Orderly markets

DVC mechanism – impact on EU equity markets

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We provide evidence on the impact of MiFID's DVC mechanism on European equity markets in the first six months of its application. The DVC mechanism introduces limits on the amount of transactions executed in dark pools and aims to protect the price discovery process in equity markets. We find that, overall, for equities, most of the trading is executed in lit markets. We also analyse the impact of the DVC mechanism on market liquidity in lit markets, building on a set of market liquidity indicators. The results are mixed. For equities banned by the DVC mechanism, market liquidity in lit markets improved in terms of tightness, breadth and depth (measured by bid ask spreads, turnover, and the Amihud index), while it worsened when measured by the turnover ratio and average trade size.

Background

In the past ten years European equity markets have changed profoundly owing to several factors, including the implementation of MiFID combined with the effect of technological advances. Following the introduction of MiFID, competition between venues in the trading of financial instruments has increased significantly. Across countries, in 2018 the market share of the incumbent national exchange was, on average, between 60% and 70% of total European electronic order book trading in equities.[81] The rapid technological changes and, in particular, the growth of automated trading and high-frequency trading have raised concerns about possible new risks to the orderly functioning of markets. Moreover, the financial crisis highlighted the weaknesses in the functioning and the transparency of financial markets, and the need to strengthen the regulation. Against this background, MiFID II and MiFIR were published in 2014[82], triggering a major overhaul of European securities legislation.

A key goal of MiFID II/MiFIR is to ensure a higher level of transparency. For equity trading this goal is related to the need to ensure the proper functioning of the price-formation process and it has been translated in the so-called DVC mechanism. The DVC mechanism introduces limits on the amount of transactions executed in dark pools and aims to protect the price discovery process in equity markets.

In this article we focus on the impact of the DVC mechanism on European equity markets in the first six months of application. After providing a review of the regulatory background, we present some empirical evidence for the period between January 2018 and September 2018, based on MiFID DVC data, related to the changed trading patterns in EU equity markets. We find that, overall, for equities most of the trading is executed in lit markets. For the equities banned by the DVC mechanism in March 2018 and for which the ban ended in November 2018, the amount of trading executed in dark pools[83] dropped as expected, from more than 7% in January 2018 to less than 1% of the total in August 2018,[84] while the share of trading in periodic auctions increased over the same period from virtually 0% to 4% of the total. However, as the restriction for a number of instruments ended in September, the volume of trading executed in dark pools increased to more than 5% and the volume in periodic auctions declined to 2%. Then, using commercial databases for the period between January 2018 and August 2018, we analysed the impact of the DVC mechanism on market liquidity in lit markets, building on a set of market liquidity indicators. The results are mixed. For equities banned by the DVC mechanism, market liquidity in continuous trading and auction

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[80]   The article has been authored by Claudia Guagliano, Cyrille Guillaumie, Alessandro Spolaore and Arianna Zanon.

[81]   See Fidessa Fragmentation Index https://fragmentation. fidessa.com/ and FESE (2018).

[82]   Directive 2014/65/EU (MiFID II) https://eur-lex.europa.eu /legal-content/EN/TXT/HTML/?uri=CELEX:32014L0065& from=en and Regulation No. 600/2014 (MiFIR) https://eur-lex.europa.eu/legal-content/EN/TXT /HTML/ ?uri=CELEX:32014R0600&from=EN.

[83]   In this article we define trading in dark pools as the trading happening under the negotiated transactions waiver or the reference price waiver.

[84]   As explained in the section "Regulatory background", the share of trading in dark pools for the banned equities is higher than 0 because for some ISINs the ban can be applied to one trading venue.

markets (lit markets) generally improved in terms of breadth, tightness and depth (measured by bid ask spreads, turnover, and the Amihud index and the turnover ratio) but it worsened when measured by the turnover ratio and the average trade size.[85]

Regulatory background

In 2007, MiFID introduced the concept of pre-trade transparency waivers, meaning that – where waivers apply – bid and offer prices did not need to be published by the trading venue before an order was executed.

The waivers introduced by MiFID allowed for the creation of dark pools. MiFID permitted competent authorities to grant four types of waivers:

— Reference price waiver (RPW): systems matching orders based on the midpoint within the current bid and offer process of the trading venue where that financial instrument was first admitted to trading or the most relevant market in terms of liquidity.

