(-0.905)
Post30 × Post × Low	-0.010	-0.008	-0.006
	(-0.657)	(-0.633)	(-0.288)
Post30 × High	-0.112***	-0.103***	0.072**
	(-3.411)	(-3.397)	(2.139)
Post30 × Low	-0.111***	-0.114***	0.107***
	(-3.520)	(-3.506)	(3.197)
Pre30 × High	0.087**	0.101***	-0.104***
	(2.625)	(3.519)	(-2.938)
Pre30 × Low	0.088**	0.082**	-0.134***
	(2.831)	(2.673)	(-3.667)
Pre30 × Post	0.003	0.003	0.003
	(0.334)	(0.307)	(0.280)
Post30 × Post	0.013	0.014	0.008
	(1.542)	(1.592)	(0.864)
Pre30	-0.168***	-0.168***	-0.174***
	(-5.986)	(-5.959)	(-5.309)
Post30	0.174***	0.173***	0.184***
	(5.932)	(5.883)	(5.393)
Post × High	0.008	-0.010	0.007
	(0.408)	(-0.934)	(0.529)
Post × Low	-0.009	-0.001	-0.016
	(-0.481)	(-0.056)	(-0.835)
High		0.214***	0.007
		(24.626)	
Low		0.188***	
		(23.397)	
Observations	77,762	77,762	77,762
R-squared	0.1851	0.1852	0.1854
Controls	Yes	Yes	Yes
Cluster	Country	Country	Country
Year FE	Yes	Yes	Yes
Firm FE	No	No	No
Country FE	Yes	Yes	Yes

Table 10 *continued*. Insider trading around MAR adoption – cross-country characteristics

Panel B.	Spread		
	Self-Dealing	Non-Cash Compensation	Pre-MAR Closed Period
Post	0.008	0.010	0.007
	(0.292)	(0.348)	(0.233)
Pre30 × Post × High	**-0.020**	**0.042*****	**0.010**
	(-0.899)	**(3.383)**	**(0.399)**
Pre30 × Post × Low	**0.064****	**0.037**	**0.066****
	(2.832)	**(1.465)**	**(2.509)**
Post30 × Post × High	0.001	-0.001	-0.005
	(0.027)	(-0.060)	(-0.365)
Post30 × Post × Low	0.005	0.009	0.013
	(0.301)	(0.434)	(0.585)
Post30 × High	0.009	0.013	0.009
	(0.679)	(1.200)	(0.487)
Post30 × Low	0.003	-0.000	-0.046*
	(0.174)	(-0.018)	(-1.986)
Pre30 × High	0.026	-0.034***	0.018*
	(1.262)	(-3.156)	(1.769)
Pre30 × Low	-0.039*	-0.015	-0.008
	(-1.769)	(-0.633)	(-0.339)
Pre30 × Post	-0.007	-0.006	-0.007
	(-0.819)	(-0.770)	(-0.839)
Post30 × Post	0.010	0.008	0.010
	(0.711)	(0.539)	(0.740)
Pre30	0.017*	0.017*	0.017*
	(1.859)	(1.842)	(1.856)
Post30	-0.016	-0.015	-0.016
	(-1.545)	(-1.410)	(-1.521)
Post × High	-0.034	-0.027	0.000
	(-0.680)	(-0.430)	(0.009)
Post × Low	-0.083	-0.083	-0.132**
	(-1.349)	(-1.303)	(-2.296)
High		0.058	
		(0.652)	
Low		0.118***	
		(3.221)	
Observations	46,201	46,201	46,201
R-squared	0.7595	0.7595	0.7599
Controls	Yes	Yes	Yes
Cluster	Country	Country	Country
Year FE	Yes	Yes	Yes
Firm FE	No	No	No
Country FE	Yes	Yes	Yes