— Negotiated trade waiver (NTW): systems that formalise negotiated transactions.

— Large in scale (LIS): orders that are large in scale compared with normal market size.

— Order management facility (OMF): orders held in an order management facility of the trading venue pending disclosure.

Concerns have mounted over time that the waivers have not been implemented consistently across markets and venues, resulting in a lack of price discovery. To address this issue, MiFID II introduced the DVC mechanism to limit the amount of dark trading in equities allowed under the reference price waiver and the negotiated trade waiver for liquid instruments.[86] In particular, dark trading in equity and equity-like instruments is limited in the case of instruments whose percentage of trading on a single trading venue under the waivers is higher than 4% of the total volume of trading in those financial instruments across all EU trading venues over the previous twelve months; and whose percentage of trading across all EU trading venues under the waivers is higher than 8% of the total volume of trading in that financial instrument across all EU trading venues over the previous twelve months.[87]

When the percentage of trading in a financial instrument carried out on a trading venue under the waivers has exceeded the 4% limit, the use of those waivers in the financial instrument is suspended on that venue for a period of six months. When the percentage of trading in a financial instrument carried out on all trading venues across the EU under those waivers has exceeded the 8% limit, the use of those waivers is suspended in all trading venues across the EU for a period of six months.[88]

Every month the DVC is calculated per instrument (ISIN) on the basis of the average of trading executed in that instrument over a rolling period of twelve months.

ESMA regularly publishes the results of the DVC on its website in the Double Volume Cap Register. The results were first published on 7 March 2018.[89]

As of September 2018, the application of the DVC resulted in the suspension of dark trading for more than 1200 instruments, mainly equities.

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[85] The sample used for the econometric analysis is based on commercial databases and includes a subset of the equities banned by the DVC mechanism.

[86] The volume cap mechanism shall not apply to negotiated transactions which are in a share, for which there is not a liquid market (MiFIR article 5). In a liquid market a share is traded daily where the market is assessed according to the following criteria: i) the free float is not less than EUR 100 million for shares admitted to trading on a regulated market and not less than EUR 200 million for shares that are only traded on MTFs; ii) the average daily number of transactions in the share is not less than 250; iii) the average daily turnover for the share is not less than EUR 1 million (Commission delegated regulation (EU) 2017/567).

[87] According to Article 5(1) of MiFIR, to ensure that the use of the negotiated trade waiver and of the reference price waiver (provided for in Article 4(1)(a) and 4(1)(b)(i) of MiFIR) does not unduly harm price formation, trading under those waivers is restricted as follows: (a) the percentage of trading in a financial instrument carried out on a trading venue under those waivers shall be limited to 4% of the total volume of trading in that financial instrument on all trading venues across the Union over the previous 12 months. (b) overall Union trading in a financial instrument carried out under those waivers shall be limited to 8% of the total volume of trading in that financial instrument on all trading venues across the Union over the previous 12 months.

[88] See Article 5(2) of MiFIR: "When the percentage of trading in a financial instrument carried out on a trading venue under the waivers has exceeded the limit referred to in paragraph 1(a), the competent authority that authorised the use of those waivers by that venue shall within two working days suspend their use on that venue in that financial instrument based on the data published by ESMA referred to in paragraph 4, for a period of six months". See also Article 5(3) of MiFIR: "When the percentage of trading in a financial instrument carried out on all trading venues across the Union under those waivers has exceeded the limit referred to in paragraph 1(b), all competent authorities shall within two working days suspend the use of those waivers across the Union for a period of six months".

[89] ESMA shall regularly publish the results of the DVC mechanism on its website in the Double Volume Cap Register. On a temporary basis, the results of the DVC mechanism will be published on the ESMA website in spreadsheet format. https://www.esma.europa.eu/double-volume-cap-mechanism

Periodic auctions

With the application of MiFID II and MiFIR on 3 January 2018, periodic auction trading systems have been rapidly gaining market share. This trend has further accelerated following the start of the first suspensions of trading under the DVC waivers for instruments in March 2018.

Sometimes also called auctions on demand, the periodic auction trading systems for equity instruments are auctions of a very short duration triggered by market participants ('frequent batch auctions') and occurring during the trading day.[90] MiFID II and MiFIR do not provide a definition of periodic auction trading systems as such. However, Commission Delegated Regulation 2017/587 further specifies the pre-trade transparency requirements for different types of trading systems, including periodic auction trading systems. According to Table 1 of Annex I of the Delegated Regulation a periodic auction trading system is 'a system that matches orders based on a periodic auction and a trading algorithm operated without human intervention'.[91]

Trading venues operating periodic auction systems collect offers to sell (buy) financial instruments at or above (below) a minimum (maximum) price by the selling (buying) firm. Based on those offers, the trading algorithm determines a single 'uncrossing' price which maximises the volume of instruments that can be executed at that price.

Periodic auctions are not a new development; they have been used for a long time, either in the form of closing and opening auctions to set the price for the beginning or the closure of the trading day or, for less liquid instruments, in the form of intra-day auctions to gather sufficient liquidity to allow trading. Moreover, following a trading interruption due to market volatility, most trading venues resume normal operations via an auction. Those trading systems can be labelled as 'conventional periodic auction systems'.

Recently, with frequent batch auction systems a new type of periodic auction trading system has gained market share. While those frequent batch auctions, including auctions on demand, function in a similar way to conventional periodic auctions operated by many trading venues, two differences between conventional periodic auctions and the frequent batch auctions can be noted.

First, the duration of frequent batch auctions is very short and lasts only some milliseconds, as opposed to conventional periodic auctions that last several minutes. Second, whereas conventional periodic auctions are scheduled by the trading venue, for frequent batch auctions two different models for triggering an auction exist. One commonly used approach is to collect trading interest throughout the day, and to trigger a 'call period' every time a pair of opposing orders can be matched. Another frequent approach is to trigger an auction as soon as one order has been submitted.

On 9 November 2018, ESMA published a call for evidence on this issue to gather further insights from stakeholders before concluding its assessment and considering whether further ESMA measures or recommendations are needed for those new types of trading systems.[92]

Empirical evidence

ESMA published the calculations related to the DVC mechanism for the first time on 7 March 2018, and, since then, it has published the results monthly. The total number of ISINs in the DVC mechanism scope was more than 25,000 as of September 2018. Overall, for the ISINs included in the sample, volumes of continuous trading and auctions (including opening and closing auctions and post-circuit-breaker auctions) represent most of trading, being constantly well above 90%. In the overall sample, periodic auctions increased from less than 0.1% at the beginning of 2018 to around 2% in September 2018. Trading in dark pools under the reference price waiver, and the negotiated trade waiver, decreased from around 5% at the beginning of 2018 to less than 3% in September 2018. During the same period, the total volume traded remained broadly stable, around EUR 680bn on average over ten trading days (V.1).

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[90]   Budish et al (2015) find that when high-frequency trading is prevalent, frequent batch auctions may eliminate the mechanical arbitrage rents, enhance liquidity for investors, and stop the high-frequency trading arms race.

[91]   Commission Delegated Regulation 2017/583 (RTS 2) provides for the same definition for periodic auction trading systems for non-equity instruments.

[92]   https://www.esma.europa.eu/press-news/esma-news /esma-launches-call-evidence-periodic-auctions-equity-instruments. The call for evidence ended on 11 January 2019.

V.1
Trading volumes for all ISINs in DVC scope
Increase in periodic auction trading
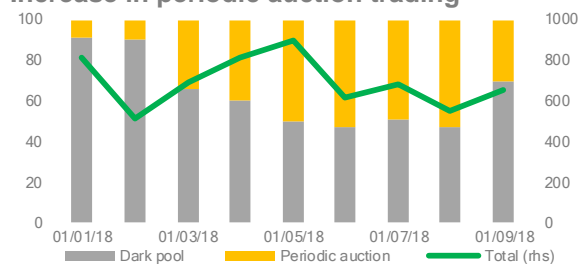
Note: Total includes trading volumes for continuous trading and auctions (conventional auctions as part of regular trading, including opening and closing auctions and post-circuit breaker auctions), periodic auctions and under the waivers trading, in EUR bn. Trading volumes under the waivers and in periodic auction expressed as a share of the sum of under the waivers and periodic auctions.
Sources: ESMA.