This table presents regression results testing the association between country-level quality of corporate governance and the effect of the introduction of insider trading closed periods via Market Abuse Regulation (MAR) on the occurrence of insider trading (*Panel A. Probability*) and information asymmetry (*Panel B. Spread*). MAR took effect in July 2016 in the European Union and prohibits corporate insiders from trading within 30 days prior to earnings announcements. Our unit of observation is firm-month. For the probability results the dependent variable is equal to 1 if there is at least one insider trade in a firm-month and zero otherwise. *Spread* is calculated as the difference between the ask and bid prices divided by the midpoint *Self-dealing* is an Anti-Self Dealing Index measuring the protection of minority shareholders against expropriation by management and controlling shareholders at a country level (source: Djankov et al. 2008). High (Low) Anti-Self-Dealing Index is one if

the Anti-Self-Delaing Index is above (below or equal) 0.38. *Non-cash compensation* is the average percentage of non-cash compensation at the country level. Non-cash compensation corresponds to compensation type 31 from CIQ compensation classification. Total compensation is obtained from type 18 from CIQ compensation classification. *High (Low)* is a dummy variable equal to one if a country's Non-cash Compensation is above (below) the yearly median. *Pre-MAR closed period* is an index that takes value of one for firms incorporated in ccountries with closed periods recommended at country level before MAR, equals to two for firms incorporated in countries with closed periods recommended at a firm level before MAR and three for countries without closed period before MAR adoption (i.e. *Treated*). High (Low) Pre-MAR closed period is equal to one if the treated country had (did not have) recommended closed periods. *Post* is a dummy variable equal to one for firm-months after the adoption of MAR (i.e. 06/07/2016 – 31/12/2018) and zero before (01/2014 – 05/07/2016). *Treatment* is a dummy variable equal to one for firm-months in countries where closed periods were introduced either for the first time with the adoption of MAR or where MAR increased trading restrictions and zero for firm-months in a control group that includes countries with existing and at least equally stringent closed periods prior to MAR. *Pre30* is a dummy variable equal to one for a period of 30 days prior to earnings announcement and zero for any other firm-month. *Post30* is a dummy variable equal to one for a period of 30 days subsequent to earnings announcement and zero for any other firm-month. The sample includes all European countries subject to MAR for which insider trading and earnings announcement data are available in the period 2014-2018. All variables are defined in Appendix A. T-statistics are reported in parentheses. *, **, *** denote significance at the 10%, 5% and 1% level, respectively. Standard errors are clustered at the country level.

Table 11. Insider trading around MAR adoption – firm transparency

Dependent variable:	Spread			
Partition:	Analysts	No Analysts	Guidance	No Guidance
Post × Treatment	-0.072*	-0.174*	-0.129***	-0.075
	(-1.926)	(-1.914)	(-3.765)	(-0.693)
Post	0.014	0.074	0.069**	-0.007
	(0.454)	(1.274)	(2.431)	(-0.122)
Pre30 × Post × Treatment	**0.004**	**0.129***	**0.036**	**0.098****
	(0.259)	**(1.924)**	**(1.407)**	**(2.262)**
Post30 × Post × Treatment	0.024	-0.036	0.021	0.008
	(1.432)	(-1.075)	(1.184)	(0.245)
Post30 × Treatment	-0.014	0.015	-0.023**	0.002
	(-0.747)	(0.478)	(-2.596)	(0.079)
Pre30 × Treatment	-0.004	-0.001	-0.009	-0.038
	(-0.361)	(-0.021)	(-0.448)	(-1.203)
Pre30 × Post	-0.025***	0.022	-0.020*	0.012
	(-4.577)	(1.023)	(-1.948)	(0.885)
Post30 × Post	-0.010	0.035	-0.010	0.014
	(-0.752)	(1.121)	(-0.552)	(0.702)
Pre30	0.013**	-0.003	0.006	0.024**
	(2.766)	(-0.211)	(0.697)	(2.789)
Post30	0.003	-0.007	0.013**	-0.016
	(0.236)	(-0.324)	(2.537)	(-0.911)
Size	-0.131***	-0.200***	-0.129***	-0.180***
	(-11.213)	(-8.391)	(-10.010)	(-8.249)
Book-to-Market	0.187***	0.299***	0.193***	0.288***
	(6.758)	(2.903)	(3.357)	(3.786)
Return FYE	0.004	0.119**	0.069	0.013
	(0.122)	(2.190)	(1.629)	(0.203)
Negative Earnings	0.099**	0.142	0.143***	0.082
	(2.651)	(1.402)	(3.613)	(0.955)
Volatility	9.905***	25.163***	8.133***	24.882***
	(6.509)	(4.660)	(4.729)	(4.169)
Rank SUE	0.023***	0.013	0.017*	0.016
	(4.792)	(1.289)	(2.106)	(1.715)
Price	0.000	0.000	-0.000	0.000**
	(1.573)	(1.623)	(-0.909)	(2.691)
Turnover	-0.763***	-1.606***	-0.810***	-1.232***
	(-9.497)	(-6.581)	(-7.702)	(-5.208)
Ln (Analysts)			-0.045***	-0.167***
			(-3.660)	(-4.827)
Guidance	-0.058**	-0.246***		
	(-2.112)	(-4.678)		
GDP	0.000	-0.000	-0.000	0.000
	(0.318)	(-0.502)	(-1.037)	(0.697)
GDP Growth	-0.017	-0.043	-0.009	-0.036
	(-0.869)	(-1.655)	(-1.664)	(-1.367)
Fiscal year end	0.049**	0.504***	0.099***	0.281***
	(2.454)	(2.902)	(4.660)	(4.664)
Observations	27,255	18,946	23,594	22,607
R-squared	0.3590	0.4096	0.4474	0.3761
Cluster	Country	Country	Country	Country
Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No
Country FE	Yes	Yes	Yes	Yes