V.2
Trading volume for banned ISINs
Dark trading dropped for banned ISINs
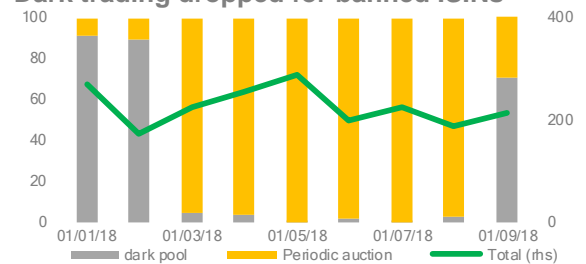
Note: Total includes trading volumes for continuous trading and auctions (conventional auctions as part of regular trading, including opening and closing auctions and post-circuit breaker auctions), periodic auctions and dark pool trading, in EUR bn. Trading volumes in dark pool and periodic auction expressed as a share of the sum of dark pools and periodic auctions.
Sources: ESMA.

The number of ISINs banned by the DVC mechanism as of September 2018 was 1,356 (around 5% of the total).[93]

For the ISINs banned by the DVC publications, volumes of continuous trading and auctions (including opening and closing auctions and post-circuit-breaker auctions) also represent more than 90% of the volumes traded. The ban introduced by the DVC publication mostly affects the share of volumes traded in periodic auctions and in dark pools under the reference price waiver and the negotiated trade waiver. For the 618 ISINs that were banned in March 2018 for the following six months, and for which the ban was removed in September 2018, traded volumes in dark pools experienced large fluctuations. In January 2018, the sum of volumes traded in dark pools and periodic auctions amounted to 8% of the total volume traded, then it declined to less than 3% in March 2018, and then gradually increased to 4% in August and to 7% at the end of September 2018.[94] In particular, the decline was driven by the drop of dark pool volumes which shrank from more than 7% to 0% of the total in August 2018. Over the same period, the volume traded in periodic auctions – i.e. recurring auctions on individual ISINs, based on distinct order books – increased from 0.2% to almost 4% of the total between January and August 2018. When, in September 2018, the ban was removed, the volume traded in dark pools immediately surged to more than 5% of the total, while the share of trading volume in periodic auctions declined to 2% (V.2).

For the ISINs banned by one of the DVC publications between March and September 2018, excluding the ISINs for which the suspension was removed in September 2018, volumes of continuous trading and auctions (including opening and closing auctions and post-circuit-breaker auctions) represent most of the trading, being constantly above 90%. These ISINs experienced a decline of the trading volumes in dark pools, like the ISINs banned by the DVC mechanism in March 2018.[95] However, in contrast with the previous category, in September 2018, the share of trading in dark pools continues to decline and no structural change is observed. In particular, dark pool volumes shrank from almost 8% to 2% of the total between January 2018 and September 2018, while volume traded in periodic auctions – i.e. recurring auctions on individual ISINs, based on distinct order books – increased from 0.7% to 2.4% of the total over the same period (V.3).

[93] The large majority of suspensions involved equities for which their percentage of trading across all trading venues under the waivers goes beyond 8% of the total volume of trading in that financial instrument across all EU trading venues over the previous twelve months. Less than 1% of suspensions concerned equities for which their percentage of trading on a single trading venue under the waivers went beyond 4% of the total volume of trading in

those financial instruments across all EU trading venues over the previous twelve months.

[94] Volumes traded under the large in scale waiver are excluded from the analysis as they are outside the scope of the DVC publication.

[95] The decreasing share of trading in dark pools derives directly by the increasing number of ISINs getting banned by the subsequent publications.

V.3
Trading volume for banned ISINs
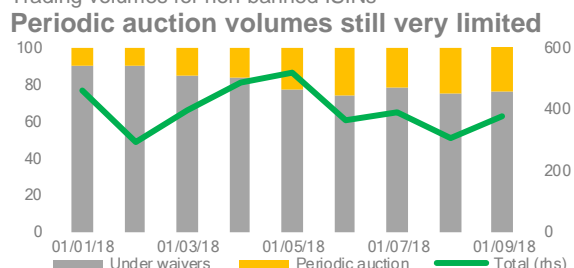**Dark trading dropped for banned ISINs**
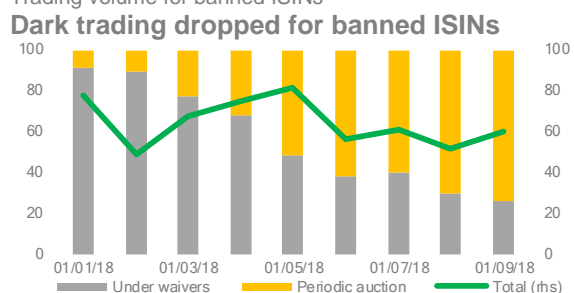
Note: Total includes trading volumes for continuous trading and auctions (conventional auctions as part of regular trading, including opening and closing auctions and post-circuit breaker auctions), periodic auctions and under the waivers trading, in EUR bn. Trading volumes under the waivers and in periodic auction expressed as a share of the sum of under the waivers and periodic auctions.
Sources: ESMA.

Finally, for the ISINs that have never been affected by the ban introduced by the DVC mechanism over the period considered (around 24,000 ISINs), trading volumes remained broadly stable in relative terms and no structural changes in trading could be identified. Continuous trading and auctions represent 96% of the total trading volume (up from 95% at the beginning of the year), while volumes traded in periodic auctions slightly increased from less than 0.1% to around 1% of the total; trading volumes in dark pools under the reference price waiver and the negotiated trade waiver slightly decreased from around 4% at the beginning of the year to around 3% of the total volume traded in September 2018 (V.4).

V.4
Trading volumes for non-banned ISINs
Periodic auction volumes still very limited

Note: Total includes trading volumes for continuous trading and auctions (conventional auctions as part of regular trading, including opening and closing auctions and post-circuit breaker auctions), periodic auctions and under the waivers trading, in EUR bn. Trading volumes under the waivers and in periodic auction expressed as a share of the sum of under the waivers and periodic auctions.
Sources: ESMA.

Market liquidity impact

We investigate market liquidity in EU equity markets in the period between 1 January 2018 and 30 November 2018, focusing on the impact of the publication of the first calculations of the DVC mechanism by ESMA on 7 March 2018. We analyse market liquidity in continuous trading and auction markets and assess if a different impact on market liquidity could be identified for the equities affected by the DVC ban on 7 March and for those that have not been affected by the ban in the observation period.

It is widely recognised that liquidity is not a concept that is directly observed or uniquely defined and cannot be captured by one single metric. In line with the related literature, we analyse several dimensions of market liquidity building on liquidity proxies that can be meaningfully developed, also relying on trade level data: tightness, depth, breadth and resilience.[96] Tightness identifies the possibility of executing transactions at a low cost. Depth, which using order-level data refers to the existence of enough orders at prices above or below market price, can also be meaningfully proxied by looking at volumes of trades. Breadth can be defined as the ability to transact large volumes with a minimum impact on prices: it can be proxied by the Amihud illiquidity index, by the turnover ratio and by the average trade size. Finally, resilience refers to the availability of liquidity in periods of higher volatility and market stress.[97]

Data used

For this analysis, we use ESMA's Financial Instruments Transparency System (FITRS) data as the primary source.[98] Our sample comprises 1,934 ISINs corresponding to liquid equities. The sample covers 129 trading venues between 1 January 2018 and 30 November 2018. All trading venues on which trades occurred for the ISINs in the sample during the observation period are included. For each ISIN, information is available about the relevant trading types: continuous trading and auction, dark, OTC[99], periodic auction and systematic internaliser. Over the analysed period, 82% of the trades and 64%

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[96]   We could not analyse those dimensions of market liquidity that require order-level data to more precisely measure liquidity, such as, immediacy, considered as the speed at which orders can be executed.

[97]   See De Renzis et al (2018) for a review of market liquidity indicators.

[98]   https://www.esma.europa.eu/policy-activities/mifid-ii-and-mifir/transparency-calculations

[99]   OTC is identified by the Market Identifier Code (MIC) 'XOFF' corresponding to financial instruments admitted to trading, or traded on a trading venue or for which a request for admission was made, where the transaction on that financial instrument is not executed on a trading venue, SI or organised trading platform outside of the Union, or where an investment firm does not know it is trading with another investment firm acting as an SI.

of the turnover happened in continuous trading and auction markets (V.5).[100]

V.5
Summary statistics
The dataset: trading venue information

	Number of trading venues	Turnover	Number of trades
Continuous trading and auctions	66	372	69,730
SI	38	26	228
Dark	15	58	13,690
Periodic auction	10	7	1,051
OTC	-	123	67

Note: Continuous trading and auctions comprise continuous trading and conventional auctions as part of regular trading (including opening and closing auctions and post-circuit breaker auctions). Periodic auction is a system that matches orders based on a periodic auction and a trading algorithm operated without human intervention. Number of trading venues per type. Turnover in EUR bn, computed as a monthly average. Number of trades in thousands, computed as a monthly average.
Sources: ESMA.