This table presents regression results testing the effect of introduction of insider trading closed periods via Market Abuse Regulation (MAR) on information asymmetry (*Spread*) depending on the information environment of the firm (*High Analysts*

versus *Low Analysts,* and *Guidance* versus *No Guidance*). *Spread* is calculated as the difference between the ask and bid prices divided by the midpoint. MAR took effect in July 2016 in the European Union and prohibits corporate insiders from trading within 30 days prior to earnings announcements. Our unit of observation is firm-month. *High/Low Analysts* are defined as one if the number of analysts is greater/equal than/to zero and zero otherwise. *Guidance* (*No Guidance)* is equal to one if the firm issued/did not issue a guidance the prior year and zero otherwise. *Post* is a dummy variable equal to one for firm-months after the adoption of MAR (i.e., 06/07/2016 – 31/12/2018) and zero before (01/2014 – 05/07/2016). *Treatment* is a dummy variable equal to one for firm-months in countries where closed periods were introduced either for the first time with the adoption of MAR or where MAR increased trading restrictions and zero for firm-months in a control group that includes countries with existing and at least equally stringent closed periods prior to MAR. *Pre30* is a dummy variable equal to one for a period of 30 days prior to earnings announcement and zero for any other firm-month. *Post30* is a dummy variable equal to one for a period of 30 days subsequent to earnings announcement and zero for any other firm-month. The sample includes all European countries subject to MAR for which insider trading and earnings announcement data are available in the period 2014-2018. All variables are defined in Appendix A. T-statistics are reported in parentheses. $^{*, **, ***}$ denote significance at the 10%, 5% and 1% level, respectively. Standard errors are clustered at the country level.