We augment the database with data from Thomson Reuters Eikon to increase the information available for each equity.[101] Following the matching of the two datasets, our sample includes 537 ISINs.

The sample period includes the entry into force of MiFID 2/MiFIR, with the first publication of the results of the DVC mechanism on 7 March 2018. To analyse the impact of the DVC mechanism on the trading structure in the EU markets we keep only those ISINs that do not change status (banned vs non- banned) after the first publication of the DVC mechanism on 7 March 2018. As a result, we are left with 481 ISINs, including 217 banned ISINs and 265 non-banned ISINs.[102]

At the ISIN level, daily information is retrieved from Thomson Reuters Datastream about mid-price, bid-ask spread, returns, returns volatility and market capitalisation (V.6).

V.6
Summary statistics
The dataset: ISIN level information

	Banned	Non-banned
Bid-ask spread	0.002	0.003
Returns	0.002	0.002
Returns volatility	0.7	0.6
Market capitalisation	7.6	8.8
Number of ISINs	217	265

Note: The summary statistics represent monthly averages of January and February 2018. Bid-ask spread in basis points; market capitalisation in EUR bn. Returns are computed as a weekly average and are expressed as a percentage.

Empirical approach

We analyse the impact of the DVC mechanism on market liquidity in continuous trading and auction markets following a difference-in-difference approach. The baseline model is the following:

$$Y_{it} = \alpha_i + \beta Ban_{it} + \gamma Event_t + \delta ISIN_{it} + \epsilon_{it}$$

where:

— i represents the ISIN included in the analysis and t is a time variable for each trading day between 1 January 2018 and 30 November 2018.

— Y_{it} is one of our liquidity measures. To obtain a comprehensive assessment of the impact on market liquidity, we employ more than one dependent variable measuring its different dimensions: turnover, bid-ask spreads, the turnover ratio, the average trade size and the Amihud illiquidity index.

— Ban_{it} is a dummy variable equal to one for the banned instruments after the first publication of the DVC mechanism on 7 March 2018.

— $Event_{it}$ is a dummy variable equal to one after the first publication of the DVC mechanism on 7 March 2018.

— $ISIN_{it}$ includes the other relevant controls at the ISIN level.

The control variables included at ISIN level are:

— A fragmentation index calculated as the inverse of the Herfindahl-Hirschman Index which is a widely used measure to determine the concentration of a market. This is in line with the Fidessa Fragmentation Index. As shown by Degryse et al (2015) fragmentation may have a significant impact on market liquidity. In particular, visible fragmentation improves liquidity aggregated over all visible trading venues but may lower liquidity in the traditional market.

— The periodic auction share of trading volume, which is closely related to the fragmentation indicator. A larger portion of trading happening in periodic auctions may be negatively related to market liquidity in continuous trading and auctions markets. In the same spirit, the share of daily SI and OTC trading at ISIN level is added.

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[100] Volumes traded and transactions in all categories except lit markets may be underestimated. The bias may be particularly relevant for periodic auctions (one trading venue available), dark pools (two trading venues) and OTC (five trading venues).

[101] To analyse market liquidity price information as bid-ask spreads and end-of -day prices are particularly relevant.

[102] The share of banned ISINs in the sample we use for the econometric analysis is much larger than in the sample of ISINs included in the DVC scope (58% vs less than 1%).

— Tick size, which is important for market liquidity. If the tick size is too small, the outbidding cost is extremely low, and liquidity does not aggregate effectively as there are too many increments of possible prices. If the tick size is too large the passive execution latency increases and can discourage investors from placing orders in the book.[103]

— Market capitalisation, which is used to control for firm size. As larger firms generally benefit from larger coverage by financial analysts, they tend to have larger trading volumes and possibly higher market liquidity.

— The lagged volatility of returns, which is added to consider market developments and uncertainty in the market.[104]

Finally, we add time fixed effects in the panel estimation.