Table 12. Annual vs. interim announcements

Dependent Variable	Probability		Spread	
Partition	Year End	Interim	Year End	Interim
Post × Treatment	0.001	-0.006	-0.070	-0.131**
	(0.055)	(-0.355)	(-0.914)	(-2.387)
Post	-0.035**	-0.016	-0.115	0.121***
	(-2.126)	(-1.576)	(-1.448)	(3.226)
Pre30 × Post × Treatment	**-0.034***	**-0.016**	**0.047**	**0.083***
	(-1.992)	**(-1.094)**	**(1.531)**	**(1.800)**
Post30 × Post × Treatment	-0.043	-0.012	0.016	0.007
	(-1.610)	(-0.785)	(0.507)	(0.349)
Post30 × Treatment	-0.161***	-0.073***	0.013	-0.018
	(-3.045)	(-3.285)	(0.559)	(-1.379)
Pre30 × Treatment	0.105***	0.072**	-0.047	-0.016
	(3.257)	(2.213)	(-1.565)	(-0.503)
Pre30 × Post	0.015*	-0.010	-0.008	0.001
	(1.922)	(-0.745)	(-0.472)	(0.051)
Post30 × Post	0.047*	0.014	0.008	0.001
	(2.034)	(1.093)	(1.009)	(0.028)
Pre30	-0.200***	-0.146***	-0.000	0.033
	(-9.920)	(-4.559)	(-0.002)	(1.354)
Post30	0.243***	0.127***	-0.042**	0.012
	(4.826)	(6.091)	(-2.482)	(1.299)
Size	0.023***	0.019***	-0.112***	-0.169***
	(3.962)	(4.481)	(-4.079)	(-11.538)
Book-to-Market	-0.031***	-0.031***	0.220***	0.230***
	(-4.118)	(-2.952)	(3.495)	(3.817)
Return FYE	-0.004	-0.008	-0.056	0.102***
	(-0.514)	(-0.732)	(-0.881)	(3.460)
Negative Earnings	-0.036***	-0.026**	0.105*	0.100*
	(-4.506)	(-2.364)	(1.931)	(2.009)
Volatility			21.513***	14.908***
			(4.615)	(4.570)
Rank SUE			0.015	0.024**
			(1.322)	(2.661)
Price			0.000**	0.000
			(2.157)	(1.676)
Turnover			-0.914***	-1.119***
			(-7.491)	(-8.321)
Ln (Analysts)			-0.262***	0.034
			(-3.906)	(0.958)
Guidance			-0.120**	-0.169***
			(-2.594)	(-4.484)
GDP	0.000	0.000	0.000	0.000
	(0.426)	(0.279)	(0.187)	(0.133)
GDP Growth	-0.001	-0.001	-0.044	-0.009
	(-0.729)	(-0.708)	(-1.353)	(-0.929)
Observations	24,177	53,585	77,762	77,762
R-squared	0.1085	0.0597	0.0408	0.0609
Cluster	Country	Country	Country	Country
Year FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No
Country FE	Yes	Yes	Yes	Yes

This table presents regression results for difference-in-difference tests for the probability of insider trading (columns 1-2) and bid-ask spread (columns 3-4) around the adoption of Market Abuse Regulation (MAR) adoption depending on whether the earnings announcement is for annual or interim fiscal periods (*Year end* versus *Interim*). Probability is the dependent variable equal to 1 if there is at least one insider in a firm-month and zero otherwise. *Spread* is calculated as the difference between the ask and bid prices divided by the midpoint. MAR took effect in July 2016 in the European Union and prohibits corporate insiders from trading within 30 days prior to earnings announcements. Our unit of observation is firm-month. *Year End* are results that consider closed periods before end of year earnings announcement. *Interim* are results that consider close periods before either quarterly or semiannual earnings announcement, depending on firm's reporting regime. *Post* is a dummy variable equal to one for firm-months after the adoption of MAR (i.e. 06/07/2016 – 31/12/2018) and zero before (01/2014 – 05/07/2016). *Treatment* is a dummy variable equal to one for firm-months in countries where closed periods were introduced either for the first time with the adoption of MAR or where MAR increased trading restrictions and zero for firm-months in a control group that includes countries with existing and at least equally stringent closed periods prior to MAR. *Pre30* is a dummy variable equal to one for a period of 30 days prior to earnings announcement and zero for any other firm-month. *Post30* is a dummy variable equal to one for a period of 30 days subsequent to earnings announcement and zero for any other firm-month. The sample includes all European countries subject to MAR for which insider trading and earnings announcement data are available in the period 2014-2018. All variables are defined in Appendix A. T-statistics are reported in parentheses. *, **, *** denote significance at the 10%, 5% and 1% level, respectively. Standard errors are clustered at the country level.