Results

The effect of the ban on market liquidity seems to be overall positive (V.7).[105] On the one hand, consistently with the scope of the DVC mechanism, the turnover in continuous trading and auction markets of banned ISINs significantly increased following the ban, meaning that a portion of trading shifted from dark pools to continuous trading and auction markets. This happened even though trading volume in our sample has generally decreased in the same period, as underlined by the sign and the statistical significance of the coefficient of the dummy variable *Event*. In addition, banned instruments have reduced their price responsiveness to volumes traded, since their Amihud illiquidity index is negatively correlated with the *Ban* dummy, suggesting an increase in market liquidity.

Banned instruments experienced a decrease in the bid-ask spread compared with the ISINs not affected by the ban after the first publication of the DVC mechanism, pointing to a lower tightness in the market.

On the other hand, the ban reduced the average trade size and the turnover ratio for the affected ISINs, signalling a potential slight deterioration of market liquidity.

Overall trading in the equities included in our sample has been lower over the analysed period following the first publication of the DVC mechanism, and this may have had an impact on the results. [106]

V.7
Econometric results
DVC mechanism impact on market liquidity

	Turnover	Bid-Ask	Trade Size	Turnover Ratio	Amihud index
Ban	+***	-*	-***	-	-***
Event	-***	+*	-	-***	-***
Fragmentation	+***	+	+***	-	+***
Capitalisation	+***	-***			-
Tick Size	+	-	-***	+	-*
Periodic Auction	-***	-	-***	-***	+***
SI	-	+	-***	-**	-***
OTC	-	-	+***	+***	-
Volatility	+	+*	-	+*	+
Observations	75,993	75,993	75,993	75,993	75,993

Note: Estimated coefficients from a fixed-effects panel regression, where the dependent variables represent different dimensions of liquidity. A positive coefficient indicates that the explanatory variable and the liquidity measure considered are positively correlated. ***Statistically significant at 99%, **Statistically significant at 95%, *Statistically significant at 90%.
Sources: ESMA.

An increase in the tick size has a significant and negative effect on average trade size and on the Amihud index, while it does not have a significant impact on turnover, the turnover ratio and the bid-ask spread in our estimates.[107]

As expected, a rise in the share of auction trading negatively affects liquidity in continuous trading and auctions markets, as shown by the negative coefficient relative to turnover, the turnover ratio, the average trade size and the positive coefficient for the Amihud index.

Market fragmentation is related to larger volumes and larger trade size in lit markets but with lower market liquidity in lit markets when measured by bid-ask spreads, the Amihud ratio, trade size and the turnover ratio.

These preliminary results point to a mixed impact of the DVC mechanism on market liquidity in the lit markets, depending on the dimension of market liquidity analysed. Overall, it is possible to state that bid-ask spreads, turnover and price response to volumes have improved, even though the turnover ratio and the average trade size seem to have been adversely affected.

Conclusion

In this article we focus on the impact of the DVC mechanism on European equity markets in the first six months of application. After providing a review of the regulatory background, we present

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[103] See AMF (2018) for a first analysis of the new tick size regime introduced by MiFID 2/MiFIR.

[104] The lagged returns are calculated for each ISIN as the returns of the week preceding time t.

[105] We have picked the most representative specification, but the results are relatively consistent across different ones.

[106] This result is confirmed when time fixed effects are added to the regressions.

[107] A comprehensive analysis of the impact of tick size on market liquidity is left for future research. The preliminary results obtained are not completely consistent with AMF (2018), in which an increase in the tick size is positively correlated with a widening of the spreads.

some empirical evidence related to the changed trading patterns in EU equity markets. We find that, overall, for equities most of the trading is executed in lit markets. For equities banned by the DVC mechanism in March 2018, the amount of trading in dark pools dropped as expected from more than 7% in January 2018 to less than 1% of the total in August 2018 while the share of trading in periodic auctions increased over the same period from virtually 0% to 4% of the total. However, as the restriction ended in September, the volume of trading executed in dark pools increased to more than 5% and the volume in periodic auctions declined to 2%. We then analyse the impact of DVC mechanism on market liquidity in lit markets, building on a set of market liquidity indicators. The results are mixed. For equities banned by the DVC mechanism, market liquidity in lit markets improved in terms of tightness, breadth and depth (measured by bid ask spreads, turnover and the Amihud index) while it worsened when measured by the turnover ratio and average trade size.

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